EXHIBIT P
FISH AND WILDLIFE HABITAT
OAR 345-021-0010(1)(P)

CONTENTS

1.0 INTRODUCTION....5
1.1 DEFINITION OF TERMS....5
1.1.1 Site Boundary....5
1.1.2 Analysis Area....5
1.2 EXHIBIT OVERVIEW....5
1.3 INFORMATION REVIEW....6

2.0 BIOLOGICAL AND BOTANICAL SURVEYS....7
2.1 SURVEY METHODS....7
2.1.1 Database Searches....7
2.1.2 Habitat Mapping....8
2.1.3 Vegetation Surveys....8
2.1.4 Wetland Surveys....9
2.1.5 Wildlife Surveys....9
2.1.6 Raptor Surveys....9
2.1.7 Fisheries Surveys....9

3.0 FISH AND WILDLIFE HABITAT....10
3.1 GENERAL HABITAT CONDITIONS....10
3.2 ODFW HABITAT CATEGORIZATION....10
3.2.1 Upland Habitats....12
3.2.2 Freshwater Wetland Habitats....14
3.2.3 Estuarine Habitats....16
3.2.4 Nature, Extent, and Duration of Impacts....18

4.0 MAP OF HABITAT LOCATIONS....19

5.0 IDENTIFICATION OF POTENTIAL STATE SENSITIVE SPECIES AND SITE-SPECIFIC ISSUES....20
5.1.1 Amphibians and Reptiles....32
5.1.2 Birds....32
5.1.3 Mammals....33
5.1.4 Marine Mammals....34
5.1.5 Fish....34
5.1.6 Macro-invertebrates....35
5.1.7 Plants....35
5.2 OREGON CONSERVATION STRATEGY SPECIES....36
5.3 SITE-SPECIFIC ISSUES OF CONCERN....36
5.3.1 Exotic and Invasive Species....36
5.3.2 Habitat Fragmentation....37
5.3.3 Noise Impacts on Birds....38
5.3.4 Wildlife-Salvage....38

6.0 BASELINE SURVEYS OF STATE SENSITIVE SPECIES 40

7.0 DESCRIPTION OF POTENTIAL ADVERSE IMPACTS 42
7.1 HABITAT IMPACTS 42
7.1.1 Upland Habitat 42
7.1.2 Freshwater Wetlands 43
7.1.3 Estuarine Habitat 43
7.2 FISH AND WILDLIFE 45
7.2.1 Amphibians and Reptiles 46
7.2.2 Birds 46
7.2.3 Terrestrial Mammals 48
7.2.4 Marine Mammals 48
7.2.5 Fish 48
7.2.6 Aquatic Invertebrates 49
7.2.7 Plants 49
7.3 NOISE EMISSIONS 49
7.4 LIGHT EMISSIONS 51
7.5 HABITAT FRAGMENTATION 52

8.0 MITIGATION MEASURES 53
8.1 AVOIDANCE AND MINIMIZATION 53
8.1.1 Upland Habitat 53
8.1.2 Wetland Habitats 56
8.1.3 Estuarine Habitat 58
8.1.4 Wildlife Salvage 59
8.2 MITIGATION 60
8.2.1 Upland Habitat 60
8.2.2 Wetland Habitat 61
8.2.3 Estuarine Habitat 61

9.0 MONITORING PLANS 62
9.1 SDPP SITE MONITORING 62
9.2 MITIGATION SITE MONITORING 63
9.2.1 As-Built Survey 64
9.2.2 Photo Documentation 64
9.2.3 Mitigation Objectives and Performance Standards 64
9.2.4 Contingency Plan 65

10.0 PROPOSED FINDINGS 66

11.0 REFERENCES 67

TABLES

Table P-1. Botanical, Fish, and Wildlife Surveys: Timing and Scope 6
Table P-2. Summary of ORBIC Data Provided for the SDPP 7
Table P-3. Fish and Wildlife Habitat Mitigation—Key Definitions 10
Table P-4. Botanical, Fish, and Wildlife Surveys: Timing and Scope 10
Table P-5. Nature, Extent, and Duration of Habitat Impacts 17
Table P-6. State Sensitive Wildlife Species Known to Occur, or with the Potential to Occur, within the Analysis Area 20
Table P-7. Noxious Species Occurrence with the Analysis Area 36
Table P-8. Nature and Duration of Impacts 44
Table P-9. SDPP Wildlife Habitat Mitigation Acreage Provided at the Panhandle Mitigation Site 59

FIGURES

Figure P-1. Vicinity Map
Figure P-2. ODFW Wildlife Habitat Types and Categories within the Analysis Area
Figure P-3. ODFW Wildlife Habitat Types and Categories within the Site Boundary: Existing Condition
Figure P-4. ODFW Wildlife Habitat Impact Areas
Figure P-5. Field Survey Dates and Locations
Figure P-6. Noxious Weed Occurrence within the Site Boundary
Figure P-7. EFSC Wildlife Habitat Mitigation Acreage

APPENDICES

Appendix P-1 Agency and Stakeholder Correspondence
Appendix P-2 LBJ Enterprises 2006 Pre-Construction Wildlife Survey Report
Appendix P-3 SHN 2013 Botanical Resources Assessment Report
Appendix P-4 SHN 2013 Wildlife Assessment Survey Report
Appendix P-5 Alice Berg 2006 Fisheries Report, Relevant Excerpts
Appendix P-6 DEA October 2014 Wildlife Habitat Mitigation Plan
Appendix P-7 ODFW Wildlife Division 2008 Sensitive Species List
Appendix P-8 BLM Coos Bay District Final North Spit Plan
Appendix P-9 Oregon Administrative Rules Division 415: ODFW Fish and Wildlife Habitat Mitigation Policy
Appendix P-10 Oregon Conservation Strategy, Summary of Strategy Species
Appendix P-11 Oregon Forest Practices Act Guidelines for Osprey, Great Blue Heron and Bald Eagles, Relevant Excerpts
Appendix P-12 Literature Review Sourcesrpts
Appendix P-13 Literature Review Sources

1.0 INTRODUCTION

OAR 345-021-0010(1)(p). *Information about the fish and wildlife habitat and the fish and wildlife species, other than the species addressed in subsection(q) that could be affected by the proposed facility, providing evidence to support a finding by the Council as required by OAR 345-022-0060.*

OAR 345-022-0060. *[T]he Council must find that the design, construction and operation of the facility, taking into account mitigation, are consistent with the fish and wildlife habitat mitigation goals and standards of OAR 635-415-0025 in effect as of September 1, 2000.*

The Jordan Cove Energy Project (JCEP) proposes to construct and operate the South Dunes Power Plant (SDPP), located in Coos Bay, Oregon, at the former Weyerhaeuser North Bend containerboard mill site. The mill was demolished in 2003 and the site is currently being used as an industrial waste landfill. Prior to the commencement of construction on the SDPP, the landfill will be closed and pre-construction activities will be conducted, including the placement of clean sand fill to approximately 46 feet in elevation over the majority of the site. Impacts to habitat and wildlife as a result of these activities are discussed in this Exhibit.

The site of the proposed SDPP is located on the North Spit of Coos Bay, adjacent to Jordan Cove. Coos Bay/North Bend is the largest urban area located in the Coast Range Ecoregion, and is a center for the fisheries, forestry and transportation industries (ODFW 2006a). Within the Coast Range Ecoregion, Coos Bay is located in the Coastal Lowlands, which are characterized by beaches, dunes, and marine terraces below 400 feet in elevation (Thorson et al. 2003).

1.1 DEFINITION OF TERMS

The following terms are outlined in detail to provide context for the information presented in Exhibit P. Figure P-1 illustrates the site boundary and analysis area in closer detail.

1.1.1 Site Boundary

The Energy Facility Siting Council (EFSC) Site Boundary is defined as the area encompassing the temporary and permanent direct impact footprint of the project. The site boundary consists of 137.86 acres, and includes the area of the former mill site, all temporary lay-down and staging areas, heavy haul road, utility corridor and barge berth.

1.1.2 Analysis Area

The analysis area for fish and wildlife species and habitat includes the area within the site boundary as well as a one-half mile buffer in all directions, as shown in Figure P-1.

1.2 EXHIBIT OVERVIEW

Exhibit P identifies and evaluates the fish and wildlife species and habitat that may be affected by the construction, operation, and retirement of the proposed SDPP. Potential impacts to

species and existing conditions from pre-construction activities at the site will be analyzed. Mitigation measures for impacts to species and habitat will also be analyzed.

Exceptions to fill areas within the site boundary are shown in Figures P-2 and P-3 and include narrow areas of dune forest and other native habitats, some more weedy habitats, and Department of State Lands (DSL) jurisdictional wetlands and estuarine habitat. Impacts to DSL jurisdictional habitat are addressed in Exhibit P, but will be mitigated for under the DSL removal fill permit application and associated Compensatory Wetland Mitigation Plan (Appendix J-2). Please refer to Exhibit J for a discussion of wetlands, estuarine habitat and associated permits.

Federally and/or state listed threatened, endangered, proposed or candidate species are discussed in detail in Exhibit Q.

1.3 INFORMATION REVIEW

Prior to conducting field surveys, the U.S. Fish and Wildlife Service (USFWS) list of federal species of concern that may occur in Coos County, Oregon (Appendix 5 of the SHN Wildlife Survey Assessment Report in Appendix P-4)), Oregon Department of Fish and Wildlife (ODFW) State Sensitive Species list (Appendix P-7), Bureau of Land Management (BLM) Final North Spit Plan (BLM 2006), and Oregon Biodiversity Information Center (ORBIC) species database search for Coos County (ORBIC 2013) were reviewed to help determine which state sensitive and other non-listed special-status species have the potential to occur within the analysis area. Following the literature review, a list was compiled of species that occur, or have the potential to occur, within the analysis area, which is provided in Table P-6.

2.0 BIOLOGICAL AND BOTANICAL SURVEYS

OAR 345-21-0010(1)(p)(A). *A description of biological and botanical surveys performed that support the information in this exhibit, including a discussion of the timing and scope of each survey.*

Fish and wildlife surveys of the analysis area were conducted in 2005 and 2006, and again in 2012 and 2013. The timing and scope of each survey is summarized in Table P-1. The objective of these surveys was to document the type and condition of habitat and identify the vegetation, fish, and wildlife species present in the analysis area.

Agency and stakeholder correspondence relating to fish and wildlife and environmental concerns in the analysis area are provided in Appendix P-1. Survey reports are provided in Appendices P-2 through P-5.

Table P-1. Botanical, Fish, and Wildlife Surveys: Timing and Scope

Survey Team	Survey Scope	Timing of Surveys
LBJ Enterprises (LBJ)	Wildlife and Herptile Area Searches, Bay Scans, and Raptor Scans	June 2005- November 2006
LBJ Enterprises	Track Plates	September 2005
EartHerp Consulting	Herptiles	September 2005
SHN Consulting Engineers & Geologists (SHN)	Plant Surveys	2005-2006
Alice Berg & Associates, LLC	Fisheries Surveys Review	2006
SHN Consulting Engineers & Geologists	Plant Surveys	August 2012- May 2013
SHN Consulting Engineers & Geologists	Wildlife and Herptile Area Searches, Bay Scans, and Raptor Scans	October 2012- July 2013

2.1 SURVEY METHODS

The following survey sections provide descriptions of the methods used to survey and map vegetation, wetlands, fish and wildlife, and habitat types in the analysis area.

2.1.1 Database Searches

The ODFW Sensitive Species List (Appendix P-7), which lists all sensitive species in the state of Oregon by sub-basin and by a status of Critical or Vulnerable, was consulted for the analysis area, which falls within the Coos sub-basin.

A list of state sensitive species documented in or near the analysis area was purchased from ORBIC in 2006, 2012, and 2013 for the overall JCEP. ORBIC data was requested for the 1/2-mile radius analysis area, with the exception of the 2013 query, which requested information within a five-mile radius of the site boundary. Per ORBIC's data use agreement, the species lists

purchased for the JCEP are confidential and, therefore, not included in the Appendices of this Exhibit. Table P-2 provides the dates when ORBIC data was provided for the project. The results of these database searches are discussed in Section 5.0.

Table P-2. Summary of ORBIC Data Provided for the SDPP

Date Received	Area Covered
March 24, 2005	Site Boundary and 0.5 miles from the Site Boundary
October 19, 2012	Site Boundary and 0.5 miles from the Site Boundary
July 24, 2013	Site Boundary and 5.0 miles from the Site Boundary

2.1.2 Habitat Mapping

Habitat types were identified and mapped by David Evans & Associates (DEA) during site visits conducted in 2012 and 2013. The intent of habitat mapping was to provide a summary of characteristic habitat features and composition suitable for compliance with ODFW Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-0000 through 0025). Vegetation associations were also mapped, which are defined by the presence of dominant species in the area. The Botanical Resources Assessment Report provided in Appendix P-3 (SHN 2013a) identifies the six major categories of vegetation associations in the analysis area as Forest, Woodland, Shrubland, Herbaceous, Other Plant Species (i.e. grass), and Dune Forest, and provides detailed information about these associations.

Habitat types were characterized according to dominant vegetation and overall condition of the vegetation community and included consideration of surrounding land uses. Habitat types were then digitized into a geographic information systems (GIS) database using aerial photos and field collected data. The GIS database was used to produce habitat maps and acreage estimates for each habitat type. Each habitat type was assigned to a specific habitat category according to the ODFW Fish and Wildlife Habitat Mitigation Recommendations in OAR 635-415-0025. Habitat categories refer to the "classification of a site or area based on its dominant plant, soil and water associations or other salient features (e.g. tidal influence, salinity, substrate, alkalinity, etc.) of value to support use by fish and wildlife (OAR 635-415-0005)." The complete Fish and Wildlife Habitat Mitigation Policy ruling is provided in Appendix P-9 and habitat maps are included in Figure P-3.

2.1.3 Vegetation Surveys

The SDPP site was surveyed and evaluated in 2005 and 2006, and again in 2012 and 2013. The 2012 and 2013 vegetation surveys were conducted to supplement the previous surveys and ensure that all existing botanical resources that may be directly impacted by the project were evaluated. Vegetation survey locations are provided in Figure P-5 and survey reports are provided in Appendix P-3.

Sensitive plant surveys included general habitat characterization by botanists familiar with species in the site area and habitat-specific sensitive plant species surveys in areas where suitable

conditions existed to support any of the target sensitive plant species identified through the project's information review.

2.1.4 Wetland Surveys

A complete description of wetland field survey methodology and results is provided in Appendix J.

2.1.5 Wildlife Surveys

Surveys for sensitive wildlife species known or likely to occur within the analysis area were conducted by qualified wildlife biologists in 2005 and 2006 (LBJ 2006). Additional surveys covering the relevant portions of the analysis area were conducted in 2012 and 2013 (SHN 2013b). Wildlife survey locations are provided in Figure P-5 and survey reports are provided in Appendices P-2 and P-4.

2.1.6 Raptor Surveys

Raptor surveys were conducted along with wildlife surveys in 2005 and 2006 (LBJ 2006). While raptor species were observed flying over the site, only three birds were observed perching within the site boundary. As a result, it was determined that additional nest surveys were not necessary for the SDPP site. Nest surveys were, however, conducted as part of the wildlife surveys in 2012 and 2013 (SHN 2013b). Raptor survey locations are provided in Figure P-5 and survey reports are provided in Appendices P-2 and P-4.

2.1.7 Fisheries Surveys

Alice Berg & Associates, LLC (ABA) compiled a fisheries report in 2006 (ABA 2006), which includes descriptions of the habitat subsystems that occur in Coos Bay (marine, lower bay, upper bay, slough, riverine), fish and invertebrate species known to occur, and essential fish habitat assessments for those species that occur within the analysis area. The fisheries report in provided in Appendix P-5.

3.0 FISH AND WILDLIFE HABITAT

OAR 345-21-0010(1)(p)(B). *Identification of all fish and wildlife habitat in the analysis area, classified by the habitat categories as set forth in OAR 635-415-0025 and a description of the characteristics and condition of that habitat in the analysis area, including a table of the areas of permanent disturbance and temporary disturbance (in acres) in each habitat category and subtype.*

3.1 GENERAL HABITAT CONDITIONS

Habitats within the analysis area include a variety of upland, wetland, and estuarine habitat types typical of the Coast Range ecoregion, as well as large areas of previously developed habitat within the site boundary (see Figure P-2). No irreplaceable habitat types were found within the analysis area during habitat surveys conducted by LBJ, SHN, or DEA.

Habitats in the northwest portion of the analysis area include undeveloped lands (forests, dunes, and wetlands) within the Oregon Dunes National Recreation Area, which is administered by the U.S. Forest Service (USFS). The western edge of the analysis area includes a portion of Henderson Marsh. Southwest of the analysis area, the Bureau of Land Management (BLM) manages a Special Recreation Management Area and the North Spit Area of Critical Environmental Concern. No other federal wildlife refuges, state game, or wildlife management areas exist within the ½-mile buffer outside of the site boundary.

The identification of existing wildlife habitat categories within the site, as well as potential impact and mitigation areas, were agreed upon by ODFW in a memorandum email dated October 30, 2013 (Appendix P-1). The accepted ODFW wildlife habitat types and categories are shown in Figures P-2 and P-3.

3.2 ODFW HABITAT CATEGORIZATION

The ODFW Habitat Mitigation Recommendations described in OAR 635-415-0025 prioritize fish and wildlife habitats for the six habitat categories outlined in Table P-3, and establish mitigation goals and recommendations for each category. Habitat categories are based on the dominant plant, soil, and water associations of value to the support and use of fish and wildlife. The six habitat categories range from irreplaceable, essential habitat (Category 1) to low potential habitat (Category 6). Each habitat category description also has corresponding mitigation recommendations for development actions that impact fish and wildlife habitat, from no net loss, to mitigation measures, to avoidance or minimization of impacts. Tables P-3 and P-4 summarize the habitat descriptions and categories as presented on the ODFW website (http://www.dfw.state.or.us/lands/mitigation_policy.asp).

Table P-3. Fish and Wildlife Habitat Mitigation—Key Definitions

Habitat Description	Definition
Essential Habitat	Any habitat condition or set of habitat conditions which, if diminished in quality or quantity, would result in depletion of a fish or wildlife species.
Limited Habitat	An amount insufficient or barely sufficient to sustain fish and wildlife populations over time.
Important Habitat	Any habitat recognized as a contributor to sustaining fish and wildlife populations over time.
Irreplaceable Habitat	Successful in-kind habitat mitigation to replace lost habitat quantity and/or quality is not feasible within an acceptable period of time or location, or involves an unacceptable level of risk or uncertainty.
Habitat with High Restoration Potential	Previous uses or activities that have reduced habitat values need to be able to be eliminated or severely reduced.

Table P-4. Botanical, Fish, and Wildlife Surveys: Timing and Scope

Habitat Category	Definition	Example	Goal for Mitigation	Mitigation Strategy
Category 1	Irreplaceable, essential and limited habitat	Bogs and fens, certain springs and pools	No loss of habitat quantity or quality	Avoidance
Category 2	Essential and limited habitat	Salt marshes, cottonwood galleries, big game winter range, salmonid migration corridors, some spawning and rearing areas	No net loss of habitat quantity or quality and to provide a net benefit of habitat	In-kind, in-proximity mitigation
Category 3	Essential habitat, or important and limited habitat	Older forested areas, reed canary grass wetland, spawning and rearing areas	No net loss of habitat quantity or quality	In-kind, in-proximity mitigation
Category 4	Important Habitat	Isolated or degraded wetlands, big game summer range, spawning, rearing and foraging areas	No net loss of habitat quantity or quality	In-kind or out-of-kind, in-proximity or off-proximity mitigation
Category 5	Habitat having high potential to become either essential or important habitat	Restorable rye grass fields or diked or drained coastal marshes, marshes, some types of reservoirs	Net benefit in habitat quantity or quality	Actions that improve habitat conditions
Category 6	Habitat that has low potential to become essential or important habitat	Urban Areas and other areas with little or no restoration potential, artificial ponds without native species	Minimize impacts	Minimize direct habitat loss and avoid off-site impacts

Characterizations of wildlife habitats potentially affected by construction of the SDPP were based on resource agency consultation, habitat mapping site visits, and the ODFW Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-0025).

3.2.1 Upland Habitats

3.2.1.1 Coastal Dune Forest Habitat

Coastal dune forest habitat consists of forested areas established on fully stabilized sand dunes in the region. It is found throughout the analysis area in various successional stages. Dominant species include Douglas fir (*Pseudotsuga menziesii)*, western hemlock (*Tsuga heterophylla*), shore pine (*Pinus contorta*) and Port Orford cedar (*Chamaecyparis lawsoniana*), with scattered Sitka spruce (*Picea sitchensis*). In some places, patchy canopy promotes vigorous shrub growth and cover, ranging from dense to nearly impenetrable (Appendix P-1).

Dominant shrubs are evergreen huckleberry (*Vaccinium ovatum*), salal (*Gaultheria shallon*), bearberry (*Arctostaphylos uva-ursi*), and Pacific rhododendron (*Rhododendron macrophyllum*), with scattered California wax myrtle (*Myrica californica*) and hairy Manzanita (*Arctostaphylos columbiana*). Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), and English ivy (*Hedera helix*) are common along the edges of the forest in some places, primarily near recent or historic development. The understory is generally lacking herbaceous species due to dense canopy cover, although portions of the forest are less dense than others (Appendix P-1).

Based on consultation with the ODFW, coastal dune forest habitat is considered essential, Category 3 habitat because populations of species such as Pacific marten (*Martes caurina*), bats, and some songbirds depend upon it for species survival. Additionally, loss of the habitat could result in depletion of some of these species on a local scale (Appendix P-1). This habitat is not limited, however, because similar habitat is located to the north and east of the SDPP site.

3.2.1.2 Riparian Forest Habitat

Riparian forest habitat in the analysis area consists of a small area of early to mid-seral forest along the northern shore of Jordan Cove, outside the site boundary and east of the SDPP. The proximity of the forest to Coos Bay and the elevation of the highest measured tide appear to influence the plant composition, which is more mesic than the typical coastal dune forest, but is not considered wetland. The canopy is dominated by red alder (*Alnus rubra*) and willow (*Salix sp*.) with scattered Sitka spruce and California wax myrtle. This habitat is distinct from, but interspersed with, forested wetlands. Understory vegetation is generally similar to coastal dune forest habitat, and Himalayan blackberry and English ivy are similarly common along the edges of the forest in some areas.

Based on consultation with the ODFW, this habitat is classified as essential, Category 3 habitat because it is essential to wildlife but is not limited on a watershed basis, since the riparian forest in the project area is fragmented and fairly young in age (Appendix P-1).

3.2.1.3 Herbaceous Habitat

The herbaceous habitat type is found within the analysis area primarily on recently colonized dunes and historically leveled or excavated areas where pioneering species consist mainly of European beachgrass, (*Ammophila arenaria*), tall fescue (*Festuca arundinacea*), sweet vernal grass (*Anthoxanthum odoratum*), Queen Anne's lace (*Daucus carota*), hedgehog dogtail grass (*Cynosurus echinatus*), and other non-native species. Some areas contain native species including American dunegrass (*Leymus mollis*), seashore lupine (*Lupinus littoralis*), small-head clover (*Trifolium microcephalum*), and beach strawberry (*Trifolium microcephalum*). Scotch broom is present in places, but is fairly limited. Other species include red fescue (*Festuca rubra*), velvet grass (*Holcus lanatus*), English plantain (*Plantago lanceolata*), yarrow (*Achillea millefolium*), pearly everlasting (*Anaphalis margaritacea*), tall orchardgrass (*Dactylis glomerata*), colonial bentgrass (*Agrostis capillaris*), hairy catsear (*Hypochaeris radicata*), hop clover (*T. dubium*), and red and white clover (*T. pratense and repens*).

Based on consultation with the ODFW, herbaceous habitat is neither essential nor limited, but considered important to wildlife. Therefore, this habitat type is classified as Category 4 habitat. No species are known to depend upon herbaceous habitat exclusively for their survival, and loss of this habitat type would not likely result in the depletion of any species. Herbaceous habitat is not limited, since similar habitats are found in the vicinity (Appendix P-1).

3.2.1.4 Herbaceous/Shrub Habitat

The herbaceous/shrub habitat type is found within the analysis area on less-recently colonized dunes and historically leveled or excavated areas that have developed shrub cover, in addition to herbaceous cover. This habitat has been invaded by shrubs, primarily Scotch broom and Himalayan blackberry, as well as some native shrub species such as shore pine and coyote brush (Baccharis pilularis), and trailing blackberry (Rubus ursinus). Overall shrub cover is 10 percent or less in this habitat type. Dominant herbaceous species include primarily tall fescue and European beachgrass, as well as sweet vernal grass, Queen Anne's lace, hedgehog dogtail grass, and other non-native species.

Based on consultation with ODFW, herbaceous/shrub habitat is neither essential nor limited, but important to wildlife. Therefore, this habitat type is classified as Category 4 habitat. No species are known to depend upon herbaceous/shrub habitat exclusively for their survival, and loss of this habitat type would not likely result in the depletion of any species. Herbaceous/shrub habitat is not limited, since similar habitats are found in the vicinity (Appendix P-1).

3.2.1.5 Shrub Habitat

The shrub habitat type is located within the analysis area on stabilized dunes and disturbed areas that have been colonized by shrubs and young trees, primarily Scotch broom and scattered young lodgepole pine (*Pinus contorta*). Overall shrub cover is 20 percent or more in this habitat type. Himalayan blackberry is present in some areas, especially upslope of wetland areas. The herbaceous species include mainly the non-native species described above such as European beachgrass, sweet vernal grass, and colonial bentgrass, among others.

Based on consultation with the ODFW, shrub habitat is neither essential nor limited, but important to wildlife. Therefore, this habitat type is classified as Category 4 habitat. Shrub habitat at the project site is not essential because no species are known to depend upon it exclusively for their survival, and loss of this habitat type would not likely result in the depletion of any species. This habitat type is not limited, since similar habitats are found in the vicinity (Appendix P-1).

3.2.1.6 Unvegetated Sand Habitat

The upland, unvegetated sand habitat type is found north of Jordan Lake and north of the SDPP, and includes areas of moving sand that have not been colonized by vegetation, with the exception of very scattered herbaceous pioneer species such as European beachgrass and very scattered trees and shrubs that were included due to their isolation within the habitat type. Although the habitat formed by these dunes is generally devoid of vegetation, it provides important habitat for a variety of wildlife, including songbirds that forage on seeds blown into the area and raptors and small mammals that use the edges for foraging.

Based on consultation with the ODFW, unvegetated sand habitat is limited on a local scale, since it is present only on a small strip of land on the North Spit between Highway 101 and the Pacific Ocean. This habitat type is not essential because species do not depend upon it for their survival, but is important to wildlife. Therefore, unvegetated sand habitat is classified as Category 3 habitat (Appendix P-1).

3.2.1.7 Developed Habitat

Developed areas within the site boundary include portions of the site that have been significantly disturbed by development or other land use activities. This includes paved roads and parking lots, gravel roads and road fill, and buildings. Based on consultation with the ODFW, these areas have limited potential to become important or essential habitat in the foreseeable future and are therefore classified as Category 6 habitat.

3.2.2 Freshwater Wetland Habitats

3.2.2.1 Open Water Habitat

Open water is present within the analysis area in steep-sided interdunal areas and within deeper portions of wetland areas, where vegetation is primarily absent except for floating

species such as yellow pond lily (*Nuphar lutea*) and other aquatic species (Appendix P-1). Ponds provide areas of open water adjacent to the more heavily vegetated freshwater shrublands and thickets, and support a community of aquatic invertebrates, fish and amphibians. Many of the species inhabiting these ponds are important food sources for other animals. Although the inland open water sites on the North Spit are not considered high quality nesting habitat for most species of waterfowl, they are used for foraging by a variety of migrating waterfowl during the spring, fall and winter (BLM 2006). Open water is present in areas at the Oregon Dunes National Recreation Area, the Panhandle mitigation site, and in smaller areas such as the non-jurisdictional ponds at the SDPP site. The open water habitat type is limited to fresh water areas, and does not include Coos Bay or other estuarine resources.

Based on consultation with the ODFW, most open water habitat within the analysis area is essential to wildlife and limited due its location adjacent to native wetland assemblages and because it provides diverse habitat. As this habitat type can be replaced through mitigation, it is classified as Category 2 habitat. The exception to the Category 2 habitat is the open water portion of the isolated, non-jurisdictional, artificial ponds at the Mill Site, which are classified as Category 3 habitat because it is not essential, but is limited on a local scale (Appendix P-1).

3.2.2.2 Emergent Wetland Habitat

The herbaceous emergent wetland habitat type is located in low-lying areas throughout the analysis area. Vegetation is typically dominated by slough sedge (*Carex obnupta*), spreading rush (*Juncus patens*), water parsley (*Oenanthe sarmentosa*), Pacific silverweed (*Potentilla anserina*) and salt grass (*Distichlis spicata*). Wetter portions of this habitat type consist of aquatic floating and emergent plants in relatively shallow seasonally or perennially inundated areas, including pond lily (*Nuphar polysephalum*), water parsley, cattail (*Typha latifolia*), and small-fruited bulrush (*Scirpus microcarpus*) (SHN 2013a).

Based on consultation with the ODFW, emergent wetland habitat is essential because species depend upon it for their survival, and limited on a local scale. This habitat type can be replaced through mitigation and is therefore classified as Category 2 habitat (Appendix P-1). The exception to the Category 2 habitat is the emergent wetland portion of the isolated, non-jurisdictional, artificial ponds at the Mill Site, which are classified as Category 3 habitat because it is not essential, but is limited on a local scale (Appendix P-1).

3.2.2.3 Scrub Shrub Wetland Habitat

Scrub shrub wetland habitat is commonly dominated by Hooker willow (*Salix hookeriana*), with salmonberry and other common coastal wetland species such as slough sedge and skunk cabbage (*Lysichiton americanus*) present. Pacific crabapple (*Malus fuscus*) was also a dominant shrub species in some areas.

Based on consultation with the ODFW, scrub shrub wetland habitat is essential because species depend upon it for their survival, and limited on a local scale. This habitat type

can be replaced through mitigation and is therefore classified as Category 2 habitat (Appendix P-1).

3.2.2.4 Forested Wetland Habitat

The forested wetland habitat type consists of wetlands that have remained undisturbed long enough to develop a consistent tree canopy. It is dominated at the project site primarily by red alder, with some areas of tree-sized Hooker willow and lodgepole pine. Mature Sitka spruce also occurs in places, typically at the wetland boundary or on upland hummocks within the wetlands. The shrub layer is dominated by common coastal wetland species such as Pacific crabapple and twinberry (*Lonicera involucrata*).

Based on consultation with the ODFW, forested wetland habitat is essential and limited, but can be replaced through mitigation. Therefore, forested wetland at the site is classified as Category 2 habitat (Appendix P-1).

3.2.3 Estuarine Habitats

3.2.3.1 Salt Marsh

Salt marsh habitat consists of salt-tolerant herbaceous species in brackish water areas connected to Coos Bay and subject to tidal influence. Dominant plant species are typical of the area and include saltgrass, pickleweed (*Salicornia virginica*), silverweed, tufted hairgrass (Deschampsia cespitosa), gumweed (Grindelia integrifolia), fleshy jaumea (Jaumea carnosa) and others.

The salt marsh habitat type supports a unique assemblage of species and is limited due to the historic loss of salt marsh habitat in the region. Thus, this habitat type is classified as Category 2 because it is essential for wildlife and limited, but can be replaced through mitigation (Appendix P-1).

3.2.3.2 Intertidal Unvegetated Sand

Intertidal unvegetated sand is located in the areas of the Coos Bay shoreline below the highest tide line. The sand is unconsolidated and shifts in response to tides and winds.

Based on consultation with the ODFW, intertidal unvegetated habitat within the analysis area is both essential for wildlife and limited. Due to the location of the project site within the Coos Bay ecosystem, the slope of the shoreline is more sheltered and less steep than similar habitats nearby, which provides a limited habitat type for foraging species at higher tides. While this habitat type is essential and limited, it can be replaced through mitigation, and is therefore classified as Category 2 habitat (Appendix P-1).

3.2.3.3 Algae, Mud, and Sand Habitat

Algae, mud and sand habitat is found in the areas of the Coos Bay shoreline below unvegetated sand habitat and above eelgrass habitat. Much of the area consists of unvegetated mud and sand, mixed with areas of various algae species. Algae, mud and sand habitat is inundated more frequently and for a longer duration than intertidal

unvegetated sand habitat and is therefore more likely to support aquatic organisms. Mollusk and/or burrowing shrimp holes occur within this habitat, with varied abundance and diversity.

Based on consultation with the ODFW, algae, mud and sand habitat is essential to wildlife and limited, but can be replaced through mitigation. Therefore this habitat type is classified as Category 2 habitat (Appendix P-1).

3.2.3.4 Eelgrass Habitat

Eelgrass habitat is found along the areas of the Coos Bay shoreline below unvegetated sand and algae, mud and sand habitats. Eelgrass habitats are relatively common in the lower bay subsystem. Color infrared aerial photographs taken near the proposed barge berth reveal a narrow band of sparsely populated eelgrass near the low tide line and partially submerged along the beach, west of the Roseburg dock (Figure P-2). The eelgrass habitat within the analysis area was mapped using a compilation of field surveys performed by DEA, the Environmental Protection Agency (EPA), and Ellis Ecological between 2010 and 2013. Eelgrass is an annual aquatic plant and production can vary widely from year to year; however, aerial photography and field verification provide an indication of the extent of eelgrass within the analysis area.

These submerged aquatic vegetation areas appear to exhibit great species diversity and are preferred by many aquatic species. In general, eelgrass habitat is highly productive and provides important ecological functions for estuarine ecosystems. These functions include providing cover for small organisms such as juvenile salmonids; substrate for attachment by marine organisms (various algae species, mussels, and herring egg masses); nutrient cycling processes; food web support; and sediment stabilization. Most fish species within Coos Bay use the flats of the lower bay at some time during the year, where a majority of the eelgrass beds exist (Berg 2006).

Based on consultation with the ODFW, eelgrass habitat is classified as Category 2 habitat because it is essential for wildlife, supporting a unique assemblage of species, and limited due to historic loss of eelgrass habitat in the region, but can be replaced through mitigation (Appendix P-1).

3.2.3.5 Subtidal Habitat

Subtidal habitats within the analysis area are assumed to be a mix of sand and mud with predominately coarser grain sizes. Exposed sandstone may also be present, particularly closer to the mouth of the bay. Portions of this habitat are disturbed on an annual basis as part of the navigation channel maintenance. Initial mapping of the barge berth area included both shallow and deep subtidal areas, which were delineated by 15-feet of elevation, because bathymetry was available for those portions of the analysis area. Due to lack of bathymetry within the remainder of the analysis area, shallow and deep subtidal habitats have been merged into one category – subtidal.

Based on consultation with the ODFW, subtidal habitat is essential and limited, but can be replaced through mitigation. Therefore, this habitat type is classified as Category 2 habitat (Appendix P-1).

3.2.4 Nature, Extent, and Duration of Impacts

The nature, extent and duration of impacts to the different habitat types within and adjacent to the site boundary are outlined in Table P-5. Temporary and permanent habitat impacts within the site boundary will result from the construction and operation of the SDPP, as illustrated in Figure P-4.

Table P-5. Nature, Extent, and Duration of Habitat Impacts

Habitat Type	ODFW Habitat Category	Acres Present w/in Site Boundary	Permanent Impacts (acres)	Temporary Impacts (acres)
Developed	6	47.036	33.581	13.455
Coastal Dune Forest	3	9.979	8.006	1.973
Riparian Forest	3	1.435	0.771	0.664
Herbaceous	4	12.667	10.047	2.619
Shrub	4	2.494	0.918	1.577
Herbaceous Shrub	4	34.209	30.551	3.658
Upland Unvegetated Sand	3	3.507	3.081	0.426
Forested Wetland	2	0.378	0.256	0.123
Scrub-Shrub Wetland	2	0.150	0.150	--
Emergent Wetland	2	3.452	1.642	0.541
Non-Jurisdictional Wetlands	2	1.771	1.771	--
Open Water	2	0.175	0.175	--
Salt Marsh	2	0.125	0.088	0.036
Eelgrass	2	0.319	0.182	0.319
Algae, Mud, Sand	2	1.073	0.700	0.373
Intertidal Unvegetated Sand	2	1.378	1.253	0.125
Subtidal	2	1.047	0.94	0.107

4.0 MAP OF HABITAT LOCATIONS

OAR 345-021-0010(1)(p)(C). *A map showing the locations of the habitat identified in (B).*

Figure P-2, Sheets 1-4, displays the habitat types and ODFW habitat categories present within the analysis area and site boundary.

5.0 IDENTIFICATION OF POTENTIAL STATE SENSITIVE SPECIES AND SITE-SPECIFIC ISSUES

OAR 345-021-0010(1)(p)(D). *Based on consultation with the Oregon Department of Fish and Wildlife (ODFW) and appropriate field study and literature review, identification of all State Sensitive Species that might be present in the analysis area and a discussion of any site-specific issues of concern to ODFW.*

State sensitive fish, wildlife and plant species that occur, or have the potential to occur, within the analysis area are discussed by species group below. Information in this section includes survey results conducted for the JCEP (Appendices P-2 through P-5). The North Spit Plan (BLM 2006), which provides information regarding species that are known or suspected to occur on the North Spit, and includes the site boundary and most of the analysis area, was also reviewed to identify the occurrence of state sensitive species. The ORBIC database was also reviewed for confirmed occurrences of state sensitive species within the analysis area.

Table P- 6 provides a list of state sensitive fish, wildlife and plant species that are either known to occur, or have the potential to occur, within the analysis area. All state sensitive species listed in the table were obtained from the most recent version of the USFWS list of federal species of concern that may occur in Coos County (USFWS 2012), and the ODFW State Sensitive Species List (ODFW 2008). In addition, ODFW was contacted regarding the status of the bald eagle and Steller sea lion, which have both been delisted from the federal Endangered Species Act (ESA) since the release of the ODFW State Sensitive Species list in 2008. The ODFW confirmed that both species are now included on the State Sensitive Species list, and that any federally delisted species is automatically added to the list as State Sensitive-Vulnerable upon delisting (Nugent, personal communication 2014).

Table P-6 also lists the likelihood of occurrence for each species, which is rated as high, moderate, or low, erring on the side of higher likelihood in the event of uncertainty. The likelihood of occurrence is discussed in more detail in the Wildlife Assessment Survey Report in Appendix P-4. Species with the potential to be impacted by the project, or that have been identified as being of particular concern to the ODFW, are discussed in more detail in the text below.

Table P- 6. State Sensitive Wildlife Species Known to Occur, or with the Potential to Occur, within the Analysis Area

Common Name/ Species Latin Name	Federal/State Status	General Habitat Requirements*	Likelihood of Occurrence*
Amphibians and Reptiles			
Clouded salamander *Aneides ferreus*	--/SV, OCS**	Moist coniferous forests. Usually found under bark, in rotten logs, or in rock crevices. Requires large down logs of mid-decay classes with sloughing bark.	Moderate based on presence of suitable habitat.
Coastal tailed frog *Ascaphus truei*	SOC/SV,OCS**	Found in clear, cold swift-moving mountain streams with coarse substrates. Primarily in older forest sites.	Not present due to lack of habitat.
Del Norte salamander *Plethodon elongatus*	SOC/SV,OCS	Strongly associated with moist talus and rocky substrates, in redwood or Douglas fir forests, including riparian zones.	Low due to lack of habitat.
Foothill yellow-legged frog *Rana boylii*	SOC/SC, SV, OCS**	This species inhabits partially shaded, rocky streams at low to moderate elevations, in areas of chaparral, open woodland, and forest	Low due to lack of habitat.
Northern red-legged frog *Rana aurora aurora*	SOC/SV, OCS	Habitat includes the vicinity of permanent waters of stream pools, marshes, ponds, and other quiet bodies of water. This frog regularly occurs in damp woods and meadows some distance from water, especially during wet weather.	Observed within site boundary, in wetlands along the utility corridor. Salvage planned.
Southern torrent salamander *Rhyacotriton variegatus*	SOC/SV, OCS**	Coastal coniferous forests in small, cold, clear, high-gradient mountain streams and spring seepages, especially in gravel-dominated riffles with low sedimentation.	Low due to lack of habitat.

Common Name/ Species Latin Name	Federal/State Status	General Habitat Requirements*	Likelihood of Occurrence*
Western pond turtle *Actinemys marmorata marmorata*	SOC/SC,OCS**	Habitat includes permanent and intermittent waters of rivers, creeks, small lakes and ponds (including human-made features). Sometimes found in brackish water.	High. Documented on the North Spit outside analysis area (BLM 2006), but not detected during surveys. If present, salvage is planned.
Western Toad *Anaxyrus boreas*	--/SV, OCS**	Occur in a wide variety of habitats: upland habitats around ponds, lakes, reservoirs, and slow-moving rivers and streams. The BLM does not list this species on the North Spit (BLM 2006).	Moderate based on presence of suitable habitat.
Western rattlesnake *Crotalus oreganus*	--/SC	This snake occupies a wide diversity of habitats, from shrubby coastal dunes to timberline, from shrubby basins and canyons to open mountain forests.	High based on presence of suitable habitat.
Birds			
Acorn woodpecker *Melanerpes formicivorus*	SOC/SV, OCS	Found near oaks, either in unmixed open woodland or mixed with conifers. Formerly a rare resident in southeastern Coos County; likely extirpated from the county in the 1990s.	Moderate based on presence of suitable habitat.
American peregrine falcon *Falco peregrinus anatum*	--/SV, OCS**	Various open situations from tundra, moorlands, steppe, and seacoasts, especially where there are suitable nesting cliffs, to mountains, open forested regions, and human population centers.	Observed within the analysis area, flying overhead during surveys. No breeding records within analysis area, but numerous listings at North Bend bridge, including adjacent power towers from 1991-2008 (ORBIC 2013).
Arctic peregrine falcon *Falco peregrinus tundrius*	--/SV	Cliffs; may perch in trees. Occasional visitor to Oregon. Documented on North Spit as an uncommon year-round resident. (BLM 2006).	Moderate based on presence of suitable habitat.

Common Name/ Species Latin Name	Federal/State Status	General Habitat Requirements*	Likelihood of Occurrence*
Bald eagle *Haliaeetus leucocephalus*	--/SV***, OCS**	Breeding habitat most commonly includes areas close to coastal areas, bays, rivers, lakes, reservoirs with primary food sources including fish, waterfowl, or seabirds.	Observed: seven sightings, including one bird on mudflats, one on ridge east of project, and others seen flying over bay. No nests documented within analysis area (ORBIC 2013).
Band-tailed pigeon *Patagioenas fasciata*	SOC/ OCS	In Oregon, most abundant in western third of the Coast Range in association with distribution of Pacific red elder and cascara buckthorn.	Observed flying over the site boundary. May be present in coastal dune forest.
Black oystercatcher *Haematopus bachmani*	SOC/SV, OCS**	Breeding habitat is exclusively associated with the high tide margin of the intertidal zone, and includes mixed sand and gravel beaches, cobble and gravel beaches, exposed rocky headlands, rocky islets, and tidewater glacial moraines.	Moderate, though preferred intertidal habitat is limited.
Bobolink *Dolichonyx oryzivorus*	--/SV, OCS	Grasslands, open areas. Occurs on the coast only as a fall vagrant.	Moderate based on presence of suitable habitat.
Cassin's auklet *Ptychoramphus aleuticus*	--/SV	Mostly pelagic, less frequently along rocky seacoasts. Nests on offshore islands, mostly in areas with low vegetation.	Low. No breeding habitat present.
Common nighthawk *Chordeiles minor*	--/SC, OCS	Habitats include open and semi-open areas; open coniferous forests, savanna, grasslands, fields, vicinity of cities and towns. Nesting occurs on the ground on a bare site in an open area. Uncommon breeder in Coos County.	Observed once within the analysis area, flying overhead.
Franklin’s gull *Larus pipixcan*	--/SV, OCS	Seacoasts, bays, estuaries, lakes, rivers, marshes, ponds and irrigated fields, mudflats. Nests in areas of prairie and steppe (Natureserve 2014).	Moderate. No breeding habitat present.

Common Name/ Species Latin Name	Federal/State Status	General Habitat Requirements*	Likelihood of Occurrence*
Harlequin duck Histrionicus histrionicus	SOC/--	Uncommon wintering species. Nests along fast-moving rivers and mountain streams on rocky islands or banks. Streams are braided to reticulate with many riffles and rapids.	Moderate. No breeding habitat present.
Lewis' woodpecker *Melanerpes lewis*	SOC/SC, OCS	Distribution closely associated with open ponderosa pine forest in western North America, and is strongly associated with fire-maintained old-growth ponderosa pine.	Low. No ponderosa pine forest.
Little willow flycatcher *Empidonax traillii brewsteri*	--/SV,OCS	Strongly tied to brushy areas of willow and similar shrubs. Found in thickets, open second growth with brush, swamps, wetlands, streamsides, and open woodland.	Observed within the analysis area near the SDPP.
Long-billed curlew *Numenius americanus*	--/SV, OCS	Beaches and mudflats. Breeds inland in prairies and grassy meadows, generally near water (Natureserve 2014).	Moderate. No breeding habitat present.
Mountain quail *Oreortyx pictus*	SOC/SV, OCS	Brushy mountainsides, coniferous forest, forest and meadow edges, dense undergrowth. Uncommon in Coos County.	Observed within the analysis area, just south of the Utility Corridor.
Northern goshawk *Accipiter gentilis*	SOC/SV, OCS	Nests in a wide variety of mature forest types including deciduous, coniferous, and mixed forests. Extremely rare on the coast.	Low. Mature forest is limited.
Olive-sided flycatcher *Contopus cooperi*	SOC/SV,OCS**	Olive-sided flycatchers prefer openings with dead standing trees found near water, burns, and blowdown areas.	Observed within the analysis area throughout forested habitat.
Oregon vesper sparrow *Pooecetes gramineus affinis*	SOC/SC, OCS	Habitats include plains, prairies, dry shrublands, savannas, weedy pastures, fields, etc. Rare summer resident and occasional breeder.	Moderate based on presence of suitable habitat.

Common Name/ Species Latin Name	Federal/State Status	General Habitat Requirements*	Likelihood of Occurrence*
Pileated woodpecker *Dryocopus pileatus*	--/SV, OCS	Prefers woods with a tall closed canopy and a high basal area. Most often in areas of extensive forest or minimal isolation from extensive forest.	Moderate based on presence of suitable habitat.
Purple martin *Progne subis*	SOC/SC, OCS	A wide variety of open and partly open situations; frequently near water or around towns.	Observed flying over analysis area, and documented at the BLM boat ramp and along Coos Bay from Haynes inlet to Pierce Point (ORBIC 2013).
Red-necked grebe *Podiceps grisegena*	--/SC, OCS	Winters along seacoasts, bays, and estuaries. During migration, found on lakes, ponds, and rivers. Nests mainly on shallow, freshwater lakes and secluded bays of larger lakes.	Observed. No breeding habitat present.
Rhinoceros auklet *Cerorhinca monocerata*	--/SV	Nests in burrow mainly on grassy or shrubby sea-facing slope or level area near edge of island; small numbers of nests on cliffs or steep slopes; also recorded nesting in caves in Oregon and California.	Low due to lack of habitat.
Snowy egret *Egretta thula*	--/SV,OCS	Marshes, lakes, ponds, lagoons, and shallow coastal habitats. Nests in trees or shrubs or, in some areas, on ground or in marsh vegetation (Natureserve 2014).	Moderate. No breeding areas noted during surveys
Tufted puffin *Fratercula cirrhata*	--/SV, OCS**	Primarily pelagic. Can be found well out to sea all year; summer observations probably immature non-breeders. Nests on offshore islands or along the coast.	Moderate. No breeding habitat present.

Common Name/ Species Latin Name	Federal/State Status	General Habitat Requirements*	Likelihood of Occurrence*
Upland sandpiper *Bartramia longicauda*	SOC/SC, OCS	Rare, vagrant species on the North Spit (BLM 2006). Restricted primarily to extensive, open tracts of short grassland habitat. Nest in native prairie, dry meadows, pastures, domestic hayfields, short-grass savanna, plowed fields, along highway rights-of-way and on airfields.	Moderate based on presence of suitable habitat.
Western bluebird *Sialia mexicana*	--/SV, OCS	Rare, migrant species on the North Spit (BLM 2006). Habitat includes open woodlands, farmlands, orchards, savanna, riparian woodlands, and burned woodlands. Nests are in natural tree cavities, abandoned woodpecker holes, or bird nest boxes.	Moderate based on presence of suitable habitat.
Western meadowlark *Sturnella neglecta*	--/SC,OCS	Habitat includes grasslands, savannas, cultivated fields, pastures, lowland and mountain valleys, foothills, and open mountains.	Observed within the analysis area in disturbed grassland east of Henderson marsh.
Yellow-breasted chat *Icteria virens*	SOC/SC,OCS	Nests in bushes, brier tangles, vines, and low trees; generally in dense vegetation less than 2 meters above ground.	Moderate based on presence of suitable habitat, although not documented on the North Spit (BLM 2006).
Mammals			
California myotis bat *Myotis californicus*	--/SV, OCS**	Western lowlands: sea coast to desert, oak-juniper, canyons, riparian woodlands, desert scrub, and grasslands. Often uses man-made structures for night roosts. Uses crevices of various kinds, including those in buildings, for summer day roosts.	Moderate based on presence of suitable habitat.
Fringed myotis bat *Myotis thysanodes*	SOC/SV,OCS**	Roosts in caves, mines, rock crevices, buildings, and other protected sites. Nursery colonies occur in caves, mines, and sometimes buildings.	Low based on lack of caves, mines, and other protected sites.

Common Name/ Species Latin Name	Federal/State Status	General Habitat Requirements*	Likelihood of Occurrence*
Hoary bat *Lasiurus cinereus*	SOC/SV,OCS**	Deciduous and coniferous forests, including areas altered by humans. Roost sites are usually in trees, with dense foliage above and open flying room below (Natureserve 2014).	Moderate based on presence of suitable habitat.
Long-eared myotis bat *Myotis evotis*	SOC/--	Mostly forested areas, especially those with broken rock outcrops; also shrubland, over meadows near tall timber, along wooded streams, over reservoirs. Often roosts in buildings, in hollow trees, mines, caves, fissures, etc.	Moderate based on presence of suitable habitat.
Long-legged myotis bat *Myotis volans*	SOC/SV,OCS**	Uses caves and mines as hibernacula, but winter habits are poorly known. Roosts in abandoned buildings, rock crevices, under bark, etc.	Moderate based on presence of suitable habitat.
Pacific marten- Coastal Population *Martes caurina*	--/SV, OCS**	Found in dense deciduous, mixed, or (especially) coniferous upland, and lowland forest. When inactive, occupies holes in dead or live trees or stumps, abandoned squirrel nests, conifer crowns, rock piles, burrows, or snow cavities. Often associated with coarse woody debris.	Moderate based on presence of suitable habitat, although woody debris is lacking within the site boundary.
Red tree vole *Arborimus longicaudus*	--/SV, OCS**	Red tree voles inhabit mixed evergreen forests; optimum habitat consists of wet and mesic old-growth Douglas fir forest and various other mesic habitats, including those dominated by grand fir, Sitka spruce, or western hemlock.	Low based on the absence of mesic old-growth forest.
Silver-haired bat *Lasionycteris noctivagans*	SOC/SV,OCS**	Habitat is primarily forested (frequently coniferous) areas adjacent to lakes, ponds, or streams, including areas that have been altered by humans. Roosts under loose bark.	Moderate based on presence of suitable habitat.

Common Name/ Species Latin Name	Federal/State Status	General Habitat Requirements*	Likelihood of Occurrence*
Townsend's western big-eared bat *Corynorhinus townsendii townsendii*	SOC/SC,OCS**	Habitats in western Oregon include pine-fir-hemlock-broadleaf deciduous forest. Breeds in caves and mines; bridges for night roosts (BLM 2006).	Moderate based on presence of suitable habitat. No breeding habitat present.
White-footed vole *Arborimus albipes*	SOC/--	Little is known about the natural history of the species, but it is correlated with basal area and density of alder and cover of hazel.	Low based on relative lack of alder, which is found scattered at the edges of larger wetlands and riparian forest habitat.
Yuma myotis bat *Myotis yumanensis*	SOC/--	More closely associated with water than most other North American bats. Found in a wide variety of upland and lowland habitats, including riparian, desert scrub, moist woodlands and forests, but usually found near open water.	Moderate based on presence of suitable habitat.
Marine Mammals			
Steller sea lion *Eumetopias jubatus*	--/SV***	Coastal waters near shore and over the continental slope; sometimes rivers are ascended in pursuit of prey (Natureserve 2014).	Observed throughout Coos Bay, especially during salmon migration.
Invertebrates			
California floater mussel *Anodonta californiensis*	SOC/--	A freshwater mussel. This is a low elevation species that is found in both lakes and lake-like stream environments (Natureserve 2014).	Moderate based on presence of suitable habitat, though potentially limited by salt water in Coos Bay.
Newcomb's littorine snail *Algamorda newcombiana*	SOC/ OCS**	Within coastal environments, clinging to the rocky shores in the upper intertidal zone. Inhabits the narrow strip of land where glasswort (Salicornia virginica) occurs in coastal estuarine wetlands, living on the stems of Salicornia and possibly some other marsh plants (Natureserve 2014).	High based on presence of suitable habitat within estuarine habitats. Documented on the North Spit by BLM (2006) and ORBIC (2013), but not within analysis area.

Common Name/ Species Latin Name	Federal/State Status	General Habitat Requirements*	Likelihood of Occurrence*
Fish			
Coastal cutthroat trout (Oregon Coast ESU) *Oncorhynchus clarki clarki*	SOC/SV, OCS**	Estuaries or marine waters near the coast, small rivers, gravelly streams, and isolated mountain lakes (NatureServe 2014).	High. This species has known habitat within Coos Bay (SHN 2006).
Coho salmon (Lower Columbia River ESU) *Oncorhynchus kisutch*	T/SC	Coho salmon is an anadromous salmonid species that migrates between the ocean and freshwater environments. Coho salmon spawn in freshwater tributaries in select areas such as pool tailouts, runs, and riffles during the fall or winter (SHN 2013C).	Discussed in Exhibit Q.
Green sturgeon *Acipenser medirostris*	T/OCS**	Green sturgeon spend most of their lives in coastal marine waters, estuaries, and the lower reaches of large rivers. They ascend rivers to spawn, but specific spawning and rearing habitats are poorly known (NatureServe 2014).	Discussed in Exhibit Q.
Millicoma dace *Rhinichthys catarctae ssp.*	SOC/SV, OCS**	Millicoma dace are found in freshwater habitat (NatureServe 2014).	Low due to lack of habitat.
Pacific lamprey *Lampetra tridentata*	SOC/OCS**	Pacific lamprey range from Baja California to the Bering Sea in Alaska and Asia, and is anadromous. Like salmon, lamprey are born in freshwater streams, migrate out to the ocean, and return to fresh water as mature adults to spawn (Berg 2006)	High. This species has known habitat within Coos Bay (SHN 2006).
River lamprey *Lampetra ayresi*	SOC/--	Habitat includes fresh and salt water. Ammocoetes burrow in sandy-muddy backwaters of streams. Adults are anadromous, feeding in estuaries and at sea and spawning over gravel riffles in clear freshwater streams (NatureServe 2014).	Moderate based on presence of suitable habitat.

Common Name/ Species Latin Name	Federal/State Status	General Habitat Requirements*	Likelihood of Occurrence*
Steelhead (Oregon Coast ESU) *Oncorhynchus mykiss ssp.*	--/SV, OCS**	Steelhead typically spend two years in fresh water, migrate to marine waters, where they spend 2-3 years, then return to natal stream to spawn (NatureServe 2014).	High. Multiple occurrences of this species have been observed near the Project area (ORBIC 2013).
Plants			
Bensonia *Bensoniella oregana*	SOC/--	Wet meadows and at the edges of bogs and springs within coniferous forests approximately 1150-5,000 feet in elevation. In damp, but well-drained, soils (NatureServe 2014).	Low due to lack of habitat.
Coast checker bloom *Sidalcea malvaeflora* ssp. *patula*	SOC/--	Occurs in coastal bluff scrub, coastal prairie, and North Coast coniferous forest (Natureserve 2014).	Moderate based on presence of suitable habitat.
Frye's Limbella Moss *Limbella fryei*	SOC/--	Dense lakeside shrub swamp dominated by Hooker willow, crabapple, Douglas spirea, and slough sedge; on level, peaty flats and sandy or silty banks at the edge of the lake. Limbella fryei is best developed on buttress roots and decumbent stems of tall shrubs, and on rotten wood, leaf and twig litter at the edges of pools (NatureServe 2014).	Low due to lack of habitat.
Pink sand-verbena *Abronia umbellata* ssp. *breviflora*	SOC/E, OCS**	The species usually occurs on beaches in fine sand between the high-tide line and the driftwood zone, and in areas of active sand movement below the foredune (SHN 2013c).	Discussed in Exhibit Q.

Common Name/ Species Latin Name	Federal/State Status	General Habitat Requirements*	Likelihood of Occurrence*
Point Reyes bird's beak *Cordylanthus maritimus* ssp. *palustris*	--/E, OCS**	Occurs in coastal salt marshes, typically within the zone that is periodically or frequently inundated by high tides (SHN 2013a)	Observed in estuarine habitat around Jordan Cove (SHN 2013a), and discussed in Exhibit Q. Multiple occurrences within Jordan Cove have been documented by ORBIC (2013).
Seaside gilia *Gilia millefoliata*	SOC/--	Occurs in semi-stabilized sand dunes (NatureServe 2014).	Moderate potential based on presence of suitable habitat.
Silvery phacelia *Phacelia argentea*	SOC/T, OCS**	Occurs in open sand above the high tide line, open and partly stabilized sand dunes further inland, and coastal bluffs (SHN 2013a).	High. Suitable habitat for this species exists at the Project site in areas with active or semi-stabilized dunes and upper beach habitat where European beachgrass and red fescue-salt rush herbaceous vegetation associations occur (SHN 2013). Discussed in Exhibit Q.

FEDERAL STATUS
SOC: Species of Concern
--: not listed

STATE STATUS
SC: Sensitive–Critical
SV: Sensitive – Vulnerable
OCS: Oregon Conservation Strategy species
--: not listed

* Source: LBJ 2006,SHN 2013b, except as noted
** OCS species for the Coast Range Ecoregion
*** Species that are federally delisted will automatically be added to the State SV list.

5.1.1 Amphibians and Reptiles

Based on the final North Spit Plan, provided in Appendix P-8 (BLM 2006), the BLM recognizes 11 species of amphibians (8 salamanders and 3 frogs) and has observed at least 10 species of reptiles on the North Spit. Despite the presence and continual threat of invasion by non-native American bullfrogs (Rana catesbeiana), native amphibians were observed within suitable habitat during the wildlife surveys conducted in 2005 and 2006 (LBJ 2006). Special status amphibians and reptiles that have been observed or are considered likely to occur within the site boundary include the western pond turtle and northern red-legged frog (SHN 2013b).

5.1.1.1 Northern Red-Legged Frog

Habitat for the northern red-legged frog includes the vicinity of permanent waters of marshes, ponds, and other quiet bodies of water. This frog regularly occurs in damp woods and meadows some distance from water, especially during wet weather. During 2012 surveys, all age classes of this species were observed in multiple wetlands, including those present along the utility corridor. During these same surveys, no American bullfrogs, a known predator of the northern red-legged frog, were observed (SHN 2013b). During field surveys conducted in 2005 and 2006, however, only juvenile tadpoles were observed in suitable habitat at the site, while a high density of American bullfrogs were also observed in the area (LBJ 2006). Northern red-legged frogs are abundant within some wetlands within the site, and it is likely that native amphibians are present throughout wetlands within the site boundary and analysis area, where bullfrogs have not been introduced or invaded (SHN 2013b).

5.1.1.2 Western Pond Turtle

The western pond turtle is known to occur throughout Coos County, including several sites in the Coos Bay area and on the North Spit. The species was not observed during pre-construction wildlife surveys of the SDPP project area, nor were any signs of basking activity found.

Despite their absence during site surveys, western pond turtles are known to occur on the North Spit and suitable habitat exists at the site at Jordan Lake, the wetlands north of the utility corridor and the wetlands west of the SDPP, although basking areas are limited and the soil may be too sandy to allow turtles to nest (SHN 2013b). These conditions suggest that there is a high potential for occurrence of western pond turtles at the site (SHN 2013b). Since freshwater wetlands could contain the species, additional surveys for western pond turtles will be conducted prior to the start of construction (SHN 2013b).

5.1.2 Birds

The southern Oregon coast, located along the Pacific Flyway, provides wintering and migratory habitat for a wide variety of birds. Coos Bay is one of a number of important areas for shorebirds between San Francisco Bay and British Columbia (SHN 2013b).

The BLM Final Plan for the North Spit (BLM 2006) documented 275 avian species using habitats on or near the North Spit of Coos Bay. In addition, LBJ documented 151 avian species

during their 2005 and 2006 pre-construction surveys of the Jordan Cove LNG and SDPP sites, including two additional species not previously documented by the BLM (LBJ 2006). 107 out of 151 bird species recorded in the general site area were observed within the proposed Jordan Cove project area (SHN 2013b).

State sensitive birds were observed flying over or foraging at several locations at or near the project site (LBJ 2006, SHN 2013b). Common nighthawk (*Chordeiles minor*) was observed once as a flyover at the site; purple martins (*Progne subis*) were observed multiple times during the breeding season, with active nests within view of the site; olive-sided flycatcher (*Contopus cooperi*) was recorded singing near the Jordan Cove LNG site; little willow flycatcher (*Empidonax traillii brewsteri*) was recorded near the SDPP site; mountain quail (*Oreortyx pictus*) was observed in Dune Forest B near the water tanks; western meadowlark (*Sturnella neglecta*) was observed once at the site; band-tailed pigeon (*Patagioenas fasciata*) was observed once, flying over the site; and red-necked grebe (*Podiceps grisegena*) were observed on multiple occasions throughout the site.

Coos Bay and the North Spit also provide a mosaic of habitat types with abundant prey for raptors. Predatory birds (i.e., hawks and owls) are abundant year-round residents in Coos Bay and are most likely to be encountered around Coos Bay in terrestrial habitats (SHN 2013b). Falcons, in particular, are likely to be associated with salt marsh and tidal mudflats, where shorebirds are likely to be abundant. Surveys conducted by LBJ in 2005 and 2006 also observed peregrine falcons flying over the analysis area (LBJ 2006). Bald eagles (*Haliaeetus leucocephalus)* were observed seven times, including once on mudflats, once on a ridge east of the project site, multiple birds flying over the bay, but no nests were observed (SHN 2013b). According to ORBIC, no nests are documented within the analysis area (ORBIC 2013). Waterfowl, seabirds, shorebirds, and wading birds known to occur, or likely to occur, within the analysis area are described in Appendix P-4 (SHN 2013b).

5.1.3 Mammals

The Coos Bay area and North Spit provide a substantial amount of high quality habitat, allowing for a diverse assemblage of mammals. The BLM has documented 58 mammal species on the North Spit (BLM 2006). Pre-construction wildlife surveys conducted in the area of the SDPP site in 2005 and 2006 documented 16 mammal species (LBJ 2006). State sensitive species with the greatest potential to occur include bats and Pacific marten.

5.1.3.1 Bats

Although no bats were documented by ORBIC within the analysis area (2013), bat species are known to occur on the North Spit (BLM 2006) and may be encountered in any terrestrial area within the analysis area, with limited distribution over the aquatic areas. Bats are generally associated with a variety of habitat types, including caves, forests, open grasslands, and water. No bat species were documented during site surveys; however, all surveys were conducted during the day and may not be indicative of the presence or absence of bats within the analysis area, as bats are nocturnal animals. The mosaic of habitat types and abundant over-water foraging habitat present within the Coos Bay area suggest that bat presence is highly possible. Bat species with moderate potential

to occur within the analysis area include the California myotis bat (*Myotis californicus*), hoary bat (*Lasiurus cinereus*), long-eared myotis bat (*Myotis evotis*), long-legged myotis bat (*Myotis volans*), silver-haired bat (*Lasionycteris noctivagans*), Townsend's western big-eared bat (*Corynorhinus townsendii townsendii*) and Yuma myotis bat (*Myotis yumanensis*) (SHN 2013b).

5.1.3.2 Pacific Marten

The Pacific marten is a subspecies of the American marten (*Martes americana*), and occurs in coastal regions from the Oregon-California border to British Columbia (Zelinski et al 2001). Pacific marten have been documented on the North Spit by the BLM (BLM 2006) and have a moderate potential to occur within the analysis area in coastal dune forest (SHN 2013b). The Pacific marten occurs in mature, closed-canopy forests and travels through openings if sufficient cover exists. Although not documented during site surveys, occasional dispersing individuals could wander into the forested portions of the site boundary (LBJ 2006). Loss of dune forest for the project could potentially reduce this species' habitat should they occur in dune forest within the analysis area (SHN 2013c).

5.1.4 Marine Mammals

According to the Wildlife Survey Assessment Report in Appendix P-4 (SHN 2013b), the only state sensitive marine mammal likely to occur in Coos Bay is the Steller sea lion (*Eumetopias jubatus*) (SHN 2013b).

The Steller sea lion is expected to occur more frequently at the bay mouth, near Charleston Harbor, where it is attracted to fishing-related activities, or may be encountered offshore. However, during the salmon fishing season when salmon migrate through Coos Bay, Steller sea lions are frequently observed throughout Coos Bay (SHN 2013b).

5.1.5 Fish

Coos Bay and its connecting waterways provide foraging, migratory, spawning, and juvenile nursery habitat to numerous species of fish and invertebrates. This area also contains important crab, clam and salmon resources, as well as marine fish such as flatfish and rockfish. It is also a migration corridor for salmon and steelhead that spawn and rear in the Coos River systems (Berg 2006).

5.1.5.1 Steelhead

Of the state sensitive species present in Coos Bay, the Oregon Coast evolutionarily significant unit (ESU) of steelhead trout (*Oncorhynchus mykiss*) is listed as State-Vulnerable within Coos Bay. Anadromous Steelhead are generally transitory, passing through the bay in the fall as adults to Coos River, while juveniles primarily out-migrate in the spring and summer (Berg 2006). Steelhead use Coos Bay for rearing and migration (ORBIC 2013), and could be present within the area to be impacted by construction of the barge berth.

5.1.5.2 Coastal Cutthroat Trout

The Oregon Coast ESU of coastal cutthroat trout (*Oncorhynchus clarki clarki*), both resident and anadromous, are native to the Coos River system and are widely distributed throughout the freshwater and estuarine portions of the drainage (Berg 2006). Sea-run cutthroat trout migrate through Oregon's estuaries in late August and early September on their way to freshwater spawning grounds. The ODFW has reported a relative abundance of cutthroat trout in Coos Bay based on seining surveys conducted since 1978 (Berg 2006). Both resident and anadromous coastal cutthroat trout could be present within the area to be impacted by construction of the barge berth and access triangle.

5.1.5.3 Pacific Lamprey

Pacific lamprey (*Lampetra tridentata*) are widely distributed throughout Oregon, although their distribution and abundance has decreased in recent years. Pacific lamprey are anadromous and out-migrate from their native, freshwater streams from July to October and return to spawn the following spring once water temperatures are between 50° and 60° F (Berg 2006). Pacific lamprey were captured by the ODFW in the Coos Bay system during seining surveys from 1996-2000 and could be present within the area to be impacted by construction of the barge berth and access triangle.

5.1.5.4 River Lamprey

River lamprey (*Lampetra ayresi*) is an anadromous fish species that spends much of its life living in estuaries. Adult river lamprey feed in estuaries and at sea before returning to spawn in their native freshwater streams (NatureServe 2014). River lamprey were not captured during seining surveys conducted by the ODFW in the Coos Bay system from 1996-2000 (Berg 2006), but are moderately likely to occur within Coos Bay based on the presence of suitable habitat. Thus, river lamprey could be present within the area to be impacted by construction of the barge berth and access triangle.

5.1.6 Macro-invertebrates

Two federal species of concern may occur within the area to be directly impacted at the barge berth and in Jordan Cove. Of the two species, Newcomb's littorine snail (*Algamorda newcombiana*) is the most likely to occur in the coastal estuarine wetlands within the analysis area. Although Newcomb's littorine snail has the potential to occur, it is not known to occur in the area and has not been documented by ORBIC (2013). The freshwater California floater mussel (*Anodonta californiensis*) also has the potential to occur within the analysis area, but is likely limited by the concentration of salt water in Coos Bay (SHN 2013b).

5.1.7 Plants

The Botanical Resources Assessment Report (SHN 2013a) provided in Appendix P-3 describes the results of the botanical surveys conducted for the JCEP. Surveys conducted included portions of the analysis area to the west, but not north of the Trans Pacific Parkway.

No state sensitive plant species were observed during botanical surveys at the site. Five state threatened and endangered species occur, or have the potential to occur, within the analysis area and are discussed in detail in Exhibit Q.

5.2 OREGON CONSERVATION STRATEGY SPECIES

In addition to the consideration of state sensitive species and federal Species of Concern, species and habitat within the analysis area that are listed in the Oregon Conservation Strategy (OCS) have also been considered (Appendix P-10). The OCS promotes the conservation of declining species and habitats and provides recommendations for conservation actions to reduce the possibility of future state or federal listings. The OCS considers fish and wildlife species from a state-wide perspective, but with a focus on ecoregions. Ecoregions listed for a given species have been designated as having the greatest conservation need and/or opportunity.

Species listed under the OCS that were observed during field surveys or are known to occur in the area are listed in Table P-6. Species listed specifically for the Coast Range ecoregion are noted in the table using two asterisks (**). While the OCS does not trigger any regulatory requirements, impacts to OCS species from the construction, operation and retirement of the SDPP will be avoided or minimized to the extent possible.

In addition to OCS species, coastal dune, estuarine, freshwater aquatic, riparian, and wetland habitats are also listed under the OCS. While impacts to these habitats will occur, they will be minimized to the extent practicable by project design and facility siting and unavoidable impacts will be mitigated.

5.3 SITE-SPECIFIC ISSUES OF CONCERN

The ODFW identified site-specific issues of concern for the SDPP in a memorandum dated October 16, 2012 (Appendix P-1), the applicable portions of which are discussed in detail below.

5.3.1 Exotic and Invasive Species

Exotic and invasive wildlife species often have a higher tolerance for human impacts and disturbance and may benefit from food wastes associated with daily human presence at the site. Additionally, the construction of the SDPP will likely also create nesting and perching opportunities for invasive and exotic bird species. For example, native mourning doves (*Zenaida macroura*) could be replaced by ring-necked doves (*Streptopelia capicol*), and native sparrows could be replaced by house sparrows (*Passer domesticus*) and European starlings (*Sturnus vulgaris*) (Appendix P-1).

The ODFW was also concerned with an increase in corvid bird species at the site (ravens, crows, jays), which prey upon the western snowy plover (*Charadrius alexandrines nivosus*).

Soil disturbance and vegetation removal at the site, combined with the installation of SDPP infrastructure, may lead to the invasion of non-native plants at the site and further decrease habitat function for native species. Table P-7 lists the noxious weed species that occur, or are

likely to occur, within the analysis area (SHN 2013a). Noxious weed species observed at the SDPP site are shown in Figure P-6.

Table P-7. Noxious Species Occurrence with the Analysis Area

Common Name	Scientific Name	Occurrence
Bull thistle	*Cirsium vulgare*	L
Canada thistle	*Cirsium arvense*	X
English ivy	*Hedera helix*	X
European beachgrass	*Ammophila arenaria*	X
Field bindweed	*Convolvulus arvensis*	L
French broom	*Cytisus monspessulanas*	L
Gorse	*Ulex europaeus*	X
Himalayan blackberry	*Rubus armeniacus (R. discolor)*	X
Jubata grass	*Cortaderia jubata*	L
Parrotfeather	*Myriophyllum aquaticum*	X
Pennyroyal	*Mentha pulegium*	X
Poison hemlock	*Conium maculatum*	X
Scotch broom	*Cytisus scoparius*	X
Smooth cordgrass	*Spartina alterniflora*	X
Sweet fennel	*Foeniculum vulgare*	X
Yellow glandweed	*Parentucellia viscosa*	X

Source: SHN 2013a
"X" – indicates species has been documented at the project site
"L" – indicates species is likely to occur at the project area

At the ODFW's recommendation, project personnel have coordinated, and will continue to coordinate, with ODFW staff to minimize impacts from exotic and invasive species at the site. In addition, minimization of exotic and invasive species impacts is addressed in the Wildlife Habitat Mitigation Plan (Appendix P-6) and in Section 8.0 of this exhibit.

5.3.2 Habitat Fragmentation

The ODFW considers the upland habitats on the North Spit to be uniquely situated on a peninsula adjacent to both Coos Bay and the Pacific Ocean, and expressed concern about habitat fragmentation as a result of construction of the SDPP. The ODFW recommended that project personnel consider construction and operation options that would maintain wildlife corridors wherever possible to minimize the number of isolated habitats. These options include considerations for infrastructure layout, the installation of crossings under fences, and the minimization of road networks.

The layout of the project has been designed to minimize habitat fragmentation to the extent possible, and no habitats that are usable by wildlife will become isolated as a result of the project design. Similarly, road networks at the site have been minimized to the extent possible. The installation of crossings under fences, however, is not appropriate for the SDPP site, given security and safety requirements.

5.3.3 Noise Impacts on Birds

When conducting any loud noise-producing activities such as blasting or pile driving, the ODFW has recommended implementation of protection measures for great blue herons, osprey, peregrine falcons, bald eagles and golden eagles that may be in the area. To minimize noise impacts to great blue herons, osprey, bald eagles and golden eagles, the ODFW has recommended following Oregon Forest Practices Act (OFPA) guidelines (Appendix P-11). Although not specifically addressed in the OFPA, similar protection measures will be implemented for peregrine falcons as well.

No known great blue heron, peregrine falcon, bald eagle or golden eagle nests are located within the analysis area. However, if any of these species establishes nests within the analysis area during construction of the SDPP, project personnel will consult with the ODFW to implement the appropriate protection measures.

One osprey nest is located at the Roseburg Forest Products company site to the west of the SDPP site boundary. The nest is in a highly disturbed area and the birds are habituated to a high level of disturbance. While construction activity at the SDPP site may result in some initial disturbance to the osprey, they will likely become habituated to construction noise fairly quickly (SHN 2013c). If, in consultation with the ODFW, it is determined that protection measures are required to minimize noise impacts to osprey, OFPA guidelines for osprey will be implemented (OAR 629-665-0110).

Although there are no active great blue heron nests within the analysis area, there are two historic rookeries that may warrant additional analysis. One rookery is located within the site boundary, approximately 300 feet from Jordan Cove road and 2,000 feet east of the JCEP LNG site. ODFW and BLM biologists visited the rookery in 2006 and determined it to be inactive. The BLM also indicated that the rookeries had been inactive the previous two breeding seasons.

The second great blue heron rookery is located outside the site boundary, adjacent to the southwestern portion of the JCEP LNG site, on the south side of Henderson marsh. The BLM also indicated that this rookery has been inactive for several years. While great blue herons were observed at this site during pre-construction surveys in 2005, 2006 and 2012, no evidence of breeding was observed (SHN 2013b).

Surveys will be conducted at the two rookery sites prior to the start of construction on the SDPP to determine whether the rookeries remain inactive. If surveys determine that the rookery has become active and/or breeding is taking place, project personnel will consult with the ODFW to implement OFPA guidelines for great blue herons (OAR 629-665-0120), if necessary.

5.3.4 Wildlife-Salvage

The ODFW has placed an emphasis on the importance of wildlife salvage activities to minimize impacts to sensitive species as a result of construction of the SDPP. The agency has provided wildlife capture, holding, transport, and relocation guidance, which has been incorporated into Appendix C of the Wildlife Mitigation Plan (Appendix P-6).

In coordination with the ODFW, wildlife will be captured and relocated to the nearest suitable habitat within the same watershed and, preferably, on the same property. If suitable habitat is unavailable in the same watershed, deemed fully occupied, or the ODFW determines relocation is not in the best interest of the species, the agency will decide whether to release the species at an alternative site, transfer the species to a temporary holding facility, or pursue another alternative.

6.0 BASELINE SURVEYS OF STATE SENSITIVE SPECIES

OAR-345-021-0010(1)(p)(E). *A baseline survey of the use of habitat in the analysis area by species identified in (D) performed according to a protocol approved by the Department and ODFW.*

As described in Section P.2, extensive biological surveys were conducted in 2005, 2006 and 2012 to document plant and wildlife species utilizing habitat within the analysis area, including any state sensitive species. Survey methodologies and focus were developed in consultation with the ODFW (LBJ 2006). Survey locations are shown in Figure P-5 and detailed survey methodologies are provided in Appendix P-2. In addition to site surveys, the following sources were reviewed to document all species known to occur, or with the potential to occur, within the analysis area:

- Oregon Biodiversity Information Center (ORBIC) Rare, Threatened, and Endangered Species of Oregon list (SHN 2013b)
- Oregon Department of Agriculture (ODA) threatened, endangered and candidate plant species list (SHN 2013a)
- ODFW Threatened, Endangered and Candidate Fish and Wildlife Species List (SHN 2013b)
- ODFW Sensitive Species List (Appendix P-7)
- USFWS Proposed, Candidate Species and Species of Concern for Coos County (Appendix Q-5)
- BLM Final North Spit Plan (Appendix P-9)
- Oregon Conservation Strategy species list (Appendix P-14)
- Consultation with ODFW staff

State sensitive species, federal Species of Concern and Oregon Conservation Strategy species that were observed during field surveys or documented by the above sources are listed in Table P-6. The results of the site surveys are provided in the botanical and wildlife assessment reports in Appendices P-2 through P-4. In addition to these survey reports, a fisheries report was developed by ABA that contains descriptions of the fish species that occur, or have the potential to occur, within the analysis area. The fisheries report also summarizes the results of previous seining surveys conducted by the ODFW in Coos Bay from 1978-2000. The Fisheries Report is located in Appendix P-5.

Based on the results of surveys at the SDPP site and in consultation with the ODFW, additional surveys for sensitive species will be conducted prior to construction. As discussed in the Wildlife Survey Assessment Report (Appendix P-4), additional surveys are planned to occur closer to the time of construction to provide a comprehensive picture of the presence of sensitive species at the SDPP site, and to aid in the focus of wildlife salvage efforts. Additional surveys will be conducted for the following species:

- American peregrine falcon
- Bald eagle
- Pacific marten
- Northern red-legged frog
- Western pond turtle
- Clouded salamander
- Great blue heron

The results of these future surveys will help inform the need for wildlife salvage efforts and refine impact avoidance and minimization measures at the site. Wildlife salvage efforts and impact avoidance and minimization measures specific to sensitive species will be developed in concert with the ODFW. In the case of wildlife salvage efforts, the ODFW has provided guidance on the capture, holding, transport and relocation of wildlife species, which is provided in Appendix C of the Wildlife Mitigation Plan (Appendix P-6).

7.0 DESCRIPTION OF POTENTIAL ADVERSE IMPACTS

OAR 345-021-0010(1)(p)(F). *A description of the nature, extent and duration of potential adverse impacts on the habitat identified in (B) and species identified in (D) that could result from construction, operation and retirement of the proposed facility.*

This section contains a description of potential adverse impacts from the construction, operation and retirement of the proposed facility to habitats and species identified in the previous sections. The nature, extent, and duration of potential adverse impacts are addressed by habitat type and species taxon, with the exception of indirect impacts associated with noise and light emissions, and habitat fragmentation. These potential impacts are addressed from a project-wide perspective.

Based on the ODFW's Fish and Wildlife Habitat Mitigation Policy (OAR 635-415), no irreplaceable habitats or wildlife populations were found within the site boundary (LBJ 2006 and SHN 2013b). Thus, all habitat adversely impacted by the construction, operation or retirement of the SDPP can be mitigated. Additionally, as shown in Figure P-2, habitats similar to those being impacted are present within the analysis area and adjacent to the site boundary. As such, wildlife that may be impacted by activities at the SDPP site could relocate to similar habitat outside the site boundary but within the analysis area.

7.1 HABITAT IMPACTS

Estimated impacts to habitat as a result of construction of the SDPP are summarized in Table P-5. Mitigation for these impacts is discussed in Section 8.0, with the exception of wetland mitigation, which is discussed in detail in Exhibit J.

7.1.1 Upland Habitat

The majority of the upland habitat within the site boundary will be impacted by construction of the SDPP, as illustrated in Figure P-4 and outlined in Table P-5. Impacts may include direct loss of habitat, potential direct mortality, and long-term disturbances associated with the operation of the facility. Because the site was previously developed, impacts due to conversion of existing Category 6 habitat will be negligible. 33.581 acres of previously developed habitat will be permanently converted for the construction and operation of the SDPP, with temporary impacts to 13.455 acres. The remaining upland habitat at the site consists of Category 3 and Category 4 habitat, 53.374 acres of which will be permanently impacted by construction, operation and retirement of the SDPP. Temporary impacts to 10.917 acres of upland habitat are also anticipated as a result of construction activities.

Habitat that is temporarily impacted during construction will be subsequently graded and re-vegetated upon completion of construction activities. Although temporarily impacted areas may retain minimal function for a few wildlife species during construction of the SDPP, and therefore be considered Category 4 habitat, their proximity to active site disturbances and re-contoured ground surfaces will likely negate any beneficial habitat features. For purposes of an impact assessment, all impacts to Category 4 and Category 6 habitats are considered to be permanently

impacted. As such, all impacted habitats within the site boundary, whether Category 4 or Category 6, will be mitigated for at a one to one ratio (Appendix P-6). Further discussion of mitigation measures are discussed in Section 8.0.

Impacts to upland habitat outside the site boundary are inherently difficult to quantify, but could include diminished soil and vegetation quality, changes in moisture availability, increased solar radiation, dust deposition and the introduction of invasive species. Best management practices (BMPs), discussed in detail in Section 8.0, will be implemented to prevent impacts outside the site boundary to the extent practicable.

7.1.2 Freshwater Wetlands

Impacts to freshwater wetlands at the SDPP site will take place as a result of the construction, operation and retirement of the SDPP. Impacts to both jurisdictional and non-jurisdictional wetlands are discussed below; however, only impacts to non-jurisdictional wetlands will be mitigated for under the Wildlife Habitat Mitigation Plan (Appendix P-6). Impacts to jurisdictional wetlands will be mitigated under the Compensatory Wetland Mitigation Plan included in the JCEP DSL removal fill permit application (Appendix J-2) and are discussed in detail in Exhibit J.

7.1.2.1 Non-Jurisdictional Wetlands

Non-jurisdictional wetlands at the SDPP site were previously used as containment ponds during the operation of the Weyerhaeuser mill site. As such, these wetlands are not regulated under Section 404 of the Clean Water Act (CWA) and therefore not subject to DSL jurisdiction (Exhibit J).

Impacts to non-jurisdictional Wetlands F, G, I (South) and N are anticipated as a result of project activities, primarily the filling of the SDPP site. An estimated 1.771 acres of emergent wetland, scrub shrub wetland and open water habitat will be permanently impacted (Table P-5) and mitigated for under the Wildlife Habitat Mitigation Plan (Appendix P-6).

7.1.2.2 Jurisdictional Wetlands

Impacts to jurisdictional wetlands regulated under Section 404 of the CWS are addressed in this exhibit; however, mitigation for these impacts is addressed in Exhibit J.

Permanent impacts to 2.223 acres of freshwater wetlands are anticipated as a result of project activities (Table P-5), which will include the filling of the SDPP site, the construction of the haul road and construction of a bridge and transmission lines in the existing utility corridor. An additional 0.664 acres of temporary impacts are anticipated from compaction and disturbance of vegetation during construction (Appendix J-2).

7.1.3 Estuarine Habitat

Construction of the barge berth, access triangle and SDPP facility will directly impact estuarine habitat in a portion of Coos Bay. An estimated 3.163 acres of Category 2 estuarine habitat will

be permanently converted to developed habitat, and 0.778 acres will be temporarily impacted by construction (Table P-5). Temporarily impacted areas will be restored to pre-construction condition at the completion of construction activities and mitigation will be provided for permanently impacted habitat under the Compensatory Wetland Mitigation Plan in the JCEP DSL removal fill permit application (Appendix J-2).

In addition to direct habitat loss from construction, other potential impacts to estuarine habitat may include potential direct mortality, alteration of vegetation communities, temporarily increased turbidity and sedimentation and other disturbances resulting from construction activities (Appendix P-18). Potential impacts outside of the site boundary include habitat fragmentation, increases in non-native and invasive species (ODFW 2012) and oil spills from barge traffic associated with the project (JCEP 2014). A variety of BMPs will be implemented during construction to avoid and minimize impacts to habitat, fish and wildlife, both inside and outside of the site boundary, which are discussed in further detail in Section 8.0.

7.1.3.1 Barge Berth

In order to construct the barge berth, 21,666 cubic yards of permanent fill will be placed in estuarine habitat below the highest mean tide (HMT) of 10.26 feet. Construction of the barge berth will permanently impact 1.62 acres of intertidal habitat (Table P-5). An additional 3,589 cubic yards of temporary fill will also be placed in order to construct the barge berth. This fill will then be removed upon completion of construction. Open Cell sheet pile membrane walls will be installed to shield fill areas from the bay. The Open Cell sheet piles, along with a turbidity curtain, will serve to minimize sedimentation and turbidity impacts associated with construction activities. Pile driving will take place within temporary fill areas using land-based cranes, as opposed to in-water, to avoid impacts to habitat and wildlife from turbidity and noise. Consequently, no impacts from pile driving are anticipated during construction of the barge berth (Appendix J-2).

7.1.3.2 Access Triangle

In order to dredge the access triangle, 36,820 cubic yards of estuarine habitat will be permanently removed, resulting in impacts to 0.74 acres of intertidal, shallow subtidal, and eelgrass habitat (Table P-5). Dredging activities will be conducted primarily with a cutter-head suction dredge, which minimizes both turbidity and noise. Impacts to estuarine habitat will be mitigated for and are discussed in more detail in Section 8.0. All removal fill activities will be conducted and mitigated for under the JCEP DSL removal fill permit application (Appendix J-2), which is described in detail in Exhibit J.

7.1.3.3 Estuarine Wetlands

Construction of the SDPP facility will result in impacts to estuarine wetland as well as some adjacent habitat below the HMT. 5,025 cubic yards of fill will be placed in Wetland M and construction activities will result in permanent impacts to 0.21 acres of wetland habitat. Ground improvements at the site will also result in temporary impacts to 0.09 acres (Table P-5). In the estuarine areas of Jordan Cove that are adjacent to Wetland M, 5,063 cubic yards of permanent fill will be placed. Construction will result in permanent

impacts to 0.18 acres of adjacent wetland habitat and temporary impacts to 0.03 acres of adjacent habitat.

Wetland H (West) will also be impacted by construction of the SDPP facility. The estuarine wetland will be filled with 3, 596 cubic yards of sand fill and a total of 0.06 acres of wetland will be permanently impacted (Table P-5).

The estuarine habitat below the HMT that is adjacent to Wetland J will also be impacted. 3,339 cubic yards of fill will be placed in that area. Impacts resulting from the construction of the SDPP will result in 0.27 acres of temporary impacts and 0.14 acres of permanent impacts to the habitat adjacent to Wetland J (Table P-5).

As with the barge berth and access triangle, all removal fill activities in estuarine wetland habitat will be conducted and mitigated for under the JCEP DSL removal fill permit application (Appendix J-2).

7.2 FISH AND WILDLIFE

As shown in Table P-8 below, impacts to fish and wildlife are likely to vary inside and outside of the site boundary, and depending on the type of activity. Permanent impacts to habitat, fish and wildlife within the site boundary are likely during construction of the SDPP. Temporary or less severe impacts are more likely to occur in areas adjacent to the site boundary during construction, operation and retirement of the SDPP. More mobile species such as birds, mammals, and fish are less likely to be adversely impacted by project activities as they will be more able to move to nearby areas with suitable habitat. Less mobile species such as amphibians, reptiles, invertebrates and plants, which cannot readily move to adjacent habitat, would likely be impacted the most by the project. If not salvaged prior, these species will likely be killed during construction activities and experience loss of fitness or mortality during operational and retirement activities. Wildlife salvage will reduce mortality from construction by removing many of the less mobile individuals prior to construction and relocating them to more suitable habitat (Appendix P-6).

Table P-8. Nature and Duration of Impacts*

Impact		
Resource	**Nature**	**Duration**
Habitat Removal (Effects on resources within site boundary)		
Upland Habitat	Loss of habitat	Permanent
Wetland Habitat	Loss of habitat	Permanent
Mobile Species	Relocation to other suitable habitat	Permanent
Less Mobile Species	Potential mortality	Permanent
Construction Activities (Effects on resources adjacent to site boundary)		
All Adjacent Habitat	Decreased habitat quality*	Duration of construction
Mobile Species	Relocation to other suitable habitat	Duration of

		construction
Less Mobile Species	Potential loss of fitness or mortality if unable to relocate	Duration of construction
Operational Activities (Effects on resources adjacent to site boundary)		
All Adjacent Habitat	Decreased habitat quality**	Life of project
Mobile Species	Relocation to other suitable habitat	Life of project
Less Mobile Species	Potential loss of fitness or mortality if unable to relocate	Life of project
Retirement Activities (Effects on resources adjacent to site boundary)		
All Adjacent Habitat	Decreased habitat quality**	Duration of retirement
Mobile Species	Relocation to other suitable habitat	Duration of retirement
Less Mobile Species	Potential loss of fitness or mortality if unable to relocate	Duration of retirement

*The extent of habitat impacts is discussed in detail in the text of Section 7.
**Decreased habitat quality resulting from operational and retirement activities would be the result of impacts to habitat previously degraded by construction activities.

7.2.1 Amphibians and Reptiles

Amphibians and reptiles will be directly affected by the filling of wetlands and upland areas within the site boundary. To minimize the impacts to these species, wildlife salvage will be conducted prior to filling the site (Appendix P-6). While biologists will survey and attempt to salvage any amphibians or reptiles present prior to the commencement of construction, the roughness of vegetation and cryptic nature of species may prevent the capture of all individuals. For wildlife that avoid detection during salvage, mortality will likely occur as a result of construction activities. Potential impacts to amphibians and reptiles outside of the site boundary are also possible. Red-legged frogs and western pond turtles are known or likely to occur in wetlands near the utility corridor and these species may be negatively influenced by nearby construction activities. While both species will likely relocate away from construction activities and impacted habitat, a decline in fitness due to stress is possible. To prevent impacts to amphibians and reptiles adjacent to the site boundary, wildlife salvage in a wider footprint than just the direct impact area may be advisable. Expanded wildlife salvage will be determined in consultation with the ODFW and other stakeholders.

Mitigation for potential amphibian and reptile mortality is provided through preservation of high-quality wetlands at the Lagoon site, as described in the Wildlife Mitigation Plan (Appendix P-6) and shown in Figure P-7. Additional avoidance and mitigation measures for all species that may be impacted are described in Section 8.0.

7.2.2 Birds

Adverse impacts to bird species are not anticipated as a result of the construction, operation and retirement of the SDPP. Given the mobile nature of bird species, any birds using habitat within the site boundary for foraging or roosting could relocate to nearby suitable habitat. Adverse

impacts to nesting birds within the site boundary also are not anticipated, as vegetation at the site will be removed outside of the nesting season, in compliance with the Migratory Bird Treaty Act (MBTA), to discourage nesting and avoid impacts.

Birds flying over the site are not likely to be adversely impacted. Although transmission lines will be constructed as part of the project, they will be sited in an existing utility corridor and bird flight diverters will be installed to avoid collisions with birds (JCEP 2014).

Raptors and other birds that may nest in the project vicinity will likely avoid building nests in the area of the transmission corridor given disturbances from construction, operational and retirement activities and regular human presence in the area (LBJ 2006, SHN 2013b). Bird species that live and nest near industrial areas are generally habituated to human activity and the presence of facility structures. Industrial activities at the adjacent Roseburg facility have been ongoing for some time, which would suggest that birds living and nesting in the area are already accustomed to human activities and facility structures. Thus, no adverse impacts from construction, operation or retirement activities in the utility corridor are anticipated.

Some impacts to breeding bird species from construction activities may occur in areas outside of, but near, the site boundary. Construction, which is expected to occur over a three-year period, may cause disturbance to breeding birds over three to four nesting seasons. For example, the forested areas adjacent to the site boundary in the western portion of the analysis area are suitable breeding habitat for the olive-sided flycatcher, which was detected regularly in small numbers during summer surveys in the SDPP area (LBJ 2006). Construction will result in permanent impacts to 8.78 acres of coastal dune and riparian forest, and temporary impacts to 2.64 acres. A portion of these forested areas are located on the western side of the SDPP site, and would therefore result in the loss of some suitable habitat for the olive-sided flycatcher (DEA 2014). However, since additional suitable nesting habitat is available adjacent to the site boundary, minimal impacts to breeding birds are anticipated and may include displacement to neighboring habitats.

Construction, operation and retirement of the SDPP will likely also attract exotic and invasive birds to the project area. Exotic and invasive wildlife often have a higher tolerance for direct associations with human activity and may be drawn to the project site by food and other wastes associated with daily human activities. The presence of exotic and invasive species is of particular concern to the ODFW, as articulated in the agency's October, 2012 memo (Appendix P-1) in response to JCEP's Notice of Intent (NOI). In response to ODFW's concerns, BMPs will be implemented in consultation with the ODFW to discourage exotic and invasive bird species presence at the project site.

BMPs and other avoidance and minimization measures, as well as mitigation measures for impacts to bird species are discussed in detail in Section 8.0 and in the Wildlife Habitat Mitigation Plan (Appendix P-6).

7.2.3 Terrestrial Mammals

No adverse impacts to terrestrial mammals are anticipated as a result of the construction, operation or retirement of the SDPP. Of the terrestrial mammal species known or likely to occur within the analysis area, bats may be present within the site boundary and could potentially experience loss of habitat or decreased fitness due to disturbance. However, given the mobile nature of bat species, they would likely move to suitable habitat nearby during disturbances from construction and retirement activities. Since breeding habitat such as caves or mines is not present, impacts to breeding bats that use these features are not be anticipated.

Although not observed during surveys of the analysis area, Pacific marten have a moderate potential for occurrence and have been documented previously as occurring on the North Spit. Suitable habitat for Pacific marten does not occur within the site boundary; however, the species could be found in coastal dune forest within the analysis area. Consequently, loss of coastal dune forest habitat as a result of project activities could impact Pacific marten. Given the mobile nature of this species, Pacific marten would likely relocate to other suitable habitat on the North Spit and avoid adverse impacts. Additional surveys will be conducted for the species prior to the start of construction and if any individuals are observed at that time, additional BMPs will be implemented in consultation with the ODFW to avoid or minimize impacts to the species. Other terrestrial mammal species, if present within the site boundary, will likely move to adjacent suitable habitat during construction activities, and fencing will discourage them from re-entering the site during construction, operation and retirement of the facility.

7.2.4 Marine Mammals

Adverse impacts to marine mammals are not anticipated as a result of construction of the barge berth and access triangle. The Steller sea lion is the only state sensitive marine mammal species known to occur within the project area, although it was not observed during site surveys. The nearest haul-out sites utilized by Steller sea lions are located at Cape Arago, approximately 10 miles south of the project site, and there are no rookeries in Coos County. The species tends to occur more frequently at the mouth of the bay where fishing activities take place, so their presence within the analysis area is likely infrequent (SHN 2013b). In addition, Steller sea lions are highly mobile, so any disturbances caused by the construction of the barge berth and access triangle, such as noise generation and light emissions, could be avoided by relocating to nearby areas.

7.2.5 Fish

Potential impacts to state sensitive fish species are anticipated as a result of construction of the barge berth. Steelhead trout and coastal cutthroat trout both have a high likelihood of occurrence within the analysis area, while river lamprey and Pacific lamprey both have a moderate chance of occurrence. Construction activities associated with the barge berth and access triangle will likely impact these fish species through the removal of intertidal, subtidal and eelgrass habitat.

In addition, fish species may experience temporary impacts from localized turbidity and sedimentation, and construction noise. As described in Section 7.0, Open Cell membrane walls and turbidity curtains will be employed to minimize turbidity and sedimentation during

construction of the barge berth and all pile driving work will be conducted in the dry to minimize noise generation. All in-water work will be conducted during the ODFW-approved in-water work window from October 1st through February 15th to avoid vulnerable fish life stages including migration, spawning and rearing (ODFW 2008). BMPs to avoid or minimize impacts to fish, as well as mitigation measures, are discussed in more detail in Section 8.0 and in the Wildlife Habitat Mitigation Plan (Appendix P-6).

7.2.6 Aquatic Invertebrates

Aquatic invertebrates have the potential to be impacted by construction of the barge berth and access channel. Of the two state sensitive invertebrate species in Coos Bay (Table P-6), Newcomb's littorine snail is known to occur on the North Spit. Although it has not been documented in the analysis area, suitable habitat exists that suggests the likelihood of their occurrence is high. Although the California floater mussel has a moderate likelihood of occurrence, it is limited by saltwater in Coos Bay and therefore not expected to be abundant in the estuarine waters within the analysis area (SHN 2013b). Consequently, this species is not expected to be adversely impacted by project activities.

Construction of the barge berth and access channel will disturb or reduce shoreline aquatic habitat and potentially eliminate or displace established benthic communities. To minimize impacts to aquatic invertebrate surveys, pre-construction surveys and subsequent wildlife salvage may be performed if deemed appropriate during consultation with the ODFW. Species not captured during wildlife salvage would likely experience mortality due to construction activities. Mitigation for impacts to aquatic invertebrates is discussed in further detail in Section 8.0 and in the Wildlife Habitat Mitigation Plan (Appendix P-6).

7.2.7 Plants

No adverse impacts to state sensitive plant species or federal Species of Concern are anticipated as a result of the construction, operation or retirement of the SDPP. No sensitive species were observed during pre-construction site surveys and no known unique habitats exist within the site boundary. Although permanent loss of habitat will occur as a result of project activities, no impacts to sensitive plant species are expected. Potential impacts to state or federally threatened and endangered species are discussed in detail in Exhibit Q.

7.3 NOISE EMISSIONS

Potential noise impacts to sensitive species during construction, operation and retirement of the project are likely to include those from human presence, noises from heavy equipment, and noise level increases from increased vehicle traffic on roads in the area. These noises will likely displace many animals that occur within the analysis area during the hours of construction activity, and possibly during the duration of project construction or operation for more noise-sensitive species.

Ambient noise levels were measured at four sites in the vicinity of the project site, the most representative site being the Horsfall Sand Campground. This location is applicable to assessing noise impacts to wildlife because it is located in a semi-forested area adjacent to some traffic,

light industrial operations and recreational areas, which is representative of areas that will be impacted by project-generated noise (Figure X-1). The source and duration of noise generation during the construction, operation and retirement of the facility are described in detail in Exhibit X. Daytime ambient sound levels at Horsfall Sand Campground were measured at 55-60 decibels (dBA), with an average of 57 dBA (Figure X-2). As concluded by the USFWS in studies conducted in 2003 and 2006, bird species are thought to detect noises that are 4 dBA or more above ambient conditions (USFWS 2003, 2006). Based on average ambient noise levels of 57 dBA, bird species would detect additional noise from the project at 61 dBA. Levels impacting wildlife species are difficult to quantify due to a lack of scientific consensus. Consequently, an assumption of 61 dBA has been applied to all wildlife species for the purposes of assessing potential impacts from project-generated noise.

Based on a conservative, worst case estimate that assumes all construction equipment is operating simultaneously, noise is generated at the site boundary edge and equidistant from a receptor, and attenuation is only from geometrical spreading, construction and retirement noise levels are not expect to exceed 60 dBA at Horsfall Sand Campground (Table X-2). The exception to this would be during steam blow activities, which would occur infrequently and near the center of the SDPP site. Noise levels are expected to be 60 dBA at 1,200 to 1,400 feet from construction activities, suggesting that impacts to wildlife would only occur within 1,200 to 1,400 feet of the site boundary. Operational noise levels are expected to be approximately 47 dBA at the Horsfall Sand Campground and noise levels reaching 60 dBA would occur entirely within the site boundary. Therefore, impacts due to operational noise are not anticipated for this project. All noise level predictions at the site are described in detail in Exhibit X.

In order to avoid impacts from project-generated noise within 1,200 to 1,400 feet of the site boundary, individual species may disperse from within the site to adjacent suitable habitat within the analysis area or elsewhere on the North Spit. Wildlife remaining near the site during construction, operation or retirement of the facility may experience behavioral disruptions or may alter their behavior to avoid the most noise-intensive activities. For example, wildlife may use the site at night or later than usual when construction activities have ceased each day.

Fish species in Coos Bay may also disperse from areas within or adjacent to the site boundary to avoid noise generated from construction of the barge berth and access triangle. Pile driving will be conducted in the dry to minimize noise generation. Dredging of the access triangle will be conducted using a cutter-head suction dredge, which will greatly decrease noise impacts in comparison to other dredging equipment. All other in-water work will be conducted during the ODFW-approved in-water work window from October 1st through February 15th to avoid vulnerable fish life stages such as migration, spawning and rearing (ODFW 2008). Consequently, adverse impacts to fish species from noise generation are not anticipated.

Noise generated from the construction, operation and retirement of the SDPP cannot be entirely avoided and, as such, some species may be impacted. To minimize impacts to fish and wildlife, BMPs will be implemented to avoid or minimize noise generation to the extent possible. Avoidance and minimization measures are discussed in more detail in Section 8.0 and in the Wildlife Habitat Mitigation Plan (Appendix P-6) and Compensatory Wetland Mitigation Plan (Appendix J-2).

7.4 LIGHT EMISSIONS

Potential impacts to wildlife from light include disorientation from or attraction to artificial light, structural-related mortality due to disorientation, and behavioral effects on species adapted to lower light levels.

Exposure to artificial light can disorient species adapted to lower light levels, interrupting natural behaviors, exposing individuals to increased predation, or disrupting navigational abilities (Longcore & Rich 2006). Additionally, lighting at the SDPP site may impact foraging behavior in some species such that species typically active during the day, including predatory birds and reptiles, may forage at night in the presence of artificial lights. While artificial lights may prove beneficial for predatory species, artificial lights could be detrimental to prey species. Salamanders, for example, may be impacted by increased lighting within the site boundary, as artificial light during nighttime can disrupt internal cycles, resulting in impacts to endocrine function, foraging behavior, territoriality and activity patterns (Longcore & Rich 2006).

Facility lighting is required to provide for a safe, secure work environment, and the use of nighttime lighting is a necessary component of facility operations. Existing night lighting from the adjacent Roseburg Forest Products facility and the TransPacific Parkway already illuminates portions of the area in and around the site boundary; however, the addition of operational night lighting at the SDPP would create a new landscape feature to which wildlife would need to adjust. The applicant has taken a series of steps to minimize impacts related to facility lighting. The project's proposed Operational Lighting Plan (Appendix R-7) was designed to include the minimum amount of lighting necessary to satisfy essential safety and security needs of the facility while minimizing light impacts to the extent possible through the implementation of a number of BMPs. Light minimization measures such as the use of low emission light fixtures, cut-off optics and shielding are discussed in detail in the lighting plan in Appendix R-7. As shown in Figures 1-3 of the lighting plan, illumination from light fixtures along roadways and fence lines within the site boundary is expected to extend a maximum of 80 feet in most areas. In areas on steeper slopes, illumination may extend up to 100 feet and at the barge berth, would extend a maximum of approximately 70 feet into Coos Bay. As illustrated in Figures 1-3 of the lighting plan, all lighting illumination would be contained within the site boundary and is not anticipated to extend into adjacent portions of the analysis area.

Lighting requirements during construction and retirement of the SDPP will likely differ from operational lighting. Most construction and retirement activities will be conducted during daylight hours, negating the need for extensive construction lighting. During the darkest months of the year, however, additional lighting may be required. If construction or retirement activities fall behind schedule, operations may be adjusted to occur during nighttime hours, which would result in increased lighting at the site (Fuller, personal communication 2014).

Wildlife may need to adapt to operational lighting in and around the site boundary or relocate to similar habitats in the immediate vicinity. As safe and secure lighting is a necessary component of project activities, impacts to fish and wildlife cannot be entirely avoided. The applicant will coordinate with the ODFW to ensure that proper avoidance and minimization measures are

employed to limit impacts to fish and wildlife from facility lighting to the extent possible, which are discussed further in Section 8.0.

7.5 HABITAT FRAGMENTATION

Habitat fragmentation from construction, operation and retirement of facilities, and associated human disturbance, will reduce wildlife use and movement in and through the site boundary. However, the presence of suitable habitat adjacent to the site boundary provides other use options for potentially affected species. Mobile species will likely be relocated to other suitable habitat; however, less mobile species may experience reduced fitness or mortality. Fragmentation resulting from project activities can be offset by enhancing connectivity to other habitats within adjacent mitigation parcels (Appendix P-6).

8.0 MITIGATION MEASURES

OAR 345-021-0010(1)(p)(G). *A description of any measures proposed by the applicant to avoid, reduce or mitigate the potential adverse impacts described in (F) in accordance with the ODFW mitigation goals described in OAR 635-415-0025 and a discussion of how the proposed measures would achieve those goals.*

8.1 AVOIDANCE AND MINIMIZATION

The proposed SDPP has been designed to avoid or minimize impacts to fish, wildlife and habitat to the maximum extent possible. In order to facilitate avoidance and minimization of impacts, the permanent facilities at the proposed SDPP have been designed to occupy previously developed land within the site boundary. Siting of the SDPP has avoided unique vegetation communities (SHN 2013a) and wetland impacts, where unavoidable, were concentrated in lower functioning wetland types (see Exhibit J).

To minimize significant potential impacts to fish, wildlife and habitat in the analysis area, no irreplaceable Category 1 habitat will be impacted by the project. Impacts to Category 2, 3 and 4 habitats have been minimized or avoided to the extent practicable. Any unavoidable impacts will be mitigated for at a one to one ratio for all permanent and temporary impacts incurred during construction (Appendix P-6).

8.1.1 Upland Habitat

To avoid and minimize impacts to upland habitat from the construction, operation or retirement of the SDPP, the Conceptual Erosion and Sediment Control Plan and Conceptual Stormwater Management Plan (Appendix I-4) address project activities and provide BMPs and other measures to reduce erosion, sedimentation and stormwater runoff at the SDPP site. Measures that will be taken to reduce impacts are discussed in detail in these plans and include:

- Prior to construction activities, the limits of grading, clearing and grubbing will be clearly marked with stakes and fencing to minimize the extent of disturbance
- Storm drains, catch basins and other stormwater conveyance structures will be clearly marked to prevent construction traffic damage and to delineate these features for personnel awareness
- Temporary seeding will be conducted to re-establish vegetative cover in previously disturbed areas to prevent erosion of exposed soils. Compost or peat layers will be placed on disturbed areas to absorb wind and rain forces and to develop a growing medium for vegetation
- Dust will be controlled by reducing vehicle speeds, irrigating, applying dust palliatives, installing sand fences and placing compost or peat layers on disturbed areas
- Sediment fences will be installed to pond and filter stormwater upstream of the fence and promote the settlement of soil particles

- Check dams will be constructed in drainage courses to minimize velocity and prevent erosion
- An infiltration basin will be constructed to direct stormwater runoff from the SDPP to the basin
- Installation of infiltration trenches throughout the project site to treat runoff from roads and paved areas
- Exposed slopes in disturbed areas will be covered with a rolled erosion control fabric to prevent wind or water erosion prior to the establishment of vegetation. Peat and processed woody materials will be used to develop a seed bed on top of the fabric and subsequently planted with American dune grass to provide permanent revegetation and stabilize slopes.

Exotic and invasive species control measures will also be implemented to reduce invasions by non-native species at the site throughout the life of the project. The project will follow noxious weed management BMPs outlined in the Wildlife Habitat Mitigation Plan (Appendix P-6), including the following management methods (SHN 2013c):

- Pre-construction surveys will be conducted to identify noxious species listed by the ODA that persist despite previous and recent control efforts
- Pretreatment of weed infestations will be performed, primarily by mechanical or manual means such as mowing to ground level, disking, ripping, chopping, or hand pulling. Spot treatments with appropriate herbicides may also be applied
- In areas where weed infestation occur, cleared vegetation, salvaged topsoil and other materials generated from clearing and grading activities will be stockpiled in adjacent areas to minimize the transfer of noxious weed seeds, roots or rhizomes to other parts of the site
- Ongoing weed control at the site will be conducted by mechanical or manual means to prevent the spread of noxious weed species throughout the site. Herbicides may also be used in combination with other weed control methods
- Herbicides will not be used within 100 feet of a wetland or waterbody, unless allowed by the appropriate agency. Treatment buffers will be applied to noxious weed infestations in sensitive areas to avoid impacts to non-target species
- Restoration of treatment areas will be conducted using a native seed mix that conforms to BLM policy

8.1.1.1 Upland Species

Other measures to avoid, limit, or mitigate for impacts to wildlife species include protection measures for sensitive avian species under the MBTA. In order to minimize impacts to birds, transmission lines in the utility corridor have been designed to be as short as possible and include bird flight diverters to avoid collisions. To prevent electrocution of birds, raptors in particular, transmission lines have been designed so that the distance between conductors, and between conductors and grounded hardware, is

greater than the wingspan of any raptor. Raptors are electrocuted when they contact two energized conductors or an energized conductor and grounded hardware. Among avian species, raptors are at greatest risk of electrocution because of their large wingspans and tendency to perch on power poles.

Additionally, efforts will be made to conduct vegetation removal at the SDPP site outside of the breeding season to avoid impacts to breeding or nesting birds. In compliance with the MBTA, vegetation removal will be scheduled prior to March 1st or after August 31st to avoid nesting birds. If construction activities must occur during the breeding season, pre-construction surveys will be conducted to determine whether active nests are present within the site boundary. Thirty days prior to planned ground disturbance activities, surveys will be conducted to ensure that nesting bird species are not being disturbed. If any birds are observed within planned disturbance areas, the ODFW will be contacted for guidance regarding appropriate construction phase nest buffers. Pre-construction surveys and construction buffers, if necessary, will help reduce impacts to breeding and nesting birds within the site boundary, including habitat removal and noise.

Direct impacts to terrestrial mammal species are not expected as a result of the project, as these animals are highly mobile and will likely move to adjacent suitable habitat during periods of disturbance. Prior to the commencement of construction, additional surveys will be conducted for the American peregrine falcon, bald eagle, Pacific marten, northern red-legged frog, western pond turtle, clouded salamander and great blue heron to further evaluate the need for species-specific avoidance and minimization measures (Appendix P-4). An implementation plan will be developed and reviewed by the ODFW before conducting surveys. If any of these species are observed within the site boundary during pre-construction surveys, the ODFW will be notified and avoidance and minimization measures, including potential wildlife salvage, will be developed alongside the agency (Appendix P-4).

Potential noise impacts to upland species as a result of project activities will be avoided or minimized to the extent possible. Measures will be implemented to minimize noise impacts to upland species, including the following BMPs (Exhibit X):

- Air-cooled condensers will be use low noise fans during SDPP operations
- Fuel gas compressors and steam turbine generators will be furnished with enclosures to limit noise
- Heat recovery steam generators will reduce noise from turbine exhaust
- Stack silencers may be used to reduce noise levels from stacks
- Other equipment packages will be specified as necessary to minimize noise generation in accordance with project requirements

The applicant will also coordinate with the ODFW to ensure that appropriate avoidance and minimization measures are employed throughout the life of the project to protect wildlife from potential noise impacts.

Impacts to upland species from facility lighting will be minimized to the extent practicable. The project's Proposed Site Lighting Plan (Appendix R-7) was designed to include the minimum amount of lighting necessary to satisfy essential safety and security needs, while avoiding impacts to wildlife where possible. As described in detail in the lighting plan, a number of measures will be implemented to minimize impacts from facility lighting to wildlife within, and immediately adjacent to, the site boundary, including:

- Placement of exterior lighting only in places requiring vehicular traffic, safe personnel passage, monitoring of the perimeter fence or visual inspection
- Installation of low-emission LED light fixtures
- Shielding of illumination sources on light fixtures to limit light emissions to the specific area requiring illumination
- Use of cut-off optics and cobra head fixtures on roadway lighting fixtures so that the light source is not visible until near the fixture.
- Use of fixtures with a near zero uplight rating for illuminating walkways and ground-level equipment.
- Top- and side-shielding of all floodlights, which will be directed inward toward the facility

As well as the above measures, the applicant will consult with the ODFW to ensure that proper avoidance and minimization measures are employed throughout the life of the project.

8.1.2 Wetland Habitats

Impacts to wetland habitats are anticipated as a result of the project, but have been avoided or minimized to the maximum extent feasible. Mitigation will be provided for unavoidable impacts to non-jurisdictional wetlands as part of the Wildlife Habitat Mitigation Plan (Appendix P-6). All other impacts to DSL jurisdictional wetlands will be mitigated under the JCEP DSL removal fill application (Appendix J-2), and are discussed in detail in Exhibit J.

Including the measures summarized for upland habitat and as outlined in the Conceptual Erosion and Sediment Control Plan, Conceptual Stormwater Management Plan (Appendix I-4) and NPDES 1200-C permit application (Appendix E-3), measures will be implemented to avoid or minimize impacts to wetland habitat, including:

- Identification, protection and preservation of critical riparian areas and associated vegetation
- Preservation of vegetative buffer zones between the project site and sensitive areas, including perimeter areas
- Covering of all unpaved roads on site with gravel to prevent sediment tracking on public and private roads
- Maintenance of wetland areas near the site to allow for detention and treatment of uncontaminated stormwater runoff that naturally flows from the site to these areas
- Perimeter sediment control measures, including storm drain inlet protection, sediment basins, traps and barriers
- Non-stormwater pollution control measures for material and waste storage areas
- Construction of an infiltration pond to allow for the washout of concrete trucks and settlement of particles, while allowing water to infiltrate into the soil
- Stream bank stabilization and runoff control measures to protect areas from concentrated flows
- Permanent erosion prevention measures including stabilization and landscaping at the conclusion of construction

Potential impacts to habitat, fish and wildlife from stormwater runoff could result from increased metals concentrations in stormwater discharge. To prevent these impacts, non-contact stormwater runoff will infiltrate through bioswales and retention ponds and approximately 30 feet of clean sand fill before entering the water table, resulting in a substantial decrease in metals concentrations (Appendix E-4). Contact stormwater will be treated prior to being discharged through the Port's ocean outfall. All treated stormwater will meet the requirements of modified NPDES Permit No. 101499 (Appendix E-4) and a DEQ-approved Conceptual Stormwater Management Plan (Appendix I-4).

Mitigation for impacts to wetland habitat used by amphibians and reptiles will take place as part of the JCEP DSL removal fill permit application (Appendix J-2) for jurisdictional wetlands and the Wildlife Habitat Mitigation Plan (Appendix P-6) for non-jurisdictional wetlands. For more mobile species, it is expected that individuals will relocate to suitable habitat adjacent to the site boundary at the commencement of construction activities. For less mobile species, wildlife salvage will be conducted prior to construction to minimize impacts to sensitive amphibian and reptile species to the maximum extent possible (see Appendix P-6).

8.1.2.1 *Wetland Species*

Wildlife surveys will be conducted prior to the start of construction activities and vegetation removal that may impact wetlands to document the presence of special status herptofauna at the project site. Project personnel will first consult with the ODFW regarding nearby suitable habitat where salvaged species can be relocated. These areas

will be subsequently mapped and agreed upon with the ODFW prior to the start of construction (Appendix P-4)

Surveys will be conducted 30 days prior to the start of construction in areas where suitable habitat is anticipated to be removed or disturbed. The presence of sensitive amphibian and reptile species in these areas, specifically the northern red-legged frog and western pond turtle, will be documented at that time and identified for further pre-construction surveys and salvage efforts (Appendix P-4).

8.1.3 Estuarine Habitat

Impacts to estuarine habitat are expected as a result of construction of the barge berth and access channel, but have been avoided or minimized to the maximum extent feasible. Mitigation will be provided for unavoidable impacts as part of the JCEP DSL removal fill application (Appendix J-2).

Potential impacts to estuarine habitat from oil spills are unlikely given the background rate of oil spills in Oregon, the number of estimated barge trips and the fuel capacities of tug boats pulling the barges (JCEP 2014). Existing spill response and management plans will be implemented in the unlikely event of a spill. Tug contractors will have spill prevention and emergency response plans in place and will be responsible for reporting any release to the appropriate agencies. Additionally, the Oregon Department of Environmental Quality (ODEQ), United States Coast Guard (USCG), and the EPA have developed a Geographic Response Plan (GRP) for the Coos Bay region, which prioritizes the protection of resources in the event of a spill, and allows for immediate and proper action (ODEQ 2004). All vessel operators in Coos Bay would follow the procedures outlined in the GRP in the event of a spill.

Removal of salt marsh, algae, mud and sand, intertidal and eelgrass habitats are expected from the construction of the barge berth and access channel; however, measures will be taken to avoid or minimize any additional impacts to estuarine habitat as a result of construction activities. All in-water work will be conducted during the ODFW-approved in-water work window from October 1st through February 15th to avoid vulnerable fish life stages, including migration, spawning and rearing (ODFW 2008).

To prevent turbidity and sedimentation impacts, the following BMPs, avoidance and minimization measures will be implemented, as outlined in the JCEP DSL removal fill application (Appendix J-2):

- Installation of Open Cell sheet pile membrane walls during construction of barge berth to isolate construction activities, resulting in only localized turbidity impacts.
- Installation of turbidity curtains to further reduce turbidity and sedimentation impacts to surrounding species and habitat
- Conduct dredging activities primarily with a cutter-head suction dredge to minimize turbidity and noise impacts

- Conduct water quality monitoring throughout construction to ensure compliance with federal and state standards

To avoid or minimize noise impacts to aquatic species as a result of the construction of the barge berth and access triangle, BMPs and avoidance and minimization measures will be implemented, as outlined in the JCEP DSL removal fill application (Appendix J-2). The barge berth area will be temporarily filled with clean sand so that pile driving can be conducted on dry land, which will greatly reduce noise generation and lessen impacts to aquatic species in the area. Additionally, the use of a cutter-head suction dredge during dredging of the access triangle will reduce noise impacts to aquatic species, as compared to other potential dredging equipment.

8.1.3.1 Estuarine Species

Mitigation for impacts to wetland and estuarine habitat used by aquatic species will take place as part of the DSL permit process for the SDPP (Appendix J-2), and salvage of aquatic invertebrates within the estuary will occur to the extent possible (see Appendix P-6). The scope and extent of wildlife salvage will be determined in conjunction with the ODFW.

In order to avoid impacts to fish, lighting at the SDPP onshore facilities will include a mixture of low-power fluorescent lighting and higher intensity security lighting that will primarily be located on shore, in and adjacent to the facility. The lighting placed along the barge berth will be effectively shielded from the water by the barge when in the berth. When a barge is not in the berth, the lighting will be reduced to that required for security and will be focused upon the structures. Illumination will not extend outside of the site boundary, which will reduce or eliminate any behavioral effects to sensitive fish and marine mammal species in the vicinity of the barge berth (Appendix R-7).

8.1.4 Wildlife Salvage

Special status herptofauna and fish present in wetlands will be salvaged, to the extent possible, in accordance with the ODFW-approved salvage plan provided in Appendix C of the Wildlife Habitat Mitigation Plan (Appendix P-6). The ODFW-approved salvage plan provides protocols for the handling of amphibians and turtles, and will be incorporated into the applicant's mitigation plan for northern red-legged frogs and western pond turtles to demonstrate compliance with Council standards. Salvage protocols for additional special status species are being developed with ODFW and stakeholder input and will be incorporated into the salvage plan when available.

The wildlife salvage plan will reduce mortality from construction activities by removing less mobile species from construction and fill areas. Although mortality of individuals will likely decrease as a result of wildlife salvage, this benefit will need to be weighed against the potential loss of fitness to individuals resulting from the salvage process. As such, the ODFW and other stakeholders will be consulted as to the exact distance from the site boundary in which to conduct salvage.

Detailed guidelines regarding the capture, holding and transport of individuals are provided in the Wildlife Salvage Plan (Appendix P-6), and include instructions regarding the type and dimensions of equipment used to hold and transport individuals, proper care of captured individuals, appropriate holding temperatures and light exposure, and handling of individuals.

8.2 MITIGATION

As defined in the ODFW's Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-0010), the agency "requires or recommends, depending upon the habitat protection and mitigation opportunities provided by specific statutes, mitigation for losses of fish and wildlife habitat resulting from development actions."

Mitigation will be provided by the project for losses of fish and wildlife habitat resulting from development actions. Mitigation actions are identified in the Wildlife Habitat Mitigation Plan (Appendix P-6), which will take place primarily at the Panhandle site, but also at the Lagoon and North Bank sites (Figure P-7). Mitigation for DSL jurisdictional wetlands and estuarine habitat is discussed in detail in Exhibit J. In addition to mitigation, enhancement and protection measures for all habitats in the analysis area, including DSL jurisdictional wetlands and estuarine habitat, are outlined below. Mitigation will occur prior to or concurrent with construction and thus, no net loss in habitat quantity or quality is expected as a result of the project.

Table P-9. SDPP Wildlife Habitat Mitigation Acreage Provided at the Panhandle Mitigation Site

Habitat Type	In-Kind Mitigation	Out-of-Kind Mitigation	Total Mitigation Provided
Coastal Dune Forest	10.0	0.0	10.0
Riparian Forest*	1.4	0.0	1.4
Shrub	2.5	0.0	2.5
Herbaceous Shrub	0.4	33.8	34.2
Herbaceous	12.7	0.0	12.7
Unvegetated Sand**	1.6	1.9	3.5
Emergent Wetland***	1.0	0.0	1.0
Open Water***	0.8	0.0	0.8
TOTAL	**30.4**	**35.7**	**66.1**

*1.4 acres of in-kind mitigation of riparian forest habitat will occur at the North Bank mitigation site (Parcel S).
**1.9 acres of in-kind mitigation of weedy herbaceous habitat at the Lagoon site (Parcel W) will be converted to unvegetated sand in addition to 1.6 acres of existing sand to be used for in-kind mitigation at the Panhandle site (3.5 acres total).
** *1.8 acres of in-kind mitigation of non-jurisdictional wetlands at the Panhandle site.

8.2.1 Upland Habitat

The applicant will provide mitigation for adverse impacts to habitat and species within the site boundary as outlined in the Wildlife Habitat Mitigation Plan (Appendix P-6). Figure P-4 shows the impacted areas within the site boundary and Figure P-7 displays the mitigation areas at the

Panhandle, North Bank and Lagoon sites specific to SDPP-related impacts. Mitigation acreage at these sites is outlined in Table P-9.

All habitat mitigation for the SDPP is provided at a one to one ratio (Appendix P-6). As shown in Figure P-7, in-kind, in-proximity mitigation is provided for all Category 3 upland habitats, which includes coastal dune forest, riparian forest and unvegetated sand. For Category 4 habitats, a combination of in-kind and out-of-kind mitigation will be provided, as provisioned in ODFW's Habitat Mitigation Recommendations (OAR 635-415-0025(4)(b)(B)). The Category 4 habitats to be mitigated include herbaceous, herbaceous shrub and shrub habitat.

8.2.2 Wetland Habitat

Mitigation for impacts to jurisdictional wetlands is provided under the Compensatory Wetland Mitigation Plan in the JCEP DSL removal fill permit application (Appendix J-2), and is described in detail in Exhibit J. For impacts to Category 3 non-jurisdictional wetlands (Figure P-4), which includes emergent wetland and open water habitat, in-kind mitigation will be provided at the Panhandle mitigation site to create Category 2 habitat (Figure P-7) and is described in detail in the Wildlife Habitat Mitigation Plan (Appendix P-6).

8.2.3 Estuarine Habitat

Mitigation for impacts to estuarine habitat is provided under Compensatory Wetland Mitigation Plan in the JCEP DSL removal fill permit application (Appendix J-2) and is described in detail in Exhibit J. For impacts to Category 2 estuarine habitat, which includes salt marsh, algae, mud and sand, intertidal unvegetated sand, and eelgrass habitat, in-kind mitigation will be provided at the Kentuck and Eelgrass mitigation sites (Exhibit J).

9.0 MONITORING PLANS

OAR 345-021-0010(1)(p)(H). *A description of the applicant's proposed monitoring plans to evaluate the success of the measures described in (G).*

9.1 SDPP SITE MONITORING

Monitoring activities will be conducted in all disturbed areas at the project site to ensure that measures to avoid or minimize impacts to habitat and species are successful. Monitoring of disturbed areas will be ongoing throughout the construction of the SDPP, and will continue until sufficient vegetative cover has been reestablished in temporarily impacted areas. On-site monitoring activities will be conducted in accordance with BMPs outlined in the Conceptual Stormwater Management Plan (Appendix I-4), JCEP DSL removal fill permit application (Appendix J-2) and Wildlife Habitat Mitigation Plan (Appendix P-6).

Planned monitoring activities at the SDPP site will focus primarily on the prevention of erosion and sedimentation, stormwater runoff, and invasive and noxious weed species management, as well as the re-establishment of vegetation following construction. Environmental inspectors will be employed by the project during construction and will be responsible for agency notification and reporting requirements and will have the authority to halt activities that potentially violate the measures set forth in the applicable permits and authorizations. Environmental inspectors will verify compliance with management protocols and identify additional site management needs, if necessary (Appendix P-6).

Monitoring activities will be conducted to ensure that impacts from erosion, sedimentation and stormwater runoff at the SDPP site are being avoided or minimized. As outlined in the Conceptual Stormwater Management Plan (Appendix I-4), these monitoring activities will include:

- Inspection of work areas for stains, spills or leaks, and inspection of containment areas for any accumulation of stormwater or sheens
- Inspection and collection of litter and debris from drainage courses and cleaning catch basins of accumulated sols or oils
- Inspection of trucks and equipment, as well as performing preventive and scheduled maintenance
- Inspection of stored vehicles, equipment and materials for leaks and installation of drip pans, absorbent pads, coverings and other measures to collect and contain leaks or spills and prevent stormwater exposure
- Inspection for accumulated fine sediment in infiltration trenches and basins.

Monitoring activities will also be conducted prevent the spread of invasive and noxious weed species during the construction, operation and retirement of the SDPP facility. Monitoring of

revegetation efforts will also be conducted. These activities are outlined in detail in the Wildlife Habitat Mitigation Plan (Appendix P-6) and include:

- Monitoring for infestations of noxious weeds will be conducted during the first and second years post-construction
- Monitoring will focus on areas where noxious weeds were identified in pre-construction surveys to ensure prior infestations do not become re-established or spread to other areas
- If infestations occur, project personnel will develop a treatment plan to treat and control the infestation using integrated weed management principles and appropriate landowner and agency approvals
- Revegetation monitoring will be conducted during the first and second growing seasons post-construction
- Revegetation monitoring will continue until the density and cover of vegetation in disturbed areas is similar to that of vegetation in adjacent, undisturbed areas. If density and cover are not similar or if there are excessive weed species present, additional restoration measures will be implemented in consultation with qualified professionals to ensure the success of revegetation efforts.

In addition to erosion, sediment, stormwater and noxious weed monitoring, water quality monitoring will also be conducted during in-water construction activities at the barge berth and access triangle to ensure compliance with federal and state standards. As outlined in the JCEP DSL removal fill permit application (Appendix J-2), water quality monitoring will be conducted to ensure that turbidity impacts are reduced to the maximum extent possible. If test results indicate that a given activity is out of compliance with federal and/or state standards, work will cease until corrective actions are taken.

In addition to the above listed monitoring activities, the applicant will consult with ODEQ, NMFS and other appropriate agencies as part of the NPDES permitting process (Appendix E-3 and Appendix E-4) and approval of an associated Stormwater Management Plan (Appendix I-4) to further refine planned monitoring activities at the site.

9.2 MITIGATION SITE MONITORING

The applicant has completed a Wildlife Habitat Mitigation Plan in accordance with OAR 635-415-0000 through 0025, which will be implemented as part of the overall JCEP project (Appendix P-6). The mitigation acreage specific to the SDPP is shown in Figure P-7 and Table P- 9, and discussed in detail in the Wildlife Habitat Mitigation Plan (Appendix P-6).

Mitigation for impacts at the SDPP site will be implemented primarily at the Panhandle site, but also at the North Bank and Lagoon sites (Figure P-7). As part of the mitigation process, the applicant will endow a land manager to conduct long-term monitoring and maintenance at the mitigation sites throughout the life of the project (Appendix P-6).

Monitoring efforts will continue for the duration and frequency needed to ensure that the goals and standards outlined in OAR 635-415-0025 are met, unless the ODFW determines that no significant benefit would result from additional monitoring. The monitoring plan outlined in the Wildlife Habitat Mitigation Plan proposes a monitoring period of no more than five years, with the first year of monitoring beginning upon the substantial completion of mitigation construction and implementation (Appendix P-6).

9.2.1 As-Built Survey

In the first year of monitoring, an as-built survey will be conducted to document that the appropriate contours have been attained where grading is proposed and plantings were installed as designed. An as-built report will be prepared, which will include the as-built survey, photos, and a brief synopsis of work completed, including any design changes.

9.2.2 Photo Documentation

Photo locations will be established within the Panhandle, North Bank and Lagoon sites to document conditions at the sites every year for the first five years post-mitigation. Supplemental photos will be taken as appropriate to document any problem areas or enhancement actions.

9.2.3 Mitigation Objectives and Performance Standards

A number of mitigation objectives and performance standards have been identified to assess the success of mitigation at all project mitigation sites. Long-term monitoring and site management will be conducted at the mitigation sites to determine whether performance standards have met the mitigation objectives.

Objective 1: Permanent preservation of parcel.

Performance Standard 1.1: A legal protection instrument is in place in the form of a conservation easement.

Objective 2: The portion of the parcel preserved for mitigation purposes is demonstrably managed for conservation for the life of the project.

Performance Standard 2.1: A land manager will be endowed to monitor and maintain the parcels, demonstrate that an ecological uplift has been provided at each site, provide monitoring reports for the first five years after implementation of proposed mitigation measures, and maintain the sites throughout the life of the project.

Performance Standard 2.2: A long-term maintenance plan will be developed in coordination with the appropriate agencies to guide long-term stewardship for each mitigation site.

Objective 3: An ecological uplift has been provided at each mitigation site.

Panhandle Site

Performance Standard 3.1: Ecological uplift (in the form of Scotch broom removal over a minimum of 5.8 acres) has been completed and is reflected in monitoring reports for five years.

North Bank Site

Performance Standard 3.2: Ecological uplift (forestry activities designed to encourage succession to mature forest within a minimum of 71.2 acres) has been completed for five years based on annual monitoring reports.

Lagoon Site

Performance Standard 3.3: Ecological uplift (in the form of Scotch broom and Himalayan blackberry removal within a minimum of 10.2 acres, and construction of an educational kiosk) has been completed and maintained for five years based on annual monitoring reports.

Performance Standard 3.4: Placement and compaction of sand to an approximate depth of six feet has been completed and maintained over an area of at least 1.9 acres to provide at least 95% open sand cover for five years based on annual monitoring reports.

In addition to the monitoring activities outlined above, long-term maintenance will be conducted at the mitigation sites, which may include garbage and debris removal, installation of protective signage and other deterrents in the event that vandalism or other inappropriate activities are found to occur at any of the sites.

9.2.4 Contingency Plan

Contingency plans will be developed by the endowed land manager and coordinated with ODFW should mitigation not meet performance standards. The nature of the contingency plan will depend on the problems that arise and would likely be related to weed control and potential vandalism or effects from natural disasters.

10.0 PROPOSED FINDINGS

The proposed facility will be located on a former industrial site and previously developed lands that will consist primarily of sand fill and be managed to discourage use of the site by wildlife prior to completion of construction. Direct impacts to species will occur within upland, wetland and estuarine habitat. In addition, construction, operation and retirement of the SDPP will likely impact species at the project site and permanently alter wildlife use of the site. For habitat and species affected by the project, the applicant shall implement the necessary avoidance, minimization, mitigation and monitoring measures outlined in Exhibit P to offset impacts from construction, operation, and retirement of the facility.

11.0 REFERENCES

Alice Berg & Associates, LLC (Berg). 2006. Jordan Cove Fisheries Report. October 2006.

Fuller, Stephanie. Kiewit construction manager. Personal communication on September 30, 2014.

Jordan Cove Energy Project (JCEP). Draft Biological Assessment and Essential Fish Habitat Assessment for the Jordan Cove Energy and Pacific Connector Gas Pipeline Project. April, 2014.

LBJ Enterprises (LBJ). 2006. *2005-2006 Pre-construction wildlife surveys for proposed Jordan Cove Liquified Natural Gas Plant, Coos Bay, Oregon*. May 10, 2006 Revised December 26, 2006.

Longcore, Travis; Rich, Catherine. 2006. Ecological consequences of artificial night lighting. Island Press. 459 pages.

ODEQ. Coos Bay, Oregon Geographic Response Plan (GRP). December 2004. http://www.deq.state.or.us/lq/pubs/docs/cu/CoosBayGeographicResponsePlan.pdf

Oregon Department of Fish and Wildlife (ODFW). 2012. Comments submitted to Oregon Department of Energy on Resource Reports for the Jordan Cove Energy Project and for the Pacific Connector Gas Pipeline Project. November 30, 2012. Oregon Department of Energy, 625 Marion Street NE, Salem OR 97301-3737.

Oregon Department of Fish and Wildlife (ODFW). 2008. Wildlife Division Sensitive Species List, organized by category. Online at: www.dfw.state.or.us/wildlife/diversity/species/sensitive_species.asp

Oregon Department of Fish and Wildlife. 2006a. Oregon Conservation Strategy, Coast Range Ecoregion. January, 2006.

Oregon Department of Fish and Wildlife (ODFW). 2006b. Oregon Conservation Strategy Oregon Department of Fish and Wildlife, Salem, Oregon. Oregon Department of Fish and Wildlife. Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources. June 2008. Online at: http://www.dfw.state.or.us/lands/inwater/Oregon_Guidelines_for_Timing_of_%20InWater_Work2008.pdf.

Oregon Administrative Record 635-415-0025. Implementation of Department Habitat Mitigation Recommendations. Online at: http://www.dfw.state.or.us/OARs/415.pdf

Oregon Department of Forestry, 2008. Forest Practices Act and the Forest Practice Administrative Rules, July 2008. Online at: www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_042935.pdf

SHN Consulting Engineers & Geologists, Inc. 2013a. Botanical Resources Assessment Report. SHN 365 N. 4th Street, Coos bay, OR. November.

SHN Consulting Engineers & Geologists, Inc. 2013b. Wildlife Assessment Survey Report. Jordan Cove Energy Project, Coos Bay, Oregon. SHN 365 N. 4th Street, Coos bay, OR. January.

SHN Consulting Engineers & Geologists, Inc. 2013c. Resource Report 3: Fish, Wildlife, and Vegetation. Table 3.2-4. SHN 365 N. 4th Street, Coos bay, OR. May. 2013.

Thorson T.D., Bryce, S.A., Lammers, D.A., Woods, A.J., Omernik, J.M., Kagan, J., Pater, D.E., and Comstock, J.A. Ecoregions of Oregon. 2003.

US Department of the Interior, Bureau of Land Management, Coos Bay District, Umpqua Field Office. 2006. *Coos Bay District Final North Spit Plan, an Update to the Coos Bay Shorelands Plan of 1995.* 98 pp.

U.S. Fish and Wildlife Service. 2003. Biological Opinion and Letter of Concurrence of Effects on Bald Eagles, Marbled Murrelets, Northern Spotted Owls, Bull Trout, and Designated Critical Habitat for Marbled Murrelets and Northern Spotted Owls from Olympic National Forest Program Activities for August 5, 2003 to December 31, 2008. Reference number 1-3-03-F-0833. U.S. Fish and Wildlife Service. Washington State Office, Lacey, Washington.

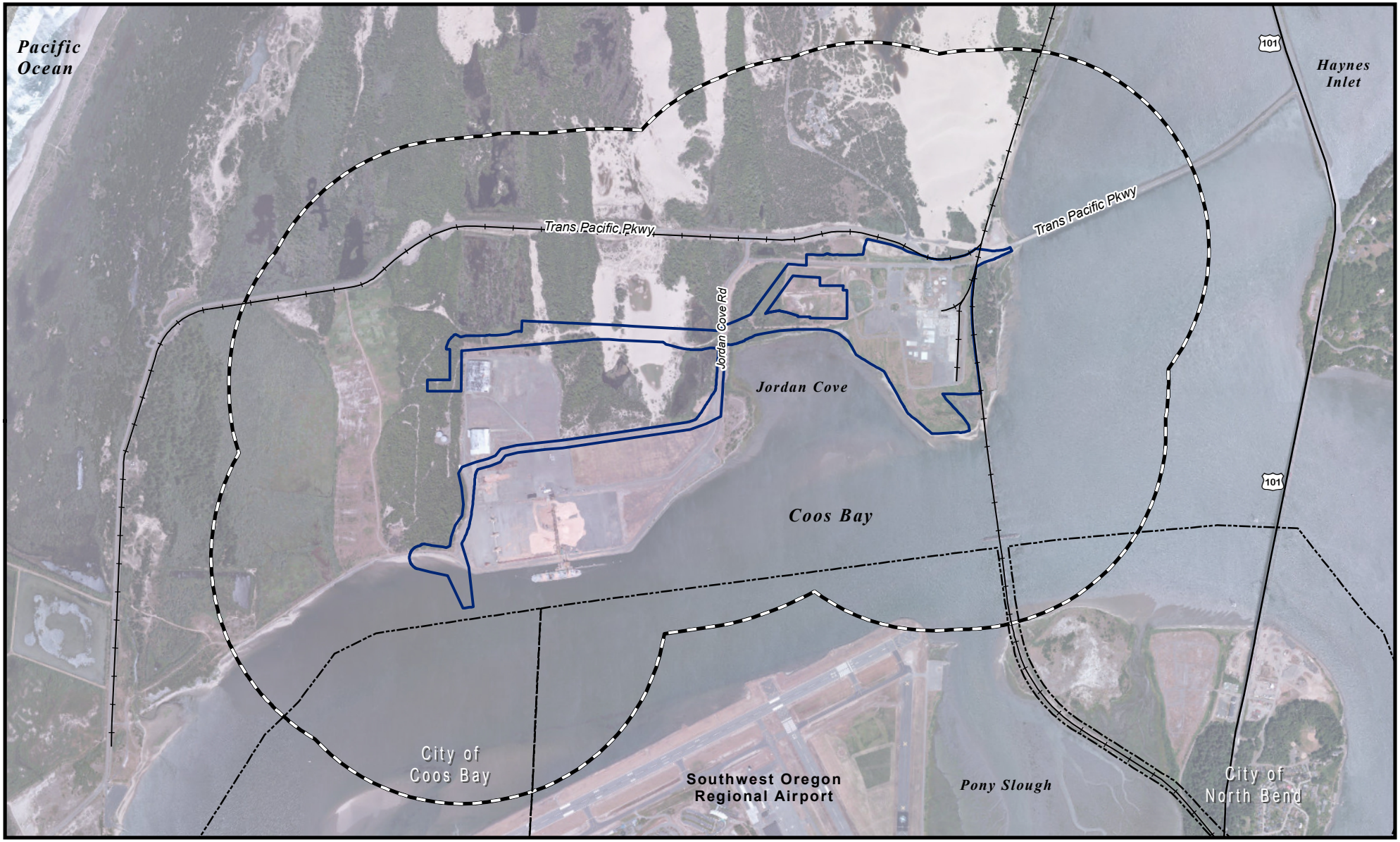
U.S. Fish and Wildlife Service. 2006. Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California. Memorandum 8-14-2006-2887, U.S. Fish and Wildlife Service, Arcata Office, Arcata, California.

USFWS 2007 National Bald Eagle Management Guidelines (May 2007). Online at: www.fws.gov/southdakotafieldoffice/NationalBaldEagleManagementGuidelines.pdf

Washington Department of Fish and Wildlife. 2009. Compiled White Papers For Hydraulic Project Approval Habitat Conservation Plan (HCP). March 2009. 904 pages. Online at: http://wdfw.wa.gov/publications/00803/

Zielinski, William J., Slauson, Keith M., Carroll, Carlos R., Kent, Christopher J., Kudrna, Donald G. 2001. Status of American martens in coastal forests of the Pacific states. Journal of Mammalogy, 82(2), 478-490.

Figure P-1. Vicinity Map



N

0 900 1,800 Feet

1 inch = 1,800 feet

EFSC Site Boundary
Analysis Area (1/2 mile buffer from EFSC Site Boundary)
City Limits
Existing Rail

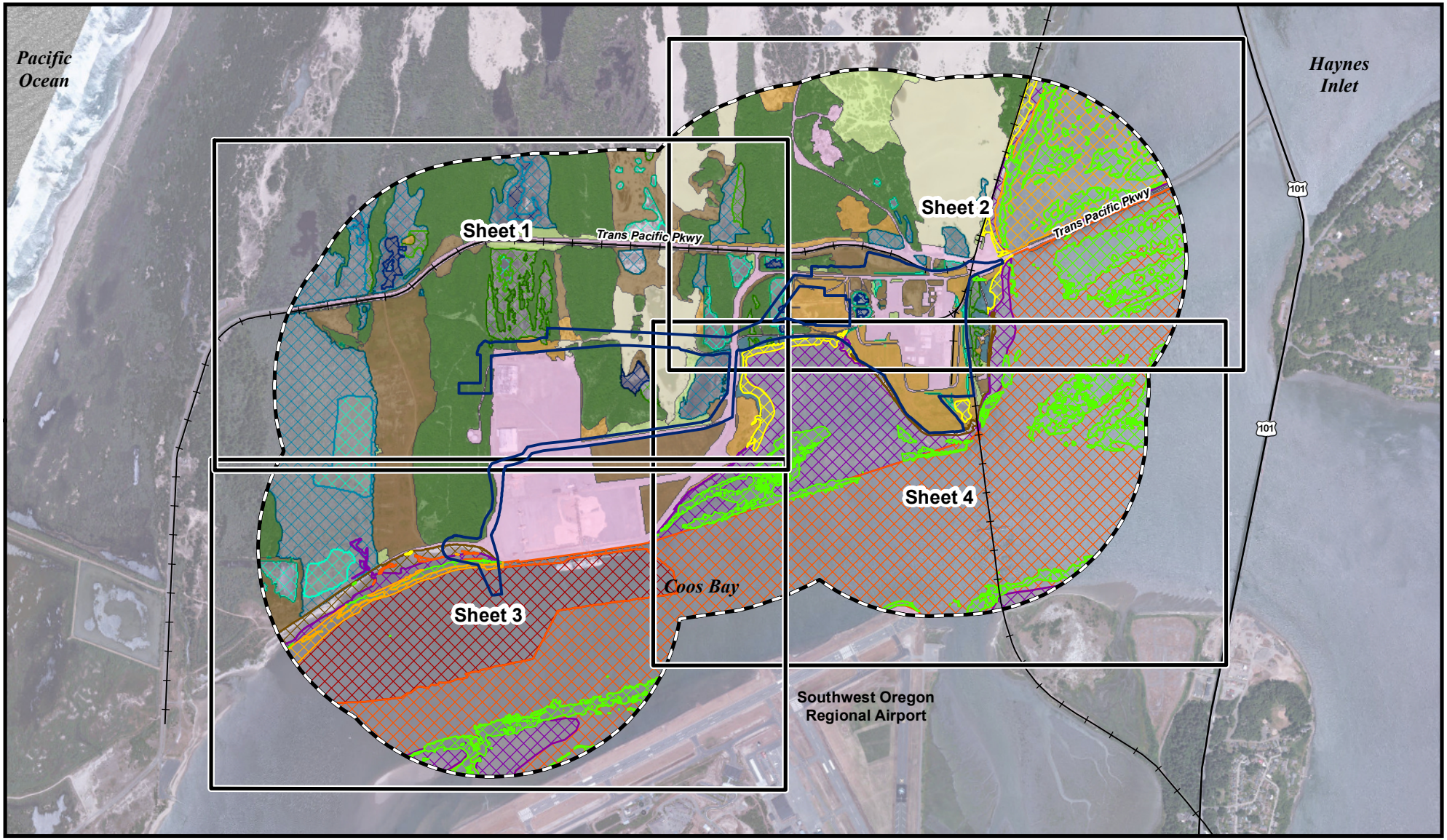
South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-1
Vicinity Map

Date: 9/5/2014
Reviewed By PR
Designed By SAST

Figure P-2. ODFW Wildlife Habitat Types and Categories within the Analysis Area



0 1,000 2,000 Feet

1 inch = 2,000 feet

EFSC Site Boundary
Analysis Area (1/2 mile buffer from EFSC Site Boundary)
Existing Rail

Upland Habitat Types
- 3/Coastal Dune Forest (CF)
- 3/Riparian Forest (RF)
- 4/Rock Fill (RFU)
- 4/Shrub (SH)
- 4/Herbaceous Shrub (HS)
- 4/Herbaceous (HE)
- 3/Unvegetated Sand (US)
- 6/Developed (DE)

Wetland Habitat Types
- 2/Forested Wetland (FOW)
- 2/Scrub-Shrub Wetland (SSW)
- 2/Emergent Wetland (EMW)
- 2/Open Water (WTR)

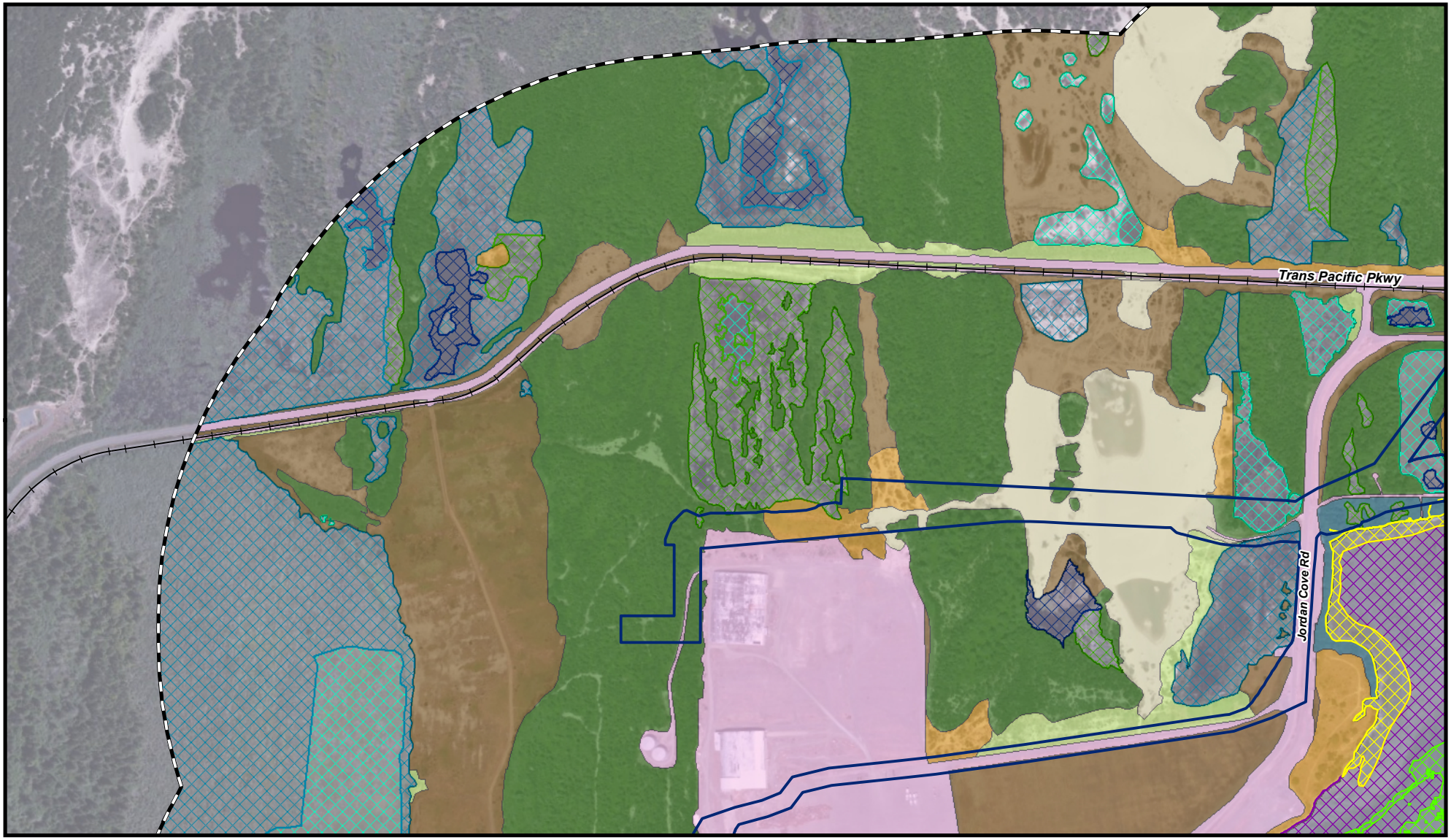
Estuarine Habitat Types
- 2/Salt Marsh (SM)
- 2/Intertidal Unvegetated Sand (IUS)
- 2/Shallow Subtidal (SST)
- 2/Subtidal (ST)
- 2/Algae/Mud/Sand (AMS)
- 2/Eelgrass (EEL)
- 3/Deep Subtidal (DST)

South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-2, Index Map
ODFW Wildlife Habitat Types and Categories within the Analysis Area

Date: 4/28/2014
Reviewed By PR
Designed By SAST



N

0 400 800 Feet

1 inch = 800 feet

EFSC Site Boundary
Analysis Area (1/2 mile from EFSC Site Boundary)
Existing Rail

Upland Habitat Types
- 3/Coastal Dune Forest (CF)
- 3/Riparian Forest (RF)
- 4/Shrub (SH)
- 4/Herbaceous Shrub (HS)
- 4/Herbaceous (HE)
- 3/Unvegetated Sand (US)
- 6/Developed (DE)

Wetland Habitat Types*
- 2/Forested Wetland (FOW)
- 2/Scrub-Shrub Wetland (SSW)
- 2/Emergent Wetland (EMW)
- 2/Open Water (WTR)

Estuarine Habitat Types
- 2/Salt Marsh (SM)
- 2/Algae/Mud/Sand (AMS)
- 2/Eelgrass (EEL)

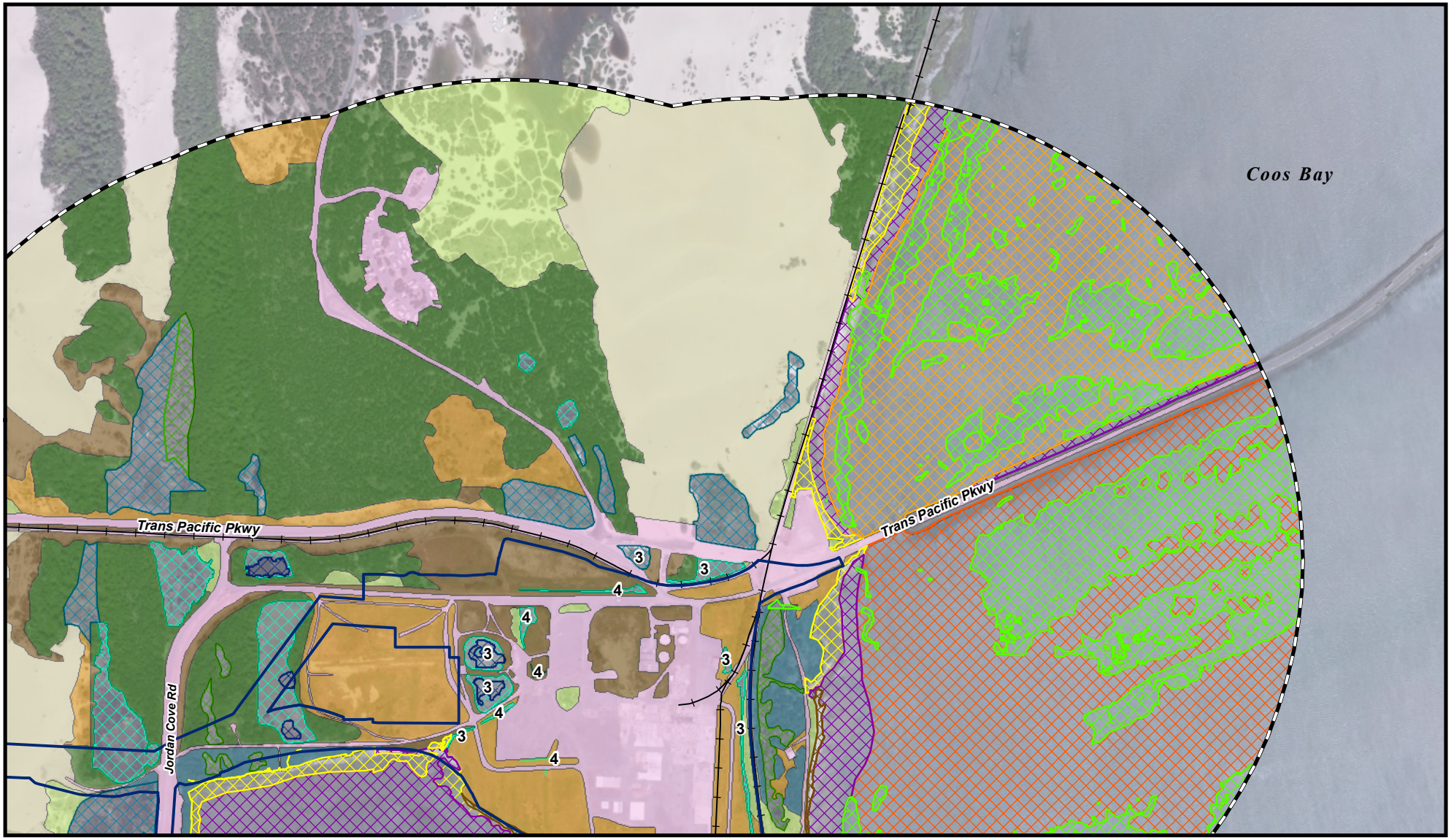
* Habitat categories are provided in the legend except as noted on the map.

South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-2, Sheet 1 of 4
ODFW Wildlife Habitat Types and Categories within the Analysis Area

Date: 9/5/2014
Reviewed By PR
Designed By SAST



N

0 400 800 Feet

1 inch = 800 feet

EFSC Site Boundary
Analysis Area (1/2 mile from EFSC Site Boundary)
Existing Rail

Upland Habitat Types
- 3/Coastal Dune Forest (CF)
- 3/Riparian Forest (RF)
- 4/Rock Fill (RFU)
- 4/Shrub (SH)
- 4/Herbaceous Shrub (HS)
- 4/Herbaceous (HE)
- 3/Unvegetated Sand (US)
- 6/Developed (DE)

Wetland Habitat Types*
- 2/Forested Wetland (FOW)
- 2/Scrub-Shrub Wetland (SSW)
- 2/Emergent Wetland (EMW)
- 2/Open Water (WTR)

Estuarine Habitat Types
- 2/Salt Marsh (SM)
- 2/Intertidal Unvegetated Sand (IUS)
- 2/Shallow Subtidal (SST)
- 2/Subtidal (ST)
- 2/Algae/Mud/Sand (AMS)
- 2/Eelgrass (EEL)

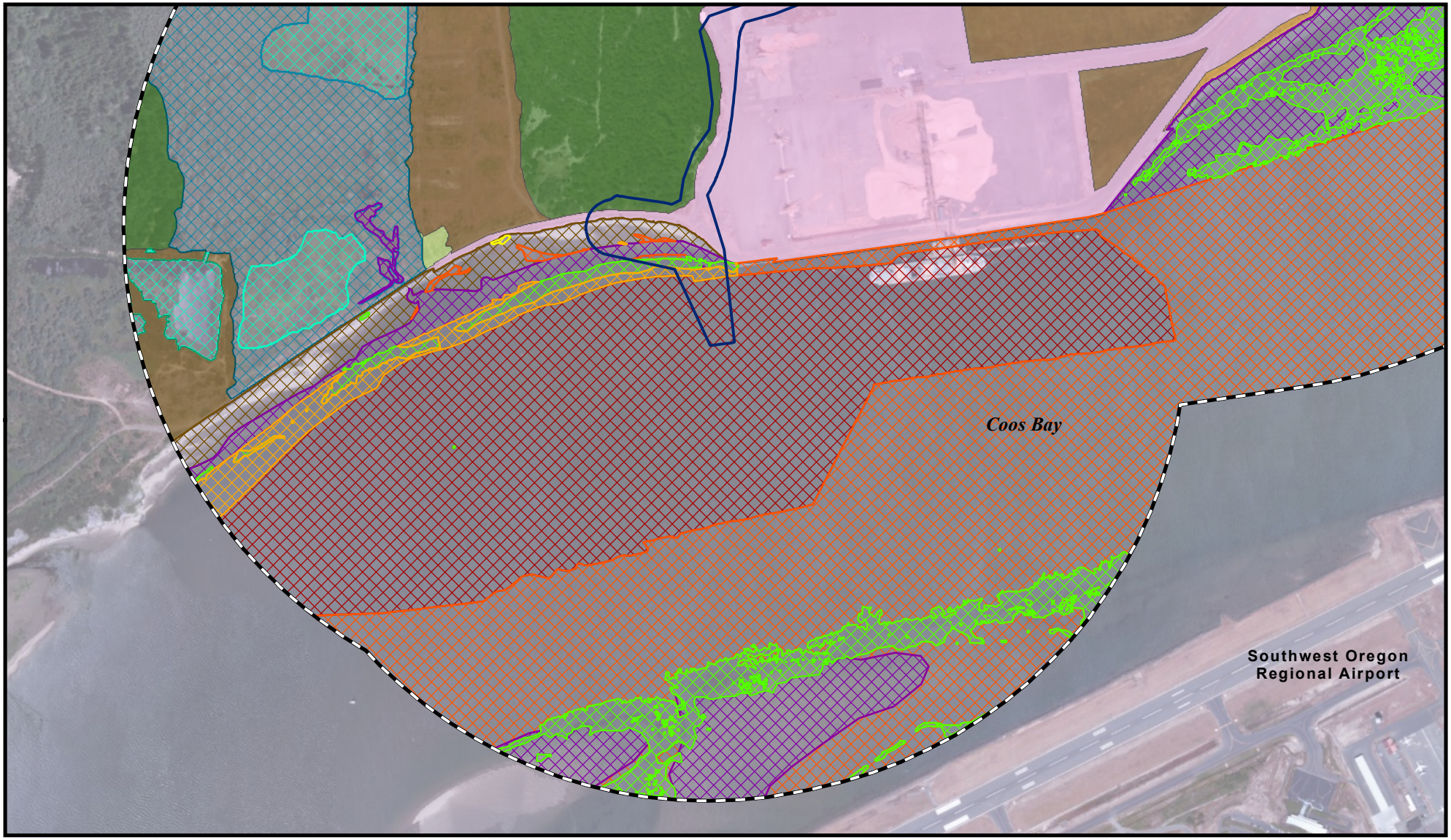
* Habitat categories are provided in the legend except as noted on the map.

South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-2, Sheet 2 of 4
ODFW Wildlife Habitat Types and Categories within the Analysis Area

Date: 9/5/2014
Reviewed By PR
Designed By SAST



N

0 400 800 Feet

1 inch = 800 feet

EFSC Site Boundary

Analysis Area (1/2 mile from EFSC Site Boundary)

Upland Habitat Types
- 3/Coastal Dune Forest (CF)
- 4/Shrub (SH)
- 4/Herbaceous Shrub (HS)
- 4/Herbaceous (HE)
- 6/Developed (DE)

Wetland Habitat Types*
- 2/Scrub-Shrub Wetland (SSW)
- 2/Emergent Wetland (EMW)

Estuarine Habitat Types
- 2/Salt Marsh (SM)
- 2/Intertidal Unvegetated Sand (IUS)
- 2/Shallow Subtidal (SST)
- 2/Subtidal (ST)
- 2/Algae/Mud/Sand (AMS)
- 2/Eelgrass (EEL)
- 3/Deep Subtidal (DST)

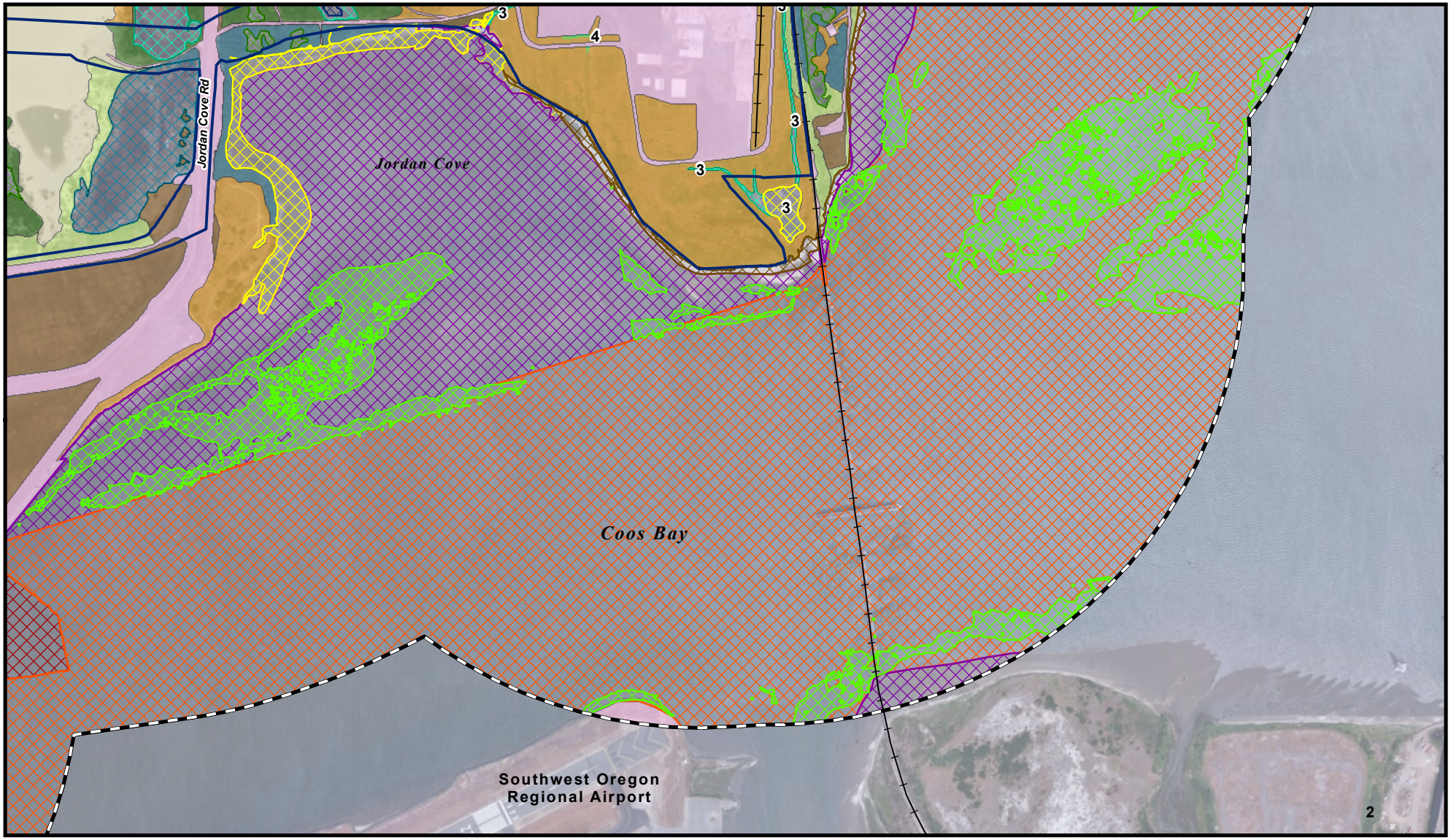
* Habitat categories are provided in the legend except as noted on the map.

South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-2, Sheet 3 of 4
ODFW Wildlife Habitat Types and Categories within the Analysis Area

Date: 9/5/2014
Reviewed By PR
Designed By SAST



N

0 400 800 Feet

1 inch = 800 feet

EFSC Site Boundary
Analysis Area (1/2 mile from EFSC Site Boundary)
Existing Rail

Upland Habitat Types
- 3/Coastal Dune Forest (CF)
- 3/Riparian Forest (RF)
- 4/Shrub (SH)
- 4/Herbaceous Shrub (HS)
- 4/Herbaceous (HE)
- 3/Unvegetated Sand (US)
- 6/Developed (DE)

Wetland Habitat Types*
- 2/Forested Wetland (FOW)
- 2/Scrub-Shrub Wetland (SSW)
- 2/Emergent Wetland (EMW)
- 2/Open Water (WTR)

Estuarine Habitat Types
- 2/Salt Marsh (SM)
- 2/Intertidal Unvegetated Sand (IUS)
- 2/Subtidal (ST)
- 2/Algae/Mud/Sand (AMS)
- 2/Eelgrass (EEL)
- 3/Deep Subtidal (DST)

* Habitat categories are provided in the legend except as noted on the map.

South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-2, Sheet 4 of 4
ODFW Wildlife Habitat Types and Categories within the Analysis Area

Date: 9/5/2014
Reviewed By PR
Designed By SAST

Figure P-3. ODFW Wildlife Habitat Types and Categories within the Site Boundary: Existing Condition



EFSC Site Boundary
Existing Rail

Upland Habitat Types
- 3/Coastal Dune Forest (CF)
- 3/Riparian Forest (RF)
- 4/Shrub (SH)
- 4/Herbaceous Shrub (HS)
- 4/Herbaceous (HE)
- 3/Unvegetated Sand (US)
- 6/Developed (DE)

Wetland Habitat Types*
- 2/Forested Wetland (FOW)
- 2/Scrub-Shrub Wetland (SSW)
- 2/Emergent Wetland (EMW)
- 2/Open Water (WTR)

Estuarine Habitat Types
- 2/Salt Marsh (SM)
- 3/Intertidal Unvegetated Sand (IUS)
- 2/Shallow Subtidal (SST)
- 2/Algae/Mud/Sand (AMS)
- 2/Eelgrass (EEL)
- 2/Deep Subtidal (DST)

* Categories are shown in the legend, except where noted on the map

N

0 450 900 Feet

1 inch = 900 feet

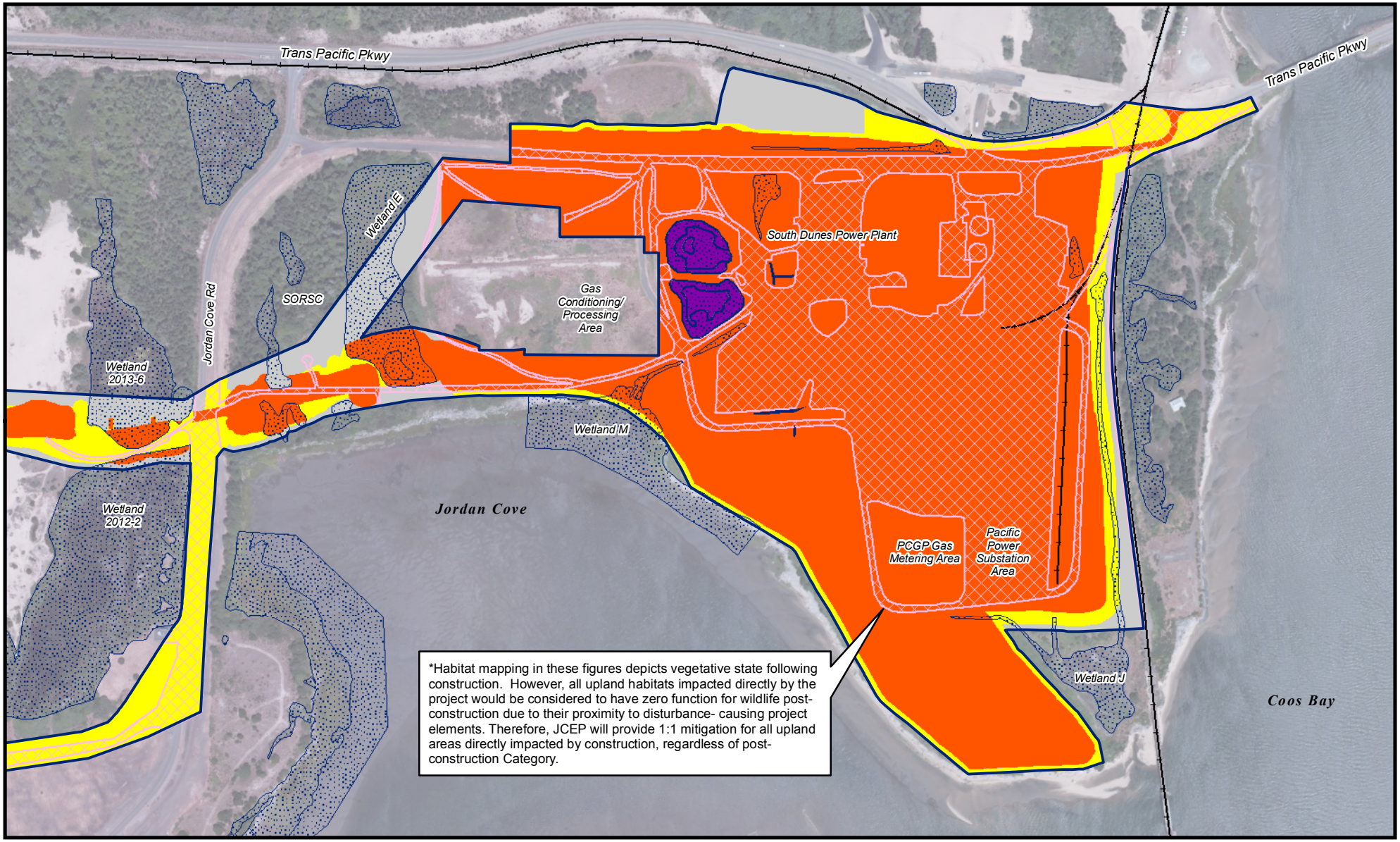
South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-3
ODFW Wildlife Habitat Types and Categories within the Site Boundary: Existing Condition

Date: 9/25/2014
Reviewed By PR
Designed By SAST

Figure P-4. ODFW Wildlife Habitat Impact Areas



N

0 250 500 Feet

1 inch = 500 feet

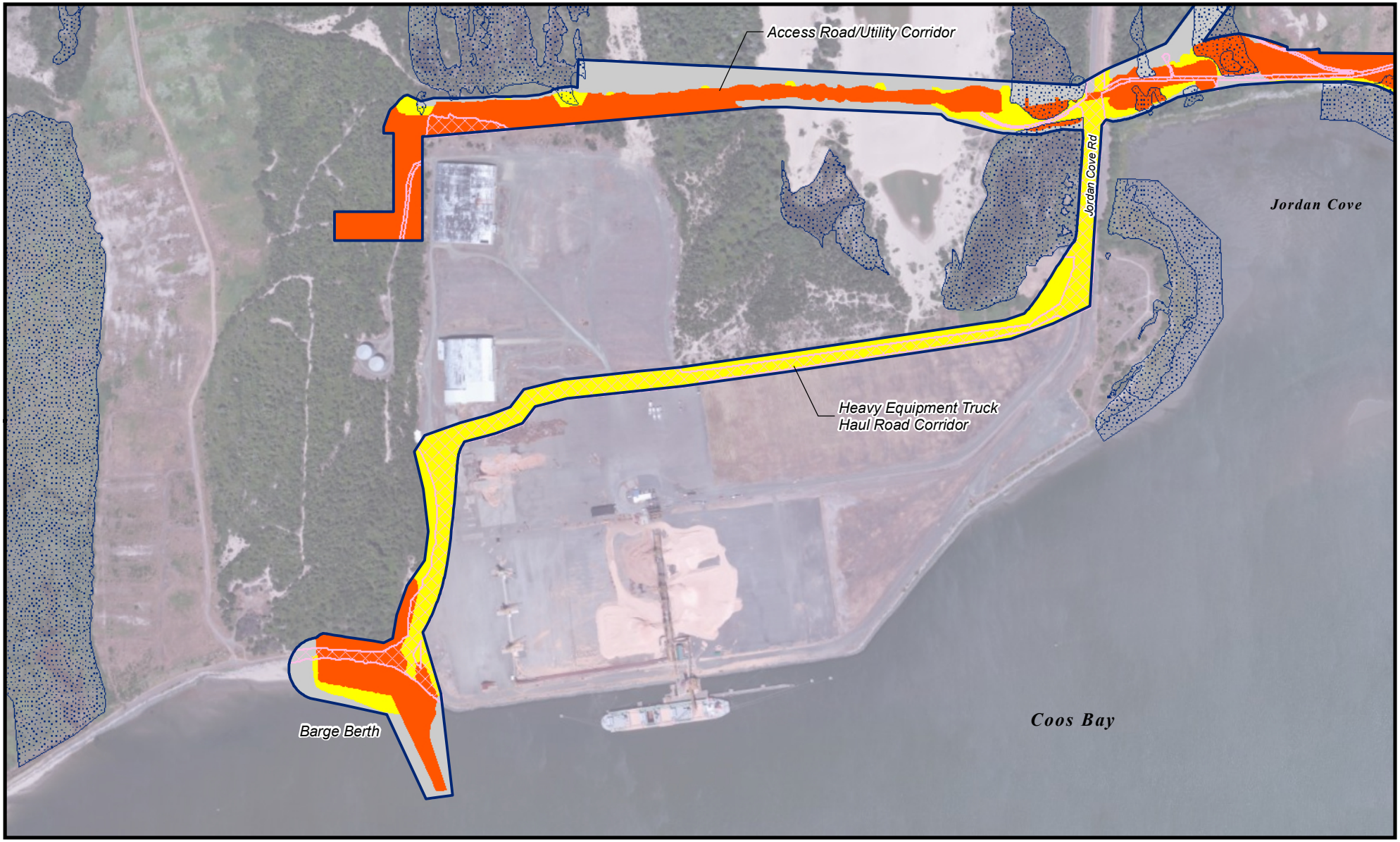
EFSC Site Boundary
Existing Rail
Delineated Wetland
Previously Disturbed Habitat
Permanent Disturbance Area
Temporary Disturbance Area
Undisturbed Area
Non-Jurisdictional Wetland Permanent Disturbance Area

South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-4, Sheet 1 of 2
ODFW Wildlife Habitat Impact Areas

Date: 9/26/2014
Reviewed By PR
Designed By SAST



N

0 350 700 Feet

1 inch = 700 feet

EFSC Site Boundary
Existing Rail
Delineated Wetland
Previously Disturbed Habitat
Permanent Disturbance Area
Temporary Disturbance Area
Undisturbed Area

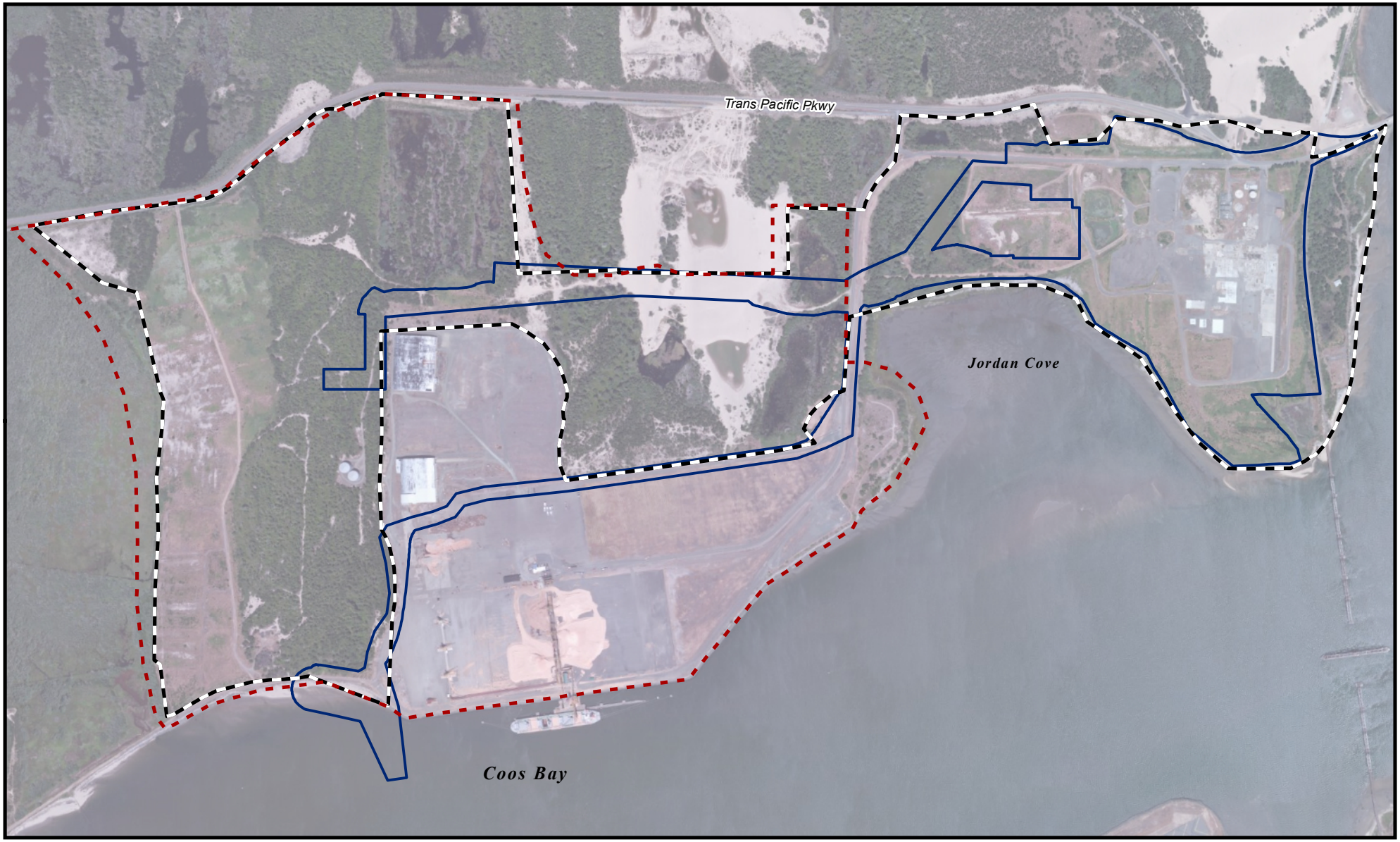
South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-4, Sheet 2 of 2
ODFW Wildlife Habitat Impact Areas

Date: 9/26/2014
Reviewed By PR
Designed By SAST

Figure P-5. Field Survey Dates and Locations



N

0 500 1,000 Feet

1 inch = 1,000 feet

EFSC Site Boundary

Vegetation Survey Study Area Boundary, 2012-2013 (SHN)

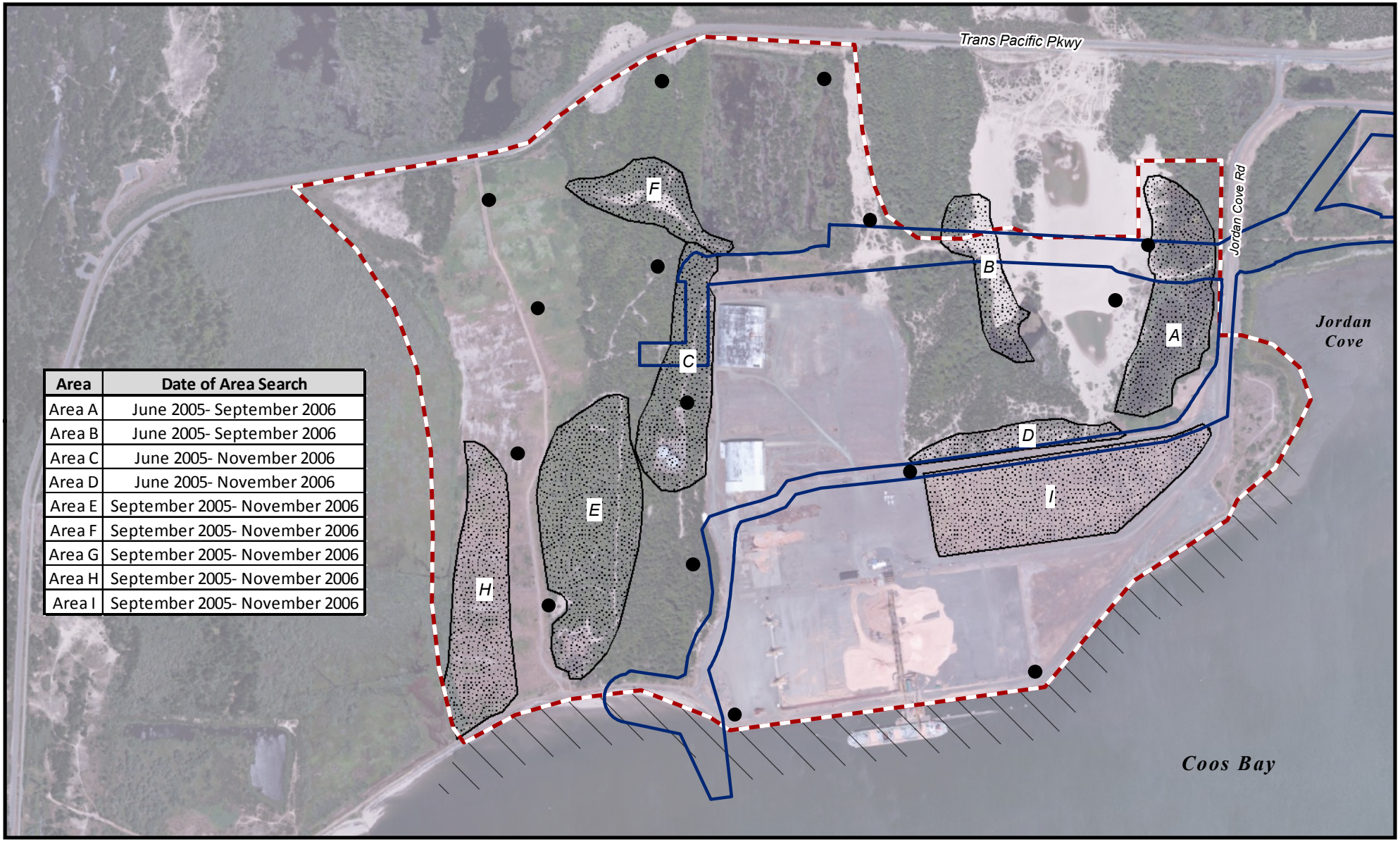
Vegetation Survey Study Area Boundary, 2005-2006 (LBJ)

South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-5, Sheet 1 of 3
Vegetation Survey Study Areas

Date: 9/25/2014
Reviewed By PR
Designed By SAST



Area	Date of Area Search
Area A	June 2005- September 2006
Area B	June 2005- September 2006
Area C	June 2005- November 2006
Area D	June 2005- November 2006
Area E	September 2005- November 2006
Area F	September 2005- November 2006
Area G	September 2005- November 2006
Area H	September 2005- November 2006
Area I	September 2005- November 2006

N

0 450 900 Feet

1 inch = 900 feet

EFSC Site Boundary

Approximate Study Area Boundary

Search Area

Shoreline Scan Area

Bay/Raptor Scan Location

South Dunes Power Plant Project

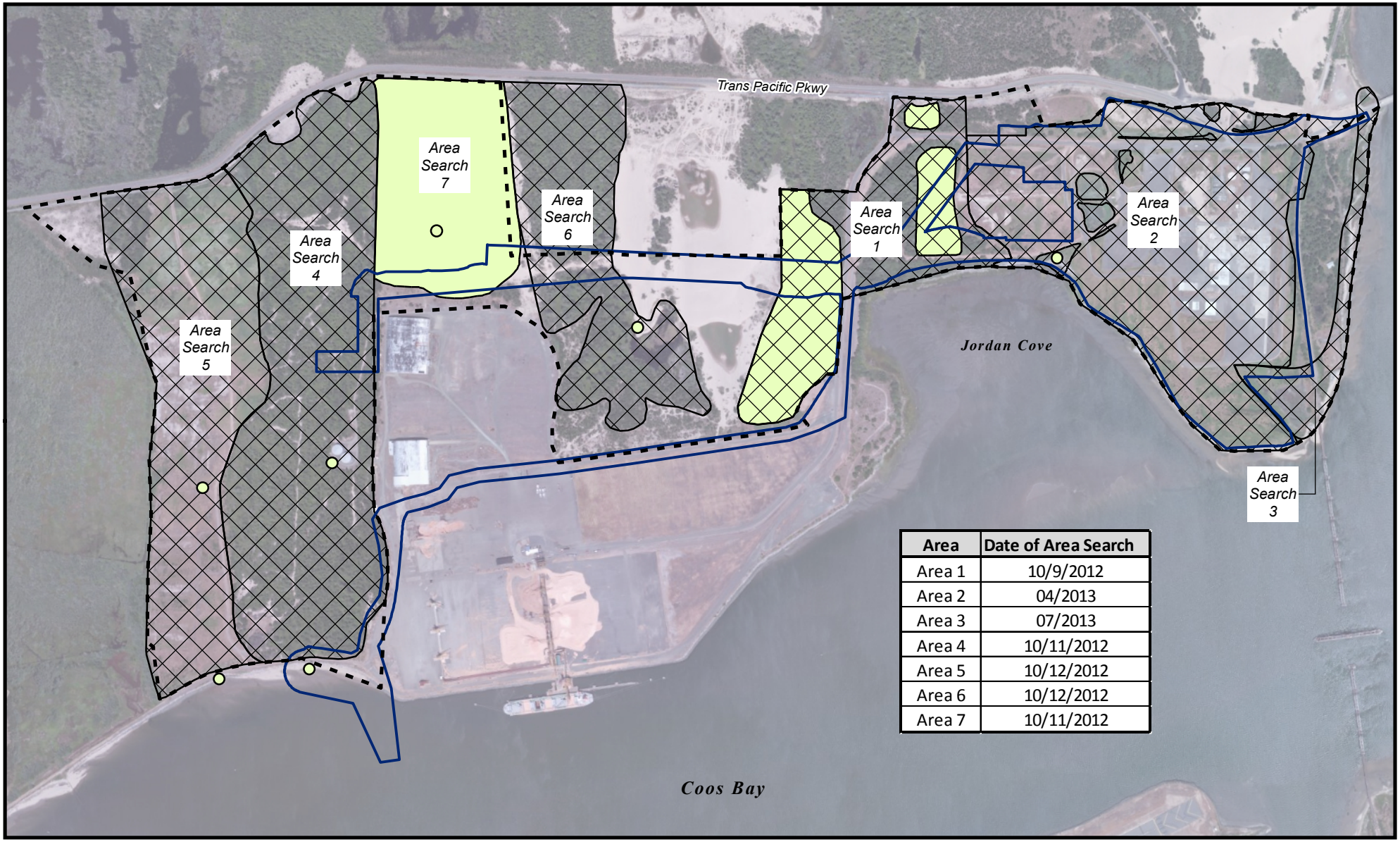
EFSC Application

EXHIBIT P

Figure P-5, Sheet 2 of 3

Field Survey Dates and Locations 2005-2006 (LBJ)

Date: 9/25/2014
Reviewed By PR
Designed By SAST



Area	Date of Area Search
Area 1	10/9/2012
Area 2	04/2013
Area 3	07/2013
Area 4	10/11/2012
Area 5	10/12/2012
Area 6	10/12/2012
Area 7	10/11/2012

N

0 500 1,000 Feet

1 inch = 1,000 feet

Survey: SHN Consulting Engineers & Geologists, Inc., 2012-2013

EFSC Site Boundary

Area Search for Birds and Mammals

Area Search for Amphibians and Reptiles

Bay/Raptor Scan Location

South Dunes Power Plant Project

EFSC Application

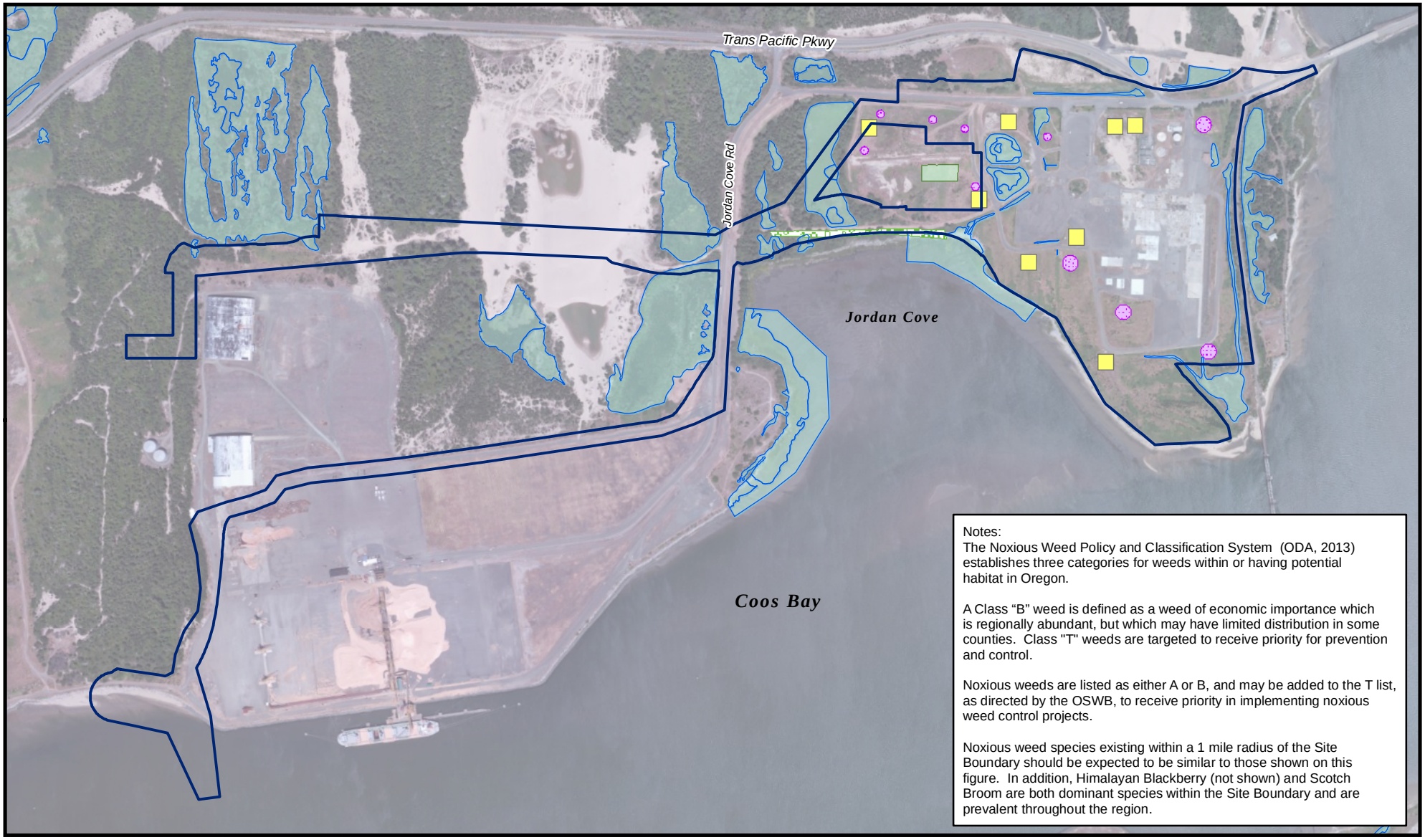
EXHIBIT P

Figure P-5, Sheet 3 of 3

Field Survey Dates and Locations 2012-2013 (SHN)

Date: 9/25/2014
Reviewed By PR
Designed By SAST

Figure P-6. Noxious Weed Occurrence within the Site Boundary



Notes:
The Noxious Weed Policy and Classification System (ODA, 2013) establishes three categories for weeds within or having potential habitat in Oregon.

A Class "B" weed is defined as a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties. Class "T" weeds are targeted to receive priority for prevention and control.

Noxious weeds are listed as either A or B, and may be added to the T list, as directed by the OSWB, to receive priority in implementing noxious weed control projects.

Noxious weed species existing within a 1 mile radius of the Site Boundary should be expected to be similar to those shown on this figure. In addition, Himalayan Blackberry (not shown) and Scotch Broom are both dominant species within the Site Boundary and are prevalent throughout the region.

0 450 900 Feet

1 inch = 900 feet

Data Source:
Noxious Weed Reference: Coos County Noxious Weed List, Oregon State University Extension Service 2011-2012

Survey: SHN Consulting Engineers & Geologists, Inc., 4/17-18/2013 and 8/20-22/2013

EFSC Site Boundary
Delineated Wetland

Approximate Extent of Class "B" Weeds
English Ivy
Gorse*
Italian Thistle
Pampas Grass
Parrotfeather*
Poison Hemlock
Scotch Broom
Sweet Fennel

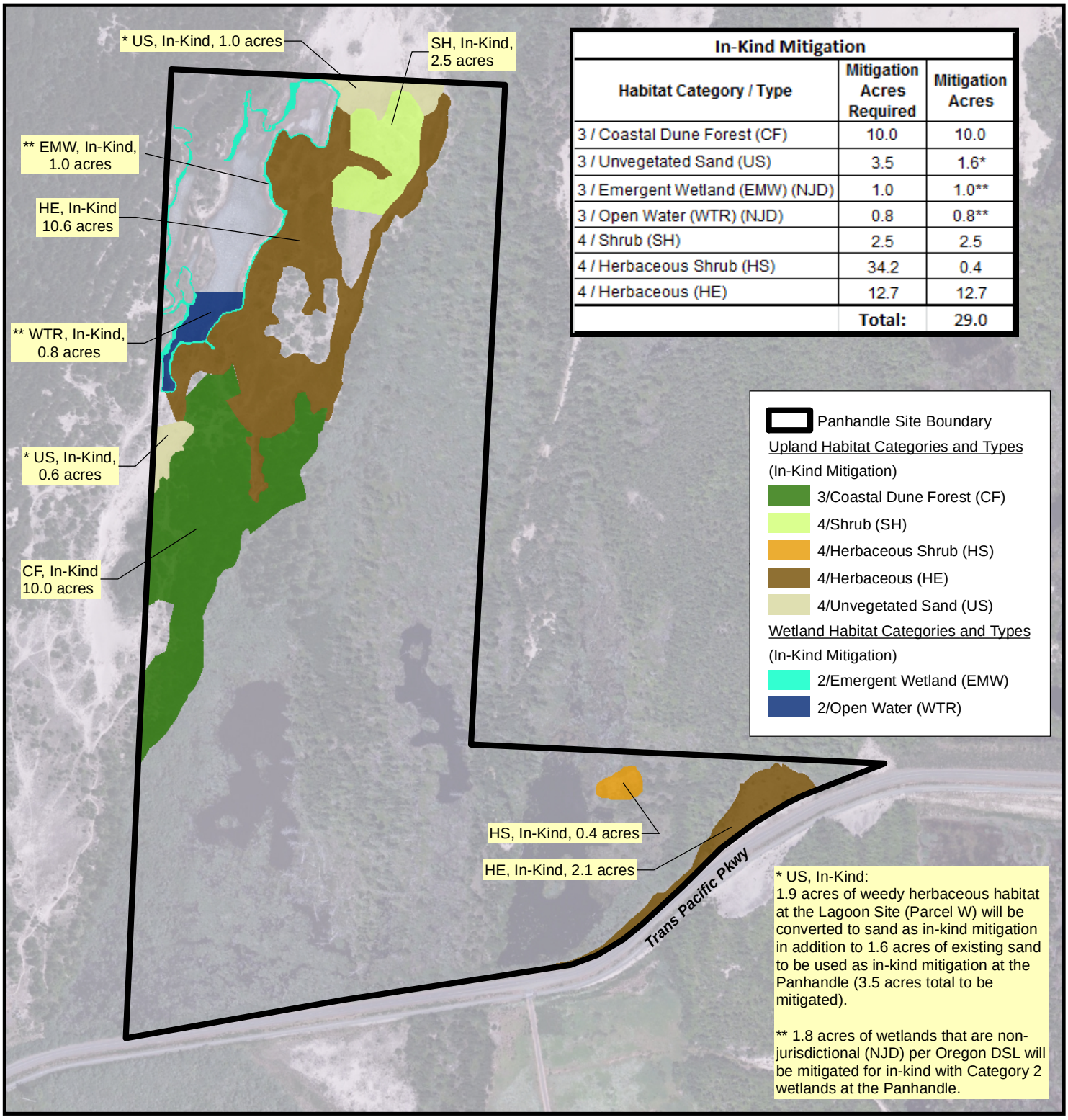
South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-6
Noxious Weed Occurrence within the Site Boundary

Date: 9/25/2014
Reviewed By PR
Designed By SAST

Figure P-7. EFSC Wildlife Habitat Mitigation Acreage



In-Kind Mitigation

Habitat Category / Type	Mitigation Acres Required	Mitigation Acres
3 / Coastal Dune Forest (CF)	10.0	10.0
3 / Unvegetated Sand (US)	3.5	1.6*
3 / Emergent Wetland (EMW) (NJD)	1.0	1.0**
3 / Open Water (WTR) (NJD)	0.8	0.8**
4 / Shrub (SH)	2.5	2.5
4 / Herbaceous Shrub (HS)	34.2	0.4
4 / Herbaceous (HE)	12.7	12.7
	Total:	29.0

* US, In-Kind:
1.9 acres of weedy herbaceous habitat at the Lagoon Site (Parcel W) will be converted to sand as in-kind mitigation in addition to 1.6 acres of existing sand to be used as in-kind mitigation at the Panhandle (3.5 acres total to be mitigated).

** 1.8 acres of wetlands that are non-jurisdictional (NJD) per Oregon DSL will be mitigated for in-kind with Category 2 wetlands at the Panhandle.

0 275 550 Feet

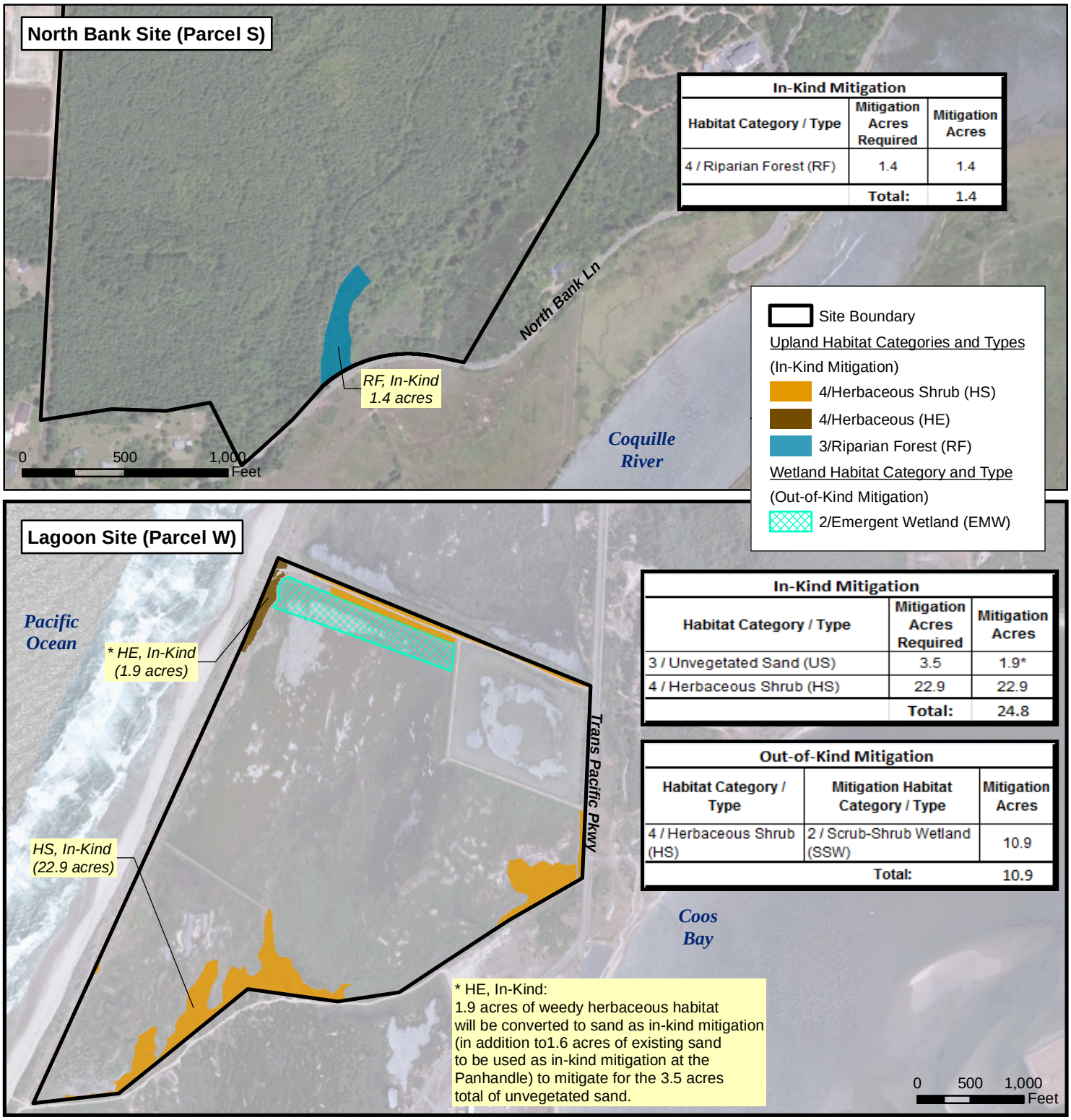
1 inch = 550 feet

South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-7 (Sheet 1 of 2)
EFSC Wildlife Habitat Mitigation Acreage Provided at the Panhandle Mitigation Site

Date: 10/22/2014
Reviewed By PR
Designed By SAST



South Dunes Power Plant Project

EFSC Application

EXHIBIT P Figure P-7 (Sheet 2 of 2)
EFSC Wildlife Habitat Mitigation Acreage Provided at North Bank (Parcel S) and Lagoon (Parcel W) Mitigation Sites

Date: 10/22/2014
Reviewed By PR
Designed By SAST

APPENDIX P-1

Agency and Stakeholder Correspondence

Oregon Department of Fish and Wildlife (ODFW) Comments
On the August 21, 2012, NOTICE OF INTENT (NOI) by the Jordan Cove/Pacific Connector Gas Pipeline (JCEP)/(PCGP) Energy Project to Construct the 380 MW South Dunes Power Plant (SDPP) on the North Spit of Coos Bay

10/16/12

General Comments

South Dunes Power Plant-- The project NOI outlines proposed impact of 130 acres of upland that is in addition to the acreage that will be affected by the JCEP/PCGP. There are a number of concerns relating primarily to wildlife resources at the proposed SDPP project site. (**Note:** *The primary impacts from the SDPP are considered to be disturbance and displacement of wildlife as well as conversion of habitat resources. The ODFW recommends that these habitats be categorized based on the ODFW Fish and Wildlife Mitigation Policy* (OAR 635-415-0025 www.dfw.state.or.us/OARs/415.pdf) *and compensated for similarly to the main JCEP terminal and slip).* Concerns include:

Aquatic Comments

1. **Direct Construction:** There are not anticipated to be impacts to aquatic resources from construction of the SDPP. The NOI has not, however, identified if water from the bay will be used for cooling of the SDPP. Additionally the distance the project will be placed from the upper extent of tide may have impacts if the shoreline will need rip-rapped. There also likely are wetland habitats present within the 130 acres of the proposed project area. ODFW recommends that **Fish and Wildlife Mitigation Policy (OAR 635-415-0000 through 0025**) be utilized to categorize any estuary and upland wetland aquatic habitats that may be impacted in order to provide framework for mitigation based on habitat category.

2. **Invasive Aquatic Species:** The SDPP NOI does not identify that there will be direct impacts to habitats below the highest extent of tidal influence.

Upland Comments

1. **Habitat Avoidance, Minimization, and Mitigation (Fish and Wildlife Mitigation Policy (OAR 635-415-0000 through 0025):** The ODFW recognizes a notable proportion of the habitats at the SDPP /JCEP site(s) are not in pristine condition. However, they have been in a relative state of quiescence for the past decade. Although not categorized to date, they likely will be considered Category 3, 4, and 5 habitats (OAR 635-415-0025). The SDPP project is anticipated to greatly expand the acreage of habitats impacted on North Spit in combination with the JCEP construction and eliminate the majority of the productive potential of wildlife upland habitats at the site. Direct replacement or creation of equivalent upland habitats will be impossible. However, mitigation/enhancement of in-kind, in-proximity habitats might be attainable. ODFW recommends that the applicant complete an adequate

habitat avoidance, minimization, and mitigation plan for any anticipated impacts to fish and wildlife habitats . This habitat avoidance, minimization, and mitigation plan should include categorization by Habitat Category (1-6) of all habitats directly or indirectly affected by the proposed project consistent with Oregon's Fish and Wildlife Habitat Mitigation Policy. ODFW further recommends avoidance of impacts to all Category 1 habitats and mitigation proposal(s) to replace lost form and function to remaining Categories 2-6 habitats consistent with the policy.

2. **Exotic Plants and Wildlife:** Disturbed soils and removal of vegetation at the site combined with the installation of the SDPP infrastructure including road networks, and fences will present opportunity for invasion of non-native plants and could result in further loss of habitat function for native wildlife species (e.g. replacement of mourning doves *Zenaida macroura* with ring-necked doves *Streptopelia capicol*; native sparrows with house sparrows *Passer domesticus* and European starlings *Sturnus vulgaris)*. There is also concern corvid bird species (ravens, crows, jays) that are predators on snowy plover *(Charadrius alexandrinus nivosus)* may directly benefit from the SDPP project. Exotic and invasive wildlife species often have a higher tolerance for direct association with human impacts, benefitting from food wastes associated with daily human activities. Resultantly it is highly likely they will use perching and nesting opportunities that may become available due to this project. ODFW recommends that the project proponents coordinate with local ODFW staff throughout the planning and implementation of this project to minimize to the greatest degree the colonization of the SDPP project area by both invasive plants and wildlife.

3. **Habitat Fragmentation:** Upland habitats on the North Spit are unique in that they are located on a peninsula adjacent to Coos Bay and the ocean. Further fragmentation of these habitats will contribute to further reductions in the productive capacity of North Spit. ODFW recommends that the SDPP project consider construction/installation options allowing for wildlife corridors when possible between isolated habitats that may continue to support avian wildlife and larger mammals (bear, deer) post project. Corridors may be accommodated by actions such as layout of the infrastructure, installation of crossings under fences, minimization of road networks, etc.

4. **Noise/Direct Impacts and Wildlife Impacts** – ODFW recommends that analysis and discussion of potential noise impacts on threatened and endangered (T&E) species and other sensitive species occur for the SDPP development. ODFW recommends that when any blasting, pile driving, or other loud noise producing activity takes place: 1) the applicant uses the Oregon Forest Practices Act guidelines for ospreys and great blue herons; 2) the applicant use the specific ODFW recommendations given for the 2008 JCEP project DEIS for peregrine falcons; 3) the applicant use the Bald and Golden Eagle Protection Act and federal recommendations to protect bald and golden eagles.

ODFW HABITAT MAPPING AND MITIGATION MEETING NOTES

MEETING DATE:	July 23, 2013	
LOCATION:	Location: SHN offices, 275 Market Avenue, Coos Bay, OR 97420-2228	
ATTENDEES:	Stuart Love	Oregon Department of Fish & Wildlife
	Chris Clair	Oregon Department of Fish & Wildlife
	Art Martin	Oregon Department of Fish & Wildlife (via telephone)
	Phil Rickus	David Evans and Associates, Inc.
	Barb Gimlin	SHN Consulting Engineers & Geologists, Inc.
	Felicia Knox	SHN Consulting Engineers & Geologists, Inc.

PURPOSE:

The purpose of the meeting was to discuss habitat mapping for the Jordan Cove Energy Project (JCEP), and formulate an overall mitigation strategy that meets the Oregon Department of Fish & Wildlife (ODFW) Habitat Mitigation Policy. A successful outcome from this meeting is concurrence from ODFW with Pre and Post-Construction Habitat Mapping, and feedback on potential mitigation sites and strategies.

SUMMARY:

David Evans and Associates, Inc. (DEA) staff presented a summary of existing conditions and unavoidable impacts to habitat resulting from proposed project development. We discussed potential strategies and locations for mitigating impacts. Following is a recap of the notes recorded by Barb Gimlin, SHN Consulting Engineers & Geologists, Inc. (SHN) and Phil Rickus, DEA.

- We began by agreeing that since mitigation for wetland and estuarine resources is overseen by Oregon Department of State Lands (DSL) and US Army Corps of Engineers (USACE) and others, ODFW finds that this is sufficient, and we would focus our meeting on upland mitigation. The only exception would be if Category 1 habitat were present (wherein ODFW suggests that impacts are entirely avoided). Category 1 would include habitat such as certain springs and pools, bogs and fens, and no such habitat is present within the study area.

- If impacts to estuarine resources are proposed in new areas, Scott Groth, ODFW shellfish specialist, may need to be included in future discussions. He worked with Stuart (Stu) and Chris on previous habitat mapping concurrence.

- Art mentioned that for the South Dunes Power Plant (SDPP) footprint, Oregon Department of Energy (ODOE) maintains jurisdiction, and relies on ODFW for biological recommendations. The mitigation plan for the SDPP needs to meet Energy Facility Siting Council (EFSC) siting standards, and Hilary Dobson and Chris Green need to be included in mitigation discussions as we move forward.

- Phil mentioned that at this point, the plan is to go through the draft habitat pre and post-construction mapping with ODFW, investigate mitigation options, and bring in a wider agency and stakeholder audience in late September. It appears that a separate group of site visits would be required in mid-August to further investigate mitigation options.

TOPIC-SPECIFIC DISCUSSIONS

Existing Conditions

Handouts provided:

- Figure i-1, Vicinity (from the USACE Section 404/10 Permit Application submitted on June 11, 2013)
- Figure 2, *Draft* ODFW Habitat Maps, Sheets 3-8
- *Draft* ODFW Habitat Categorization Memo, July 19, 2013
- ODFW habitat mitigation policy guidance flowchart and documents
- *Draft* JCEP Habitat Type and Category summary Table

- We discussed general project elements and locations found in Figure i-1, then moved on to habitat mapping in Figure 2. Figure 2 includes two study area boundaries: the project footprint wherein all planned temporary and permanent impacts would take place (and all habitat has been mapped), and the wetland delineation study area outside the project footprint wherein no impacts would take place but some mapping has been done.
- Phil mentioned that some of this habitat (Herbaceous) was previously mapped as grassland, but since no native grassland is present, and the previously mapped grassland habitat does not differ substantially from the previously mapped herbaceous habitat, the two were combined for simplicity.
- Phil shared some aspects of the Internal Working Draft "Guidance for Implementing the Fish and Wildlife Habitat Mitigation Policy" dated February 20, 2001 (ODFW), that he was using to help inform the process. The guidance has never been completed, but was somewhat helpful and did not appear to contradict meeting discussion. Art mentioned that changes to the policy could occur in the fairly near future, but did not give a timeline for this.
- Habitat boundaries, which had previously been managed in CADD by SHN and GIS by DEA, leading to errors and omissions in translation between the two, would be managed in GIS by DEA moving forward, with assistance provided to SHN as required for update of resource reports.

Rationale for Habitat Categories

The group discussed individual habitat types and ran through the ODFW flowchart in order to calibrate our understanding of categories, beginning with the herbaceous habitat type. Table 1 provides a summary of these findings.

Habitat Type- Herbaceous (HE):

The flowchart asks whether the habitat meets the following definitions:

Essential? No. Herbaceous habitat would not be considered essential (based on ODFW policy definition) because no known populations depend upon it for species survival, and loss of the habitat would not be expected to result in depletion of a species (even on a local scale). The group felt that this (and most

habitats within the study area), are fairly homogenous, and that local wildlife populations would generally be able to use adjacent habitat.

Important? Yes. It does contribute to sustaining populations over time. This definition gets at whether the habitat has a function and is used by wildlife, even simply for foraging habitat. Most habitat types meet this definition, even (as discussed at length) roadside habitats that are not only quite degraded (but have little potential for restoration) but are used sporadically for foraging by songbirds or other species. The key is to think about which species may be using the habitat and view definitions in that light.

-Stu recalled that various species surveys have been done over the years. All these surveys, and best available scientific knowledge, would inform the flowchart decisions. DEA and SHN have also completed extensive wetland, botanical, and wildlife surveys which inform this mapping.

Limited? No. It was agreed that weedy herbaceous habitat is not limited on a local or wider scale. Therefore, according to the flowchart, Herbaceous is correctly labeled as Category 4 habitat. Note: Use hydrologic units or a smaller geographic basis to determine limited, or whatever spatial scale makes the most sense for each habitat unit given the species that use it.

-The group agreed that Shrub and Herbaceous Shrub habitats, being similarly weedy and non-limited, would also be Category 4.

Habitat Type- Coastal Dune Forest (CDF):

Essential? Yes. Coastal Dune Forest habitat would be considered essential (based on ODFW policy definition) because according to ODFW, populations of species such as American marten, bats, and some songbirds depend upon it for species survival, and loss of the habitat could result in depletion of a species on a local scale. Since it is considered essential, it would automatically be considered important.

Limited? No. It was agreed that this habitat is not limited on a local or wider scale. Therefore, according to the flowchart, CDF is correctly labeled as Category 3 habitat. Note: Use hydrologic units or a smaller geographic basis to determine limited, or whatever spatial scale makes the most sense for each habitat unit given the species that use it.

Although not discussed specifically, Riparian Forest would go through the same flowchart route to be categorized as 3.

Habitat Type- Unvegetated Sand (US):

Essential? No. This habitat would not be considered essential (based on ODFW policy definition) because no known populations depend upon it for species survival, and loss of the habitat would not be expected to result in depletion of a species.

Important? Yes. It does contribute to sustaining populations over time. Stu mentioned that songbirds forage on seeds blown into this habitat, and raptors and small mammals use the edges for foraging.

Limited? Yes. Stu asserted that unvegetated sand is limited on a local scale, being present on a small strip of land between Highway 101 and the ocean. Therefore, according to the flowchart, US would change

from previously labeled Category 4 habitat to Category 3. Less than 4 acres of this habitat would be impacted by this project, so little change to mitigation would occur, other than that mitigation would need to take place in-kind and in-proximity.

Table 1: Upland Habitat Category Results

Habitat Type	ODFW Flowchart Results	Habitat Category
Herbaceous	Non-essential, Important, non-limited	4
Shrub/Herbaceous Shrub	Non-essential, Important, non-limited	4
Coastal Dune Forest	Essential, Important, Non-limited	3
Riparian Forest	Essential, Important, Non-limited	3
Unvegetated Sand	Non-essential, Important, Limited	3

Impacts and Mitigation

Handouts provided:

- Figure i-4, Project Footprint (from the USACE Section 404/10 Permit Application)
- Figure 3, *Draft* Post-Construction ODFW Habitat Maps, Sheets 1-7
- LNG Project Impact Minimization Measures (from the USACE Section 404/10 Permit Application)
- *Draft* JCEP Upland Habitat Impacts Tables

- The bulk of the project area includes the Ingram Yard, the Slip and Access Channel, the Utility Corridor, and the Mill Site/South Dunes Site. The narrow corridors connecting these facilities consist of temporary impact areas: haul roads, waste water lines, and dredge pipeline corridors. These corridors were not included in the habitat impact calculations because function for wildlife would not decrease during or following construction.
- Impact and post-construction habitat mapping assumptions were discussed. All structures, roads, gravel, etc. were mapped as Developed, Category 6, which requires no mitigation, just minimization.
- Pre-construction Category 3 habitat includes dune forest and riparian forest, though little riparian forest would be disturbed. Much of the existing dune forest habitat within the project footprint would be converted to herbaceous habitat post-construction, although it may succeed to forested habitat over time.
- These habitats would be altered during construction - graded and leveled or sloped as required by project design, but post-construction habitats categorized as 3 and 4 would be replanted with native herbaceous species. Although they would be planted with native vegetation, they were classified as Category 4 since they would be graded (resulting in removal of all species present) and would (for the most part) be located in proximity to the new facilities, which could decrease value to wildlife (make the habitat non-essential).

- SDPP is under Federal Energy Regulatory Commission (FERC) jurisdiction. Phil requested clarification from Art on jurisdiction of the remaining JCEP project. Art described it as such: it is required by statute in Oregon, and the only jurisdiction the state has is through comments on mitigation provided to the Department of Justice through the FERC process.
- A lively discussion of temporary vs. permanent impacts followed. Art gave a thorough history of this issue, which has evolved through various power project iterations. The upshot is that it is a very complicated issue and it is important to document the rationale used for all decisions.
- The key is to analyze the level of function that remains after construction (both long-term and short-term) in order to determine the magnitude of impact.
- Importantly, ODFW would consider most, if not all areas within the project footprint to experience a 'net loss of habitat quality' and therefore require mitigation. Although temporarily impacted areas would be seeded with native herbaceous species, the function of the habitat would be nearly or entirely lost due to re-contouring and disturbance from adjacent project elements (compared to existing conditions). Chris mentioned that for the most part, wildlife use around project elements is limited to generalist species such as starlings and crows.
- It's possible to attempt to quantify percent remaining function and use that to develop acreage proposals. However, the burden of proof is on the applicant to show that (for example) 20% of the function still remains at a certain distance from the project. For coastal dune forest, the simplest approach may be to assume 100% loss of function for habitat near project elements and mitigate for it. For impacted Category 4 Herbaceous habitat, some percent of function may remain post-construction, but the rationale for this would need to explained in detail by the applicant team, using best available science and documenting all decisions.
- If a percent of function approach is pursued, the team agreed that it would be valuable to arrange a meeting/ conference call with project engineers, biologists, and agency folk to discuss specific functions at or near project elements. Attendees may include representatives from ODOE, U.S. Fish and Wildlife Service (USFWS), and other interested stakeholders.
- ODFW also mentioned that indirect impacts can extend beyond the project footprint. Art asked Stu and Chris if they felt that this would be the case. They did feel it would be the case. Phil expressed concern with the difficulty in quantifying these impacts given the lack of specific data in the literature. The meeting attendees agreed that due to the complexity and mitigation implications, the applicant would not address the issue directly, and that ODFW would discuss this internally and comment on indirect impacts as the process evolves. However, it should be assumed that some form of additional mitigation may be required for indirect impacts outside the project footprint, especially for indirect impacts to valuable wildlife areas such as the Henderson Property.
- Due to time constraints, the impact tables provided for the meeting have not yet been quality checked, and require thorough assessment. However, assuming all areas temporarily impacted by construction (leveled and re-seeded with native vegetation) would lose all function following construction, the *draft* impact numbers would be as follows:
  - In-kind, in-proximity: approximately 106 acres
  - Out-of-kind, out-of-proximity: approximately 151 acres
  - Total mitigation acres required = approximately 257 acres

Upland Habitat Mitigation Planning History:

A brief description of upland habitat mitigation efforts to date was given. Handouts provided:

- *Draft* Dune Habitat Mitigation Options Memo (dated June 14, 2011)
- Panhandle Mitigation Site Map

- 2007 - DEA discussed potential for enhancement of Bureau of Land Management (BLM) lands on the north spit (wetland creation and noxious weed removal) with BLM and ODFW. Local agency personnel agreed to a concept plan, but BLM supervisors walked away from the concept due to political concerns. It is unknown whether BLM would now be amenable to such mitigation.
- 2010 - DEA researched private lands north of JCEP for mitigation potential, but none wanted to sell. It may be possible to contact them to see if easements or sale would now be desirable.
- 2011 - DEA researched County and U.S. Forest Service (USFS) lands north of JCEP, and conducted a site visit with ODFW to examine opportunities and constraints. Several parcels were possible for mitigation, including Tenmile creek, which is owned by the County. Need to investigate these options further.

Potential Upland Habitat Mitigation Opportunities:

- ODFW agreed that that the portions of the Panhandle not used for DSL/USACE wetland mitigation (approximately 120 acres) would be acceptable as a preservation area for ODFW upland habitat mitigation, subject to in-kind mitigation rules. We would need to detail which habitats would be preserved as mitigation for which impacts, and provide a 'net benefit' to preservation such as snag or large woody debris enhancement, signage, noxious weed control, or other actions.
- 'Net benefit' can include a variety of activities: noxious weed control, adding snags, adding large woody debris, signage or fencing, etc. No specific ratio or acreage of net benefit is required- the applicant would propose a net benefit and ODFW would comment on its suitability.
- The 22-acre county parcel at Tenmile Creek is still acceptable as mitigation for dune forest impacts. Net benefits previously discussed were signage or fencing to preclude use by Off-Highway Vehicles (OHVs).
- The private landowners contacted in 2010 and 2011 were not interested in selling their property, but would they potentially be interested in sale now, or in conservation easements rather than sale?
- Stu had questions about the dunes west of D.B. Western - what is the current land ownership? Mitigation could include preservation at these dunes. We visited this area after the meeting, and Stu thought it looked good for preservation. Post-meeting note: These lands are zoned industrial and the Port is planning to develop them, so they are unavailable for mitigation.
- Stu said that preservation of the Henderson Property would be excellent for mitigation. Phil said that he has been told in no uncertain terms that it is not possible. ODFW mentioned that although the Port may be able to find DSL/USACE mitigation for Henderson property impacts, since the wetlands are Category 2, ODFW policy states that mitigation would need to be in-kind (meaning that salt marsh restoration wouldn't be acceptable).
- ODFW is supportive of salt marsh restoration because of the 3,000 acres of salt marsh lost in the Coos Bay area historically.

- For out-of-kind mitigation (Category 4), it IS possible to use salt marsh restoration at a 1:1 ratio, but we can't double-dip (use acreage from DSL/USACE mitigation sites for upland mitigation). This does not mean that these agencies can require separate mitigation actions for the same impact (the wetland mitigation would count for both DSL/USACE and ODFW), but that even though the DSL/USACE mitigation would occur at a higher ratio, it is not possible to use the acreage that is above the DSL/USACE 1:1 ratio as mitigation for ODFW. Take, for example, 1 acre of impact requiring 3 acres of mitigation for DSL/USACE. ODFW would generally request 1 acre of mitigation (plus a net benefit of some kind), but we can't use the 2 additional acres as mitigation for other upland habitat impacts.
- ODFW mentioned that conservation easements on stream buffers could work for in-kind mitigation for dune forest. It may be possible to obtain easements from Weyerhaeuser or other timber companies, especially in wide riparian areas where they currently log, but it's difficult due to saturated soils.
- Barb mentioned that riparian forest planting may be able to occur on the edges of APCO property, and ODFW was amenable to the potential. Post-meeting note: City of North Bend and the private owner's development plans for this property may preclude this option, but it will be researched.
- If agencies such as BLM or USFS are interested in obtaining funds for maintenance of lands as mitigation, it could work for ODFW. They would need assurances that the agencies are committed to the mitigation for the life of the project. This is sometimes difficult for BLM or USFS to do, but if a legal agreement could be reached that would be acceptable.
- It may be easier to focus on private and County lands if possible. Depending on the agencies to approve long-term mitigation on their lands is risky and could cause schedule problems.
- ODFW is supportive of enhancing public access unless sensitive species would be impacted.
- Chris mentioned potential mitigation at Catching Slough if landowners are interested. There has been discussion with Fred Messerle in the past, which could be pursued.

ACTION ITEMS

- Phil will finalize habitat maps for concurrence, and continue to prioritize and pursue mitigation options.
- ODFW agreed a wider agency and stakeholder audience in late September would be good. In the meantime, DEA will investigate mitigation options thoroughly and coordinate with ODFW.
- ODFW requested that we make descriptions of temporary vs. permanent, or long-term vs. short-term, very clear. Unfortunately, ODFW could not provide specific examples of how they would like to see this described because the one large project they worked on was withdrawn. But they urged a clear rationale, taking into account the 'duration of recovery' and 'percent of function' post-construction.
- Determine the level of effort we want to put forth to calculate post-construction 'percent of function'. If it is determined that any effort is worthwhile, Phil will set up a discussion with project Engineers and ODFW to agree on the specific details of post-construction habitat impacts (e.g. 'percent of function' post-construction).
- ODFW gave some guidance on how they would like to see impacts shown on maps and in text – the intent is to make the ODFW flowchart rationale very clear using specific examples for each habitat type.

- Add superscripts to the maps referencing specific descriptions of habitat mapping.
- Add the Highest Measured Tide line to the maps.
- ODFW asked to see SDPP acreage totals separately on the maps to help track EFSC jurisdiction.
- DEA will put the full JPA on DEA's website, along with the draft habitat maps.
- We did not have enough time to conduct many site visits, but are tentatively planning site visits with ODFW in late August or early September to further investigate mitigation options that are developed in the interim.

ODFW HABITAT MAPPING AND MITIGATION MEETING NOTES

MEETING DATE:	August 26, 2013	
LOCATION:	SHN offices, 275 Market Avenue, Coos Bay, OR 97420-2228	
ATTENDEES:	Stuart Love	Oregon Department of Fish & Wildlife
	Chris Clair	Oregon Department of Fish & Wildlife
	Art Martin	Oregon Department of Fish & Wildlife
	Phil Rickus	David Evans and Associates, Inc.
	Barb Gimlin	SHN Consulting Engineers & Geologists, Inc.

PURPOSE:

The purpose of the meeting was to continue to discuss habitat mapping for the Jordan Cove Energy Project (JCEP), and further develop mitigation strategies that meets the Oregon Department of Fish & Wildlife (ODFW) Habitat Mitigation Policy. A successful outcome from this meeting is clarification of outstanding questions regarding ODFW with Pre- and Post-Construction Habitat Mapping, and development of specific mitigation actions on potential mitigation sites provided by JCEP. Prior to the meeting, Art Martin provided responses to previous habitat mapping questions. These responses informed the meeting and are attached.

SUMMARY:

David Evans and Associates, Inc. (DEA) staff presented a review of recent mapping efforts, and of outstanding questions. ODFW provided further clarification and made requests for information. The group discussed specific strategies and locations for mitigating impacts. Following is a recap of the notes recorded by Phil Rickus.

OFFICE DISCUSSION

- Art requested clarity regarding chain of command and jurisdiction over the various parts of the project. ODFW wants to make sure it has consistent input on all aspects of the project. The JCEP response is provided below:
  - *Randy Miller (Williams) will handle all aspects of the Pacific Connector Gas Pipeline Project (PCGP), and Phil Rickus will be the initial ODFW contact for all other portions of the project.*
- ODFW felt that our meetings to date have been productive, but that they will provide more specific comments when we submit the mitigation plan (to be provided in mid-September). They will attempt to review the draft report prior to the stakeholder meeting in early October.
- Temporal loss must be accounted for in the mitigation plan. If we uplift our mitigation sites prior to construction, temporal loss will be addressed completely. If not, it will need to be addressed in another manner.

- Regarding percent of function, there has not been a precedent for decreasing mitigation acreage based on percent of function at the impact site. Such an assessment could theoretically be done, but it could be risky. While ODFW may buy off on it (if the rationale is described thoroughly) it could raise challenges from other stakeholders or the public. Simpler explanations are likely most defensible. Art mentioned that it's difficult to state that the mitigation site is functioning at 100%; we may be able to describe something more like 85%. We don't necessarily need to use percentage; we can just discuss the number and level of functions that exist.
- JCEP will need to provide for monitoring of some kind to determine whether the ecological uplift has occurred, usually 5-10 years is sufficient to show that the ecological uplift actions have succeeded.
- ODFW liked the concept of a third-party manager for the lands, but this didn't necessarily decrease monitoring needs for the first 5-10 years.
- Need to make sure all staging areas have been accounted for and are included in mapping; this has been an oversight on other large projects.
- Art would like us to include a table showing impacts to Category 6 habitat, but with no mitigation necessary. He also agreed that based on short duration of impact and existing habitat along the Trans-Pacific Parkway, there is no need to quantify those impacts, just describe them briefly.
- ODFW mentioned that the Bandon Marsh Tidal Restoration Project undertaken by (U.S. Fish and Wildlife Service (USFWS) is currently experiencing problems with public perception due to the creation of mosquito habitat. In some places there are many more mosquitos, caused by ponded water trapped at high tides. They recommend contacting Dave Ledig with USFWS (541-347-1470) to discuss.

SITE VISIT RESULTS

In the afternoon, the group went to the field to review existing habitat at the Mill Site and specific ways to improve habitat function at the proposed mitigation sites.

At the **Mill Site**, the group agreed upon categories for wetlands. While doing so, ODFW expressed interest in restoration of the salt marsh at the southeast corner of the site, where a poorly functioning tide gate limits wetland function for fish. ODFW felt the tidegate could be removed and the wetland expanded into areas that are currently dredge spoils dominated by weeds. If the concept works, ODFW would like to see a vegetated buffer between the facilities and the mitigation site. DEA is reviewing this idea, but land use policy and the presence of asbestos in fill areas may make this impossible.

At the **Panhandle site**, we discussed the historic condition of the area. Prior to invasion of European beachgrass (which is extremely difficult to eradicate), it was a much more dynamic system, with native species colonizing semi-stable dunes. This resulted in a mosaic of open sand, sparsely vegetated areas, and dune forest. Therefore, one mitigation concept could include removal of encroaching lodgepole pine in some areas, and subsequent planting of native herbaceous species.

While at the Panhandle site, we reviewed the North Panhandle wetland mitigation plans, and ODFW felt that the concept was flawed because it would result in converting open water (Category 2) to emergent wetland, which is also Category 2. Although the emergent wetland would provide additional diversity of function, ODFW would prefer to see degraded habitat restored rather than existing, highly functioning habitat converted to another type of highly functioning habitat. The JCEP response is provided below:

- *JCEP appreciates the input, and is pursuing other wetland mitigation opportunities (such as the Mill Site). However, because JCEP would like to receive formal ODFW comment from DSL and ODFW (and other agencies) on the Removal/Fill Permit application and supporting Compensatory Wetland Mitigation Plan (CWMP), JCEP intends to submit the application and CWMP as-is on or about September 13. JCEP anticipates a critical review of certain aspects of the CWMP, and will use that feedback as the driver for an early October agency meeting where all reviewing agencies can collaborate on site to guide the development of a CWMP that best meets each agency's individual needs and has the best chance of gaining approval. JCEP fully expects to prepare and submit a revised CWMP based on the outcomes of this meeting.*

Roseburg Forest Site- Because the site is quite distant from the impact area and contains inland conifer forest rather than coastal dune forest, it was not considered a primary mitigation opportunity by ODFW. However, its proximity to the Oregon Dunes National Recreation Area (ODNRA) and current status as regularly harvested forest lands make it a secondary choice.

Adamek Site -Based on air photos, and the location of the parcel, ODFW felt that the Adamek site appears to be suitable for mitigation, which could potentially include adding woody debris and snags, weed removal, and restricting Off Highway Vehicle (OHV) use. However, there was not enough time to visit the parcel.

ODFW agreed that the forested portions of **Parcel L and K** provide good opportunities for mitigation. Preservation and enhancement of these parcels could benefit band-tailed pigeon, western snowy plover and, potentially pond turtle. In addition, American marten were recently documented in the area and could benefit from protection of the habitat. For these parcels, ODFW suggested a combination of techniques to protect habitat from incursion by OHVs; gating the existing access roads and reclaiming OHV trails. Signage and drift fences could also be used.

ACTION ITEMS

- Phil will discuss specific mitigation strategies further with Stu, who wasn't able to be present at the Panhandle Site and the Roseburg Site.
- The Adamek Parcel, and Parcel L and K will be reviewed further, and a half-day site visit at a later date may be helpful for determining specific mitigation strategies on the parcel.

DAVID EVANS
AND ASSOCIATES INC.

MEMORANDUM

DATE:	September 10, 2013
TO:	Stuart Love, Wildlife Biologist; Chris Claire, Fish Biologist; Art Martin, Energy and NRDA Coordinator, Wildlife Division
FIRM:	Oregon Department of Fish and Wildlife
FROM:	Phil Rickus
SUBJECT:	**ODFW Habitat Categorization, Jordan Cove Energy Project**
PROJECT:	JCEP0000-0004 – Jordan Cove Energy Project
COPIES:	Bob Braddock, Jordan Cove Energy, LP Sean Sullivan, David Evans and Associates, Inc. Steve Donovan, SHN Consulting Engineers & Geologists

This memorandum describes the Habitat Type and Habitat Categories within potential impact and mitigation areas for the Jordan Cove Energy Project (JCEP) based on the Oregon Administrative Rule (OAR) habitat categorization protocol (OAR635-415-0025). The memo covers the areas shown in the attached Figure 1, Project Vicinity map. Habitat mapping is included in Figure 2, Sheets 1-8. On behalf of JCEP, David Evans and Associated, Inc. (DEA) requests comments and concurrence with the attached figures.

The main project area includes the Ingram Yard, the Slip and Access Channel, the Utility Corridor, and the Mill Site/South Dunes Site. The narrow corridors connecting these facilities consist of temporary impact areas: haul roads, waste water lines, and dredge pipeline corridors. Where they consist of entirely developed habitats (Category 6), the full extent of these temporary impact areas is not shown, for brevity. All other habitat areas are included in Figure 2, Sheets 1-8. Figure 2 includes two study area boundaries: the project footprint wherein all planned temporary and permanent impacts would take place (and all habitat has been mapped), and the wetland delineation study area outside the project footprint wherein no impacts would take place but mapping has been completed in some places.

The North Point Workforce Housing Project lies at the north side of North Bend west of the Highway 101 Bridge (Figure 2, Sheets 7 and 8), and is proposed for use as temporary workforce housing. The Transpacific Parkway and Highway 101 site is included in the inset of Figure 2, Sheet 6, and would include impacts from widening of the Highway 101 access to the parkway. The Panhandle Site (Figure 2, Sheet 1), which is proposed for use in mitigation, lies to the northeast of the Ingram Yard site. Habitat mapping for the Pacific Connector Gas Pipeline portion of the project is being led by another entity (Williams).

Mapping is based on the OARs and discussions with the above-named Oregon Department of Fish and Wildlife (ODFW) representatives, who provided detailed guidance for mapping during meetings conducted on July 23 and August 26, 2013.

UPLAND HABITATS

Table 1 shows the upland habitat types within the project analysis areas and their corresponding ODFW habitat categories, as mapped by DEA. A discussion of these categories follows Table 1.

Table 1: Upland Habitat Types and Habitat Categories at the Jordan Cove Energy Project

Habitat Type	Habitat Subtype	ODFW Habitat Category
UPLAND TREES	Coastal Dune Forest	3 – essential habitat that is not limited
UPLAND TREES	Riparian Forest	3 – essential habitat that is not limited
SHRUBLAND	Shrub	4 – non-essential habitat that is not limited, but is important to wildlife
GRASSLAND	Herbaceous/ shrub	4 – non-essential habitat that is not limited, but is important to wildlife.
GRASSLAND	Herbaceous	4 – non-essential but important wildlife habitat that is not limited
GRASSLAND	Unvegetated Sand	3 – non-essential but important wildlife habitat that is limited
DEVELOPED	Developed	6 – habitat that has low potential to become essential or important habitat for fish and wildlife

Coastal Dune Forest Habitat

Coastal dune forest habitat consists of forest areas established on fully stabilized sand dunes in the region. It is found throughout the study area in various successional stages. Dominant species include Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), shore pine (*Pinus contorta*), and Port Orford cedar (*Chamaecyparis lawsoniana*), with scattered Sitka spruce (*Picea sitchensis*). In some places, patchy canopy promotes vigorous shrub growth and cover, ranging from dense to nearly impenetrable.

Dominant shrubs are evergreen huckleberry (*Vaccinium ovatum*), salal (*Gaultheria shallon*), bearberry (*Arctostaphylos uva-ursi*), and Pacific rhododendron (*Rhododendron macrophyllum)* with scattered California wax myrtle (*Myrica californica*) and hairy Manzanita (*Arctostaphylos columbiana*). Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), and English ivy (*Hedera helix*) are common along the edges of the forest in some places, primarily near recent or historic development. The understory is generally lacking herbaceous species due to dense canopy cover, although portions of the forest are less dense than others.

Coastal dune forest habitat would be considered essential (based on ODFW policy definition) because according to ODFW, populations of species such as American marten, bats, and some songbirds depend upon it for species survival, and loss of the habitat could result in depletion of some of these species on a local scale. However, the habitat is not limited since similar habitats are found north and east of the project.

Although species such as peregrine falcon and bald eagle have been seen flying over this habitat type, no known nests or breeding areas of state or federally-listed species are known to occur (which would be considered limited). Two previous blue heron nest trees were checked and continue to be abandoned and empty. Therefore all coastal dune forest is classified as Category 3 because it is essential to wildlife but is not limited.

This habitat type includes mid to late-seral mixed conifer forest within the North Point Workforce Housing Project Access study area, where herbaceous vegetation typical of coastal forest is more common, along with

shrub species such as cascara (*Frangula purshiana*) and salmonberry (*Rubus spectabilis*). Soil conditions within the portion of forest are slightly less well-drained than forest found on more recently vegetated dunes, and these species are adapted to moister forest conditions.

Riparian Forest Habitat

Riparian forest consists of a small area of early to mid-seral forest along the northern shore of Jordan Cove and outside the study area east of the Mill Site/South Dunes Site. The proximity of the forest to Coos Bay and the elevation of the highest measured tide appear to influence the plant composition, which is more mesic than the typical coastal dune forest (but is not wetland). The canopy is dominated by red alder (*Alnus rubra*) and willow (*Salix* sp.); with scattered Sitka spruce and California wax myrtle. This habitat is distinct from, but interspersed with, forested wetlands. Understory vegetation is generally similar to coastal dune forest habitat, and Himalayan blackberry and English ivy are similarly common along the edges of the forest in some areas. This habitat is classified as Category 3 because it is essential to wildlife but is not limited on a watershed basis, since the riparian forest in the project area is fragmented and fairly young in age.

Herbaceous Habitat

The herbaceous habitat type is found primarily on historically leveled areas (and to a lesser degree on recently colonized dunes) where pioneering species (mainly European beachgrass, (*Ammophila arenaria)*) have established themselves. Dominant species include European beachgrass, tall fescue (*Festuca arundinacea*), sweet vernal grass (*Anthoxanthum odoratum*), Queen Ann's lace (*Daucus carota*), and hedgehog dogtail grass (*Cynosurus echinatus*). Some of these areas were planted with pasture species. Much of this habitat was previously mapped as grassland, but since no native grassland is present, and the previously mapped grassland habitat does not differ substantially from the previously mapped herbaceous habitat, the two were combined for simplicity. Himalayan blackberry and scattered trees and shrubs (cultivated as well as native) are present in some places along the edges of the habitat near developed areas, and have been included in this habitat type due to their low cover overall.

This habitat type would not be considered essential (based on ODFW policy definition) because no species are known to depend upon it exclusively for their survival, and loss of the habitat would not likely to result in depletion of any species. The habitat is not limited since similar habitats are found in the vicinity. Therefore the habitat is classified as Category 4 because it is not essential, or limited, but is important to wildlife.

Herbaceous/ Shrub Habitat

The herbaceous/ shrub habitat type is found in historically leveled areas and on less-recently colonized dunes that have developed shrub cover in addition to herbaceous cover. Both habitats have been invaded by shrubs, primarily Scotch broom, and Himalayan blackberry, as well as some native shrub species and trailing blackberry (*Rubus ursinus*). Overall shrub cover is 10% or less in this habitat type.

Dominant species include primarily tall fescue and European beachgrass. Other species include velvet grass (*Holcus lanatus*), English plantain (*Plantago lanceolata*), yarrow (*Achillea millefolium*), pearly everlasting (*Anaphalis margaritacea*), tall orchardgrass (*Dactylis glomerata*), colonial bentgrass (*Agrostis capillaris*), hairy catsear (*Hypochaeris radicata*), small-head clover (*Trifolium microcephalum*), American dunegrass (*Elymus mollis*), hop clover (*T. dubium*), and red and white clover (*T. pratense and repens*), and Queen Anne's lace. The habitat is classified as Category 4 because it is not essential, or limited, but is important to wildlife.

Shrub Habitat

This habitat type is located on stabilized dunes and disturbed areas that have been colonized by shrubs and young trees, primarily Scotch broom and scattered young lodgepole pine (*Pinus contorta*). Overall shrub cover is 20% or more in this habitat type. Himalayan blackberry is present in some areas, especially upslope of wetland areas. The herbaceous species include mainly the non-native species described above such as European beachgrass, sweet vernal grass, and colonial bentgrass, among others. The habitat is classified as Category 4 because it is not essential, or limited, but is important to wildlife.

Unvegetated Sand Habitat

The unvegetated sand upland habitat type is found north of Jordan Lake and at the Panhandle mitigation site, and includes areas of moving sand that have not been colonized by vegetation, except for very scattered herbaceous pioneer species such as European beachgrass and very scattered trees and shrubs that were included due to their isolation within the habitat type. Although the habitat formed by these dunes is generally devoid of vegetation, it provides important habitat for a variety of wildlife, including songbirds that forage on seeds blown into this habitat, and raptors and small mammals that use the edges for foraging. ODFW considers the habitat to be limited on a local scale, since it is present only on a small strip of land between Highway 101 and the ocean. By ODFW definition, it is non-essential, but important to wildlife, and would therefore be classified as Category 3.

Developed Habitat

Developed areas include portions of the site that have been significantly disturbed by development or other land use activities. This includes paved roads and parking lots, gravel roads and road fill, and buildings. These areas have limited potential to become important or essential in the foreseeable future, and are therefore classified as Category 6.

FRESH WATER WETLAND HABITATS

Freshwater wetlands have been avoided to the extent possible, as shown by the location of the project footprint. Extensive high-quality freshwater wetlands occur within the Panhandle Site, and more degraded wetlands are present within the Mill Site/South Dunes Site and Utility Corridor. Most wetlands were categorized as 2, but a few small isolated and degraded emergent and scrub/shrub wetlands were categorized as 3 or 4 (Figure 2,Sheet 6), following ODFW guidance provided during a site visit to the Mill Site/South Dunes Site on August 26, 2013.

Table 2: Freshwater Wetland Habitat Types and Habitat Categories at the Jordan Cove Energy Project

Habitat Type	Habitat Subtype	ODFW Habitat Category
SURFACE WATER	Forested/ shrub wetland	2 – Essential wildlife habitat that is limited, but is replaceable through mitigation
SURFACE WATER	Forested/ shrub wetland	2 – Essential wildlife habitat that is limited, but is replaceable through mitigation
SURFACE WATER	Scrub/ shrub wetland	2 – Essential wildlife habitat that is limited, but is replaceable through mitigation
SURFACE WATER	Scrub/ shrub wetland	3 –Wildlife habitat that is not essential, but is limited.
SURFACE WATER	Scrub/ shrub wetland	4 – non-essential habitat that is not limited, but is important to wildlife

Habitat Type	Habitat Subtype	ODFW Habitat Category
SURFACE WATER	Emergent wetland	2 – Essential wildlife habitat that is limited, but is replaceable through mitigation
SURFACE WATER	Emergent wetland	3 –Wildlife habitat that is not essential, but is limited.
SURFACE WATER	Emergent wetland	4 – non-essential habitat that is not limited, but is important to wildlife
SURFACE WATER	Open water	2 – Essential wildlife habitat that is limited, but is replaceable through mitigation
SURFACE WATER	Open water	3 –Wildlife habitat that is not essential, but is limited.

Open Water Habitat

Open water was present in steep-sided interdunal areas and within deeper portions of wetland areas, where no vegetation was present. Most of this habitat is classified as Category 2 because it is essential to wildlife and limited. The exception is the open water portion of the isolated, artificial ponds at the Mill site, which were classified as Category 3 because they are not essential, but are limited.

Emergent Wetland Habitat

The herbaceous emergent wetland habitat type is located in low-lying areas throughout the study area. Vegetation is dominated typically dominated by slough sedge (*Carex obnupta*), spreading rush (*Juncus patens*), water parsley (*Oenanthe sarmentosa*), Pacific silverweed (*Potentilla anserina*), and salt grass (*Distichlis spicata*), among others. Wetter portions of this habitat type consisted of aquatic floating and emergent plants in relatively shallow seasonally or perennially inundated areas, including pond lily (*Nuphar polysephalum*), water parsley, cattail (*Typha latifolia*), and small-fruited bulrush (*Scirpus microcarpus*).

Most emergent wetland habitat is classified as Category 2 because it is essential for wildlife, and limited, but can be replaced through mitigation. However, as depicted numerically on Figure 2, Sheet 6, the isolated, degraded wetlands at the Mill Site/South Dunes Site, which were classified as either Category 3 (because they are not essential, but are important and limited) or Category 4 (because they are not essential or limited, but are important).

Scrub Shrub Wetland Habitat

This habitat type is commonly dominated by Hooker willow (*Salix hookeriana*), with salmonberry other common coastal wetland species such as slough sedge and skunk cabbage (*Lysichiton americanus*). Pacific crabapple (*Malus fuscus*) was also a dominant shrub species in some areas. The habitat is classified as Category 2 because it is essential for wildlife, and limited, but can be replaced through mitigation. The degraded scrub-shrub wetlands at the Mill Site/South Dunes Site were classified as Category 3 because they are not essential, but are important and limited.

Forested Wetland Habitat

The forested wetland habitat type consists of wetlands that have remained undisturbed long enough to develop a consistent tree canopy. It is dominated primarily by red alder, with some areas of tree-sized Hooker willow and lodgepole pine. Mature Sitka spruce also occurs in places, typically at the wetland boundary or on upland hummocks within the wetlands. The shrub layer is dominated by common coastal wetland species such as Pacific crabapple and twinberry (*Lonicera involucrata*). The habitat is classified as Category 2 because it is essential for wildlife, and limited, but can be replaced through mitigation.

ESTUARINE HABITATS

Estuarine habitats are found along Jordan Cove and between the fill pads at the North Point Workforce Housing site.

Table 3: Estuarine Habitat Types and Habitat Categories at the Jordan Cove Energy Project

Habitat Type	Habitat Subtype	ODFW Habitat Category
SURFACE WATER	Salt marsh	2 – Essential wildlife habitat that is limited, but is replaceable through mitigation
SURFACE WATER	Intertidal Unvegetated Sand	2 – Essential wildlife habitat that is limited, but is replaceable through mitigation
SURFACE WATER	Algae/ Mud/ Sand	2 – Essential wildlife habitat that is limited, but is replaceable through mitigation
SURFACE WATER	Shallow Subtidal	2 – Essential wildlife habitat that is limited, but is replaceable through mitigation
SURFACE WATER	Eelgrass	2 – Essential wildlife habitat that is limited, but is replaceable through mitigation
SURFACE WATER	Deep Subtidal	3 –Wildlife habitat that is not essential, but is limited.

Salt Marsh

This habitat type consists of salt-tolerant herbaceous species in brackish water areas connected to Coos Bay and subject to tidal influence. Dominant plant species are typical of the area and include saltgrass (*Distichlis spicata*), pickleweed (*Salicornia virginica*), and many others. The habitat is classified as Category 2 because it is essential for wildlife (supporting a unique assemblage of species), and limited (due to historic loss of salt marsh habitat in the region), but can be replaced through mitigation.

Intertidal Unvegetated Sand

This habitat type describes the unvegetated areas of the Coos Bay shoreline below the highest tide line. The sand is unconsolidated, and shifts in response to tides and winds. According to ODFW, due to its location in the Coos Bay Ecosystem the slope of the shoreline is more sheltered and less steep than other nearby habitats, which provides a limited habitat type for foraging species at higher tides. The habitat is classified as Category 2 because it is essential for wildlife (supporting a unique assemblage of species), and limited (due to its unique location within the Coos Bay ecosystem), but can be replaced through mitigation.

Algae/ Mud/ Sand

This habitat type describes the areas of the Coos Bay shoreline below the unvegetated sand habitat and above eelgrass habitat. Much of the area consists of unvegetated mud and sand, mixed with areas of various algae species. Algae/mud/ sand flats habitat is inundated more frequently and for a longer duration than intertidal unvegetated sand habitat and is therefore more likely to support aquatic organisms. Mollusk and/or burrowing shrimp holes occur within this habitat, with varied abundance and diversity. Similar to the habitat type above, this habitat is classified as Category 2 because it is essential and limited, but can be replaced through mitigation.

Shallow Subtidal Habitat (without eelgrass)

Shallow subtidal habitats are not defined by regulation, but are cited in ODFW (1979) and CBEAC (1984) as occurring from zero to -15 feet Mean Lower Low Water (MLLW) and providing important estuarine species habitat. Bottom substrates are assumed to be a mix of sand and mud with predominately courser grain sizes. The habitat is classified as Category 2 because it is essential and limited, but can be replaced through mitigation.

Eelgrass Habitat

This habitat type describes the areas of the Coos Bay shoreline below the unvegetated sand habitat that contain eelgrass habitat. In general, eelgrass habitat is highly productive and provides important ecological functions for estuarine ecosystems. These functions include providing cover for small organisms such as juvenile salmonids, substrate for attachment by marine organisms (e.g., various algae species, mussels, herring egg masses, etc.), nutrient cycling processes, food web support, and sediment stabilization. The habitat is classified as Category 2 because it is essential for wildlife (supporting a unique assemblage of species), and limited (due to historic loss of eelgrass habitat in the region), but can be replaced through mitigation.

Deep Subtidal Habitat

Deep subtidal habitats are not defined by regulation, but are cited in ODFW (1979) and CBEAC (1984) as occurring below -15 feet MLLW and being generally less productive than shallower habitats in the Coos Bay Estuary. Bottom substrates are assumed to be a mix of sand and mud with predominately courser grain sizes. Exposed sandstone may also be present, particularly closer to the mouth of the bay. This habitat is essentially disturbed on an annual basis as part of the navigation channel maintenance. According to ODFW, deep subtidal habitat is classified as Category 3 because although it is essential, but is not limited within Coos Bay.

Sincerely,
David Evans and Associates, Inc.



Philip Rickus
DEA Ecologist

Attachments/Enclosures:

* Figure 1, Project Vicinity
* Figure 2, Jordan Cove Energy Project ODFW Habitat Maps, Sheets 1-8

* Figures from memorandum are not provided here because the concurred mapping is included in Figure P-2 and Figure P-3 of Exhibit P

ODFW HABITAT MAPPING AND MITIGATION MEETING NOTES

MEETING DATE:	September 27, 2013	
LOCATION:	SHN offices, 275 Market Avenue, Coos Bay, OR 97420-2228	
ATTENDEES:	Stuart Love	Oregon Department of Fish & Wildlife
	Phil Rickus	David Evans and Associates, Inc.
	Barb Gimlin	SHN Consulting Engineers & Geologists, Inc.

PURPOSE:

The purpose of the meeting was to further develop mitigation strategies for the Jordan Cove Energy Project (JCEP), specifically to discuss ecological uplift activities at sites that Stu Love, Oregon Department of Fish & Wildlife (ODFW) was unable to visit during the previous meeting.

SUMMARY:

David Evans and Associates, Inc. (DEA) staff presented the goals of the meeting, shared existing mapping of mitigation sites, and requested feedback for specific mitigation strategies. The group discussed specific strategies and locations for mitigating impacts before visiting sites. Following is a recap of the notes recorded by Phil Rickus.

- The group discussed possible activities and the difficulty in determining specific performance standards given the adaptive nature of the mitigation. Much of the discussion centered on the roles and responsibilities of the 3rd-party manager of the mitigation. We discussed who the manager might be; a private representative, a non-profit like The Nature Conservancy (TNC) or others, or a JCEP-funded position within ODFW. The group felt that an ODFW-funded position, while providing good oversight of the mitigation, may appear to be a conflict of interest (funding for ODFW in exchange for concurrence with mitigation), and might also present administrative difficulties or delays.
- Stu mentioned the Coquille Valley Wildlife Area, which is located in the Coquille watershed and is a newly acquired parcel (from a fairly recent land swap) that has no manager or funds to maintain it. Could the JCEP project include that area in its mitigation portfolio, or have a private manager that works with that site? He was a bit concerned about the distance of Coquille from the JCEP project, but I mentioned that the Pacific Connector Gas Pipeline (PCGP) crosses the Coquille (near MP 40 or so) and that PCGP might want to look into this.
- We discussed using the monitoring report completed yearly (for the first 5 yrs. only?) by the 3rd-party manager as proof of ecological uplift. This might mean that a certain budget is set aside per year, to be used at the discretion of the manager (with the mitigation plan goals as a guide), monitored, and reported on. It would be helpful for the JCEP team to have an internal discussion regarding our thoughts on this.
- Stu also suggested contacting watershed associations to see if they want to be or work with the 3rd-party manager, especially the Umpqua watershed association (if it still exists). There can be some politics involved in this type of thing, so caution is advised.

Roseburg Forest Site – Stu was familiar with the site and liked it for mitigation due to it is surrounded by Oregon Dunes National Recreation Area (ODNRA) lands. We looked at air photos and discussed possible uplift activities, include the following.

- Increasing width of riparian areas. Could be monitored by air photo comparison over the space of years, or documentation of planting efforts.
- Improving marten habitat. Snag creation and coarse woody debris. As-builts and/or monitoring reports to document the annual efforts.
- Protecting travel corridors. Stu seemed to think that logging could continue on the parcel, but that corridors in uplands (not just riparian areas) could be retained for connectivity and diversity of habitat. Stu mentioned camera monitoring as a way to monitor for presence of marten, but admitted that it is time-consuming and doesn't always give positive results.
- Noxious weed control: Map infestations and reduce populations by a certain percent each year until eliminated (10%?). The logging road are already blocked off and overgrown with alder. If the southern parcel was used, the road would likely need to be cleared and then closed with a gate. Ownership of the parcel between N and S, and access between them, might be an issue.

Panhandle site – Due to access, weed control seems to be the best option; primarily hand-removal of Scotch broom along the west side of the parcel. It is fairly limited at this time, so control would be possible over time. Stu pointed out that natives should be seeded where Scotch broom is removed so weeds don't move in.

Parcel L and K provide good opportunities for mitigation. ODFW suggested a combination of techniques to protect habitat from incursion by Off Highway Vehicles (OHV)s; gating the existing access roads and reclaiming OHV trails.

We looked at Parcel K first, specifically the OHV incursion and turnaround that leads through (Forest Service?) property from the north. Although we may not be able to block the entire area, it may be possible to leave one turnaround area and close off the rest. Minimal weed control is also possible near the turnaround, though few weeds were noted elsewhere in the parcel. However, mapping of weeds may be valuable.

The access trail on the south side of the parcel currently leads to an old picnic area and boat ramp for access to Tenmile Creek. Stu felt that this should remain, but the access road leading south along Tenmile Creek could potentially be blocked, which would reduce OHV access to the floodplain, retain native vegetation and reduce pollution that may reach the creek (and disturbance to wildlife within the riparian zone). However it was noted that the location suitable to block this access trail lies just west of the parcel boundary, so this may not be possible.

However, it may be possible to block the southern end of that access trail, where it meets Parcel L and extends west to the ocean. This would need to be gated so that access to the snowy plover restoration areas could be retained. Also, in Parcel L there are several access points, and we were not able to visit all of them due to the width of the access (trucks didn't fit, only OHVs). Photos were taken of access points along the main sand road to the south. There were three in that area, all of which would need to be blocked to be effective. Therefore five to six trails would likely need to be blocked at L, and one gate installed.

Blocking could be accomplished using large wood, and delivery to the site would need to be by large equipment. Stu understood that this could be costly, and would need to be negotiated to determine a reasonable extent of effort for all the mitigation sites. However, it was agreed that we would discuss a portfolio of options in the mitigation plan in order to allow for a consensus among the stakeholders as to which would be enacted.

Regarding the sand and wetland areas in the eastern third of Parcel K, Stu reiterated that since it would be impossible (or costly) to restrict OHV use, little potential for wildlife mitigation would occur. However, he thought there may be potential for recreation mitigation if the project needs it, since the area is used for camping currently.

ACTION ITEMS

- Finalize the Draft mitigation plan and submit to ODFW for comment.
- Conduct internal JCEP team discussion regarding the 3rd-party manager, and potential annual budget.
- Determine fatal flaws in selected parcels, if any and which parcels are most likely to be available.

From: Art Martin <art.c.martin@state.or.us>
Sent: Wednesday, October 30, 2013 10:59 AM
To: Philip Rickus
Cc: art.c.martin@state.or.us; GREEN Chris; Christopher Claire; David Fox; Elizabeth J Ruther; Scott Groth; Stuart Love; CORNETT Todd
Subject: RE: Final JCEP ODFW habitat mapping for concurrence
Attachments: ODFW_Habitat_JCEP_sheet6[1].pdf; 2013-09-10 JCEP ODFW Habitat Memo Deliverable.pdf

Phil,

ODFW concurs with the habitat categorizations (Under OAR 635-415-0000 through 0025) for each of the identified habitat parcels proposed for impact and associated with the Jordan Cove Energy Facility footprint which also encompasses the South Dunes Power Plant footprint (EFSC Jurisdiction) as mapped and labeled in the attached (September 10, 2013) Jordan Cove LNG Terminal ODFW habitat mapping memo and revised Figure 2, Sheet 6 of 8 (provided on October 21, 2013), which constitutes the current, ODFW-reviewed habitat mapping for the project. Thank you for the opportunity to coordinate and collaborate on this pre-application phase of project development.

Thanks,

Art Martin
Energy Coordinator
Wildlife Division
Oregon Dept. of Fish and Wildlife
4034 Fairview Industrial Drive SE
Salem, Oregon 97302
art.c.martin@state.or.us
503-947-6082
503-789-9376 (cell)

From: Philip Rickus [mailto:Prr@deainc.com]
Sent: Tuesday, October 29, 2013 3:04 PM
To: art.c.martin@state.or.us
Subject: Final JCEP ODFW habitat mapping for concurrence

Hello Art- For your concurrence, I have attached the Jordan Cove LNG Terminal ODFW habitat mapping (dated September 10, 2013), along with the revised Figure 2, Sheet 6 of 8 (provided on October 21, 2013), which constitutes the current, ODFW-reviewed habitat mapping for the project.

Thanks
Phil

APPENDIX P-2

LBJ Enterprises 2006 Pre-Construction Wildlife Survey Report

2005-2006 PRE-CONSTRUCTION WILDLIFE SURVEYS FOR PROPOSED JORDAN COVE LIQUEFIED NATURAL GAS PLANT, COOS BAY, OREGON

Prepared by LBJ Enterprises
Eureka, CA

Robert Hewitt, Project Director
Kenneth M. Burton, Wildlife Program Manager
Steven J. Tucker, Associate Wildlife Biologist

For SHN Consulting Engineers
Coos Bay, Oregon

May 10, 2006
Revised December 26, 2006

Table of Contents

Page

INTRODUCTION 1
- Project Area 1
- Wildlife Habitats 1
- Habitat Analysis 2
- Wildlife Assessment Areas 3

METHODS 3
- Field Surveys 3
- Literature search 4
- Species selection and treatment 5
- Agency Field Visit 5

NATURAL RESOURCES: WILDLIFE 5
- Status Terminology 5
- Listed, proposed, and candidate species 6
- Other Sensitive Species 10

SPECIES GUILDS 22
- Amphibians and Reptiles 22
- Sensitive Breeding Birds 22
- Winter Waterfowl 23
- Wading Birds and Shorebirds 23
- Neotropical Migrants 24
- Bats 24
- Marine Mammals 25
- Big Game 25
- Other Mammals 25

POTENTIAL IMPACTS AND MITIGATION OPTIONS 25
- Impacts to Wildlife Habitat 25
- U.S. and Oregon Endangered Species Acts 26
- Marine Mammal Protection Act 26
- Other Impacts 27

Appendices

Appendix 1. Herpetologist's report
Appendix 2. Coos Bay bird species accounts
Appendix 3. Jordan Cove species list
Appendix 4. Track plate summary
Appendix 5. USFWS Species List
Appendix 6. BLM Table

List of Illustrations

Figures

Figure 1. Location of survey areas and fixed points on aerial photograph of proposed site, Coos Bay, OR.

Figure 2. Additional aerial photograph showing new survey areas added in September 2005.

Figure 3. Locations of sensitive species in the Oregon Natural Heritage Information Center (ORNHIC) database within ten miles of the project site, Jordan Cove, Coos Bay, OR.

Figure 4. Locations of T & E species detections during wildlife surveys.

Figure 5. SHN locations of northern red-legged frog found during wetland delineation, fall 2005, Coos Bay, OR.

Tables

Table 1. Approximate pre- and post-construction habitat extents within two miles of the proposed Jordan Cove LNG plant

Table 2: ORNHIC Database Records within 20 miles of Jordan Cove Energy Project, Coos Bay, Oregon

Table 3: Status of sensitive tetrapod vertebrate species potentially occurring in Coos County

Table 4: Threatened and Endangered species detections, Jordan Cove Energy Project, June, 2005-November, 2006, Coos Bay Oregon

Table 5: Wildlife survey effort, Jordan Cove Energy Project, Coos Bay, Oregon, 2005-2006

Table 6: Ten-year average numbers of waterfowl on the Coos Bay Christmas Bird Count, 1996-2005

INTRODUCTION

Jordan Cove Energy Project L.P. is proposing to construct and operate a liquefied natural gas (LNG) import terminal on an approximately 159-acre site located on the bay side of the North Spit of Coos Bay, Oregon, between Coos Bay River Miles 7.0 and 8.0. The project, known as the Jordan Cove Energy Project (JCEP) or Project, will consist of facilities to receive, store temporarily, vaporize, and send out up to 1.0 billion cubic feet per day (Bscf/d) of natural gas. The LNG terminal will be capable of unloading LNG ships ranging in capacity from 89,000 cubic meters (m^3) to 160,000 m^3. Approximately 80 ships per year are anticipated to call on the LNG terminal. The LNG unloaded from the ships will be transferred by cryogenic service piping to two 160,000 m^3 (1,006,000 barrel) full-containment LNG storage tanks where it will be stored in a liquefied state until it is pumped out, vaporized, and distributed via two natural gas send-out pipelines connecting the terminal with new and existing inter- and intrastate pipeline systems.

LBJ Enterprises has been working as a subcontractor under SHN Engineers to provide the wildlife portion of a biological and cultural assessment that SHN will provide to TRC in support of the application for the FERC permit and other permits and requirements. LBJ Enterprises has assessed the area for the potential and actual presence of listed and sensitive species. The initial starting point for species we considered was provided by a species list developed by the Bureau of Land Management (BLM) and pertaining to the Coos Bay North Spit. A marine biologist and herpetologist provided additional input in their areas of expertise.

Project Area

Coos Bay is the largest estuary on the southern Oregon Coast and is fed by the Coos River. The north spit of the bay extends approximately seven miles southwest from the project area to the mouth. The project area is located on a wider portion of the spit at the south end of the Oregon Dunes National Recreation Area. It is in portions of sections 4 and 5, T25S, R13W and is on former Weyerhaeuser property adjacent to the Roseburg Lumber wood chip site approximately 0.3 miles to the west of Jordan Cove. The site adjoins Coos Bay on the north shore of the bay at the upper end of the north spit as the bay turns east towards the Highway 101 Bridge. It is due north of the airport across Coos Bay.

Natural sand dune habitat flanks the site on the north; Roseburg Lumber and its wood chip facility are to the east. To the south is Coos Bay and to the west is Henderson Marsh. An access road that is an extension of Jordan Cove Road cuts through the yard to the southeast. Chip trucks use this to enter and leave the site on a frequent basis throughout the day and night. There are several large, vacant buildings immediately to the east of the proposed LNG site as well as a large yard area, which is mostly asphalt and short grass. These industrial areas, including the wood chip piles, comprise at least half of the area surveyed.

Wildlife Habitats

The Project botanist defined four broad habitat types within the project area boundaries for her analysis. For consistency, these have provided the basis for our habitat descriptions and analysis.

a) Disturbed and Developed Habitat

This category includes the industrial yard area, roads and building footprints as well as fill area between the dune ridge and Henderson Marsh that is now grassland.

b) Sand Dune

This category includes the open areas created by shifting sand dunes.

c) Freshwater Wetlands

This category incorporates several moderately sized ponds that hold water in the dune hollows and the adjacent Henderson Marsh to the west. Emergent and scrub-shrub vegetation is present in both.

d) Coastal Dune Forest

This category describes the vegetated areas of the dunes and varies from low brush saplings to mid-seral closed canopy forest and mature forest.

Within a 2.0-mile radius of the proposed project site the following additional habitat types are present.

e) Modified rip-rapped shoreline and airport/dock facilities.

f) Natural shoreline habitats above the mean high tide line.

g) Mudflat habitat revealed at low tide below the mean high tide line.

Habitat Analysis

The proposed development would affect a portion of the coastal dune forest, wetlands, the natural shoreline and mudflats, and some previously disturbed areas that currently have relatively high wildlife value (Table 1). Aerial photographs were used to distinguish habitat types within a 2.0-mile radius around the proposed project site. The delineated polygons were entered into a GIS mapping program and the respective areas were calculated. The habitat types were based on the definitions provided above and ground checked in the field.

Table 1
Approximate pre- and post-construction habitat extents within two miles of the proposed Jordan Cove LNG plant.

Habitat	Current acreage	Future acreage	Change
Dune forest/woodland	2458	2388	(70)
Sand dune	822	822	0
Freshwater wetland	582	581	(1)
Ocean	2131	2131	0
Bay	2255	2290	35
Tidal mudflat[1]	457	445	(12)[1]
Disturbed	1580	1754	174

[1]Intertidal non-vegetated mudflat = 5.6 acres.
Intertidal algal mud flat = 6.1 acres

Wildlife Assessment Areas

Wildlife species that occur off the project area may be affected by the Project (by noise or impact with ships or vehicles approaching or leaving the Project or by Project emissions). Species also could move into the project area if there are suitable habitat elements on site. To address these potential effects, we considered species and impact potentials at various scales dependent on the relative mobility of the different wildlife groups. For less mobile species such as reptiles and amphibians, we used a 0.25-mile radius for the assessment area as suggested by the Oregon Department of Fisheries and Wildlife (ODFW; Owens 2005). For the habitat inventory using aerial photographs, we used a two-mile radius. For highly mobile species such as raptors and large mammals, we used a ten-mile radius.

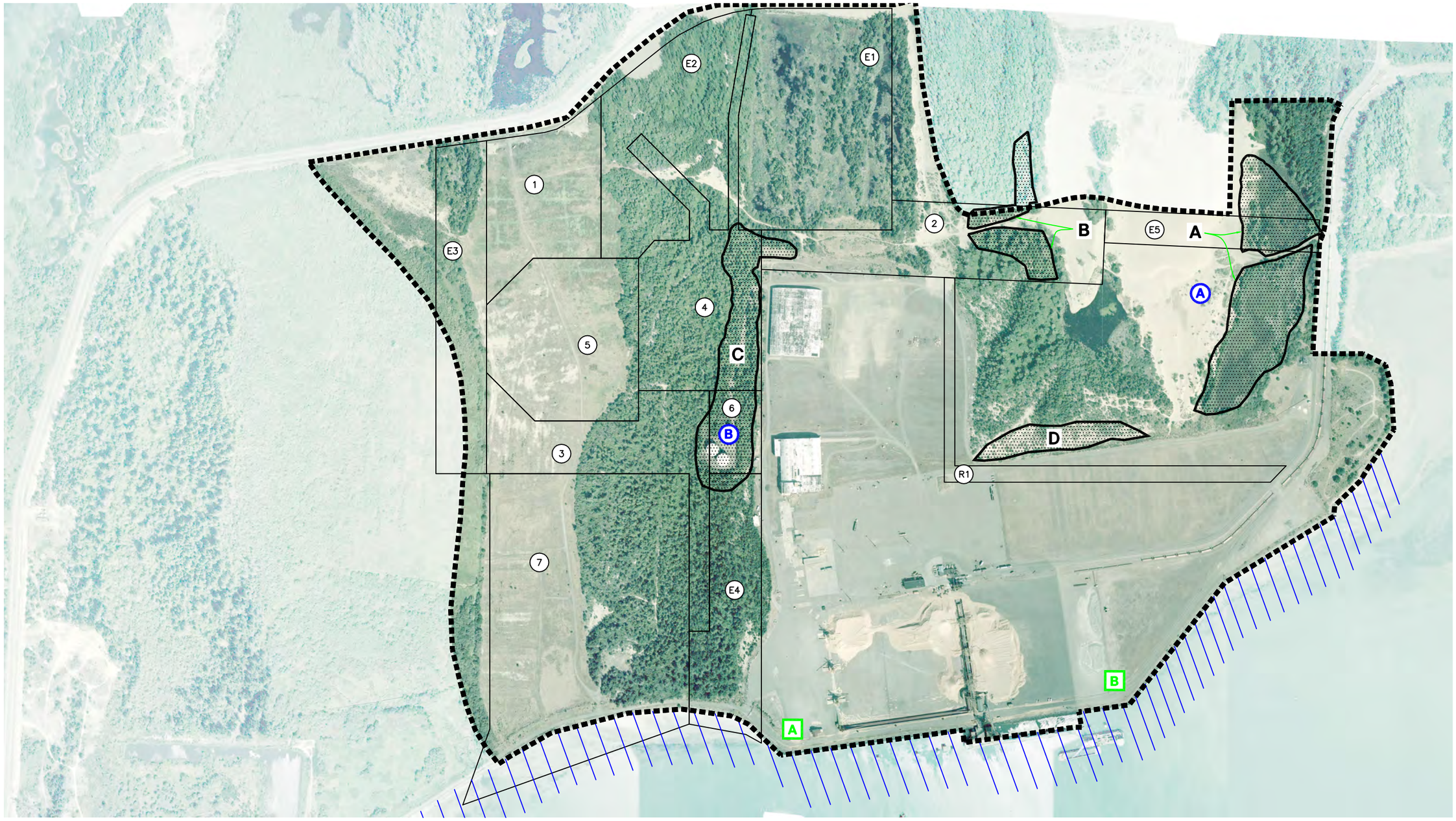
METHODS

Field Surveys

We designed our survey methodology based on a preliminary site reconnaissance visit in June 2005, and consultation with SHN and relevant agency personnel from ODFW, BLM, and U.S. Fish and Wildlife Service. The primary objective of the pre-construction surveys was to document, or assess the potential for occurrence of, listed and other sensitive tetrapod vertebrate species (amphibians, reptiles, birds and mammals) on and around the site. To achieve this, we utilized a variety of survey techniques, each of which is described in detail below. We visited the site 15 times for one to two days each from late June 2005, to early November 2006, with rigorous surveys conducted from late July 2005, to mid April 2006. Weather and time permitting, we repeated surveys on the second day of two-day visits, attempting to vary the timing of the two repetitions with relation to daylight and tide cycle.

Area Searches: We initially delineated four areas on and adjacent to the Roseburg Lumber property that contain different habitats and seral stages (Fig. 1). Area A (about 17 ac) encompasses the wetlands in the northeast corner of the Study Area and on adjacent Weyerhaeuser land to the north between Jordan Cove Road and the sand dunes. Area B (about 7 ac) encompasses mature forest edge on the west side of the dunes on Weyerhaeuser land north of the Roseburg Lumber property. Area C (about 12 ac) runs through mid-seral forest along the ridge where the water tanks sit on the west side of the Roseburg Lumber property from the tanks north to the base of the access road. Area D (about 6 ac) covers the brushy, south-facing, sandy slope in the southeast portion of the project area (which was initially proposed as the LNG terminal site). Each search consisted of 20 minutes of slow, methodical investigation of accessible portions of the area by a single observer using a binocular. We recorded all birds seen and heard, noting detection type (call, song, visual, *etc*.) and distinguishing between those within the search area and those without. This method is described by Ralph *et al*. (1993). After the September visit, we discontinued A and D and established three new area searches as a result of project design modifications: Area E in the southwest portion of the forested dune ridge, where the docking facility is proposed; Area F at the north end of the ridge, where the LNG tanks would be situated; and Area H in grassland on the artificial fill between the ridge and Henderson Marsh (Fig. 2). E and H were not conducted on the December visit.

Bay Scans: We designated two fixed points on the shoreline of the property from which large portions of the adjacent bay could be scanned (Fig. 1.) Station A is at the southwest corner of the



LEGEND:

- SHORE LINE SCAN AREA
- APPROXIMATE STUDY AREA BOUNDARY
- C — SEARCH AREA
- A — BAY SCAN STATION
- A — RAPTOR SCAN STATION
- 1 — JORDAN COVE ENERGY LAND REQUIREMENT AREA RESOURCE REPORT 1 TABLE 1.2-1

N

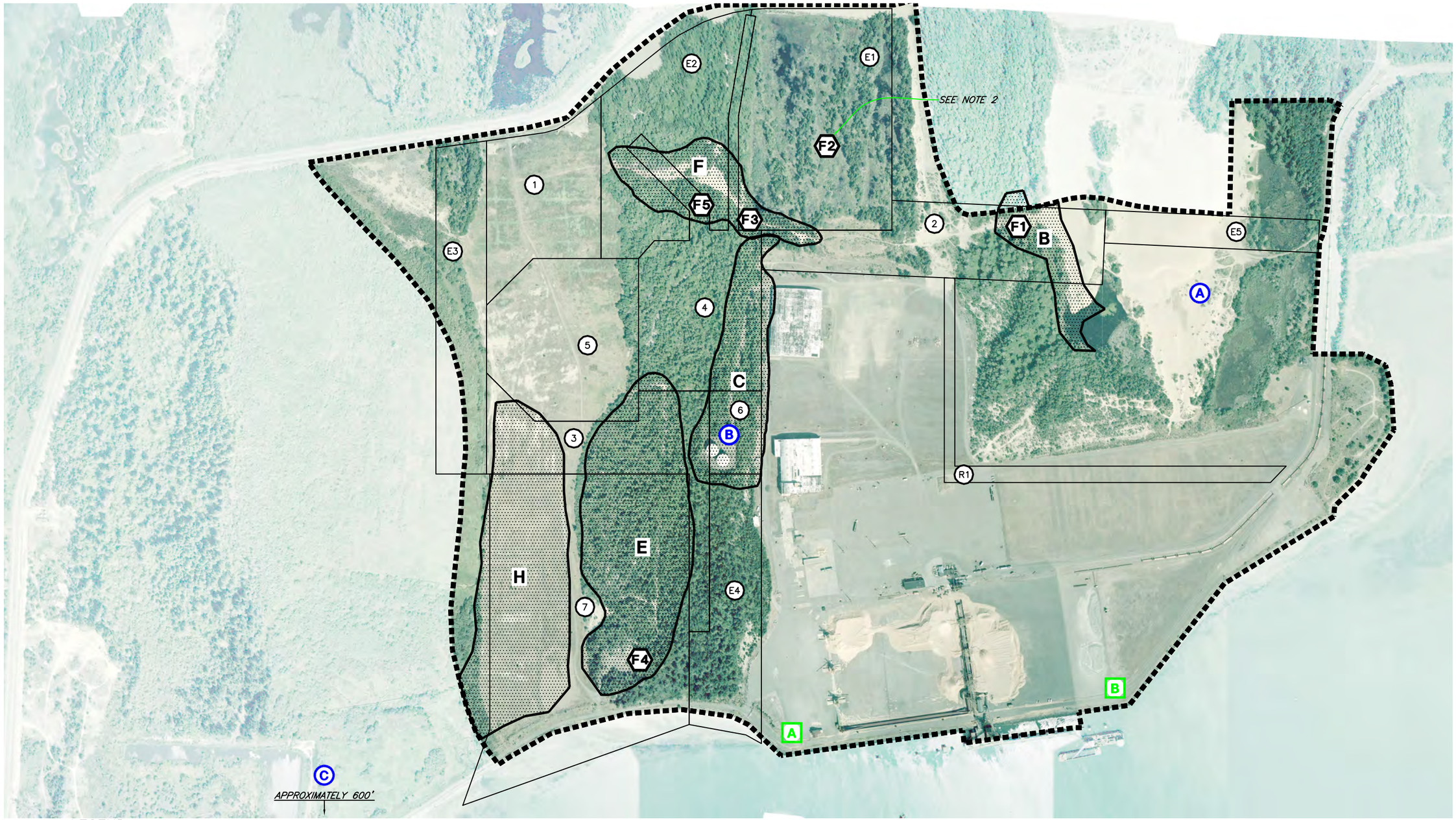
1"=300'

0 300

Consulting Engineers & Geologists, Inc.

Jordan Cove Energy Project Pre Construction Wildlife Assessment Coos Bay, Oregon		Initial LBJ Survey Areas SHN 005609.200
January 2007	005609-200-survey-AREA-fig-1.dwg	Figure 1

X:\2005\005609 Jordan Cove\dwg\1-12-07 figures\005609-200-survey-AREA-fig-1.dwg



LEGEND:

- APPROXIMATE STUDY AREA BOUNDARY
- C — SEARCH AREA
- A — BAY SCAN STATION
- A — RAPTOR SCAN STATION
- 1 — JORDAN COVE ENERGY LAND REQUIREMENT AREA TABLE RESOURCE REPORT 1 TABLE 1.2-1 RR1
- F4 — TRACK PLATES

N

1"=300'

0 300

NOTE:
1. SURVEY AREAS AFTER SEPTEMBER 2005.
2. TRACK PLATE F2 RELOCATED TO F5 AFTER OCTOBER 2005.

SHN Consulting Engineers & Geologists, Inc.

Jordan Cove Energy Project Pre Construction Wildlife Assessment Coos Bay, Oregon		Final LBJ[1] Survey Areas - September 2005 SHN 005609.200
January 2007	005609-200-survey-AREA-fig-2.dwg	**Figure** 2

X:\2005\005609 Jordan Cove\dwg\1-12-07 figures\005609-200-survey-AREA-fig-2.dwg

property, in Site D. Station B is just east of the dock facility, where the shoreline bends from a nearly east-west orientation to northeast-southwest. On each scan one observer or two recorded all birds and marine mammals seen or heard from the point during 45 minutes using binocular(s) and spotting scope(s), noting detection type and distinguishing between those on the Roseburg property or within 150 m of shore *vs*. those outside that area.

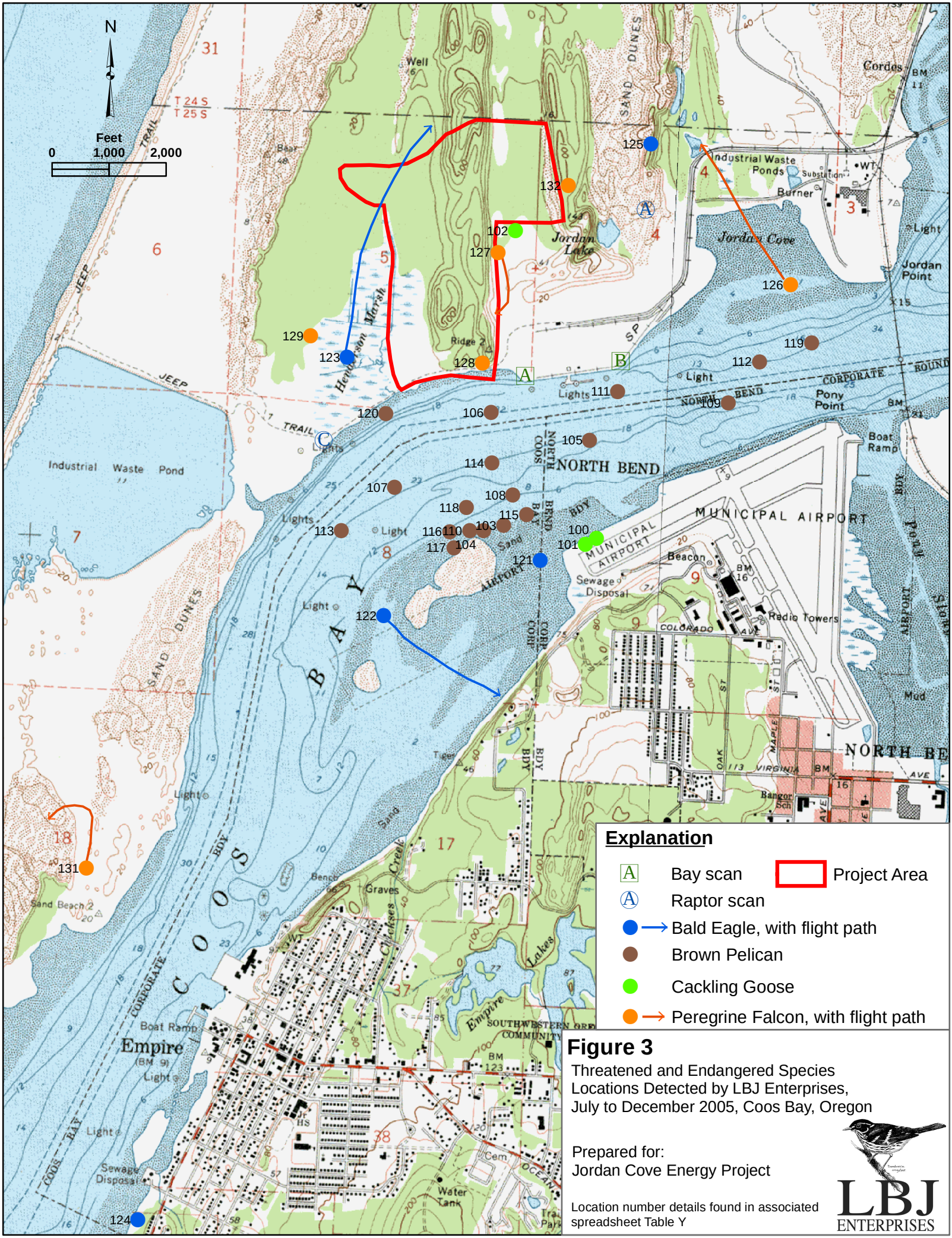
Raptor Scans: We initially designated two fixed points at elevated locations on and adjacent to the property. Station A is atop the tallest sand dune, just west of the southern section of Area Search A. Station B is immediately north of the water tanks in Area Search C. On each scan, one observer or two recorded all birds seen or heard during 45 minutes, noting detection type and distinguishing between birds within and without the study area as defined for bay scans (see above). Particular attention was paid to raptors and their flight paths noted. In October, Station C was added to cover Henderson Marsh (Fig. 2).

Track Plates: In September, 2005, we established four track-plate stations (F1-F4) in forested sites in the project area to detect sensitive meso-carnivores (fisher and marten) (Fig. 2). One (F2) was discontinued in October and moved to a new location (F5) that better samples the current project area. Each station consisted of a metal tube resembling two large mailboxes, with their doors and ends removed, taped together end to end with a wire screen at one end. On the floor was a removable metal plate running the length of the tube and wrapped with white shelf liner or contact paper, which was dusted with laser printer toner. On each visit, the paper and toner were replaced and the station baited with fresh chicken. Track plate surveys were discontinued in April, 2006. Our track plate study schedule and results are detailed in Appendix 4.

Marine Mammals and Herps: A herpetologist and a marine biologist visited the site with us to assess the occurrence potentials of sensitive species within those taxonomic groups. The herpetological survey was conducted by Don Ashton of EartHerp on September 8-9, 2005. Limited searches were conducted for some species, including binocular surveys for western pond turtles and anurans, dip net surveys for amphibian larvae, and time constrained searches for terrestrial salamanders, as well as documentation of opportunistic sightings of reptiles and amphibians during habitat assessment (Heyer *et al*. 1994, Olsen *et al*. 1997). Jan Hodder of the Oregon Institute of Marine Biology provided consultation regarding potential occurrence of and impacts to marine mammals and other marine resources.

Literature search

In addition to field surveys, we also conducted extensive literature reviews and searched the Oregon Natural Heritage Information Center (ORNHIC) database in order to place our observations within a broader context and identify species likely to occur in the area but that we did not detect in the field (Table 2, Fig. 3). Our ORNHIC search included all township/range squares at least partially within a radius of 20 miles of the Jordan Cove Energy Project.


N
Feet
0
1,000
2,000
T 24 S
T 25 S
Explanation
A Bay scan
Project Area
A Raptor scan
Bald Eagle, with flight path
Brown Pelican
Cackling Goose
Peregrine Falcon, with flight path
Figure 3
Threatened and Endangered Species Locations Detected by LBJ Enterprises, July to December 2005, Coos Bay, Oregon
Prepared for:
Jordan Cove Energy Project
Location number details found in associated spreadsheet Table Y
LBJ ENTERPRISES

Species selection and treatment

Initially, we included for consideration all sensitive species documented in Coos County according to the ORNHIC database. We then scrutinized the USFWS species list for Coos County (Appendix 5) and the list of special-status wildlife in the BLM Draft North Spit Plan (USDI 2005; Appendix 6) as cross-checks and added any species mentioned there that were not listed by ORNHIC. We prepared detailed species accounts for listed and candidate species and species proposed for listing. Our treatment of the many other federal and state sensitive species in the area was necessarily somewhat more limited. We created a table presenting our best assessment of the status of each sensitive species, from the global level to the project area level (Table 3). We also addressed several species guilds that were of concern to the agency biologists.

Agency Field Visit

On November 1, 2006, after field surveys had been completed, we met on site with local representatives of the BLM and ODFW. We conducted a tour of the study area with them, pointing out our survey locations, demonstrating our survey methods, and discussing our habitat classifications. Both BLM and ODFW representatives provided preliminary concurrence with our survey methodologies and habitat classifications.

NATURAL RESOURCES: WILDLIFE

We identified 60 sensitive species as occurring, potentially occurring, or having occurred historically in Coos County. Of these 60 species, 12 are state and/or federally listed (or recently de-listed) and another two are candidates for federal listing. We documented the presence of 13 of the 60 (northern red-legged frog, Aleutian cackling goose, mountain quail, California brown pelican, white-tailed kite, bald eagle, American peregrine falcon, band-tailed pigeon, common nighthawk, olive-sided flycatcher, little willow flycatcher, purple martin, and western meadowlark), including four listed species (Aleutian cackling goose, California brown pelican, bald eagle, and American peregrine falcon) on or very near the site (Table 4, Figure 4). No further sensitive species are expected to occur. We detected a grand total of 176 amphibian, reptile, bird, and mammal species during our site visits (Appendix 2).

Status Terminology

Endangered (USFWS/ODFW): In danger of becoming extinct within the foreseeable future.

Threatened (USFWS/ODFW): Likely to become endangered within the foreseeable future.

Candidate (USFWS): Sufficient information exists to support a proposal to list as threatened or endangered.

Federal Species of Concern (USFWS): Being reviewed for consideration as a candidate for listing.

Bureau sensitive (BLM): Considered sensitive on BLM lands.

Bureau sensitive Oregon only (BLM): Considered sensitive on BLM lands in Oregon.

Bureau assessment Oregon only (BLM): Considered potentially sensitive on BLM lands in Oregon.

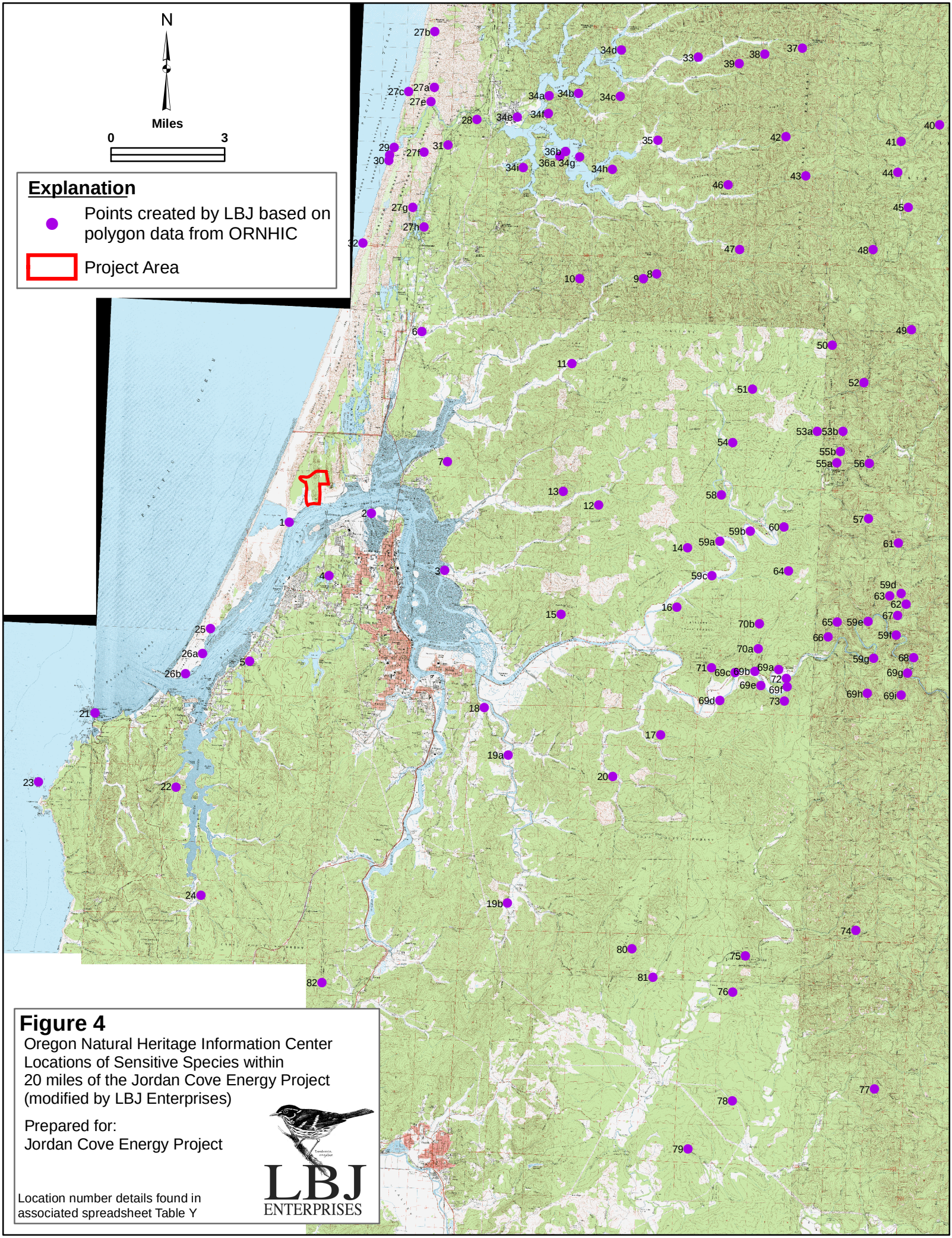


Figure 4

Oregon Natural Heritage Information Center
Locations of Sensitive Species within
20 miles of the Jordan Cove Energy Project
(modified by LBJ Enterprises)

Prepared for:
Jordan Cove Energy Project

LBJ ENTERPRISES

Location number details found in associated spreadsheet Table Y

Sensitive – Critical (SC) (ODFW): Listing as threatened or endangered would be appropriate if immediate conservation actions were not taken.

Sensitive – Vulnerable (SV) (ODFW): Not in immediate danger of being listed as threatened or endangered but could become critical, threatened, or endangered with changes in populations, habitat, or threats.

State Undetermined Status (SU) (ODFW): Status is unclear; may be susceptible to population declines that may result in a listing as endangered, threatened, critical, or vulnerable in the future but additional research is needed before a decision can be made.

State Peripheral (SP) (ODFW): On the edge of its range.

ORNHIC List 2: Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction or extirpation.

ORNHIC List 4: Not rare and apparently secure, but with cause for long-term concern.

Listed, proposed, and candidate species

The following species are protected under the U.S. and/or Oregon Endangered Species Act or are official candidates for such protection.

Leatherback (*Dermochelys coriacea*): Federally Endangered
This marine turtle sometimes enters North Pacific waters to forage in late summer and fall. It is particularly likely during *El Niño* events, when water temperatures are higher. The primary threats to this species are impacts on the nesting beaches (in the tropics) and mortality in fishing nets. The Pacific subspecies has declined so drastically that a Pacific Leatherback Conservation Area, wherein gillnet fishing is restricted, has been established stretching from central California to central Oregon. The occasional leatherback may enter Coos Bay.

Aleutian Cackling Goose (*Branta hutchinsii leucopareia*): De-listed, Bureau sensitive
Until recently, this was considered a subspecies of the Canada goose. Once nearly extinct, it is now secure and has been removed from the federal and Oregon endangered species list. It nests in Alaska on the Aleutian and Semidi Islands. The Aleutian population migrates along the entire Oregon coast to its California wintering grounds. Rodenkirk (in prep.) considers it a common spring migrant (February to May) and a fairly common fall migrant (September to November) in Coos County. They are rare but regular winter visitors to Coos County. Flocks are seen sporadically near Bandon and Langlois (Jarvis 2003) and it is an uncommon migrant on the North Spit (USDI 2005). Stopover habitat for feeding and roosting is generally pasture and cropland; neither of these habitats exists in the project area. Ponds and other wetlands also are used; Jordan Lake and nearby wetlands in the eastern portion of the project area provide suitable habitat (used by Canada geese, with which cackling geese sometimes associate) and the Aleutian goose could occur there. Thirty-five cackling geese, some possibly of a subspecies other than Aleutian, were at the Coos Bay airport October 17-18, 2005; a flock of seven flew over the project area on October 18, and two were at the airport January 25.

Short-tailed Albatross (*Phoebastria albatrus*): Federally Endangered
The Short-tailed albatross is a pelagic species that does not normally enter bays. It is now very rare and breeds only in Japan. It no longer occurs regularly in North America, though occasional individuals are sighted off the Pacific Coast. It has the potential to occur off Coos County, but it is not yet on the county list (Rodenkirk in prep.) and is not expected anywhere near the project area.

California Brown Pelican (*Pelecanus occidentalis californicus*): Federally and State Endangered
The California brown pelican is found on near-shore ocean waters, in large bays and river mouths, and on beaches and sand spits (Nehls 2003). It arrives from the south along the Oregon coast in April and becomes abundant by August and September (Eltzroth 1987, Nehls 2003, Rodenkirk in prep.). It is considered a common to abundant post-breeding migrant on the North Spit (USDI 2005). Although most have withdrawn to the south by December, small numbers now winter most years in the Coos Bay area (Contreras 1998, Rodenkirk in prep., NAS Web site). Coos Bay, adjacent to Jordan Cove, is excellent habitat for this species and we recorded it foraging within the project area and loafing across the bay in moderate numbers daily during surveys from July 21 until September 8. Numbers of pelicans recorded on surveys during that period varied from one individual to 30 (August 3 and 12), depending on season and tidal phase, (high tides submerged a sandbar across the bay that pelicans frequently used for loafing). Numbers decreased rapidly after mid August, dwindling to one on September 8. No pelicans were recorded around the project site after this date.

Bald Eagle (*Haliaeetus leucocephalus*): Federally and State Threatened
Once critically endangered in the lower 48 states due to pesticide poisoning, it now seems to be on the road to recovery. In Oregon, it is a widespread breeder, confirmed nesting in all but four counties (Isaacs and Anthony 2003). Numbers peak in late winter and early spring when breeders, transients, and winter residents are all present (Isaacs and Anthony 2003). It is an uncommon resident of forested habitats near water on the Oregon coast (Eltzroth 1987), including Coos County (Rodenkirk in prep.) and the North Spit (USDI 2005), with nesting confirmed in most of Coos County (Adamus *et al.* 2001). There is a nest site in the ORNHIC database, active at least as recently as 2003, on Mettman Ridge above Glasgow, roughly three miles from the project area. Nests are on large, prominent trees and snags, usually within a mile of water, and are almost always reused (Isaacs and Anthony 2003). Home ranges are usually about 2-3 square miles (Anthony *et al.* 1990, Garrett *et al.* 1993). We do not believe that any suitable nest sites exist within the project area, but there is ample foraging habitat in and along the bay. We had seven sightings of adults: one bird on mudflats across the bay on July 21, one flying over the bay on August 3, one over Henderson Marsh on November 10, one across the bay near Charleston and another on the ridge just east of the project area on December 7, and single birds flying over on February 13 and 14. All these sightings may represent as few as two individuals.

American Peregrine Falcon (*Falco peregrinus anatum*): State Endangered, Bureau sensitive
Populations of this bird have increased in recent decades and it has been removed from the federal endangered species list. It nests widely in coastal and montane areas throughout Oregon, possibly including the Coos Bay area (Adamus *et al.* 2001). Nesting has been confirmed in the Bandon area (Adamus *et al.* 2001). It is an uncommon, year-round resident of the North Spit (USDI 2005). Its habitat is difficult to characterize; it may occur virtually anywhere and is quite variable and adaptable in its nesting and feeding habits. All it requires are concentrations of prey such as

shorebirds, starlings, pigeons, and small ducks; elevated perch sites; and, for nesting, a relatively secluded ledge on a bridge or cliff (Henny and Pagel 2003). Ample food and nest sites occur around Coos Bay; the Highway 101 bridge could be considered a potential nest site. The project area itself probably does not offer any suitable nest sites, but peregrine territories are large and the site is used regularly by many prey species. We had seven sightings of this species, including several in the project area, from July 21 to December 8. On July 21, an adult was seen flying northwest over Jordan Cove. On August 11, a bird was seen flying over the site. On August 31, a falcon was seen perched on site in pines along the Coos Bay shoreline. An adult was observed southwest of Henderson Marsh on October 18. Two to three birds were seen south of the project area on December 7 and one was perched on a snag on site on December 8. Two birds were present February 13 and one the next day. One was seen March 29, one April 13, and one November 1, 2006. Peregrines appear to use the Jordan Cove area only for foraging. We have detected them on site in association with the tidal mudflats, which provide an excellent prey base of waterfowl and shorebirds. Nesting activity and high-quality nest sites appear to be absent within a three-mile radius of the project area. However, the presence of adults in the area in summer suggests breeding activity somewhere in the Coos Bay area.

We conducted breeding-season Peregrine Falcon surveys on March 29-30 and April 12-13, 2006. On each visit, we monitored the Highway 101 bridge from two vantage points, one on the south side of the bay (just west of the bridge) that afforded a very close view of the bridge and one on the north side of the bay (northwest of the bridge) along the causeway across Haynes Inlet. We observed the bridge from each site for 2.5 hours on each visit at times at which the sun angle was conducive, for a total of five hours per point and per visit. We did not detect any peregrine activity at the bridge. One bird was observed at the west end of the airport on April 13 while a different observer was watching the bridge. On each visit we also surveyed Cape Arago, which seems to be the most likely area for peregrine nesting in the vicinity of Coos Bay. The area has lots of cliff faces that provide suitable nesting habitat. On both visits, we stopped at every accessible area of the seaward side of the cape along Cape Arago Highway. We did not observe any peregrines.

Western Snowy Plover (*Charadrius alexandrinus nivosus*): Federally and State Threatened
The only breeding shorebird of Oregon's beaches, the snowy plover is an uncommon year-round resident on the Oregon coast (Eltzroth 1987), including the North Spit (USDI 2005), on the south end of which (roughly five miles from the project area) it nests (Stern *et al.* 2003). The spit supports the most productive snowy plover population segment on the Oregon coast, accounting for 30% of all snowy plovers fledged on the Oregon coast in 2005 (Lauten *et al.* 2006). This population is being monitored and managed intensively (Lauten *et al.* 2006, Little 2006). Critical habitat for the species on the spit includes the ocean beach from Horsfall to the Jetty and all federal lands at the south end; this excludes the Jordan Cove area. Elsewhere in Coos County the snowy plover also nests at the mouth of Tenmile Creek, on beaches around Bandon, and on the New River Spit (Stern *et al.* 2003). It is recorded in small numbers roughly every other year on the Coos Bay Christmas Bird Count (NAS Web site). There is one record in the Oregon Natural Heritage Database away from the outer coast at the Menasha Spoils near the mouth of Pony Slough, a mile from the project area. On the coast, it is almost exclusively a bird of open sand beaches; another population nests inland on alkaline playas. Its typical coastal nesting habitat is at the upper edge of the beach below the fore-dunes; it also nests on bare spits at small estuary mouths and, on the North Spit, old dredge spoils next to the beach (Stern *et al.* 2003). We did not detect this species. There does not appear to be any typical habitat in the project area, and while an occasional individual may show up on a mudflat,

it is not expected. There is some concern that the project might increase the local predator population, but we do not expect so; crows, ravens, and small carnivores already occur on the site and the project proposal does not include the addition of any food sources or other elements likely to attract them.

Marbled Murrelet (*Brachyramphus marmoratus*): Federally and State Threatened
The marbled murrelet is one of the flagship species for conservation of Pacific Coast old-growth forests. It is unique among North American seabirds in its nesting habits. It usually nests over 100 feet up on a mossy conifer branch, mostly on the west slopes of the Coast Range but up to more than 30 miles inland where suitable habitat persists (Adamus *et al.* 2001, Nelson 2003). Nesting adults make daily foraging trips to shallow, protected, near-shore coastal waters, feeding mostly on small fish but sometimes on euphausiids. The species is considered uncommon to rare year-round on the Oregon coast (Marshall *et al.* 2003), but Coos Bay is within the zone of highest density (Strong *et al.* 1995). The marbled murrelet nests on Elliott State Forest and probably in the Coos Bay area as well (Adamus *et al.* 2001). It is considered an uncommon, year-round, offshore resident on the North Spit (USDI 2005). One to four are observed most years on the Coos Bay Christmas Bird Count (NAS Web site). Although we observed none on our surveys, we consider it possible that murrelets could occur on the bay within the project area and perhaps over the project area in transit between nesting and feeding sites.

Northern Spotted Owl (*Strix occidentalis caurina*): Federally and State Threatened
The spotted owl is dependent on old-growth components in coniferous forest. In Oregon, it is found in low- and mid-elevation coniferous forest in the Coast, Siskiyou, and Cascade Ranges (Forsman 2003). There are many spotted owl habitat areas in the forests inland from Coos Bay, the nearest to the project area being about five miles away in the Kentuck Creek drainage (ORNHIC). However, the species is extremely rare on the immediate coast of Oregon (Eltzroth 1987), rare in Coos County (Rodenkirk in prep.), and absent from coastal Coos County (Adamus *et al.* 2001). It is thus not expected to occur in the Jordan Cove area and it does not appear on the North Spit wildlife list (USDI 2005).

Streaked Horned Lark (*Eremophila alpestris strigata*): Federal Candidate for Listing, State Sensitive – Critical
This subspecies is resident in the Willamette Valley and at the mouth of the Columbia River. It has been extirpated from the Umpqua and Rogue Valleys (Altman 2003) and probably never occurred as a breeder in the Coos Bay area. Some individuals winter in California (Pyle 1997) and occur along the Oregon coast on migration. A few winter on the coast. It occurs in bare and sparsely vegetated habitats such as coastal dunes, gravel roads, airport runways, grazed pastures, and dry mudflats. It has been documented on the North Spit (USDI 2005) and could occur in small numbers in suitable habitat near the project area, most likely in the weedy fields between the shoreline and the dunes on the Roseburg property. The grassland east of Henderson Marsh is probably too heavily vegetated for this species.

Gray Wolf (*Canis lupus*): Federally Threatened, State Endangered
Formerly widespread in dense coniferous forest throughout the Coast Range, this species probably was absent from the North Spit and is now extirpated from Oregon (Csuti *et al.* 2001).

Grizzly Bear (*Ursus arctos horribilis*): Federally Threatened
The grizzly barely reached southeastern Coos County in historic times; it is now extirpated from Oregon (Csuti *et al*. 2001).

Pacific Fisher (*Martes pennanti pacifica*): Federal Candidate for Listing, State Sensitive – Critical
The fisher is a large weasel of mature, closed-canopy coniferous forests with some deciduous component such as riparian corridors (Csuti *et al.* 2001). It nearly was extirpated from Oregon by logging and trapping and is now very rare. Reintroductions have been attempted in several inland counties and there have been recent sightings in the mountains east and west of the Willamette Valley (Csuti *et al.* 2001). An adult was seen near Daniels Creek just below Wren Smith Creek (about ten miles from the project area) in 1991 (ORNHIC). Fishers are known to have very large home ranges and to wander widely. Although the species is considered of potential occurrence on the North Spit (USDI 2005) and porcupines, one of its preferred prey items, are present in the project area, there are no records and we feel that there is too much disturbance, the forest too immature and fragmented, and the species too rare in the region for the site to be used by fishers.

Northern Sea Lion (*Eumetopias jubatus*): Federally Threatened, State Sensitive – Vulnerable
This large pinniped, also called Steller's Sea Lion, ranges along the North Pacific coast from Japan to California (Csuti *et al.* 2001). It breeds on rocky beaches, often on islands, and at other times is frequently seen hauled out on select coastal rocks, jetties, marinas, and navigation buoys. It forages at sea for fish and invertebrates, sometimes to several hundred miles from land. The Oregon population was estimated at over 5,000 in 2002 and productivity appears to be increasing (NOAA Web site). There are no rookeries in Coos County; the nearest (one of Oregon's two primary rookeries) is at Orford Reef in Curry County (Brown 1988, NMFS 1992b). There is a haul-out site at Cape Arago in Coos County, roughly ten miles from the project area (ORNHIC, (NOAA Web site). Sea lions probably do not normally occur as far into Coos Bay as the project area. While an occasional individual might enter Coos Bay and the species is included on the North Spit wildlife list (USDI 2005), there are no suitable haul-out sites within the project area and the species is not expected to occur there.

Southern Resident Killer Whale (*Orcinus orca*): Federally Endangered.
This species is a wide-ranging predator of the open ocean, occasionally entering bays in pursuit of salmon and pinnipeds. The Southern Resident Killer Whale designation refers to several pods that normally frequent Puget Sound in the summer, ranging along the coasts of the Pacific Northwest at other times; the population was designated Endangered in 2005. Killer whales have on occasion penetrated Coos Bay beyond the project area, and southern resident killer whales have been recorded as far south as Monterey Bay (http://www.montereybaywhalewatch.com/Features/feat0303.htm); thus, the listed population could occur in the project area.

Other Sensitive Species

The following species are considered sensitive by the USFWS, BLM, ODFW, and/or ORNHIC but currently have no protection under any endangered species act. They should, however, be considered during project planning and implementation.

Southern Torrent Salamander (*Rhyacotriton variegatus*): Federal Species of Concern, State Sensitive – Vulnerable
This species occupies shallow, cold, perennial, high-gradient streams in humid coniferous forests throughout the county. This habitat is absent from the North Spit.

Del Norte Salamander (*Plethodon elongatus*): Federal Species of Concern, State Sensitive – Vulnerable
This species occurs in moist, rocky areas within old-growth coniferous forests in southern Coos County. Coos Bay is well north of its range and there is no suitable habitat within the project area.

Clouded Salamander (*Aneides ferreus*): State Undetermined Status
Found under downed logs and other debris in moist areas of forests. Documented and believed widespread in Coos County. Not expected on North Spit according to Csuti *et al.* (2001) but potential or documented according to USDI (2005). The forests in the project area could support this species.

California Slender Salamander (*Batrachoseps attenuatus*): Peripheral in Oregon; Bureau assessment Oregon only
Found under debris in forests and open areas. Although USDI (2005) lists it as suspected in late seral forests with large down logs on the North Spit, this is probably erroneous as Csuti *et al.* (2001) and Stebbins (2003) indicate that the northern limit of its range is the Rogue River. Suitable habitat does occur in the project area.

Tailed Frog (*Ascaphus truei*): Federal Species of Concern, State Undetermined Status
Restricted to cold, fast-flowing permanent streams, usually in forests. Documented and believed widespread in suitable habitat in the county. Habitat absent from North Spit; species not expected in project area.

Western Toad (*Bufo boreas*): State Sensitive – Vulnerable
This species occurs in grasslands, woodlands, and forests near water. It is likely to occur virtually throughout the county. Csuti *et al.* (2001) indicate that it should occur on the North Spit but it is inexplicably absent from the wildlife list in USDI (2005). Jordan Lake and nearby wetlands on the east side of the project area may offer suitable breeding habitat.

Northern Red-legged Frog (*Rana aurora aurora*): Federal Species of Concern, State Undetermined Status
This species inhabits meadows, woodlands, and forests, usually near ponds, marshes, and streams, especially with dense ground cover and aquatic or overhanging vegetation essentially throughout the county. Included on North Spit wildlife list (USDI 2005) but may be absent (Csuti *et al.* 2001). Jordan Lake and nearby wetlands on the east side of the project area offer potential habitat but are heavily populated by bullfrogs (*R. catesbeiana*), which often consume and out-compete red-legged frogs. One tadpole was collected from the site by our consulting herpetologist (see Appendix 1). SHN staff has provided additional detections of this species from the site (see Figure 5).

Figure 5. Additional* northern red-legged frog (*Rana aurora aurora*) locations within the JCE project area.



Foothill Yellow-legged Frog (*Rana boylii*): Federal Species of Concern, State Sensitive – Vulnerable
Found in permanent, sluggish streams with rocky bottoms and sloping, vegetated banks in grassland, chaparral, forest, and woodland. In Coos County, known only from the southeast; absent from the Coos Bay area. No suitable habitat exists in the project area.

Northwestern Pond Turtle (*Emys marmorata marmorata*): Federal Species of Concern, Bureau sensitive Oregon only, State Sensitive – Critical
This is a species of small lakes, marshes, and sluggish streams with muddy or rocky bottoms and plentiful basking sites such as logs, rocks, floating vegetation, and muddy shorelines. It occurs throughout the county and known from several sites in the Coos Bay area, including the Empire Lakes west of North Bend. Known to occur on the North Spit; documented on adjacent Oregon Dunes NRA land. Jordan Lake and other wetlands and adjacent dunes in the project area seem to be suitable but no turtles were observed during preliminary surveys by the herpetologist, despite efforts to find them under appropriate basking conditions, nor were any signs of basking activity found. The soil may be too sandy to allow turtles to nest (see Appendix I).

Northern Sagebrush Lizard (*Sceloporus graciosus graciosus*): Federal Species of Concern
Occurs in scrub and brushy woodland and forest in southern Coos County. Absent from the Coos Bay area.

California Mountain Kingsnake (*Lampropeltis zonata*): Federal Species of Concern
In Oregon, this species is restricted to the Klamath-Siskiyou region. Suitable habitat occurs in extreme southeastern Coos County, though there are no ORNHIC records. It is not a coastal species and is absent from the Coos Bay area.

Dusky Canada Goose (*Branta canadensis occidentalis*): Bureau sensitive Oregon only
This subspecies nests in Alaska and winters almost exclusively in southwestern Washington and northwestern Oregon (Jarvis and Bromley 1998). It has been documented on the North Spit (USDI 2005) and could occur in the Project area with other Canada geese.

Trumpeter Swan (*Cygnus buccinator*): Bureau assessment Oregon only
Trumpeter Swan is a spring vagrant to Coos County (Rodenkirk 2005) and of only potential occurrence on the North Spit (USDI 2005). It could occur in Henderson Marsh.

Mountain Quail (*Oreortyx pictus*): Federal Species of Concern, State Undetermined Status
This species is uncommon in Coos County and only occasionally occurs on the outer coast in forest and scrub habitats (Contreras 1998). We detected one near the water tanks on March 29 and April 13; this may be the first North Spit record.

White-tailed Kite (*Elanus leucurus*): Bureau assessment Oregon only, ORNHIC List 2
Uncommon summer resident and irregular breeder, with only three nest records in the county. Likely to nest occasionally in Coos Bay area. Fairly common in winter. Nests in trees in and around fields and agricultural areas; forages in uncultivated open lowlands, prairie, and coastal estuaries and dunes. Roosts in trees and bushes, often communally. One to two were present in and around the project area from October onward.

Northern Goshawk (*Accipiter gentilis*): Federal Species of Concern, State Sensitive – Critical
Primarily a montane forest species, in Oregon partial to hemlock, fir, and pine forests and aspen groves. Rare in the county, nesting only on the eastern margin, and extremely rare on the coast, where unrecorded as a breeder. Not expected on the North Spit, though could occur occasionally as a migrant.

Arctic Peregrine Falcon (*Falco peregrinus tundrius*): Bureau sensitive
This migrant race of Peregrine Falcon is at least an occasional visitor to Oregon, apparently most regular in fall and spring in the Klamath Basin (Henny and Pagel 2003). It has been documented on the North Spit (USDI 2005) and could occur in the Project area. It is difficult to distinguish in the field from the American race and was recognized only recently, making status assessment problematic.

Black Oystercatcher (*Haemotopus bachmani*): ORNHIC List 4
Fairly common in winter and uncommon breeder in the county. Nests on rocky seacoasts, islands, and cliffs; confirmed nesting on the coast south of Coos Bay. Restricted to rocky shorelines and occasionally sandy beaches near stream mouths year-round. Occurs on North Spit only in winter because of lack of breeding habitat. Not expected to occur in project area.

Upland Sandpiper (*Bartramia longicauda*): Bureau sensitive Oregon only
This species has been recorded in Coos County as a spring and fall vagrant (Rodenkirk 2005) and has been documented on the North Spit (USDI 2005), but its preferred habitat of open grasslands is essentially lacking from the project area. It is a rare breeder in eastern Oregon.

Rhinoceros Auklet (*Cerorhinca monocerata*): ORNHIC List 2
Found year-round on coastal waters of the county, especially March-November, and nests on offshore islands near Coos Bay. Breeders and immature birds may forage occasionally at the mouth of the bay but probably do not venture far from the coast. Not expected in or near the project area.

Tufted Puffin (*Fratercula cirrhata*): ORNHIC List 2
Uncommon breeder, with nesting confirmed on islands just south of Coos Bay. Strictly marine, nesting on islands and headlands and spending the rest of the year at sea. Rare migrant offshore from North Spit; no suitable nesting habitat exists from Coos Bay to north of Florence. Not expected in project area.

Band-tailed Pigeon (*Patagioenas fasciata*): Federal Species of Concern
A fairly common breeder and rare winter resident. Inhabits coniferous forests throughout the county, with nesting confirmed in Coos Bay area. Occurs primarily as a migrant on the spit but may be a rare breeder. We had only one detection, a single bird flying over the project area on November 9, 2005.

Common Nighthawk (*Chordeiles minor*): ORNHIC List 4
Uncommon breeder in Coos County, present May to September. Nesting confirmed in the Lakeside area of the Oregon Dunes. May nest in the Coos Bay area but no hard evidence; considered a potential breeder on the North Spit. Uses open, sparsely vegetated sites including coastal dunes, forest clearings, and abandoned parking areas. Usually conspicuous in flight when present. Only one flyover sighting during preliminary surveys, suggesting the species may not be present regularly

on site. However, the surveys were not conducted during the optimal time of year for confirming the nesting status of this species.

Acorn Woodpecker (*Melanerpes formicivorus*): Federal Species of Concern
Formerly a rare resident of forest and woodland with oak or tanoak in southeastern Coos County. Probably extirpated from the county in the 1990s.

Olive-sided Flycatcher (*Contopus cooperi*): Federal Species of Concern, State Sensitive - Vulnerable
Fairly common breeder in Coos County and an uncommon breeder on the North Spit. Breeds in open coniferous and mixed forests; south coast mixed forest is one of its strongest habitat associations. Typically arrives on the south coast in late April and departs by mid-September. The forested portions of the project area are suitable breeding habitat for this species and we detected it regularly in small numbers during summer surveys. The last date of detection was July 21st, 2005.

Little Willow Flycatcher (*Empidonax traillii brewsteri*): State Sensitive - Vulnerable
Fairly common in Oregon from late April to mid-August and probably nests in most of Coos County but appears to be absent as a breeder from the coast north of Bandon, including the Coos Bay area. Considered a migrant on the North Spit. Nests in dense shrubs and tall herbaceous growth with scattered openings of shorter herbaceous vegetation. One juvenile, presumed dispersing or migrating, was seen in late August, 2005 near the wetlands on the east side of the project area.

Purple Martin (*Progne subis*): Federal Species of Concern, Bureau sensitive Oregon only, State Sensitive – Critical
Fairly common breeder in Coos County and uncommon breeder on the North Spit. Typically present April-August. Formerly nested in cavities in snags in mature forest; now nests almost exclusively in artificial structures and only occasionally in snags. Forages high over nearby open areas, especially aquatic habitats. There are several documented nest sites in the area, including 24 nest boxes on pilings near the BLM boat ramp on the North Spit, 11 of which were used in 2003. This area is approximately one mile from the project area. The project area contains suitable foraging habitat and potential natural nest sites and we detected small numbers regularly during pre-October surveys, particularly in the vicinity of the water tanks.

Western Bluebird (*Sialia mexicana*): State Sensitive – Vulnerable
Uncommon permanent resident in Coos County; rare migrant and winter visitor on North Spit. Nests in a variety of wooded and shrubby habitats where suitable cavities are present; avoids dense forest and does not nest in the Coos Bay area. Winter flocks use open habitats with nearby brushy cover. At most, expected to be only an occasional visitor to the project area.

Yellow-breasted Chat (*Icteria virens*): Federal Species of Concern
An uncommon summer resident and breeder in the county. Nests in dense riparian and floodplain thickets of Himalayan blackberry, willow, Oregon ash, dogwood, and other plants. Although widespread in the county and probably nesting in the Coos Bay area, suitable habitat appears to be lacking from the North Spit. The species is not on the USDI (2005) wildlife list for the spit but could occur as an occasional migrant, for example in the small blackberry and willow thickets around the wetlands on the east side of the project area. This species was not detected by bird monitoring surveys.

Oregon Vesper Sparrow (*Pooecetes gramineus affinis*): Federal Species of Concern, Bureau sensitive Oregon only, State Sensitive – Critical
Rare summer resident and occasional breeder, with only three nest records from the county. Not known to nest in the Coos Bay area. USDI (2005) indicates that it is a rare migrant and winter visitor on the North Spit, but at least some of these birds may represent *P. g. confinis* or intergrades. Prefers open, herbaceous habitats such as grasslands, pastures, and agricultural areas; such habitats are scarce in the project area and the species is not expected.

Bobolink (*Dolichonyx oryzivorus*): Bureau assessment Oregon only
This species nests in eastern Oregon (Herziger 2003) and occurs on the coast only as a fall vagrant (Rodenkirk 2005). It has been documented on the North Spit (USDI 2005) and could occur in the disturbed grassland east of Henderson Marsh.

Western Meadowlark (*Sturnella neglecta*): ORNHIC List 4
Uncommon permanent resident and fairly common winter visitor in Coos County. Common in winter and possibly a rare breeder on North Spit; breeding confirmed in Coos Bay area, the only confirmed breeding locale on the Oregon coast. Prefers lightly grazed pastures and fallow fields for nesting; also uses hayfields and cultivated grass fields. In winter, found in various grassy and weedy habitats, including industrial areas and airports. We found several in the disturbed grassland between the ridge and the marsh on the surveys conducted in February and March.

California Myotis (*Myotis californicus*): ORNHIC List 4
Widespread and found in a variety of habitats. Forages around the edges of tree clumps and over and near open water. Roosts in cliffs, caves, and tree crevices. May or may not occur on North Spit. Suitable foraging and roosting habitat appears to be present in the project area.

Long-eared Myotis (*Myotis evotis*): Federal Species of Concern, State Undetermined Status
Associated primarily with coniferous and riparian forest habitats and edges; most leave Oregon in winter. May or may not occur on North Spit. Suitable foraging and roosting habitat appears to be present in the project area.

Fringed Myotis (*Myotis thysanodes*): Federal Species of Concern, State Sensitive - Vulnerable
Prefers forested and riparian habitats. Known from southern Coos County; absent from Coos Bay area.

Long-legged Myotis (*Myotis volans*): Federal Species of Concern, State Undetermined Status
Occupies coniferous, oak, and mixed evergreen forest and woodland. Roosts in cliffs, abandoned buildings, caves, and mines. Probably widespread in Coos County; may or may not occur on North Spit. Suitable habitat probably present in project area.

Yuma Myotis (*Myotis yumanensis*): Federal Species of Concern
Strongly associated with water; probably occurs around lakes north of the project area. In western Oregon, frequents older Douglas-fir and Sitka spruce forests and oak and ponderosa pine woodlands; none of these forest types occurs in the project area and aquatic habitats are probably too limited to support a population of this species.

Silver-haired Bat (*Lasionycteris noctivagans*): Federal Species of Concern, State Undetermined Status
A bat of forested areas, reportedly most abundant in older Douglas-fir/western hemlock forests. Forages over wooded ponds and streams; roosts under loose bark. Probably widespread in Coos County; may or may not occur on North Spit. Suitable, if not preferred, habitat does appear to be present in the project area.

Pacific Western Big-eared Bat (*Corynorhinus townsendii townsendii*): Federal Species of Concern, Bureau sensitive Oregon only, State Sensitive – Critical
Inhabits forests; roosts at night on bridges and hibernates in mines and caves. Highly sensitive to disturbance. Status and distribution in Coos County unclear; expected only in upper Rock Creek drainage according to Csuti *et al*. (2001) but included on North Spit potential list by USDI (2005). Project area is probably too disturbed to support maternity roosts; mines and caves are absent.

Pallid Bat (*Antrozous pallidus pacificus*): Federal Species of Concern, State Sensitive – Vulnerable
Inhabits arid regions and open forest types, particularly pine and oak. Suitable habitat occurs on the eastern edge of Coos County, though there are no ORNHIC records from the county. Not expected anywhere on the coast of Oregon, which generally is too cool and moist for it.

Ringtail (*Bassariscus astutus*): State Undetermined Status
Found in woodlands containing tanoak near rocky areas and rivers. Ranges north to central Coos County; not found in the Coos Bay area.

American Marten (*Martes americana*): State Sensitive – Vulnerable
Occurs in mature, closed-canopy forests; travels through openings if sufficient cover exists. Probably widespread in Coos County but rare in Coos Bay area; may or may not occur on North Spit. Occasional dispersing individuals could wander into forested portions of the project area. According to ODFW, there is a population in the vicinity of the North Spit. There also is an historical record near Florence in the BLM Horsefall Dunes, based on a roadkill on Hwy. 101.

Western Gray Squirrel (*Sciurus griseus*): State Undetermined Status
Strongly associated with oak woodlands. Also found in riparian and mixed forests, usually with a broad-leafed component. Absent from northwestern Coos County, including the Coos Bay area.

White-footed Vole (*Phenacomys albipes*): Federal Species of Concern, State Undetermined Status
Ecology poorly known. Found in riparian (especially alder) thickets in coniferous forests. May also require small, herbaceous clearings. Probably fossorial and nocturnal. According to Csuti *et al*. (2001), suitable habitat in Coos County is limited to northeast (Elliott SF) and southwest (Grigsby Rock, Bill Peak), but species listed as potential or documented on North Spit by USDI (2005). Habitat appears to be lacking from project area; species not expected. Sometimes placed in genus *Arborimus*.

Red Tree Vole (*Arborimus longicaudus longicaudus*): Federal Species of Concern
Nocturnal and strictly arboreal denizen of dense, moist coniferous forest with significant Douglas-fir component. Probably widespread in hilly, forested portions of Coos County; not expected on North

Spit according to Csuti *et al*. (2001) but included on potential or documented list by USDI (2005). Habitat apparently lacking from project area; species not expected. Sometimes placed in genus *Phenacomys*.

Table 3. Status of sensitive tetrapod vertebrate species potentially occurring in Coos County. Global status is based on the international, five-level ranking scale developed by The Nature Conservancy and used by the natural heritage network. U.S. status is taken directly from the U.S. Endangered Species List. Oregon Coast status is the Oregon Endangered Species List for the state as a whole or the Oregon Coast Ecoregion if status varies within the state; if the species is not listed, this column represents the state ranking using the international heritage system. Coos County status is an interpretation of information presented in Rodenkirk (in prep.) for birds and Csuti *et al*. (2001) for other species. North Spit status is taken from USDI (2005). Project Area status is based on our own research.

SPECIES	GLOBAL	U.S.	OREGON COAST	COOS COUNTY	NORTH SPIT	PROJECT AREA
Southern Torrent Salamander	Possibly threatened	Species of Concern	Vulnerable	Widespread but uncommon	Unlikely	Unlikely (no suitable habitat)
Del Norte Salamander	Apparently secure	Species of Concern	Vulnerable	Very local	Out of range	Absent (out of range)
Clouded Salamander	Uncommon	Not listed	Possibly threatened	Widespread but uncommon	Potential or documented	Possible
California Slender Salamander	Secure	Not listed	Imperiled; Bureau sensitive	Very local	Out of range (but see USDI 2005)	Absent (out of range)
Coastal Tailed Frog	Apparently secure	Species of Concern	Vulnerable	Widespread but uncommon	Unlikely	Unlikely (no suitable habitat)
Western Toad	Apparently secure	Not listed	Vulnerable	Widespread but uncommon	Likely (but see USDI 2005)	Possible
Northern Red-legged Frog	Apparently secure	Species of Concern	Possibly threatened	Widespread and fairly common	Potential or documented	Present
Foothill Yellow-legged Frog	Uncommon	Species of Concern	Vulnerable	Local	Out of range	Absent (out of range)
Northwestern Pond Turtle	Possibly threatened	Species of Concern	Critical; Bureau sensitive	Widespread but uncommon	Documented	Possible
Leatherback	Endangered	Endangered	Endangered	Rare visitor	Possible	Possible
Northern Sagebrush Lizard	Secure	Species of Concern	Vulnerable	Local and uncommon	Out of range	Absent (out of range)
California Mountain Kingsnake	Apparently secure	Species of Concern	Vulnerable	Probable rare and local resident	Out of range	Absent (out of range)
Aleutian Cackling Goose	Uncommon	De-listed; Bureau sensitive	De-listed	Common spring, uncommon fall migrant	Uncommon migrant	Present
Dusky Canada Goose	Possibly imperiled	Not listed	Bureau sensitive	Vagrant	Vagrant	Possible
Trumpeter Swan	Apparently secure	Not listed	Bureau assessment	Vagrant	Possible	Possible
Mountain Quail	Secure	Species of Concern	Apparently secure	Uncommon resident	Rare	Present
Short-tailed	Endangered	Endangered	Endangered	Possible offshore	Possible offshore	Unlikely (no suitable

SPECIES	GLOBAL	U.S.	OREGON COAST	COOS COUNTY	NORTH SPIT	PROJECT AREA
Albatross				visitor	visitor	habitat)
California Brown Pelican	Uncommon	Endangered	Endangered	Common summer visitor, rare in winter	Common to abundant post-breeding migrant	Present
White-tailed Kite	Secure	Not listed	Breeding population imperiled; wintering population possibly threatened; Bureau assessment	Uncommon resident, fairly common winter visitor	Common wintering species, speculative rare breeding species	Present
Bald Eagle	Apparently secure	Threatened	Threatened	Uncommon resident, fairly common winter visitor	Uncommon year-round resident	Present
Northern Goshawk	Secure	Species of Concern	Critical	Rare resident	Unlikely	Unlikely (no suitable habitat)
Arctic Peregrine Falcon	Secure	Bureau sensitive	Rare visitor	Rare visitor	Rare visitor	Possible
American Peregrine Falcon	Uncommon	De-listed; Bureau sensitive	Endangered	Uncommon resident, common fall migrant	Uncommon year-round resident	Present
Western Snowy Plover	Uncommon	Threatened	Threatened	Uncommon resident	Uncommon year-round resident	Possible
Black Oystercatcher	Secure	Not listed	Possibly threatened	Uncommon resident, fairly common winter visitor	Uncommon wintering species	Unlikely (no suitable habitat)
Upland Sandpiper	Secure	Not listed	Vagrant; state breeding population critically imperiled; Bureau sensitive	Vagrant	Vagrant	Unlikely
Marbled Murrelet	Possibly threatened	Threatened	Threatened	Uncommon resident	Uncommon year-round offshore resident	Possible
Rhinoceros Auklet	Secure	Not listed	Breeding population imperiled	Uncommon breeder, rare in winter	Rare year-round resident	Unlikely (no suitable habitat)
Tufted Puffin	Secure	Not listed	Breeding population imperiled	Uncommon breeder	Rare offshore migrant	Unlikely (no suitable habitat)
Band-tailed Pigeon	Apparently secure	Species of Concern	Breeding population possibly threatened	Fairly common breeder, rare in winter	Uncommon migrant, speculative rare breeder	Present
Northern Spotted Owl	Uncommon	Threatened	Threatened	Rare resident	Unlikely	Unlikely (no suitable habitat)
Common	Secure	Not listed	Secure	Uncommon breeder	Uncommon migrant,	Present

SPECIES	GLOBAL	U.S.	OREGON COAST	COOS COUNTY	NORTH SPIT	PROJECT AREA
Nighthawk					speculative rare breeding species	
Acorn Woodpecker	Secure	Species of Concern	Possibly threatened	Probably extirpated rare resident	Historically unlikely	Historically unlikely (no suitable habitat)
Olive-sided Flycatcher	Apparently secure	Species of Concern	Vulnerable	Fairly common breeder	Uncommon breeding species	Present
Little Willow Flycatcher	Possibly threatened	Not listed	Vulnerable	Fairly common breeder	Uncommon migrant	Present
Purple Martin	Secure	Species of Concern	Critical, Bureau sensitive	Fairly common breeder	Uncommon breeding species	Present
Streaked Horned Lark	Imperiled	Candidate for Listing	Critical	Rare fall migrant, accidental in winter	Uncommon migrant, rare wintering species	Possible
Western Bluebird	Secure	Not listed	Vulnerable	Uncommon resident	Rare migrant and wintering species	Possible
Yellow-breasted Chat	Secure	Species of Concern	Critical	Uncommon breeder	Possible (but see USDI 2005)	Possible
Oregon Vesper Sparrow	Uncommon	Species of Concern	Critical, Bureau sensitive	Occasional breeder	Rare migrant, possible winter vagrant	Unlikely (no suitable habitat)
Bobolink	Secure	Not listed	Vagrant; state breeding population imperiled; Bureau assessment	Vagrant	Vagrant	Possible
Western Meadowlark	Secure	Not listed	Apparently secure	Uncommon resident, fairly common winter visitor	Common wintering species, speculative rare breeder	Present
California Myotis	Secure	Not listed	Possibly threatened	Widespread	Unclear	Possible
Long-eared Myotis	Secure	Species of Concern	Apparently secure	Widespread	Unclear	Possible
Fringed Myotis	Probably secure	Species of Concern	Vulnerable	Local	Unlikely (out of range)	Unlikely (out of range)
Long-legged Myotis	Secure	Species of Concern	Possibly threatened	Widespread	Unclear	Possible
Yuma Myotis	Secure	Species of Concern	Possibly threatened	Widespread	Potential or documented	Possible
Silver-haired Bat	Secure	Species of Concern	Possibly threatened	Widespread	Unclear	Possible
Pacific Western Big-eared Bat	Apparently secure	Species of Concern	Critical; Bureau sensitive	Possibly extremely local	Unclear	Unlikely (no suitable habitat)
Pallid Bat	Secure	Species of Concern	Vulnerable	Probable local resident	Unlikely (out of range)	Unlikely (out of range)
Gray Wolf	Apparently	Threatened	Endangered	Extirpated	Historically unlikely	Historically unlikely

SPECIES	GLOBAL	U.S.	OREGON COAST	COOS COUNTY	NORTH SPIT	PROJECT AREA
	secure				(no suitable habitat)	(no suitable habitat)
Grizzly Bear	Possibly threatened	Threatened	Extirpated	Extirpated	Historically out of range	Historically absent (out of range)
Ringtail	Secure	Not listed	Possibly threatened	Somewhat local	Out of range	Absent (out of range)
American Marten	Secure	Not listed	Vulnerable	Widespread	Unclear	Possible
Pacific Fisher	Secure	Candidate for Listing	Critical	Rare resident	Potential	Unlikely (no suitable habitat)
Northern Sea Lion	Uncommon	Threatened	Vulnerable	Local visitor	Present or expected	Unlikely (no suitable habitat)
Southern Resident Killer Whale	Endangered	Endangered	Endangered	Rare visitor	Rare visitor	Possible
Western Gray Squirrel	Secure	Not listed	Apparently secure	Somewhat local	Out of range	Absent (out of range)
White-footed Vole	Possibly threatened	Species of Concern	Possibly threatened	Local	Unclear	Unlikely (no suitable habitat)
Red Tree Vole	Possibly threatened	Species of Concern	Possibly threatened	Widespread	Unclear	Unlikely (no suitable habitat)

SPECIES GUILDS

Amphibians and Reptiles

The only threatened or endangered reptile or amphibian species that could occur in the project area is an occasional Pacific Leatherback wandering into Coos Bay. On September 8-9, 2005, a professional herpetologist conducted an assessment of habitat suitability and species occurrence potentials (Appendix 1). Based on the results of this survey, it is recommended that a preconstruction survey occur during the winter, when amphibians are easier to detect, in those areas where amphibians and reptiles could be disturbed by construction activities.

Sensitive Breeding Birds

No bird nest colonies occur in the project area. Some cormorants nest on shipping markers at the periphery of the project area and isolated gull and guillemot nests occur on the Roseburg docks.

There is an historic Great Blue Heron (*Ardea herodias*) rookery near the beginning of Jordan Cove Road, about 600 meters from the project area. This rookery, which we viewed on November 1, 2006, during a site visit with ODFW and BLM biologists, was inactive the previous two breeding seasons (BLM biologist, pers. comm.) but still contains nests. If it were to become active again, the nesting birds could be disturbed by noise from traffic associated with construction and operation of the plant as the rookery is less than 100 meters from the road. We do not believe any mitigation for potential impacts is necessary as long as the rookery is inactive. Another historic rookery is located adjacent to the project site on the south side of Henderson Marsh; it has not been active for several years (BLM biologist, pers. comm.). We did not observe any evidence of Great Blue Heron breeding in the area during 2005 or 2006 monitoring. We recommend that annual spring status assessments of both rookeries be conducted during the construction period. Following construction, the level of road traffic to the LNG terminal will be minimal in comparison to the trucks delivering chips to the export facility. In the event that revival of either rookery occurs, potential impact avoidance or mitigation measures will be evaluated in coordination with other responsible parties.

Ospreys nest on one of the tall lights in the Roseburg Lumber yard on the east side of the project area. This nest is in a highly disturbed area and the birds are habituated to a high level of disturbance. It is likely that project construction activity would agitate the birds initially but it is expected that they would become habituated to it as well.

Measures should be taken to avoid increases in local populations of animals that prey on snowy plover nests (large corvids and small carnivores). Construction and project workers should be instructed not to dispose of garbage inappropriately in the area. ODFW should authorize the destruction of any *Corvus* nests that might be built on project structures. Snags are scarce on the site and thus cavity nesters are not common, chickadees being the most prevalent. Some cavity-bearing trees/snags are likely to be removed in the course of project construction.

The olive-sided flycatcher, a federal species of concern, vulnerable in the region and probably nesting on the site, would lose nesting habitat, contributing to cumulative effects acting upon the

species. JCEP has endeavored to minimize vegetation impacts and keep structural elements such as snags, downed logs, and small wetlands intact within the environment where possible.

Winter Waterfowl

Coos Bay is the largest estuary wholly within Oregon and supports thousands of waterfowl in winter. On average, nearly 6,000 geese, swans, and ducks are recorded annually on the Coos Bay Christmas Bird Count (Table 6). The primary potential impact of the Project on wintering waterfowl would be associated with a marine accident in which a large quantity of oil is spilled. As the LNG ships are not oil tankers and carry only those quantities of oil for fueling the engines, the likelihood of impacts from LNG shipping is remote. Creation of the slip and turning basin actually would increase potential habitat for diving ducks and other deep-water species.

Table 6. Ten-year average numbers of waterfowl on the Coos Bay Christmas Bird Count, 1996-2005. Data obtained from http://audubon2.org/birds/cbc/hr/count_table.html.

Species	Individuals
Greater White-fronted Goose	1.2
Emperor Goose	0.1
Snow Goose	0.7
Brant	9.4
Cackling Goose*	16.5
Canada Goose**	388.8
Tundra Swan	0.6
Wood Duck	22.6
Gadwall	159.1
Eurasian Wigeon	2.1
American Wigeon	1,358
Mallard	441.3
Blue-winged Teal	0.1
Cinnamon Teal	0.1
Northern Shoveler	38.2
Northern Pintail	320.9
Green-winged Teal	395.7
Unidentified duck	267.3
Canvasback	33.7

Species	Individuals
Redhead	2.5
Ring-necked Duck	34.4
Greater Scaup	159.1
Lesser Scaup	63.5
Unidentified scaup	99.5
Harlequin Duck	9.5
Surf Scoter	484.3
White-winged Scoter	94
Black Scoter	8.9
Unidentified scoter	33.5
Long-tailed Duck	3.2
Bufflehead	914.1
Common Goldeneye	15.9
Barrow's Goldeneye	0.3
Hooded Merganser	16.5
Common Merganser	2.6
Red-breasted Merganser	50.2
Ruddy Duck	154
All species combined	5,602.4

*Cackling Goose is a two-year average, 2004-2005.
**Canada Goose numbers before 2004 include Cackling Goose.

Wading Birds and Shorebirds

The estuarine habitats on and adjacent to the project area are used consistently by a wide variety of species in this guild. Dredging and development of shoreline and tidal mudflats for the project would eliminate some habitat for these species and, while insignificant on their own, would contribute to cumulative effects. The removal of 5.6 acres of intertidal unvegetated mud

flat and 6.1 acres of algal flats (12 acres of mudflat) would be a direct impact that would need to be considered. A mitigation plan has been developed by the Port of Coos Bay to compensate for the loss of this habitat.

Neotropical Migrants

Approximately 18 species within this group, five of them sensitive, were detected during surveys, which were conducted mostly before and after the breeding season; and many more are likely to occur, especially as migrants. These are largely forest-nesting species and thus some are likely to be affected significantly (at a local scale) by the project. This impact will have to be assessed as will appropriate management or mitigation. Some species, such as barn and cliff swallows, nest readily on human structures and could gain nesting habitat as a result of the project. Our surveys took place from July to April; May and June surveys should be conducted in those areas to be affected by construction prior to the start of construction to obtain an accurate picture of species potentially nesting on site and that could be affected by the Project. The project site is on a major migration route and, once operational, may cause bird strikes, particularly of migrants, under adverse weather conditions,. Minimal lighting will be used and the tall structures will not be constructed of reflective materials or glass to minimize potential for disorientation of birds.

The LNG terminal site will have limited habitat remaining on the property that will be attractive to migratory bird species. This lack of favorable habitat likely will not cause migratory species to be attracted to the LNG terminal site, further reducing the likelihood of interaction with the LNG storage tanks (the tallest structures at the terminal). There is limited evidence in the scientific literature that would suggest adverse effects to migratory bird populations due to collisions with aboveground storage tanks similar to the LNG storage tanks. There is some evidence in the literature that high intensity, continuous anti-collision lighting of structures for aircraft may result in increases in the number of bird strikes, especially at night or during fog and overcast conditions. The number of strikes apparently can be reduced by strobing or blinking the anti-collision lights. The LNG storage tanks will not be illuminated with high-intensity lighting. The intensity and number of lights will be limited to what is required for security and operations. Due to the limited amount of suitable habitat present on the LNG terminal site, the lack of scientific literature reporting birds striking storage tanks, and the low-intensity lighting to be used, the likelihood of adverse effects on migratory birds from collisions with the LNG storage tanks is probably low.

Bats

Bat surveys were not conducted. In the absence of such surveys, little more than guesswork is possible regarding this group. Local distributions and habitat requirements of bats are virtually unknown and identification is extremely difficult. Csuti *et al.* (2001) and USDI (2005) contradict each other often with regard to occurrence potential of sensitive bats on the North Spit. Our best assessment is that potentially suitable foraging habitat for many species occurs in the project area, particularly around wetlands where insect prey is probably most numerous. Breeding and roosting sites are probably very limited due to the high level of disturbance in the vicinity and the absence of cliffs, rock outcrops, bridges, caves, mines, and large snags. We

observed unidentified bats in one of the buildings on site on July 21, 2005. We recommend that bat surveys be conducted in areas to be disturbed by construction prior to the start of construction and appropriate mitigation measures be developed in the event that sensitive species are encountered.

Marine Mammals

The estuarine and open ocean habitats within a 2.0 mile radius of the project area could support a variety of protected marine mammals. Only harbor seal, northern sea lion, and killer whale are likely to occur in the bay. We have detected only harbor seal at the project site. Killer whales enter Coos Bay only on an occasional basis and the northern sea lion is more to be expected at the bay mouth or offshore. All three species could be affected by increased shipping traffic; however, as Coos Bay is already an active port and has been more active in the past than is anticipated with the additional LNG ship traffic combined with current ship traffic, the increase likely will not result in a significant effect on marine mammals.

Big Game

Black bear and Roosevelt elk are fairly common on the spit and we have documented both in the project area. Mule (black-tailed) deer are numerous in the vicinity and use the site regularly. These species would lose some habitat as a result of the project, and increased vehicle traffic would increase the potential for collisions; however, due to the already disturbed nature of the property, it is not anticipated that the project would have any significant adverse effects on this group of animals.

Other Mammals

Our track-plate stations were visited regularly by a variety of mammals including Virginia opossum, striped skunk, northern raccoon, North American porcupine, and Townsend's chipmunk (Appendix 4). There was no evidence of American marten or Pacific fisher. There was no evidence of any sensitive species in this group in the project area, and the Project is not expected to affect any sensitive mammal species.

POTENTIAL IMPACTS AND MITIGATION OPTIONS

Impacts to Wildlife Habitat

After field surveys had been completed, each habitat on the project site was evaluated for its value to wildlife. Using the Oregon Administrative Rule habitat categorization scheme (OAR635-415-0025), the entire project area (excluding the eelgrass habitat in the Access Channel characterized as "Habitat Category 3" in the Fisheries report) currently can be classified as "Habitat Category 4", "important for fish and wildlife species" but not "limited" (more accurately limit"*ing*") and in the existing industrial areas (Roseburg Lumber Company property), "Habitat Category 6", low potential to become essential or important habitat.

As discussed in Resource Report 1 Table 1.2-1, Summary of Land Requirements for the Jordan Cove Energy Project, [December 2006]) the project footprint encompasses about 297 acres including 11 acres of offsite parking, 26 acres of access channel improvements, and 38 acres of already disturbed industrial areas. Of the remaining 222 acres (acreage total excluding the above), approximately 150 acres will remain "Habitat Category 4" including forest, dune, and grasslands that would be converted to open water for the slip area (Figure 6). Post Construction "Category 4" areas would not require mitigation.

Approximately 24 acres of the project area would be degraded by temporary construction activities but could be restored and thus would become "Habitat Category 5", unimportant to wildlife but with high restoration potential. Mitigation for these 24 acres will be accomplished by restoring the temporary construction areas with landscaping that incorporates native vegetation and topography common to a coastal dune setting.

The remaining 52 acres of existing "Habitat Category 4" that will be converted to "Habitat Category 6", unimportant to wildlife and lacking high restoration potential will require mitigation (Figure 6). Mitigation will be accomplished through in-kind and/or out-of-kind, off proximity habitat enhancement or protection to achieve a 1 to 1 replacement of habitat in terms of quantity and quality. A mitigation plan for this loss will need to be developed.

Impacts and mitigation for the loss of tidal mudflats and eelgrass habitat are discussed in the Port of Coos Bay's eelgrass mitigation plan (David Evans & Associates [2007]).

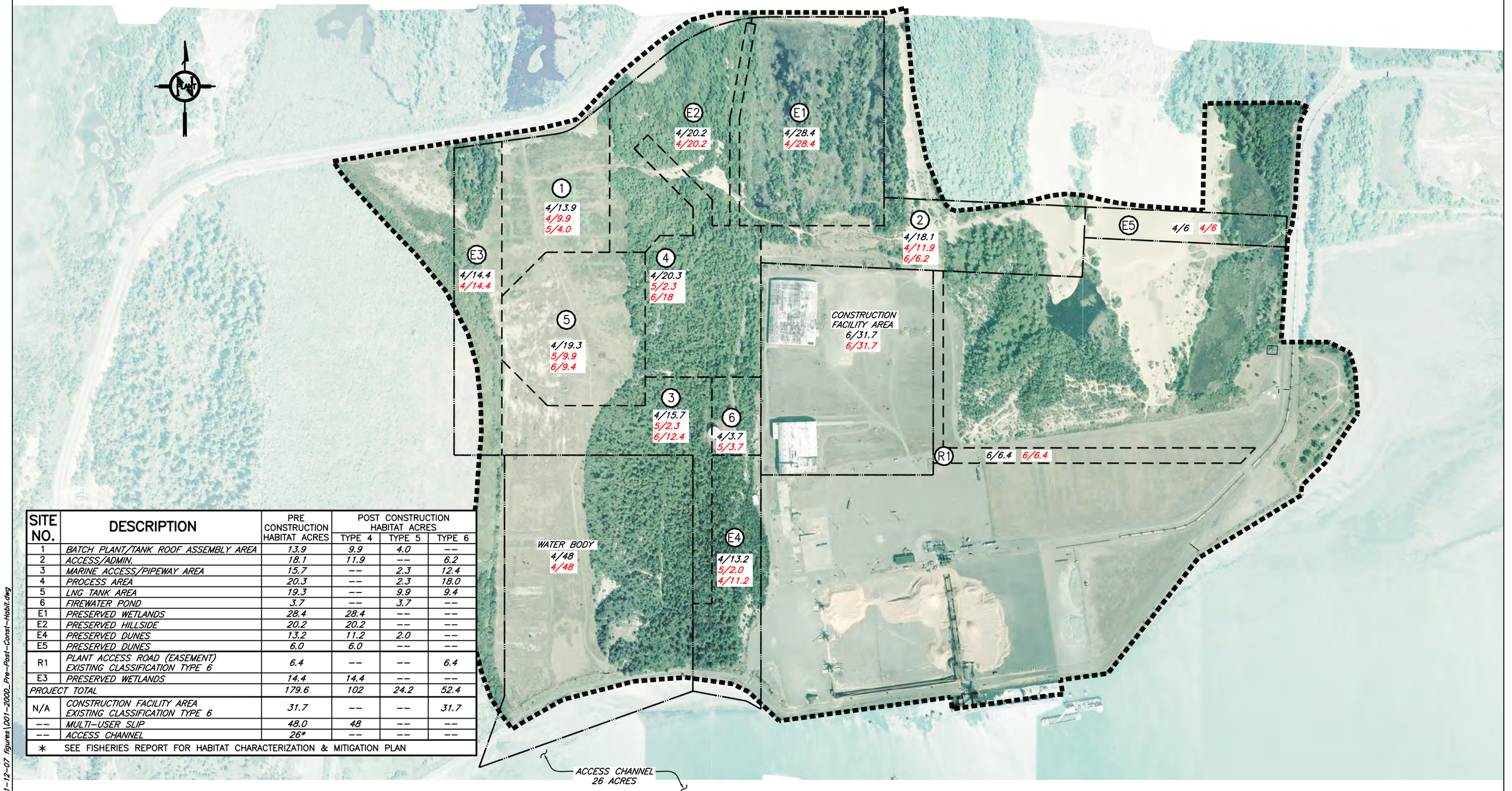
U.S. and Oregon Endangered Species Acts

No direct impacts to listed, proposed, or candidate species are anticipated as a result of this project. None of these species is believed to breed in or very near the project area. The state endangered American peregrine falcon, which was observed on about half of the visits, would lose some foraging habitat with the removal of 5.6 acres of intertidal unvegetated mud flat and 6.1 acres of algal flats (12 acres of tidal mudflat) for the proposed slip and turning basin. The mitigation for the loss of this stretch of undeveloped shoreline in the upper bay will minimize the overall impacts.

Concerns have been raised that wakes from Project-related ship traffic on the bay could swamp Snowy Plover nests on the bay side of the North Spit or that the ships themselves could strike endangered marine species. LNG ships will transit through the bay at speeds of 5-7 knots, which typically produce wakes equal to or less than what currently occurs with existing commercial and recreational ship and boat traffic. Thus, we believe these concerns can be discounted.

Marine Mammal Protection Act

No impacts to marine mammals are anticipated as a result of this project. Ship wakes will not be sufficient to displace resting or pupping harbor seals at haul-outs. Ships will move slowly enough that collisions with marine mammals are unlikely.



SITE NO.	DESCRIPTION	PRE CONSTRUCTION HABITAT ACRES	POST CONSTRUCTION HABITAT ACRES		
			TYPE 4	TYPE 5	TYPE 6
1	BATCH PLANT/TANK ROOF ASSEMBLY AREA	13.9	9.9	4.0	--
2	ACCESS/ADMIN.	18.1	11.9	--	6.2
3	MARINE ACCESS/PIPEWAY AREA	15.7	--	2.3	12.4
4	PROCESS AREA	20.3	--	2.3	18.0
5	LNG TANK AREA	19.3	--	9.9	9.4
6	FIREWATER POND	3.7	--	3.7	--
E1	PRESERVED WETLANDS	28.4	28.4	--	--
E2	PRESERVED HILLSIDE	20.2	20.2	--	--
E4	PRESERVED DUNES	13.2	11.2	2.0	--
E5	PRESERVED DUNES	6.0	6.0	--	--
R1	PLANT ACCESS ROAD (EASEMENT) EXISTING CLASSIFICATION TYPE 6	6.4	--	--	6.4
E3	PRESERVED WETLANDS	14.4	14.4	--	--
PROJECT TOTAL		179.6	102	24.2	52.4
N/A	CONSTRUCTION FACILITY AREA EXISTING CLASSIFICATION TYPE 6	31.7	--	--	31.7
--	MULTI-USER SLIP	48.0	48	--	--
--	ACCESS CHANNEL	26*	--	--	--
*	SEE FISHERIES REPORT FOR HABITAT CHARACTERIZATION & MITIGATION PLAN				

LEGEND:

BLACK – PRE CONSTRUCTION HABITAT TYPE ACREAGE

RED – POST CONSTRUCTION HABITAT TYPE ACREAGE

(7) JORDAN COVE ENERGY PROJECT LAND REQUIREMENT AREA RESOURCE REPORT 1 TABLE 1.2-1

— — STUDY AREA

300' 0 300' 600'

1"=300'

SHN Consulting Engineers & Geologists, Inc.

Jordan Cove Energy Project
Pre Construction Wildlife Assessment
Coos Bay, Oregon

Pre & Post Construction
Habitat Characterization
SHN 005609.200

January 2007 | D01-200D_Pre-Post-Const-Habit.dwg | **Figure** 6

X:\2005\005609 Jordan Cove\dwg\1-12-07 figures\D01-2000_Pre-Post-Const-Habit.dwg

Migratory Bird Treaty Act

The MBTA prohibits the killing of any native bird from the egg stage onward. Thus, active nests of native birds are protected and project implementation may not destroy nests directly or cause nest failure indirectly without mitigation. The construction phase of the project represents by far the greatest risk of violating this law.

Other Impacts

The wildlife currently inhabiting the upland habitats to be developed on the proposed construction site will be displaced and the less mobile species will suffer direct mortality. Appropriate mitigation should be considered.

Some concern has been raised as to the potential impacts to wildlife of CO_2 and NO_2 emissions from the project. Alice Berg, the fisheries biologist for this project, has concluded, based on data from another LNG plant, that emission levels more than a very short distance from their sources will be negligible. The typically windy nature of the site will disperse these and other gases quickly. We do not expect gas emissions from this project to be a threat to wildlife.

REFERENCES

Adamus, P. R., K. Larsen, G. Gillson, and C. R. Miller. 2001. Oregon Breeding Bird Atlas. CD-ROM. OFO Special Publication No. 16. Oregon Field Ornithologists, Eugene.

Altman, B. 2003. Horned Lark. Pp. 425-248 *in* Birds of Oregon: A General Reference. D. B. Marshall, M. G. Hunter, and A. L. Contreras, Eds. Oregon State University Press, Corvallis.

Anthony, R. G., M. C. Hansen, M. Sandler, N. V. Marr, C. A. Schuler, and R. S. Lutz. 1990. Short-term effects of triploid grass carp on waterfowl and Bald Eagles at Devil's Lake, Oregon. Unpubl. rep., Oreg. Coop. Wildl. Res. Unit, Oreg. State Univ., Corvallis.

Bowers, N., R. Bowers, and K. Kaufmann. 2004. Mammals of North America. Houghton Mifflin Co., New York. 351 pp.

Brown, R.F. 1988. Assessment of pinniped populations in Oregon, April 1984 to April 1985. NMFS-NWAFC Proc. Rept. 88-05. 44 pp.

Contreras, A. 1998. Birds of Coos County, Oregon: Status and distribution. Cape Arago Audubon Soc. and Oreg. Field Ornithol. (Spec. Publ. 12), Eugene.

Csuti, B., T. A. O'Neil, M. M. Shaughnessy, E. P. Gaines, and J. C. Hak. 2001. Atlas of Oregon Wildlife, 2nd ed. Oregon State University Press, Corvallis. 525 pp.

Eltzroth, M. S. 1987. Checklist of the Birds of Oregon, 4th ed. Audubon Society of Corvallis. 17 pp.

Forsman, E. D. 2003. Spotted Owl. Pp. 319-320 *in* Birds of Oregon: A General Reference. D. B. Marshall, M. G. Hunter, and A. L. Contreras, Eds. Oregon State University Press, Corvallis.

Garrett, M. G., J. W. Watson, and R. G. Anthony. 1993. Bald Eagle home ranges and habitat use in the Columbia River estuary. J. Wildl. Manage. 57:19-27.

Henny, C. J., and J. E. Pagel. 2003. Peregrine Falcon. Pp. 166-170 *in* Birds of Oregon: A General Reference. D. B. Marshall, M. G. Hunter, and A. L. Contreras, Eds. Oregon State University Press, Corvallis.

Herziger, C. 2003. Bobolink. Pp. 575-577 *in* Birds of Oregon: A General Reference. D. B. Marshall, M. G. Hunter, and A. L. Contreras, Eds. Oregon State University Press, Corvallis.

Heyer, R.W., Donnelly, M.A., McDiarmid, R.W., Hayek, L.C., and Foster, M.S. (Eds.). 1994. Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians. Smithsonian Institution Press, Washington D. C., USA.

Isaacs, F. B., and R. G. Anthony. 2003. Bald Eagle. Pp. 140-144 *in* Birds of Oregon: A General Reference. D. B. Marshall, M. G. Hunter, and A. L. Contreras, Eds. Oregon State University Press, Corvallis.

Jarvis, R. L. 2003. Canada Goose. Pp. 82-86 *in* Birds of Oregon: A General Reference. D. B. Marshall, M. G. Hunter, and A. L. Contreras, Eds. Oregon State University Press, Corvallis.

Jarvis, R. L., and R. G. Bromley. 1998. Managing racial mixed flocks of Canada Geese. Pp. 413-423 *in* Biology and management of Canada geese: Proceedings of the International Canada Goose Symposium (D. H. Rusch, M. D. Samuel, D. D. Humburg, and B. D. Sullivan, eds.). Milwaukee WI.

Lauten, D. J., K. A. Castelein, E. Seckinger, and E. P. Gaines. 2006. The distribution and reproductive success of the western snowy plover along the Oregon coast – 2005. Unpubl. Rep. ORNHIC, Portland. 60 pp.

Little, D. T. 2006. Integrated predator damage management report for the western snowy plover (*Charadrius alexandrinus nivosus*) 2005 breeding season at Baker/Sutton, Siltcoos, Overlook, Tahkenitch, Tenmile, Coos Bay North Spit, Bandon State Natural Area, and New River Area of Critical Environmental Concern. Unpubl. Rep. USDA-APHIS-Wildlife Services. 17 pp.

Marshall, D. B., M. G. Hunter, and A. L. Contreras, Eds. 2003. Birds of Oregon: A General Reference. State University Press, Corvallis.

NAS (National Audubon Society). Web site: http://www.audubon.org/bird/cbc/index.html.

NMFS (National Marine Fisheries Service). 1992b. Recovery plan for the Steller sea lion (*Eumetopia jubatus*). Prepared by the Steller Sea Lion Recovery Team for the National Marine Fisheries Service, Silver Springs, MD. 92 pp.

NOAA (National Oceanic and Atmospheric Administration). Web site: http://66.102.7.104/search?q=cache:49aLQdRyYDAJ:www.nwr.noaa.gov/1srd/Recovery/domains/willow/WMU_Plan/pdfs/TechApps/AppendixB/AppB-8_StellerSeaLions.pdf+oregon+status+%22northern+sea+lion%22&hl=en.

Nehls, H. B. 2003a. Brown Pelican. Pp. 53-54 *in* Birds of Oregon: A General Reference. D. B. Marshall, M. G. Hunter, and A. L. Contreras, Eds. Oregon State University Press, Corvallis.

Nelson, S. K. 2003. Marbled Murrelet. Pp. 290-293 *in* Birds of Oregon: A General Reference. D. B. Marshall, M. G. Hunter, and A. L. Contreras, Eds. Oregon State University Press, Corvallis.

Olsen, D.H., W.P. Leonard, and R.B. Bury. 1997. Sampling Amphibians in Lentic Habitats. Northwest Fauna Number 4. Society for Northwestern Vertebrate Biology. Olympia Washington.

Owens, R. 2005. Comments on the notice of intent for the Jordan Cove liquefied natural gas (LNG) facility near Coos Bay, Oregon. Letter to Adam Bless, Oregon Dept. of Energy, Jan. 28, 2005.

Pyle, P. 1997. Identification Guide to North American Birds, Part 1. Slate Creek Press, Bolinas, CA. 732 pp.

Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. Handbook of field methods for monitoring landbirds. Gen Tech. Rep. PSW-GTR-144. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 41 pp.

Rodenkirk, T. In prep. Status and distribution of Bird Species of Coos County, Oregon.

Stebbins, R. C. 2003. Western Reptiles and Amphibians, 3rd ed.. Houghton Mifflin Co., New York. 533 pp.

Stern, M. A., D. J. Lauten, and K. A. Castelein. 2003. Snowy Plover. Pp. 203-206 *in* Birds of Oregon: A General Reference. D. B. Marshall, M. G. Hunter, and A. L. Contreras, Eds. Oregon State University Press, Corvallis.

Strong, C. S., B. S. Keitt, W. R. McIver, C. J. Palmer, and I. Gafney. 1995. Distribution and population estimates of Marbled Murrelets at sea in Oregon during the summers of 1992 and 1993. Pp. 339-352 *in* Ecology and conservation of the Marbled Murrelet (C. J. Ralph, G. L. Hunt, Jr., M. G. Raphael, and J. F. Piatt, eds.). U.S. Dept. Agric., For. Serv. Gen. Tech. Rep. PSW-GTR-152. Albany, CA.

US Dept. of Interior, Bureau of Land Management. 2005. Draft North Spit Plan. Coos Bay District, Umpqua Field Office. 98 pp.

Appendix 1

Herpetologists's Report

Appendix 1: Herpetological Consultation for Jordan Cove LNG Proposal, Coos Bay, Oregon

Prepared by Don Ashton for LBJ Enterprises, Eureka, CA
DRAFT – February 13, 2005

An on-site assessment of herpetological resources was conducted by Don Ashton, USDA Forest Service Ecologist/Herpetologist on 08-09 September, 2005. This assessment occurred in the latter portion of the dry season and most amphibian species are difficult to detect at such time, so this assessment focused primarily on habitat suitability for amphibians and reptiles suspected to inhabit the North Spit (Csuti *et al.* 2001, USDI 2005). Limited searches were conducted for some species, including binocular surveys for western pond turtles and anurans, dip net surveys for amphibian larvae, and time constrained searches for terrestrial salamanders, as well as opportunistic sightings of reptiles and amphibians during habitat assessment (Heyer *et al*. 1994, Olsen *et al*. 1997).

The non-native bullfrog (*Rana catesbeiana*) was abundant at all wetland sites surveyed. All post-egg life stages, including multiple cohorts of larvae, were present at the wetlands designated Site 1 and Site 2, north of the Roseburg Lumber Road, indicating that reproduction of this exotic species is occurring in the proposed project area. Bullfrogs were introduced to the West a century ago and they can pose a significant threat to native species as competitors, predators, and disease vectors. In Oregon, bullfrog tadpoles over-winter and metamorphose in their second year, in contrast to native anuran larvae, which achieve metamorphosis within their first year (Leonard *et al*. 1993, Corkran and Thoms 1996). Wetlands that dry down seasonally promote native species by reducing reproductive success of exotic bullfrogs.

Habitat conditions at the wetland site appear suitable for northern red-legged frog (*Rana aurora*), although the high density of bullfrogs may be having a significant negative impact on North Spit populations of northern red-legged frog and other native anurans. By this time of year, northern red-legged frog tadpoles should have completed metamorphosis and juvenile frogs would have dispersed upland (Leonard *et al.* 1993). Any juveniles remaining around wetland shorelines are at great risk of predation by bullfrogs. One northern red-legged frog tadpole was collected in a dip net sample. This animal was identified to species by the dorsal position of the eyes, pinkish iridescence on the ventral surface, and tail fin initiating on the mid-back (Stebbins 1985, Corkran and Thoms 1996). This animal appeared to be in poor health, which may account for delayed or retarded metamorphosis. No adult or sub-adult northern red-legged frogs were seen during the two days of sampling and habitat assessment.

The Pacific treefrog (*Pseudacris regilla*) is a common, wide-ranging species likely to be present on the North Spit. This species is often abundant where present and serves a vital role in the trophic system, converting invertebrate biomass to a form available to higher vertebrates including reptiles, birds, and mammals. No Pacific treefrogs were seen or heard calling during the site visit. By this time of year, larvae have metamorphosed and dispersed from the aquatic habitat (Leonard *et al*. 1993) and terrestrial activity is limited, so detection probability is low, even if the species is present. It is possible this species may be suppressed or eliminated from the area due to the observed high density of bullfrogs.

The western toad (*Bufo boreas*) is more likely to be active at night in the dry season, but no toads or toad tracks were seen on this visit. Toad tadpoles would have metamorphosed and left the aquatic environment by the time of these surveys and would not be available for collection by dip net sampling (Leonard *et al.* 1993).

Rough-skinned newt (*Taricha granulosa*) and northwestern salamander (*Ambystoma gracile*) are both expected on the North Spit but were not detected on these surveys. No salamander larvae were detected in diurnal dip net surveys of wetland Sites 1 or 2. Adults of both species are likely to retreat to subterranean refugia during the dry season and thus are not available for detection on the surface. Surveys in the wet season for adults, or spring surveys for eggs and larvae recommended. No terrestrial-breeding salamanders were found during upland, time-constrained surveys. Lack of detection at this time of year does not constitute species absence. Terrestrial salamanders require moist soil conditions and in the dry season are likely to move deep into the substrate to avoid dry conditions on the surface. Even under the thickest forest canopy west of the Roseburg yard and south of the water tanks, the soil was very dry down to a depth of 30 cm or more. It is no surprise that no salamanders were detected near the surface in either of two 20-minute, time-constrained surveys in the dune forest. The high proportion of sand in the soil may result in a substrate that seasonally dries too deeply to support Plethodontid (lungless) salamanders, although the condensation of fog on the leaves may provide enough moisture for the canopy dwelling clouded salamander (*Aneides ferreus*). No canopy surveys were conducted. Sampling for terrestrial salamanders is more appropriate after the onset of fall rains or in spring before surface conditions begin to dry (Heyer *et al.* 1994). Surveys under more appropriate conditions of the forested area proposed for the dock excavation and facility construction are recommended.

Three reptile species were detected during time-constrained surveys or opportunistically while traversing the site. The western fence lizard (*Sceloporus occidentalis*) was the most commonly seen reptile, with dozens of observations including many young of the year animals, indicating a reproductive population. Western fence lizards were frequently seen among the shrubs bordering sand dune areas, but they also were detected in the grasslands and forest clearings. Three adult northern alligator lizards (*Elgaria coerulea*) and one shed skin were detected opportunistically. One was seen near the proposed facility site by the northwest corner of the Roseburg Lumber property and the other two were found near the bay in the habitat proposed for deposition of excavation and dredge spoils. Three northwestern garter snakes (*Thamnophis ordinoides*) were encountered in the same grassland area. This species is often associated with the coastal fog belt (Brown *et al.* 1995, St. John 2002).

Western pond turtles were not detected in a series of binocular surveys conducted under appropriate basking conditions. Twenty-minute binocular surveys were conducted from five locations within, or adjacent to, Site A (53.08 ac) as follows: Surveys of Site 1 (3.4 ac) from the east shore and from a high dune on the north shore; survey of Site 2 (7.9 ac) from the north shore; and surveys of the unnamed wetland north of Site 2, immediately west of Jordan Cove Road, from the south shore and from a high dune on the west shore. Closer searches of potential basking sites did not reveal any signs of previous turtle basking (*i.e.*, claw marks, worn spots on logs, *etc*.) or turtle tracks along the shoreline. Western pond turtles can be quite wary and may evade detection by binocular survey (Brown *et al.* 1995, St. John 2002). Coastal fog may limit

basking opportunities, but there seemed to be ample sun for basking during this two-day site assessment. The high proportion of sand in the soils may be a more important limiting factor of concern at this site. Western pond turtles nest in dry, compacted soils with good sun exposure (Holland 1994). Loose or sandy soils tend to collapse the nest chamber, resulting in reproductive failure. Creative placement excavation spoils could result in creation of suitable nesting habitat where it is now limited or absent, although the response (use) by turtles may be slow. Experiments in creation of western pond turtle nesting habitat are currently underway in at least two locations in Oregon (David Vesley, pers. comm.).

Additional surveys under appropriate environmental conditions and season for target species are recommended. Surveys for terrestrial salamanders should be conducted after the onset of fall rains. Additional late winter/spring surveys could be conducted for eggs and larvae. Surveys for eggs and larvae may be the most reliable for detecting species presence and assessing population status (Olsen *et al*. 1997). Based on the initial habitat assessment, the proposed project should have minimal impact on native herpetofauna populations. While some loss of habitat would occur in conjunction with the development, the wetland habitats do not appear spatially limited on the North Spit. Wetland pond complexes to the north of the Trans-Pacific Parkway, away from the proposed project area, appear to offer better habitat conditions for western pond turtles. These wetland areas appear to be larger and deeper than the wetlands within the proposed project area and are more likely to support western pond turtles, but these areas were viewed only from the Parkway (and maps)and were not surveyed. Unfortunately, the construction of the railway along the Trans-Pacific Parkway will result in habitat fragmentation for many amphibian and reptile species, which will have difficulty crossing the rails. Probably the biggest threat to native herpetofauna seen on the site is the robust bullfrog population. Mitigation to reduce and control the bullfrog population, such as designs that promote seasonal draining of wetlands, could result in a net improvement of conditions for native amphibian species and could spur positive public relations for the project. Standard management practices will eliminate any negative impacts to the water system. In the event of an emergency there are two containment berms which would act to eliminate any discharge outside of the project area into natural habitats.

Literature Cited

Brown, H.A., R.B. Bury, D.M. Darda, L.V. Diller, C.R. Peterson, and R.M. Storm. 1995. Reptiles of Washington and Oregon. Seattle Audubon Society Trailside Series. Seattle, Washington.

Corkran, C.C. and C. Thoms. 1996. Amphibians of Oregon, Washington, and British Columbia. Lone Pine Publishing. Renton, Washington.

Csuti, B., T.A. O'Neil, M.M. Shaughnessy, E.P. Gaines, and J.C. Hak. 2001. Atlas of Oregon Wildlife, 2nd Edition. Oregon State University Press. Corvallis, Oregon.

Heyer, R.W., Donnelly, M.A., McDiarmid, R.W., Hayek, L.C., and Foster, M.S. (Eds.). 1994. Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians. Smithsonian Institution Press, Washington D. C., USA.

Holland, D.C. 1994. The western pond turtle: habitat and history. Oregon Department of Fish and Wildlife, Final Report.

Leonard, W. P., H.A. Brown, L.L.C. Jones, K.R. McAllister, and R.M. Storm. 1993. Amphibians of Washington and Oregon. Seattle Audubon Society Trailside Series. Seattle, Washington.

Olsen, D.H., W.P. Leonard, and R.B. Bury. 1997. Sampling Amphibians in Lentic Habitats. Northwest Fauna Number 4. Society for Northwestern Vertebrate Biology. Olympia Washington.

St. John, A. 2002. Reptiles of the Northwest. Lone Pine Publishing. Renton, Washington.

Stebbins, R.C., 1985. A Field Guide to Western Reptiles and Amphibians. Petersen Field Guides. Houghton-Mifflin Company, Boston, Massachusetts, USA.

USDI Bureau of Land Mangement. 2005. Draft North Spit Plan. Coos Bay District, Umpqua Field Office.

Don Ashton,
USDA Forest Service Ecologist
Redwood Sciences Laboratory
1700 Bayview Dr., Arcata CA 95521
(707) 825-2984 dashton@fs.fed.us

EartHerp Consulting
1867 Park Street
Manila, CA 95521
(707) 444-9635
eartherp@quik.com

Appendix 2

Coos Bay Bird Species Accounts

Appendix 2: Birds detected during wildlife surveys in the Jordan Cove area, June, 2005 to November, 2006.

Compiled by Steven Tucker and Kenneth Burton. Species in bold are known to breed in the county.

Brant (*Branta bernicula*) – Brant is generally limited to salt water habitats and specializes on eelgrass. Fairly common winter visitor to the North Spit. Numbers peak in spring as migrants pass through the area on their way north. Otherwise, rare in the summer and uncommon in fall in the county. Recorded on our November, 2005, visit (three off site) and on our April visit, close to the bay shore of the project site.

Cackling Goose (*Branta hutchinsii*) – Fairly common migrant in the spring and fall in the area, uncommon to rare in the winter. *B. h. minima* and *B. h. leucopareia* both occur in the region, the latter, the "Aleutian" Cackling Goose, being considerably more abundant. Both subspecies winter farther south, mostly in the Central Valley and coastal northwestern region of California. The Oregon Legislature, as of August, 2005, has mandated that the Aleutian Cackling Goose be removed completely from the Oregon Threatened and Endangered Species List due to a rising population and the fact that Oregon played a minor role in the species' being listed in the first place. Recorded on our October visit, flying over the site and foraging on the short grass at the airport; and in January, again at the airport.

Canada Goose (*Branta canadensis*) – Common to abundant year-round in Coos Bay. The population of resident summer birds is likely supplemented by migrants during the fall and winter months. Recorded on mudflats, flying over the site, and/or using the wetlands on most visits.

Wood Duck (*Aix sponsa*) –Prefers relatively undisturbed wetlands bordering forests with trees large enough to provide nesting cavities during the breeding season. Fairly common in the county in spring and summer, uncommon in the fall and winter. Recorded in wetlands on site on nearly all summer visits; probably breeding, though no broods seen, and in April; thought to be a possible breeder on site.

Gadwall (*Anas strepera*) - Typically a freshwater species. Uncommon to rare in the summer in the county and fairly common mid-fall through spring. Recorded in 2005 on nearby wetlands but not on site.

Eurasian Wigeon (*Anas penelope*) –Occurs regularly throughout the west in very small numbers, typically in the presence of American Wigeon. Uncommon but regular in the county in winter. One was recorded in Jordan Cove with a large flock of American Wigeon on November 10, 2005.

American Wigeon (*Anas americana*) –Can be found in large flocks in a variety of freshwater, brackish and saltwater habitats. Abundant fall through spring in the county. Recorded off site on all October-December visits in 2005 and once in the project area in 2006.

Mallard (*Anas platyrhynchos*) –Mallard can be found in a large variety of wetland habitats and is thus one of the most widespread waterfowl species in North America. Fairly common in the county during the breeding season, abundant in the fall and winter. Recorded on site (typically along the shoreline and in shallow waters of Jordan Cove) and in surrounding areas on every visit.

Cinnamon Teal (*Anas cyanoptera*) - Uncommon during migration periods, rare the rest of the year in the county; rare breeder. Several recorded in nearby wetlands but not on site.

Northern Shoveler (*Anas clypeata*) - Uncommon to rare in the summer in the county, common the rest of the year. Rare breeder in the county. Recorded only on our October, 2005, visit (off site).

Northern Pintail (*Anas acuta*) – Abundant fall to spring in the county. One of the most common dabbling ducks in the area along with Green-winged Teal, Northern Shoveler and American Wigeon. Recorded on every October-December visit in 2005.

Green-winged Teal (*Anas crecca*) – Abundant in the county fall to spring; extremely rare breeder. Recorded on Coos Bay on all September-November visits in 2005 and once in 2006, off site.

Redhead (*Aythya americana*) – Normally occurs in variable numbers in the county from fall to spring. Previously unrecorded in the late summer months, but we observed at least five in nearby wetlands at that time. Not yet recorded on site.

Ring-necked Duck (*Aythya collaris*) - Uncommon in summer in the county, common the rest of the year in freshwater marshes, ponds and lakes. Two broods with attending females recorded in nearby wetlands but not detected on site. This confirms breeding within the 2.0 mile buffer in 2005. Recorded in 2006 in freshwater wetlands on site.

Greater Scaup (*Aythya marila*) –A common diving duck in bays and estuaries and frequently found in the company of the closely related Lesser Scaup (*Aythya affinis*). Uncommon to rare in the county in summer, abundant fall through spring. Several recorded on Coos Bay in November, 2005, and recorded close to the bay shoreline of the project area in 2006.

Lesser Scaup (*Aythya affinis*) – Abundant fall through spring in the county, rare or completely absent in summer. Recorded off the North Spit but not yet on site.

Surf Scoter (*Melanitta perspicillata*) – Uncommon in the county in summer, abundant the rest of the year. Fairly common in Coos Bay. Recorded on every visit but one; 100 or so present on Coos Bay opposite Jordan Cove throughout the summer of 2005, with a high number of 300 in January. Surf Scoters were frequently seen very close to shore in the project area in 2006.

White-winged Scoter (*Melanitta fusca*) –Closely associated with salt water and frequently found with surf scoter. Rare in summer in the county, fairly common the rest of the year. Surprisingly,

recorded on Coos Bay on two summer visits but only one fall visit in 2005. Also recorded on Coos Bay in 2006.

Black Scoter (*Melanitta nigra*) – Rare but regular winter visitor on most of the west coast, where small numbers may be found occasionally in flocks of the more abundant Surf Scoter or White-winged Scoter. Uncommon in the county most of the year, absent during the summer. One female observed with Surf Scoters in Jordan Cove on November 10, 2005.

Bufflehead (*Bucephala albeola*) – Common winter visitor in Coos Bay and the North Spit area. Recorded just offshore from the site from November onwards.

Common Goldeneye (*Bucephala clangula*) – Fairly common in the county in winter, absent from the area most of the year. Can be found wintering on lakes, rivers, bays and estuaries. Recorded off the North Spit but not from the site or study area.

Hooded Merganser (*Lophodytes cucullatus*) - Typically found in freshwater ponds and marshes, although sometimes seen in brackish or saltwater environments. Rare in the county in the summer, fairly common the rest of the year. Recorded on site wetlands in December and mid August, 2005. In 2006, recorded close to the bayshore adjacent to the fill area and in a freshwater pond adjacent to the site.

Red-breasted Merganser (*Mergus serrator*) –Prefers brackish and saltwater environments. Fairly common in the county October through April. Recorded on Coos Bay on October and December visits, 2005, and in 2006.

Ruddy Duck (*Oxyura jamaicensis*) – relatively common and widespread on lakes, ponds, bays and estuaries. Fairly common fall through spring in the county. One was recorded in Jordan Cove with a Surf Scoter flock in November, 2005.

Mountain Quail (*Oreortyx pictus*) – One Mountain Quail was heard seen and heard on site singing adjacent to Raptor Scan "B" on March 29 and April 13. Mountain Quail are widespread in western Oregon and usually occur above 1640 ft. in elevation. They are very rare on the immediate coast in the shrubby beachgrass-forest ecotone.

California Quail (*Callipela californica*) – Fairly common in brushy areas throughout the year in the county; may have been introduced to the area. Apparently only an occasional visitor to the site; recorded only once, in late August, 2005.

Red-throated Loon (*Gavia stellata*) - Uncommon or irregular in occurrence in summer in the county, fairly common the rest of the year. Seen on Coos Bay in small numbers on nearly all visits from August, 2005 onwards.

Pacific Loon (*Gavia pacifica*) - Can be abundant in late spring/early summer and fall as a migrant along the coast. Uncommon or irregular in occurrence in summer in the county. Seen on Coos Bay in small numbers on nearly all August-September visits and again in December, 2005.

Common Loon (*Gavia immer*) – Uncommon or irregular in occurrence in the county in summer. Present on Coos Bay on nearly all visits.

Pied-billed Grebe (*Podilymbus podiceps*) –Widespread and common in a wide variety of aquatic habitats. Fairly common in the county throughout the year. Seen on site on four visits from August onwards, including three juveniles which probably hatched there. This confirms breeding within the project area in 2005.

Horned Grebe (*Podiceps aurius*) –Found wintering in a variety of coastal wetlands and large lakes. Abundant in Coos Bay except in summer. Recorded on November and December visits, 2005, and regularly on Coos Bay in 2006.

Red-necked Grebe (*Podiceps gricigena*) – Fairly common in the county from early fall to late spring, but rare or absent in the summer months. Recorded in Coos Bay from the site on all October-December visits, 2005, and on three visits in 2006.

Eared Grebe (*Podiceps nigricollis*) – In Coos County, uncommon fall through spring, absent in the summer. Eared Grebes winter in a variety of aquatic habitats, including bays, estuaries, lakes and ponds. Recorded once on Coos Bay, on March 29.

Western Grebe (*Aechmophorus occidentalis*) –Fairly common in summer in the county, common to abundant the rest of the year. Several on Coos Bay near the bridge on most visits, consistently from September, 2005 onwards.

Clark's Grebe (*Aechmophorus clarkii*) –A rare but regular winter visitor to Coos County, usually on lower Coos Bay. Recorded only on October, 2005 visit. One seen on Coos Bay with western grebes north of Jordan Cove in June, 2005 during reconnaissance; only one previous summer record exists from the county.

Brown Pelican (*Pelecanus occidentalis*) - Common in the county in summer, declining in abundance through late fall, then occurring only rarely until April, when numbers begin to increase again. Fairly common on Coos Bay adjacent to the site in summer and early fall, often foraging near the shoreline; recorded on all pre-October visits in 2005.

Brandt's Cormorant (*Phalacrocorax penicillatus*) – Like the smaller Pelagic Cormorant, this species is found almost exclusively in saltwater habitats. Abundant in the county most of the year, it becomes uncommon during the winter months. Fairly common in Coos Bay and recorded in moderate numbers from the site on nearly every visit in 2005 and regularly on Coos Bay in low numbers in 2006.

Double-crested Cormorant (*Phalacrocorax auritus*) – Abundant in Coos County year-round. Abundant in Coos Bay and present in large numbers on every visit in 2005, with many nests on pilings and other manmade structures visible from the site; recorded regularly on Coos Bay in 2006.

Pelagic Cormorant (*Phalacrocorax pelagicus*) –Abundant in the county spring through fall, slightly less common in winter. Uncommon in Coos Bay. Present on bay waters on and adjacent to the site in small numbers on most visits, consistently from September, 2005, onwards.

American Bittern (*Botaurus lentiginosys*) - Fairly common locally in the summer, uncommon during migration periods, and only rarely found during the winter.
Recorded in Henderson Marsh on September 10th, 2005.

Great Blue Heron (*Ardea herodias*) – Abundant in the county and common in Coos Bay. Present on bay shorelines and ponds in the area in moderate to large numbers on every visit in 2005; recorded on site in 2006.

Great Egret (*Ardea alba*) – Abundant in the county. Common on Coos Bay. Recorded on bay shorelines and wetlands on and near the site on nearly every visit, sometimes in large numbers.

Green Heron (*Butorides virescens*) – Fairly common in the county in the spring thru fall, rare in winter. Recorded in Henderson Marsh on September 9th, 2005.

Turkey Vulture (*Cathartes aura*) –Fairly common in the county most of the year, rare in early winter. Frequently seen soaring overhead during raptor scans, searching for carrion on nearly all pre-October visits in 2005; also seen in 2006.

Osprey (*Pandion haliaetus*) – Fairly common in the county and common in Coos Bay. Present on nearly every visit, seen hunting over the bay and flying over the site; nests on site on the tall light fixtures. This confirms breeding, with two fledglings within the project area for 2005. Recorded on site on all visits from February onwards.

White-tailed Kite (*Elanus leucurus)* – Uncommon in summer, fairly common the rest of the year in the county. Recorded in 2005 over Henderson Marsh and in the Jordan Cove area on several visits but does not appear to use the site to any significant degree. Recorded near the project area in 2006.

Bald Eagle (*Haliaeetus leucocephalus*) –In Coos County, Bald Eagles are fairly common from late August to mid March and uncommon in late spring and summer. An adult was recorded on the opposite side of Coos Bay, on mudflats to the southwest, on July 21, 2005. Possibly the same bird was seen south of the site, flying east over Coos Bay, on August 3. One adult was seen flying west over Henderson Marsh on November 9. One adult was observed across Coos Bay from the North Spit on December 7, 2005. The only bird observed on site was an adult on December 7, 2005 perched close to Raptor Scan site A. On February 13, a bird was seen flying northwest over the site, below the forest canopy at Raptor Scan A. What was likely the same bird was seen at Shoreline Scan B flying over the site heading north on February 13. One was seen flying over Area Search B on February 14. All sightings of Bald Eagles within the project area have been adults.

Northern Harrier (*Circus cyaneus*) – Uncommon in summer in the county. Recorded near the site on two visits in 2005, August and November; not recorded in the project area. Recorded in the Henderson Marsh area on three visits in 2006.

Sharp-shinned Hawk (*Accipiter striatus*) –Uncommon throughout the year in the county. Observed in or over forest habitats on three visits; apparently more regular on the site in late fall and winter in 2005. One was perched (possibly roosting) in thick tree cover on September 9th within Area Search F.

Cooper's Hawk (*Accipiter cooperii*) –Uncommon in the county year-round. Recorded near forest habitats on three 2005 visits, late August to November. Recorded on site in 2006.

Red-shouldered Hawk (*Buteo lineatus*) - Uncommon in the summer in the county, fairly common the rest of the year. An immature was present in the forest around the eastern wetlands in August and September 2005. Recorded on site in 2006.

Red-tailed Hawk (*Buteo jamaicensis*) –Fairly common to abundant in the county. Present on site on most visits 2005. Present on site on most visits 2006.

Rough-legged Hawk (*Buteo lagopus*) – Rough-legged Hawk was recorded at Jordan Cove once, flying over the site in November, 2006. Rough-legged Hawk numbers may vary greatly from year to year, as they appear as fall migrants and winter visitors.

American Kestrel (*Falco peregrinus*) – Recorded on site but only on the November visit in 2005. It was associated with the grassland habitat on top of the historical fill area. Suitable prey and foraging conditions exist. Recorded in the project area in 2006, calling over the dune forest.

Merlin (*Falco columbarius*) – Recorded once on site in December, 2005. This small falcon is uncommon in Coos County fall through spring and absent from the area in midsummer.

Peregrine Falcon (*Falco peregrinus*) – One bird was recorded flying southwest toward the ocean over Jordan Cove on July 21, 2005. One was seen flying northeast over the site on August 11. One was seen perched on site on August 31. On October 17, 2005, an adult was seen perched above the southwest edge of Halverson Marsh. On December 7, 2005, two or three individuals were seen 4 miles south of the site along the North Spit. On December 8, 2005, one bird was seen perched on site. On February 13 from raptor scan C one was seen on the sand island in Coos Bay and one adult was seen flying south. On shoreline scan B an adult was seen sitting on a snag protruding from mudflats on the opposite side of Coos Bay on February 14. An immature was seen perched on a snag on site from Raptor Scan B on March 29. On April 13 a bird was seen on the metal boardwalk adjacent to the North Bend airport from Shoreline Scan B. On November 1 a bird was observed flying over the site.

Virginia Rail (*Rallus limicola*) – Recorded calling in Henderson Marsh in September, 2005. Fairly common in the summer, uncommon in winter.

Sora (*Porzana carolina*) – Recorded calling in Henderson Marsh in September, 2005. Fairly common in the summer, rare in winter in the county.

American Coot (*Fulica americana*) – Uncommon in summer, fairly common to abundant in the county most of the year. Recorded at Henderson Marsh in December, 2005.

Black-bellied Plover (*Pluvialis squatarola*) – Abundant in the county except in mid-summer. Recorded on site along the shoreline, once in July and on every post-September visit, 2005.

Semipalmated Plover (*Charadrius semipalmatus*) - Common migrant, uncommon in winter. Detected in low numbers on site along the shoreline on nearly every post-July visit in 2005.

Killdeer (*Charadrius vociferus*) – Fairly common resident in the county. Found regularly in small numbers foraging on the mudflats of Coos Bay and in other open areas of the site such as along the railroad tracks; recorded on nearly every visit in 2005. Recorded on site in 2006.

Greater Yellowlegs (*Tringa melanoleuca*) - Common migrant in the county.
Recorded only on the November, 2005 visit.

Lesser Yellowlegs (*Tringa flavipes*) - Uncommon fall migrant in the county.
Two recorded in nearby wetlands but not observed on site in 2005.

Willet (*Catoptrophorus semipalmatus*) - Not a common wintering bird in Oregon; uncommon migrant in the county. One was recorded on the site's mudflats August 11, 2005.

Spotted Sandpiper (*Actitis macularia*) – Fairly common in the summer in the county, uncommon the rest of the year. Detected on site only on September, 2005 visit.

Whimbrel (*Numenius phaeopus*) - Common in the county in spring and fall, rare in winter. Regular on mudflats of Coos Bay adjacent to the site until mid August, 2005. Whimbrels can be found later in the spring and earlier in the fall than many other local sandpipers.

Marbled Godwit (*Limosa* fedoa) - Fairly common migrant in the county. A group of three was seen across Coos Bay from the site on August 11, 2005.
Ruddy Turnstone (*Arenaria interpres*) – Fairly common migrant in Coos County. One detected on July 21, 2005.

Black Turnstone (*Arenaria melanocephala*) – Common in Coos County most of the year, with the exception of mid-summer. Several were seen foraging on the Jordan Cove mudflats on November 10th, 2005.

Sanderling (*Calidris alba*) – Common for much of the year but absent from the area in mid-summer. Recorded on the mudflats of Jordan Cove in November and December of 2005.

Western Sandpiper (*Calidris mauri*) – Abundant migrant in the county in spring and fall, uncommon to rare in the area the rest of the year. Flocks can number in the thousands during

both spring and fall migration periods. Recorded on Coos Bay shoreline on most visits during migration in 2005. Recorded on Coos Bay shoreline in 2006.

Least Sandpiper (*Calidris minutilla*) – One of the most abundant migrant shorebirds in Coos Bay, this species is frequently found with western sandpipers. Abundant in the county during migration periods, fairly common in winter. Like most sandpipers found in the area, all but absent in the early summer. Recorded on Coos Bay shoreline on most visits in 2005. Found roosting on site in 2006.

Dunlin (*Calidris alpine*) –Abundant in the county in late fall, winter and spring. Present on site in October and November 2005.

Ruff (*Philomachus pugnax*) – A very rare fall migrant in the county, one was seen on the site's shoreline on October 18, 2005 in the company of killdeer, below Baywatch A.

Dowitcher species (*Limnodromus*) – Both are uncommon to fairly common in migration in the area, with Long-billed Dowitcher (*L. scolopaceus*) wintering in low numbers. A flock of dowitchers flew past the site on August 3, 2005. A flock of 90 unidentified dowitchers was observed flying over Coos Bay on April 13.

Wilson's Snipe (*Gallinago delicata*) – Uncommon migrant and winter resident, absent from the area only in mid summer. One was flushed from one of the eastern wetlands on September 9, 2005.

Red-necked Phalarope (*Phalaropus lobatus*) –Common spring and fall migrant through Coos County, mostly August-September and April-May. Several were recorded in nearby wetlands as well as mudflats on site on August 23, 2005.

Bonaparte's Gull (*Larus philadelphia*) –Recorded only on November, 2005 visit. A group of 5 or 6 flew by over the bay on the 10^{th}.

Heermann's Gull (*Larus heermanni*) --Abundant in the fall in the county and uncommon or rare the rest of the year. Common on Coos Bay; present in small to moderate numbers on most pre-October visits, 2005.

Mew Gull (*Larus canus*) – One of the most abundant gulls in the area in winter but almost completely absent from the area from May to August. Recorded on site on all post-September visits 2005. Recorded regularly in Coos Bay and on the shoreline of the project site in 2006.

Ring-billed Gull (*Larus delawarensis*) – Uncommon in the county in the summer, abundant the rest of the year. Fairly common in Coos Bay. Recorded on bay shoreline on every visit in 2005. Fairly common in Coos Bay in 2006.

California Gull (*Larus californicus*) –Common in fall and spring, uncommon in winter, rare in mid-summer in the county. Recorded on most visits in bay and shoreline habitats during 2005.

Herring Gull (*Larus argentatus*) –Uncommon to fairly common visitor to the area most of the year but rare in summer. Recorded both on Coos Bay and on the ocean side of the North Spit on November 10th, 2005.

Thayer's Gull (*Larus thayeri*) – Uncommon fall thru spring in Coos County. Recorded on the ocean side of the North Spit.

Western Gull (*Larus occidentalis*) – Abundant in the county year round. Common on Coos Bay and recorded in large numbers on every visit. A pair had a brood of two chicks on the eastern mooring at the site; both appeared to be forced prematurely into the water (as of August 11) by mooring operations. Both the *wymani* and *occidentalis* subspecies have been observed in the area, with the latter being considerably more abundant. This confirms breeding for Western Gull within the project area for 2005. Recorded on site in 2006.

Glaucous-winged Gull (*Larus glaucescens*) –Uncommon in the county in summer, abundant the rest of the year. Recorded on several visits in 2005, mainly after September. Glaucous-winged/Western Gull hybrids were seen in the area as well. Recorded on the shoreline of the project area in 2006.

Glaucous Gull (*Larus hyperboreus*) – A rare visitor to Coos County in winter and spring. One first-year bird was seen feeding on the carcass of a beaked whale on the beach side of the North Spit on December 7th, 2005 and again on mudflats of the site the following day.

Black-legged Kittiwake (*Rissa tridactyla*) – Recorded from the North Spit flying over the ocean. In Coos County, a fairly common visitor in the spring and fall, uncommon in the winter and absent in mid-summer.

Caspian Tern (*Sterna caspian*) – Fairly common in the county in the summer, rare in winter. Fairly common on Coos Bay; present in moderate numbers on the first five visits in 2005, but absent thereafter. Recorded on the March and April visits flying over the site.

Common Murre (*Uria aalge*) – Abundant in the county in the summer, uncommon in winter. Fairly common on Coos Bay and recorded on most summer visits, 2005.

Pigeon Guillemot (*Cepphus columba*) – Abundant in the county in summer, rare in winter. Common on Coos Bay and present in good numbers on nearly every pre-November visit in 2005. Apparently nested on the underside of the tanker dock. This confirms breeding for Pigeon Guillemot within the project area for 2005. Pigeon Guillemot was recorded on the March and April visits in 2006.

Rock Pigeon (*Columba livia*) – Abundant in the county. Recorded on site on four visits in 2005, mostly in summer and usually in a flock, around man-made structures. Recorded on site in 2006, usually around man-made structures.

Band-tailed Pigeon (*Columba fasciata*) – Rare in winter. Recorded on site only in November 11th, 2005.

Mourning Dove (*Zenaida macroura*) –Common in Coos County spring through fall and uncommon in winter. Recorded in the area only on November 10th, 2005.

Barn Owl (*Tyto alba*) – Uncommon in the county. Historically known to be present on site but not recorded by LBJ staff.

Common Nighthawk (*Chordeiles minor*) - Uncommon in the county in the summer, absent the rest of the year. Recorded once on site, a single fly-by bird on August 11, 2005.

Vaux's Swift (*Chaetura vauxi*) - Fairly common in the county in the summer, absent during the winter months. Recorded on site on two August visits in 2005.

Anna's Hummingbird (*Calypte costae*) **-** Fairly common in the county throughout the year. Recorded in brushy habitats on site on four visits in 2005. Recorded in forest and scrubby habitats on most visits on site in 2006.

Rufous Hummingbird (*Selasphorous rufus*) **–** Recorded on site in 2006. Several unidentified *Selasphorus* hummingbirds were recorded that were probably this species; however, the very similar Allen's Hummingbird (*S. sasin*) breeds in the area as well.

hummingbird species (*Selasphorus*) – One unidentified hummingbird of this genus was recorded on site on August 3, 2005. *Selasphorus* seen in the area are most likely to be Rufous Hummingbird (*S. rufus*), which is fairly common in the county. However, the very similar Allen's Hummingbird (*S. sasin*) breeds in the area as well. Another *Selasphorus* of unknown species was recorded in February, 2006.

Belted Kingfisher (*Ceryle alcyon*) – Fairly common in the county throughout the year. Recorded along the bayshore and around the ponds on every visit in 2005. Recorded along the bayshore and around the ponds in 2006. It probably breeds within the project area.

Red-breasted Sapsucker (*Sphyrapicus ruber*) – Uncommon resident in the county year-round. Recorded on site on two visits in 2005.

Downy Woodpecker (*Picoides pubescens*) – Fairly common in the county throughout the year. Recorded on site only on three summer visits in 2005.

Hairy Woodpecker (*Picoides tridactylus*) – Fairly common in the county throughout the year. Recorded on site on four visits, including all post-September visits in 2005.

Northern Flicker (*Colaptes auratus*) – Abundant in the county year round in a wide variety of wooded habitats. Recorded on site on every visit.

Pileated Woodpecker (*Dryocopus pileatus*) – Oregon's largest woodpecker is an uncommon year-round resident in the county. One was recorded on site in January, 2006.

Olive-sided Flycatcher (*Contopus cooperi*) – Fairly common in the county in the summer, absent from the area the rest of the year. Recorded singing on site on first three official visits in 2005.

Western Wood-Pewee (*Contopus sordidulus*) –A fairly common breeder in the county but migrates out of the area by the end of September. Recorded on site only on August 3, 2005.

Willow Flycatcher (*Empidonax traillii brewsteri*) – In the county, fairly common in the summer and uncommon on migration. Recorded once adjacent to the substation on the east side of the site on August 23, 2005, most likely an early fall migrant.

Black Phoebe (*Sayornis nigricans*) –Recorded in wetlands on site on every visit.

Hutton's Vireo (*Vireo huttoni*) – Fairly common in the county throughout the year. Recorded in wooded habitats on site on nearly every visit from late August to November, 2005. Recorded in wooded habitats on site in 2006.

Steller's Jay (*Cyanocitta stelleri*) – Abundant in the county year-round. Recorded in wooded habitats on site on every visit in 2005. Recorded regularly on site in wooded habitats in 2006.

American Crow (*Corvus brachyrhynchos*) – Abundant in the county throughout the year. Recorded on site on nearly every visit in 2005. Recorded on site in 2006.

Common Raven (*Corvus corax*) – Fairly common in the county year round.
Recorded on site on half of visits during 2005. A potential predator, the level of Raven activity should be monitored. Recorded on site in 2006.

Purple Martin (*Progne subis*) – Fairly common in the county in the summer, absent in the county from mid-fall until early spring. Fairly common around Coos Bay. Recorded over the site on nearly every pre-October visit, with active nests within view of the site in 2005. This confirms breeding by Purple Martin within the 2.0 mile buffer in 2005.

Tree Swallow (*Tachycineta bicolor*) – Abundant in the county in spring and summer. Recorded on site in 2005 and 2006.

Violet-green Swallow (*Tachycineta thalassina*) – Common in spring and summer in the county. Recorded on site consistently until mid August, 2005. First recorded on site in 2006 in April. This species was seen entering man-made structures, presumably to reach a nest.

Northern Rough-winged Swallow (*Stelgidopteryx serripennis*) – A fairly common breeder in Coos County, present from April to September. Recorded on site.

Cliff Swallow (*Petrochelidon pyrrhonota*) – Abundant in the county in spring and summer, absent in the winter months. Large numbers of this species can be found breeding on man-made structures on site. First recorded on site in 2006 in April.

Barn Swallow (*Hirundo rustica*) – Abundant in the county spring through fall, rarely in winter. Recorded on nearly every pre-October visit; seen foraging over all habitats in 2005. Recorded on site in 2006.

Black-capped Chickadee (*Poecile atricapilla*) –Uncommon resident of riparian zones on site, recorded on nearly every visit in 2005. Recorded on site in 2006.

Chestnut-backed Chickadee (*Poecile rufescens*) – Abundant in the county. Common resident of forest habitats, recorded on every visit in 2005. Recorded on site on every visit in 2006.

Bushtit (*Psaltriparus minimus*) – Abundant in the county. Recorded in scrub and riparian habitats on every visit in 2005.

Red-breasted Nuthatch (*Sitta canadensis*) – In the county, fairly common in the spring and summer and irregular in occurrence the rest of the year. Apparently an uncommon resident of or visitor to the site's forests, recorded on four pre-October visits in 2005.

Brown Creeper (*Certhia americana*) –Fairly common throughout the year in Coos County. Recorded on half of our visits to the site in 2005, where it is fairly common in the dune forest.

Bewick's Wren (*Thryomanes bewickii*) – Fairly common in the county year-round. Recorded in scrub and riparian areas on site on most visits in 2005. Recorded in scrub and riparian areas on site in 2006.

Winter Wren (*Troglodytes troglodytes*) –Recorded in forest habitats on nearly every visit in 2005. Recorded on site in forest habitats on nearly every visit in 2006.

Marsh Wren (*Cistothorus palustris*) –Abundant in the county year-round. Recorded in Henderson Marsh in 2005.

Golden-crowned Kinglet (*Regulus satrapa*) – Abundant in the county year-round. Recorded on most visits in the dune forest, where it is frequently found in small flocks with other species. Easily overlooked.

Ruby-crowned Kinglet (*Regulus calendula*) – Common winter visitor in a wide range of wooded habitats. Recorded on site on all post-September visits in 2005. In 2006, Ruby-crowned Kinglet was recorded on site every visit.

Swainson's Thrush (*Catharus ustulatus*) –Abundant breeder in the county from May to August, absent by late fall. Either ceased vocalizing or moved out of the area by early August. Recorded only once on site, in dune forest on July 21st, 2005.

Hermit Thrush (*Catharus guttatus*) – Fairly common throughout the year in the county. Recorded on site on all post-September visits in 2005. Recorded on site in 2006.

American Robin (*Turdus migratorius*) –Abundant year-round resident in the county. Common on site in the dune forest and around wetlands; present on all visits in 2005.

Wrentit (*Chamaea fasciata*) –Abundant in the county throughout the year. Common in brushy areas of the dune forest and recorded on every visit in 2005. Recorded on site on every 2006 visit.

European Starling (*Sturnus vulgaris*) – Abundant year-round in the county. Recorded on nearly every visit in 2005, mostly in more disturbed areas and in small flocks along the shore. Recorded on site in 2006.

American Pipit – Common winter resident and migrant in the area. Recorded on every fall visit in 2005.

Cedar Waxwing (*Bombycilla cedrorum*) – Fairly common in the county, this species can be found in large flocks during migration. Rare in winter. Recorded on all pre-November visits in 2005.

Orange-crowned Warbler (*Vermivora celata*) – Abundant in the county in the summer, rare in the winter. Recorded on July 21, 2005. First recorded in 2006 on site in April.

Yellow Warbler (*Dendroica petechia*) – Uncommon in the county in summer, absent from the area for much of the year. Recorded on site in August, 2005. Birds recorded on site were most likely migrants based on habitat and time of year, whereas birds heard singing elsewhere on the North Spit may have been attempting to breed.

Yellow-rumped Warbler – Uncommon breeder in the higher elevations in the county, abundant the rest of the year. Recorded on site on four (mostly fall) visits in 2005. This species occurred commonly on site in both forested and scrub habitats in 2006.

Townsend's Warbler (*Dendroica townsendi*) – Uncommon in the county fall through spring. Recorded on site on all visits from August 31, 2005 onwards. Recorded regularly on site in 2006 in small numbers, often with flocks of chickadees, kinglets and yellow-rumped warblers.

Common Yellowthroat (*Geothlypsis trichas*) – Abundant in the county spring through early fall, found only rarely in the winter. Recorded at one of the ponds on site on one August 12, 2005.

Wilson's Warbler (*Wilsonia pusilla*) – Abundant in the county in the summer.
Recorded on site on two August visits in 2005.

Western Tanager (*Piranga ludoviviana*) –Breeds abundantly in the county but absent the rest of the year. Recorded on site only on one August visit in 2005.

Spotted Towhee (*Pipilo maculatus*) – Abundant in the county. Common resident of brushy habitats at Jordan Cove; frequently heard singing from the dune forest where there is thick undergrowth. Present on all visits in 2005.

Savannah Sparrow (*Passerculus sandwichensis*) – In Coos County, uncommon in winter and fairly common to abundant spring thru fall. Recorded on site in grassy areas on two August visits in 2005 and in 2006.

Fox Sparrow (*Passerella iliaca*) **–** A common winter visitor and migrant in a wide variety of shrubby habitats in the area; absent in the summer months. Present on site on all post-September, 2005 visits. Recorded on site on all 2006 visits.

Song Sparrow (*Melospiza melodia*) – Abundant year-round resident in Coos County. Fairly common near wetlands and in shrubby areas of the dune forest on every visit in 2005. Fairly common near wetlands and in shrubby areas of the dune forest on every visit in 2006.

Lincoln's Sparrow (*Melospiza lincolni)* –Fairly common winter visitor and migrant. Recorded on site in October and December, 2005. Recorded on site in 2006.

White-throated Sparrow (*Zonotrichia albicolis*) –Uncommon in Coos County in the winter. One recorded on site in December 7, 2005. One was recorded on site in November, 2006.

White-crowned Sparrow (*Zonotrichia leucophrys*) – Abundant in the county. Present on site on most visits in 2005, especially in summer. Common in shrubby areas and woodland edges. Recorded on site in 2006.

Golden-crowned Sparrow (*Zonotrichia leucophrys*) **–F**airly common winter visitor and migrant in the county but absent in the summer months. Recorded on site only in October and December, 2005. Recorded regularly on site in 2006.

Dark-eyed Junco (*Junco hyemalis*) **–** Abundant in the county from September to June, uncommon in the summer. Recorded on site on most visits; fairly common in the dune forest. Only the expected subspecies, *J. h. thurberi*, of the "Oregon" form, has been recorded.

Red-winged Blackbird (*Agelaius phoeniceus*) – Abundant in the county spring through fall, fairly common in winter, but only an uncommon visitor to Jordan Cove, where breeding habitat is lacking. Recorded on three visits in 2005. Recorded on site in 2006.

Western Meadowlark (*Sturnella neglecta*) – Fairly common in Coos County fall through spring, uncommon in the summer. One detected on site in February, 2006.

Brown-headed Cowbird (*Molothrus ater*) – Abundant in the county spring through fall, rare in winter. Recorded on site only once, in late July 2005.

Bullock's Oriole (*Icterus bullockii*) – In Coos County, they are uncommon in summer and rare in the fall. The one bird recorded on site, August 11, 2005, was most likely a fall migrant.

Purple Finch (*Carpodacus purpureus*)– Fairly common in the county in summer, uncommon in winter. Recorded on site on most visits in 2005; usually found in riparian areas and coniferous forests. Recorded on site in 2006.

House Finch (*Carpodacus mexicanus*) – Abundant in the county throughout the year. Recorded on site in disturbed habitats on nearly every visit in 2005. Recorded on every visit on site in 2006.

Red Crossbill (*Loxia curvirostra*) – Irregular occurrence in the county year round, local populations fluctuating considerably from year to year. Recorded on site on three visits in 2005.

American Goldfinch (*Carduelis tristis*) – Abundant in the county in the spring and summer, uncommon in the fall and winter. Recorded on site on nearly every visit in 2005. Recorded on site in 2006. Frequents brushy and riparian areas.

Appendix 3

Jordan Cove Species List

Appendix 3. Tetrapod vertebrates detected during LBJ site visits to Jordan Cove, Coos Bay, Oregon, June, 2005, to November, 2006.

Species in bold print are not on the BLM North Spit species list.

Amphibians
Northwestern Salamander (*Ambystoma gracile*)
Pacific Treefrog (*Hyla regilla*)
Red-legged Frog (*Rana aurora*)
Bullfrog (*Rana catesbeiana*)

Reptiles
Northern Alligator Lizard (*Elgaria coerulea*)
Western Fence Lizard (*Sceloporus occidentalis*)
Northwestern Garter Snake (*Thamnophis ordinoides*)
Common Garter Snake (*Thamnophis sirtalis*)

Birds
Brant (*Branta bernicla*)
Cackling Goose (*Branta hutchinsii*)
Canada Goose (*Branta Canadensis*)
Wood Duck (*Aix sponsa*)
Eurasian Wigeon (*Anas penelope*)
American Wigeon (*Anas americana*)
Mallard (*Anas platyrhynchos*)
Northern Shoveler (*Anas clypeata*)
Northern Pintail (*Anas acuta*)
Green-winged Teal (*Anas crecca*)
Ring-necked Duck (*Aythya collaris*)
Greater Scaup (*Aythya marila*)
Surf Scoter (*Melanitta perspicillata*)
White-winged Scoter (*Melanitta fusca*)
Black Scoter (*Melanitta nigra*)
Bufflehead (*Bucephala albeola*)
Hooded Merganser (*Lophodytes cucullatus*)
Red-breasted Merganser (*Mergus serrator*)
Ruddy Duck (*Oxyura jamaicensis*)
Mountain Quail (*Oreortyx pictus*)
California Quail (*Callipepla californica*)
Red-throated Loon (*Gavia stellata*)
Pacific Loon (*Gavia pacifica*)
Common Loon (*Gavia immer*)
Pied-billed Grebe (*Podilymbus podiceps*)
Horned Grebe (*Podiceps auritus*)
Red-necked Grebe (*Podiceps grisegena*)
Eared Grebe (*Podiceps nigricollis*)
Western Grebe (*Aechmophorus occidentalis*)
Clark's Grebe (*Aechmophorus clarkii*)
Brown Pelican (*Pelecanus occidentalis*)
Brandt's Cormorant (*Phalacrocorax penicillatus*)
Double-crested Cormorant (*Phalacrocorax auritus*)
Pelagic Cormorant (*Phalacrocorax pelagicus*)
American Bittern (*Botaurus lentiginosus*)
Great Blue Heron (*Ardea herodias*)
Great Egret (*Ardea alba*)
Green Heron (*Butorides virescens*)
Turkey Vulture (*Cathartes aura*)
Osprey (*Pandion haliaetus*)
White-tailed Kite (*Elanus caeruleus*)
Bald Eagle (*Haliaeetus leucocephalus*)
Northern Harrier (*Circus cyaneus*)
Sharp-shinned Hawk (*Accipiter striatus*)
Cooper's Hawk (*Accipiter cooperii*)
Red-shouldered Hawk (*Buteo lineatus*)
Red-tailed Hawk (*Buteo jamaicensis*)
Rough-legged Hawk (*Buteo lagopus*)
American Kestrel (*Falco sparverius*)
Merlin (*Falco columbarius*)
Peregrine Falcon (*Falco peregrinus*)
Virginia Rail (*Rallus limicola*)
Sora (*Porzana carolina*)
American Coot (*Fulica americana*)
Black-bellied Plover (*Pluvialis squatarola*)
Semipalmated Plover (*Charadrius semipalmatus*)
Killdeer (*Charadrius vociferus*)
Greater Yellowlegs (*Tringa melanoleuca*)
Willet (*Catoptrophorus semipalmatus*)
Spotted Sandpiper (*Actitis macularia*)
Whimbrel (*Numenius phaeopus*)
Marbled Godwit (*Limosa fedoa*)
Black Turnstone (*Arenaria melanocephala*)
Sanderling (*Calidris alba*)
Western Sandpiper (*Calidris mauri*)
Least Sandpiper (*Calidris minutilla*)
Dunlin (*Calidris alpine*)
Ruff (*Philomachus pugnax*)
Dowitcher sp. (*Limnodromus* sp.)
Wilson's Snipe (*Gallinago delicata*)
Red-necked Phalarope (*Phalaropus lobatus*)
Bonaparte's Gull (*Larus Philadelphia*)
Heermann's Gull (*Larus heermanni*)
Mew Gull (*Larus canus*)
Ring-billed Gull (*Larus delawarensis*)
California Gull (*Larus californicus*)
Herring Gull (*Larus argentatus*)
Western Gull (*Larus occidentalis*)
Glaucous-winged Gull (*Larus glaucescens*)
Glaucous Gull (*Larus hyperboreus*)
Caspian Tern (*Sterna caspia*)
Common Murre (*Uria aalge*)
Pigeon Guillemot (*Cepphus columba*)
Rock Pigeon (*Columba livia*)
Band-tailed Pigeon (*Columba fasciata*)
Mourning Dove (*Zenaida macroura*)
Common Nighthawk (*Chordeiles minor*)
Vaux's Swift (*Chaetura vauxi*)
Anna's Hummingbird (*Calypte anna*)
Rufous Hummingbird (*Selasphorus rufus*)
Belted Kingfisher (*Ceryle alcyon*)
Red-breasted Sapsucker (*Sphyrapicus ruber*)
Downy Woodpecker (*Picoides pubescens*)
Hairy Woodpecker (*Picoides villosus*)
Northern Flicker (*Colaptes auratus*)
Pileated Woodpecker (*Dryocopus pileatus*)
Olive-sided Flycatcher (*Contopus borealis*)
Western Wood-Pewee (*Contopus sordidulus*)
Willow Flycatcher (*Empidonax traillii*)
Black Phoebe (*Sayornis nigricans*)
Hutton's Vireo (*Vireo huttoni*)
Steller's Jay (*Cyanocitta stelleri*)
American Crow (*Corvus brachyrhynchos*)
Common Raven (*Corvus corax*)
Purple Martin (*Progne subis*)

Tree Swallow (*Tachycineta bicolor*)
Violet-green Swallow (*Tachycineta thalassina*)
Northern Rough-winged Swallow (*Stelgidopteryx serripennis*)
Cliff Swallow (*Hirundo pyrrhonota*)
Barn Swallow (*Hirundo rustica*)
Black-capped Chickadee (*Parus atricapillus*)
Chestnut-backed Chickadee (*Parus rufescens*)
Bushtit (*Psaltriparus minimus*)
Red-breasted Nuthatch (*Sitta canadensis*)
Brown Creeper (*Certhia americana*)
Bewick's Wren (*Thryomanes bewickii*)
Winter Wren (*Troglodytes troglodytes*)
Marsh Wren (*Cistothorus palustris*)
Golden-crowned Kinglet (*Regulus satrapa*)
Ruby-crowned Kinglet (*Regulus calendula*)
Swainson's Thrush (*Catharus ustulatus*)
Hermit Thrush (*Catharus guttatus*)
American Robin (*Turdus migratorius*)
Wrentit (*Chamaea fasciata*)
European Starling (*Sturnus vulgaris*)
American Pipit (*Anthus rubescens*)
Cedar Waxwing (*Bombycilla cedrorum*)
Orange-crowned Warbler (*Vermivora celata*)
Yellow Warbler (*Dendroica petechia*)
Yellow-rumped Warbler (*Dendroica coronata*)
Townsend's Warbler (*Dendroica occidentalis*)
Common Yellowthroat (*Geothlypis trichas*)
Wilson's Warbler (*Wilsonia pusilla*)
Western Tanager (*Piranga ludoviciana*)
Spotted Towhee (*Pipilo maculates*)
Savannah Sparrow (*Passerculus sandwichensis*)
Fox Sparrow (*Passerella iliaca*)
Song Sparrow (*Melospiza melodia*)
Lincoln's Sparrow (*Melospiza lincolnii*)
White-throated Sparrow (*Zonotrichia albicollis*)
White-crowned Sparrow (*Zonotrichia leucophrys*)
Golden-crowned Sparrow (*Zonotrichia atricapilla*)
Dark-eyed Junco (*Junco hyemalis*)
Red-winged Blackbird (*Agelaius phoeniceus*)
Western Meadowlark (*Sturnella neglecta*)
Brown-headed Cowbird (*Molothrus ater*)
Bullock's Oriole (*Icterus bullockii*)
Purple Finch (*Carpodacus purpureus*)
House Finch (*Carpodacus mexicanus*)
Red Crossbill (*Loxia curvirostra*)
American Goldfinch (*Carduelis tristis*)

Mammals
Virginia Opossum (*Didelphis virginiana*)
Gray Fox (*Urocyon cinereoargentus*)
Black Bear (*Ursus americanus*)
Northern Raccoon (*Procyon lotor*)
Northern River Otter (*Lontra canadensis*)
Striped Skunk (*Mephitis mephitis*)
Bobcat (*Lynx rufus*)
Harbor Seal (*Phoca vitulina*)
Elk (*Cervus elaphus*)
Mule Deer (*Odocoileus hemionus*)
Douglas's Squirrel (*Tamasciurus douglasii*)
California Ground Squirrel (*Spermophilus beecheyi*)
Townsend's Chipmunk (T*amias townsendii*)
North American Deermouse (*Peromyscus maniculatus*)
North American Porcupine (*Erethizon dorsatum*)
Brush Rabbit (*Sylvilagus bachmani*)

Appendix 4

Track Plate Summary

Appendix 4. Jordan Cove Project Track Plate Study, Coos Bay, Oregon, LBJ Enterprises.

Survey Schedule

Station	9/9/2005	10/18/2005	11/10/2005	12/8/2005	1/26/2006	2/14/2006	3/29/2006	4/13/2006
F1	X	X	-	X	X	X	X	X
F2	X	-	-	-	-	-	-	-
F3	X	X	-	X	X	X	-	-
F4	X	X	X	X	X	X	X	X
F5	-	X	X	X	X	X	-	X

Results

Eleven species were recorded on the track plates (see table). No fishers or martens were recorded.

Species	Bait station(s)
American Opossum	F1, F3, F4, F5
Gray Fox	F1, F3, F4, F5
Northern Raccoon	F3, F4, F5
Striped Skunk	F3, F4, F5
Domestic Cat or Bobcat	F4
Douglas's Squirrel	F3, F4, F5
California Ground Squirrel	F1, F2
Townsend's Chipmunk	F1, F5
North American Deermouse	F1, F3, F4, F5
North American Porcupine	F3, F4
Brush Rabbit	F1

Appendix 5

USFWS Species List

ENCLOSURE A

FEDERALLY LISTED THREATENED, ENDANGERED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN WHICH MAY OCCUR WITHIN COOS COUNTY, OREGON

LISTED SPECIES[1/]

Mammals		
Steller (=northern) sea lion	*Eumetopias jubatus*	T*
Birds		
Marbled murrelet[2/]	*Brachyramphus marmoratus*	CH T
Western snowy plover (coastal pop.)[3/]	*Charadrius alexandrinus nivosus*	CH T
Bald eagle[4/]	*Haliaeetus leucocephalus*	T
Brown pelican	*Pelecanus occidentalis*	E
Short-tailed albatross[5/]	*Phoebastria (=Diomedea) albatrus*	E
Northern spotted owl[6/]	*Strix occidentalis caurina*	CH T
Plants		
Western lily	*Lilium occidentale*	E

PROPOSED SPECIES

None

CANDIDATE SPECIES[7/]

Mammals	
Pacific fisher[8/]	*Martes pennanti pacifica*

SPECIES OF CONCERN

Mammals	
Pallid bat (west of Cascade crest)	*Antrozous pallidus pacificus*
White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Pacific western big-eared bat	*Corynorhinus townsendii townsendii*
Silver-haired bat	*Lasionycteris noctivagans*
Long-eared myotis (bat)	*Myotis evotis*
Fringed myotis (bat)	*Myotis thysanodes*
Long-legged myotis (bat)	*Myotis volans*
Yuma myotis (bat)	*Myotis yumanensis*
Birds	
Northern goshawk	*Accipiter gentilis*
Band-tailed pigeon	*Columba fasciata*
Olive-sided flycatcher	*Contopus cooperi*
Yellow-breasted chat	*Icteria virens*
Acorn woodpecker	*Melanerpes formicivorus*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Oregon vesper sparrow	*Pooecetes gramineus affinis*
Purple martin	*Progne subis*
Amphibians and Reptiles	
Tailed frog	*Ascaphus truei*

Northwestern pond turtle	*Emys marmorata marmorata*
California mountain kingsnake	*Lampropeltis zonata*
Del Norte salamander	*Plethodon elongatus*
Northern red-legged frog	*Rana aurora aurora*
Foothill yellow-legged frog	*Rana boylii*
Southern torrent (seep) salamander	*Rhyacotriton variegatus*
Fishes	
Green sturgeon	*Acipenser medirostris*
River lamprey	*Lampetra ayresi*
Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout (Oregon Coast)	*Oncorhynchus clarki clarki*
Steelhead (Oregon Coast)	*Oncorhynchus mykiss* ssp. *
Millicoma dace	*Rhinichthys catarctae* ssp.
Invertebrates	
Newcomb's littorine snail	*Algamorda newcombiana*
California floater (mussel)	*Anodonta californiensis*
Plants	
Pink sand verbena	*Abronia umbellata* ssp. *breviflora*
Bensonia	*Bensoniella oregana*
Pt. Reyes bird's-beak	*Cordylanthus maritimus* ssp. *palustris*
Seaside gilia	*Gilia millefoliata*
Moss	*Limbella fryei*
Silvery phacelia	*Phacelia argentea*
Coast checker bloom	*Sidalcea malvaeflora* ssp. *patula*
Leach's brodiaea	*Triteleia hendersonii* var. *leachiae*

(E) - Listed Endangered *(T) - Listed Threatened* *(CH) - Critical Habitat has been designated for this species*
(PE) - Proposed Endangered *(PT) - Proposed Threatened* *(PCH) - Critical Habitat has been proposed for this species*

Species of Concern - Taxa whose conservation status is of concern to the Service (many previously known as Category 2 candidates), but for which further information is still needed.

* *Consultation with NOAA's National Marine Fisheries Service may be required.*

[1/] *U.S. Department of Interior, Fish and Wildlife Service, October 31, 2000, Endangered and Threatened Wildlife and Plants, 50 CFR 17.11 and 17.12*
[2/] *Federal Register Vol. 57, No. 45328, October 1, 1992, Final Rule - Marbled Murrelet*
[3/] *Federal Register Vol. 64, No. 234, December 7, 1999, Final Rule - Critical Habitat for the Western Snowy Plover*
[4/] *Federal Register Vol. 60, No. 133, July 12, 1995, - Final Rule - Bald Eagle*
[5/] *Federal Register Vol. 65, No. 147, July 31, 2000, - Final Rule To List the Short-Tailed Albatross as Endangered in the United States*
[6/] *Federal Register Vol. 57, No. 10, January 15, 1992, Final Rule - Critical Habitat for the Northern Spotted Owl*
[7/] *Federal Register Vol. 69, No. 86, May 4, 2004, Notice of Review - Candidate or Proposed Animals and Plants*
[8/] *Federal Register Vol. 69, No. 68, April 8, 2004, 12-Month Finding for a Petition to List the West Coast Distinct Population Segment of the Fisher*

Appendix 6

BLM Table

Table 4. Special status wildlife species documented (D), suspected (S) and potentially (P) on the North Spit by name, presence, and habitat. Note: BA=Bureau assessment, BAO=Bureau assessment Oregon only, BS=Bureau sensitive, BSO=Bureau sensitive Oregon only, FE=Federally endangered, FT=Federally threatened, and FC=Federal Candidate.

NAME	Presence	Status	Habitat
AMPHIBIANS			
California Slender Salamander *Batrachoseps attenuatus*	S	BAO	Late seral forests, large down logs
REPTILES			
Northwestern Pond Turtle *Clemmys marmorata*	D	BSO	Lentic water (ponds, slow sections of rivers). Nests in open areas adjacent to water, can overwinter in forest
BIRDS			
Arctic Peregrine Falcon *Falco peregrinus tundrius*	D	BS	Cliffs, may perch in trees
American Peregrine Falcon *Falco peregrinus anatum*	D	BS	Cliffs, may perch in trees
Cacklin Goose *Branta Canadensis leucopareia*	D	BSO	Coastal grasslands
Dusky Canda Goose *Branta Canadensis occidentalis*	D	BSO	Open grasslands, wet meadows
Bald Eagle *Haliaeetus leucocephalus*	D	FT	Large trees for nesting/perching, near water
Bobolink *Dolichonyx oryzivorus*	D	BAO	Grasslands, open areas
Brown Pelican *Pelecanus occidentalis*	D	FE	Forages off shore, uses jetties and beaches to roost
Marbled Murrelet *Brachyramphus marmoratus*	D	FT	Late-seral forest, remnant large trees
Oregon Vesper Sparrow *Pooecetes gramineus affinis*	D	BSO	Grassland
Purple Martin *Progne subis*	D	BSO	Large remnant trees and snags, near water, edges
Streaked Horned Lark *Eremophila alpestris strigata*	D	FC	Coastal dunes; open ground with short grass or scattered bushes
Trumpeter Swan *Cygnus buccinator*	P	BAO	Marsh, wet meadows, bogs, ponds
Upland Sandpiper *Bartramia longicauda*	D	BSO	Coast; open grasslands
Western Snowy Plover *Charadrius alexandrinus nivosus*	D	FT	Beaches and inland areas of open sand
White-tailed Kite *Elanus leucurus*	D	BAO	Pastures, open grasslands; typically low elevations
MAMMALS			
Fisher *Martes pennanti*	P	FC	Closed or multi-canopy forest. Snags, dead parts of live trees, large live branches
Townsend's Big-eared Bat *Corynorhinus townsendii*	P	BSO	Breed in caves and mines, bridges for night roosts
INVERTEBRATES			
Salamander Slug *Glibates oregonius*	P	BSO	Moist coniferous forest with leaf litter
Spotted Tail-dropper *Prophysaon vanattae pardalis*	P	BSO	Moist, mature forests

APPENDIX P-3

SHN 2013 Botanical Resources Assessment Report

Botanical Resources Assessment Report

Jordan Cove Energy Project
Coos County, Oregon

Prepared for:

Jordan Cove Energy

Consulting Engineers & Geologists, Inc.

275 Market Ave
Coos Bay, OR 97420-2225
541-266-9890

May 2013
611048.131

Reference: 611048.131

Botanical Resources Report

Jordan Cove Energy Project
Coos County, Oregon

Prepared for:

Jordan Cove Energy
123 W. Central Avenue, Ste. 380
Coos Bay, OR 97420

Prepared by:

Consulting Engineers & Geologists, Inc.
275 Market Avenue
Coos Bay, OR 97420-2228
(541) 266-9890

May 2013

QA/QC:BJG

Table of Contents

Page

List of Illustrations ii

Abbreviations and Acronyms iii

1.0 Introduction 1

2.0 Environmental Setting 1
- 2.1 Project Location 1
- 2.2 Current Land Use 1
- 2.3 Landscape Setting 3

3.0 Methodology 4
- 3.1 Regulatory Context 4
- 3.2 Botanical Assessment and Survey Protocol 5

4.0 Vegetation Associations 7
- 4.1 Forest Associations 7
  - Shore Pine-Douglas Fir/Wax Myrtle-Evergreen Huckleberry (Evergreen, Upland) 7
  - Shore Pine-Sitka Spruce/Evergreen-Huckleberry (Evergreen, Upland) 7
  - Shore Pine/Scotch Broom/European Beachgrass (Evergreen, Upland) 9
  - Port Orford Cedar/Evergreen-Huckleberry (Evergreen, Upland) 9
  - Shore Pine/Slough Sedge (Evergreen, Seasonally Flooded) 10
  - Red Alder/Salmonberry/Slough Sedge-Skunk Cabbage (Deciduous, Saturated) 10
- 4.2 Woodland Associations 10
  - Shore Pine/Bearberry (Evergreen, Upland) 10
  - Shore Pine/Hairy Manzanita (Evergreen, Upland) 11
- 4.3 Shrubland Associations 11
  - Hooker Willow-Crabapple/Slough Sedge-Skunk Cabbage (Deciduous, Saturated) 11
- 4.4 Herbaceous Associations 12
  - European Beachgrass (Perennial, Upland) 12
  - Red Fescue-Salt Rush (Perennial, Upland) 13
  - American Dunegrass (Perennial, Upland) 13
  - Pond Lily (Perennial, Semi-permanently Flooded) 13
- 4.5 Other Plant Associations 13
  - Maintained Grasslands 13
  - Common Cattail/Open Water 13
  - Salt Marshes 14
- 4.6 Dune Forests 14

5.0 Unique and Special Status Species 16

6.0 Threatened and Endangered Species Analysis 18
- 6.1 Pink Sand Verbena (Federal Species of Concern, State Endangered) 18
- 6.2 Point Reyes Bird's-Beak (Federal Species of Concern, State Endangered) 18
- 6.3 Silvery Phacelia (Federal Species of Concern, State Threatened) 19

6.4 Western Lily (Federal Endangered, State Endangered) 19
6.5 Wolf's Evening Primrose (Federal Species of Concern, State Threatened) 21
7.0 Impact Analysis to Threatened and Endangered Species 21
8.0 Analysis of Vegetation Impacts 24
9.0 Invasive Species 25
10.0 Recommendations 25
11.0 Qualifications 26
12.0 References Cited 27

Appendices

Appendix A Species List
Appendix B Vegetation Impacted
Appendix C Vegetation Association Photos

List of Illustrations

Figures **Page**

1. Site Location Map 2
2. Study Area 6
3. Vegetation Associations 8
4. North Central Wetland 15
5. Point Reyes bird's-beak 20

Tables

Page

1. Table 1 Special Status Botanical Species with the Potential to Occur Jordon Cove Energy Project 17

Abbreviations and Acronyms

BLM	Bureau of Land Management
DEA	David Evans and Associates, Inc.
E	exotic
ESA	Endangered Species Act (federal)
FE	federally endangered
FERC	Federal Energy Regulatory Commission
MSL	mean sea level
N	native
NR	no reference
NRCS	Natural Resources Conservation Service
OAR	Oregon Administrative Rules
ODA	Oregon Department of Agriculture
OESA	Oregon Endangered Species Act
ORBIC	Oregon Biodiversity Information Center
ORS	Oregon Revised Statutes
OSS	Oregon Secretary of State
POC	Port–Orford-cedar
SE	state endangered
SHN	SHN Consulting Engineers & Geologists, Inc.
SOC	species of concern
ST	state threatened
USDA	U.S. Department of Agriculture
USDI	United States Department of Interior
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1.0 Introduction

This botanical resources report has been prepared for the Jordan Cove Energy Project (JCEP; Project). The Project proposes to construct and operate a natural gas liquefaction and export facility on the north shore of Coos Bay. The Project will include the following: LNG export facility, utility and access corridor, South Dunes Power Plant, Southwest Oregon Resource Security Center, and off-site temporary worker camp. For purposes of this report, LNG Terminal will refer to the entire, export facility mentioned above, other than the off-site worker camp. The Project area encompasses 452.4 acres of land, including nonjurisdictional facilities and temporary construction areas, and will permanently impact approximately 256.9 acres. Compensatory mitigation sites are also included in this report and include the Kentuck site for wetland and estuarine resources, the panhandle site for wetland and wildlife habitat mitigation, and an eelgrass mitigation site southwest of the Southwest Oregon Regional Airport in North Bend.

Extensive surveys have been conducted at the Project site for botanical resources by SHN Consulting Engineers & Geologists, Inc. (SHN). The project site was initially surveyed and evaluated extensively in 2005/2006 for the previously proposed LNG import facility. Additional surveys were conducted in 2012/2013 to supplement the previous assessments and ensure that all existing botanical resources are included in this evaluation. This report contains a botanical resources assessment for the Project, based on surveys conducted from June 9, 2005, through May 3, 2013.

2.0 Environmental Setting

2.1 Project Location

The Project is on the north shore of Coos Bay, in unincorporated Coos County, Oregon, within Sections 3, 4, and 5 of Township 25 South, Range 13 West, Willamette Meridian; North Bend and Empire 7.5 minute U.S. Geological Survey topographic quadrangle (Figure 1). The site is north of the towns of North Bend and Coos Bay, Oregon and is on the bay side of the North Spit. South of the project area, across the open water of Coos Bay, is the Southwest Oregon Regional Airport. Directly north of the project area is the Trans Pacific Parkway and railroad. To the north of Trans Pacific Parkway are mitigation wetlands created by the Weyerhaeuser Company and the Oregon Dunes National Recreation Area administered by the U.S. Forest Service. In the northwest corner of the study area is Bureau of Land Management (BLM)-administered land including a Special Recreation Management Area and an Area of Critical Environmental Concern. Henderson Marsh borders the western boundary of the project area.

2.2 Current Land Use

The natural habitat in the immediate area of the LNG Terminal has been altered by the historic use of this property, including the area east of Henderson Marsh (now known as the Ingram Yard) that has been altered by the historical Henderson Ranch settlement and past placement of dredged fill material. East of Ingram Yard, the Project area includes a dune forest where the majority of the site's natural habitats remain unaltered by industrial activity. Structures located immediately adjacent to the LNG Terminal site include two large buildings (Roseburg Forest Products north and

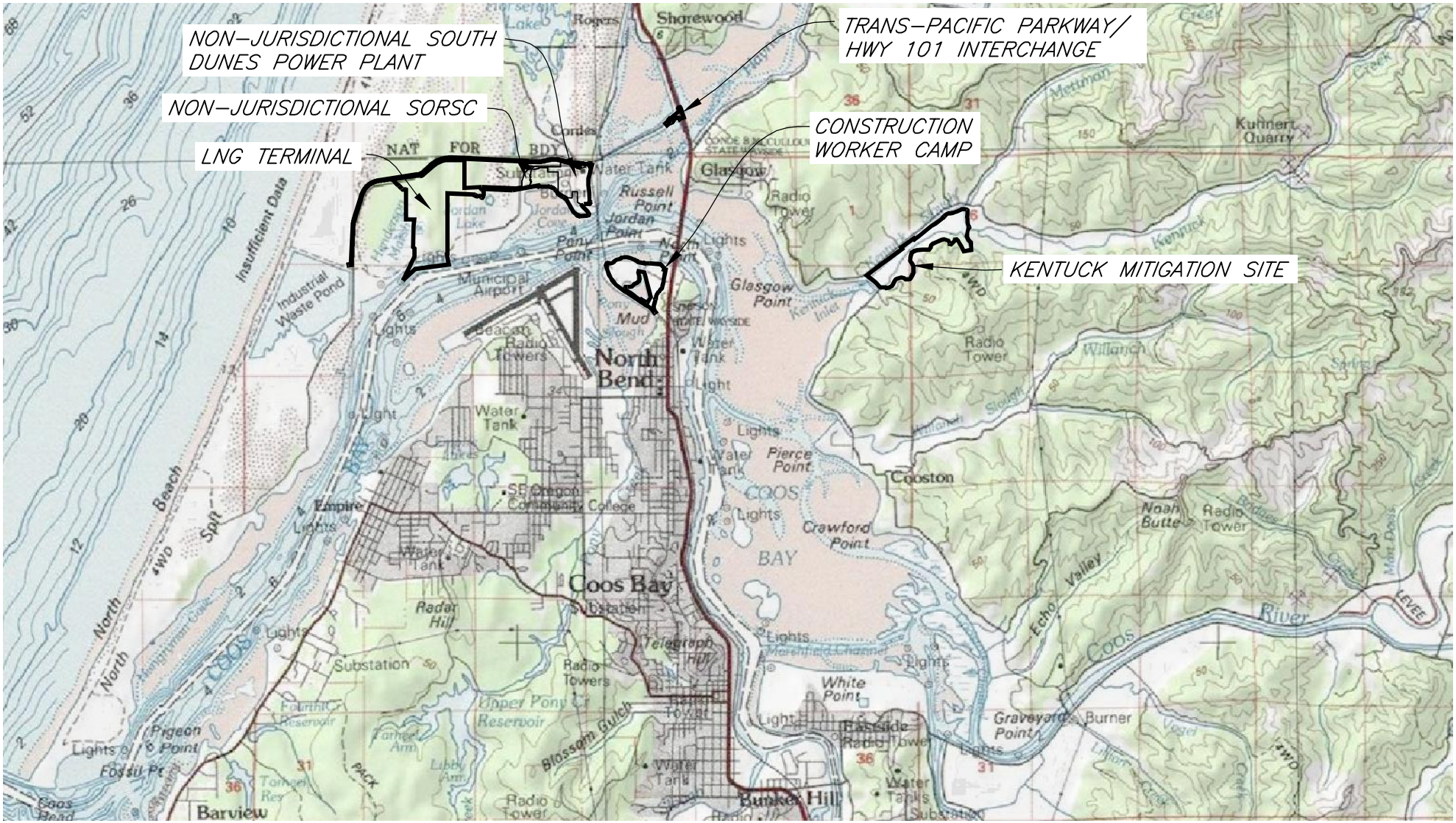


IMAGE SOURCE: USA TOPO MAP

0 500

1"=500'

SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Project Botantical Resources Assessment Report Coos County, Oregon		Site Location SHN 611048.131
	January 2013	611048HABITAT	Figure 1

south buildings), a few small outbuildings, and a substantial concrete lay down area east and south of the two buildings. Additionally, there are two large water tanks on the Project site within the dune forest along the ridgeline. A dirt road provides access to the water tanks from the developed area.

The South Dunes Power Plant site is located in the eastern portion of the Project at a former linerboard mill site owned by the Weyerhaeuser. The site includes asphalt surfacing, gravel access roads, and previously disturbed grassland habitats, along with a portion of Jordan Cove Road. To connect the LNG Terminal to the South Dunes Power Plant, the Project includes a utility and access corridor which currently supports the disposal of industrial wastewater from the landfills located on the former Weyerhaeuser property. With the exception of the utility and access corridor, the entire Project site is bordered by the Trans Pacific Parkway on the northern perimeter.

To the south of the utility and access corridor and immediately east of Ingram Yard, Roseburg Forest Products operates a chip facility on the waterfront that includes a dock for mooring ships, infrastructure for loading ships, large chip piles with associated heavy equipment used for moving the piles, and a few office buildings with parking spaces. Chip trucks enter the Project area by way of the Trans Pacific Parkway to Jordan Cove Road and unload at the Roseburg facility.

The majority of the Project site is privately-owned by Fort Chicago LNG II U.S. L.P., an affiliate of the JCEP. Upon completion of construction of LNG Terminal slip, carrier berth, and tug berth, the JCEP will enter into a sell back long-term lease agreement with the Port of Coos Bay (Port), through which the ownership of the slip will be transferred to the Port. The access channel for the slip will be constructed by the JCEP on land owned by the State of Oregon from which the Port has obtained an easement for the use and maintenance of the access channel.

Additional land for temporary construction areas will be leased from private owners, including the Roseburg Forest Products site for temporary office, laydown, fabrication, craft, break/lunchroom, and parking areas; and an additional 48.6 acres will be leased on the North Bend side of the channel adjacent to the McCullough Bridge, west side, and used for the temporary construction worker camp. The worker camp site includes two distinct areas (eastern and western) intersected by North Point Slough. The eastern half of the site includes an abandoned industrial area that is the remains of a logging deck used to store logs until recently. The western half of the site includes a historical dredge spoils site. The highly disturbed eastern half has been filled and road prisms (gravel) have been built throughout the majority of the site.

2.3 Landscape Setting

The Project will encompass a number of different habitat types that support diverse plant associations, as well as disturbed areas resulting from the placement of fill from historical dredging operations on the western portion of the study area and previous industrial use by Weyerhaeuser on the eastern portion. Vegetation in the area to be affected by construction of the Project is generally typical of vegetation and associated habitats found on the North Spit of Coos Bay. The overall location was selected on the basis of avoiding, to the extent practical, unique vegetation communities and higher value wetlands. Selection of temporary construction sites was purposely restricted to upland areas to avoid impacting wetlands. Elevations throughout the project area range from near sea level to approximately 150 feet above mean sea level. Topography varies from

flat to slopes that are greater than 70 percent. Average precipitation for the year is 65 inches (NRCS 2012).

Approximately 32.3 acres of wetlands that occur within the Project footprint will not be disturbed by construction or operation activities and will be preserved. Construction of the facility and associated access and utility corridor will result in the loss of approximately 1.8 acres of forested, scrub-shrub, emergent, and ponded wetlands. Compensation for the loss of these wetlands will be addressed through the implementation of an approved compensatory wetland mitigation plan that will preserve special high value wetlands under threat of development and convert other areas owned by the JCEP to emergent freshwater wetlands.

At the worker camp site, the former dredge spoils site on the western half lacks infrastructure and is occupied with an abundance of non-native weedy species, including dominant species European beachgrass and Scotch broom. High quality estuarine habitat was observed in the North Point Slough that intersects the site.

The proposed Kentuck and panhandle mitigation sites are also included in the discussion of the various plant communities that occur for the Project. Kentuck has been identified as an estuarine and wetland mitigation site for the JCEP. This site includes a previously maintained golf course that closed down several years ago and is currently being used sporadically for cattle grazing. The area consists of former golf course infrastructure that includes roads, trails, fencing, and landscaping; and is surrounded by semi-rural housing. The panhandle is a proposed wildlife and wetland mitigation site for the JCEP and contains habitat types typical of deflation plains found throughout the North Spit. Habitats observed at the site include forest, shrubland, and herbaceous communities.

3.0 Methodology

3.1 Regulatory Context

Federal requirements applicable to the Project include the Federal Energy Regulatory Commission's (FERC) resource report requirements for characterizing and evaluating vegetation and species listed pursuant to the Endangered Species Act of 1973 (ESA), as amended. In addition, federal agencies are required by Section 7 of the ESA to ensure that any actions authorized, funded, or carried out by a federal agency do not jeopardize the continued existence of a federally-listed threatened, endangered, or proposed species, or result in the destruction or adverse modification of designated Critical Habitat of a Federally-listed species.

At the state level, consultation is conducted with the Oregon Department of Agriculture (ODA) for state-listed plant species. However, state regulations pertaining to the protection of botanical resources are limited to Oregon Revised Statute (ORS) 564 and Oregon Administrative Rules (OAR) Chapter 603, Division 73. State threatened and endangered plant species that could be present within the Project's boundaries have no legal protective status in Oregon because they would occur on private land and Oregon regulations only apply on all non-Federal public lands (state, county, city, etc.).

A lack of federally-listed species or Critical Habitat for a given area does not necessarily indicate there are no significant elements present, only that there is no information recorded for the site. To ensure there are no significant elements present that may be affected by the Project, the Project site and vicinity, as applicable, have been surveyed during the appropriate season for individual listed species for the county.

In a discussion in 2005 about special status plant species listed for Coos County, Dr. Meinke of the ODA directed the botanical assessment and survey to focus on species that are state or federally listed as threatened or endangered rather than the majority of the species on the list that have no protective status under state or federal law.

3.2 Botanical Assessment and Survey Protocol

Prior to conducting fieldwork, the Oregon Biodiversity Information Center (ORBIC; formerly Oregon Natural Heritage Information Center) *Rare, Threatened, and Endangered Species of Oregon* was reviewed for species within the coastal range or known to occur in Coos County, Oregon (ORBIC 2010). For surveys conducted in October 2012, an additional site-specific species list was obtained from ORBIC on October 19, 2012, for special status species, including federal and state-listed threatened and endangered species and Critical Habitat occurring within two miles of the Project's action area. At that time, the action area included the LNG export terminal facility, including the South Dunes Power Plant site. Species state-listed as threatened and endangered were included on the target species list for surveys even though the study area is located on private property and is not subject to state regulations. The purpose of inclusion of state-listed species is to complete a comprehensive review of botanical resources within the study area.

Botanical surveys were conducted in 2005/2006 for the LNG Terminal site (SHN 2006), as specified in the Oregon Department of Agriculture (ODA)-approved botanical assessment and survey protocol methodology developed by SHN. The SHN 2006 survey report was used as a baseline for additional surveys conducted in 2012/2013 which included: 1) focused and reconnaissance-level botanical surveys on August 1, 2012, and from October 8-12, 2012, at the LNG Terminal site; and 2) reconnaissance-level surveys on April 9,-11, and May 3, 2013, at additional areas added to the Project. The new areas added to the study area for the Project in 2012/2013 included the South Dunes Power Plant site and worker campsite, along with the Kentuck and panhandle mitigation sites. In addition to documenting target species encountered, the species list compiled for the surveys also includes all vascular species encountered. Plants were identified to the lowest taxonomic level possible to distinguish special status species from others. The species list is attached as Appendix A.

Botanical surveys for the Project were conducted pursuant to the U.S. Fish and Wildlife's *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants* (USFWS 1996) and the western lily survey protocol (USFWS 2008). Survey protocol consisted of conducting focused botanical surveys for target species during the appropriate blooming period within suitable habitat, potentially suitable habitat, and surrounding ecotones. Surveys were conducted on foot within the botanical survey area shown on Figure 2.

\ \ Coosbay \ projects \ 2011 \ 611048-Project-Management \ 131-ResourceRpts \ Dwgs , SAVED: 5/14/2013 2:32 PM FKNOX, PLOTTED: 5/14/2013 2:44 PM , FELICIA KNOX



IMAGE SOURCE: 2011 NATIONAL AGRICULTURAL IMAGERY PROGRAM

N

1"=2000'

0 2,000

EXPLANATION

- 2005–06 STUDY BOUNDARY
- 2012–13 STUDY AREA BOUNDARY
- PROPERTY LINE

SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Project Botanical Resources Assessment Report Coos County, Oregon	Study Area SHN 611048.131
	May 2013 | 611048-VEGETATION-ASSOC	Figure 2

4.0 Vegetation Associations

Vegetation associations identified as occurring at the Project site are based on the criteria used in *Plant Associations of the Oregon Dunes National Recreation Area, Siuslaw National Forest, Oregon* (Christy et al. 1998), as defined by the presence of dominant species. Vegetation communities present within the Project area have been grouped into four main categories: forest, woodland, shrubland, and herbaceous associations. Forests are defined as associations where tree species make up at least 60 percent of the vegetation cover. Woodland associations are defined as open stands, usually without crowns touching, and cover varies from 25 to 60 percent. Communities that generally consist of at least 25 percent shrub cover are classified as shrubland associations. Conversely, communities that generally have less than 25 percent shrub cover are defined as herbaceous associations. All vegetation associations for the Project are shown in Figure 3.

Based on the habitat types identified within the associations, suitable habitat for special status plant species was identified and is further discussed in Section 5.0. Special status species is a collective term that includes federal and state-listed threatened and endangered species, proposed and candidate species for listing, species of concern, and all species listed by ORBIC.

4.1 Forest Associations

Forest associations are defined as trees with crowns overlapping and generally a cover of 60 to 100 percent. Evergreen forests in this association have greater than 75 percent tree cover. Forest associations within the Project site are dominated by coniferous species with scattered hardwoods that occur generally along ridges and the toe of slopes. Forests vary in seral (intermediate ecological) and mature stand stages. The youngest forests are generally located along the northern perimeter of the developed portions of the liquefaction facilities and adjacent to the Trans-Pacific Parkway. The more successionally mature forests are located in the interior portions of the site, on stabilized dune ridges, troughs, and dry deflation basins. Forest types included in this association that occur at the Project site are described below.

Shore Pine-Douglas Fir/Wax Myrtle-Evergreen Huckleberry (Evergreen, Upland)

Shore pine (*Pinus contorta*) and Douglas fir (*Pseudotsuga menziesii*) forests in this association occur near previously developed areas such as roads, fill sites, or industrial sites. They have been noted to occur most frequently on warm, dry ridges, and slopes on the dunes; primarily with south to west facing aspects (Christy et al. 1998). This association is characteristic of younger forest sites north of Jordan Cove. They occur in areas where dune stabilization has been achieved through recruitment of vegetation, most notably European beachgrass (*Ammophila arenaria*) and Scotch broom (*Cytisus scoparius*). This association has an open overstory dominated by shore pine with scattered Douglas fir. The shrub layer is dominated by Scotch broom and coyote bush (*Baccharis pilularis*), with scattered hairy manzanita (*Arctostaphylos columbiana*), wax myrtle (*Myrica californica*), and evergreen huckleberry (*Vaccinium ovatum*). Dominant herbaceous species include European beachgrass, silver hairgrass (*Aira caryophyllea*), little hairgrass (*A. praecox*), hairy cat's ear (*Hypochaeris radicata*), braken fern (*Pteridium aquilinum*), and sheep sorrel (*Rumex acetosella*).

Shore Pine-Sitka Spruce/Evergreen-Huckleberry (Evergreen, Upland)

This association is common in more successionally mature forests. Stands are generally dominated by shore pine and Douglas fir, but also include Sitka spruce (*Picea sitchensis*), western hemlock

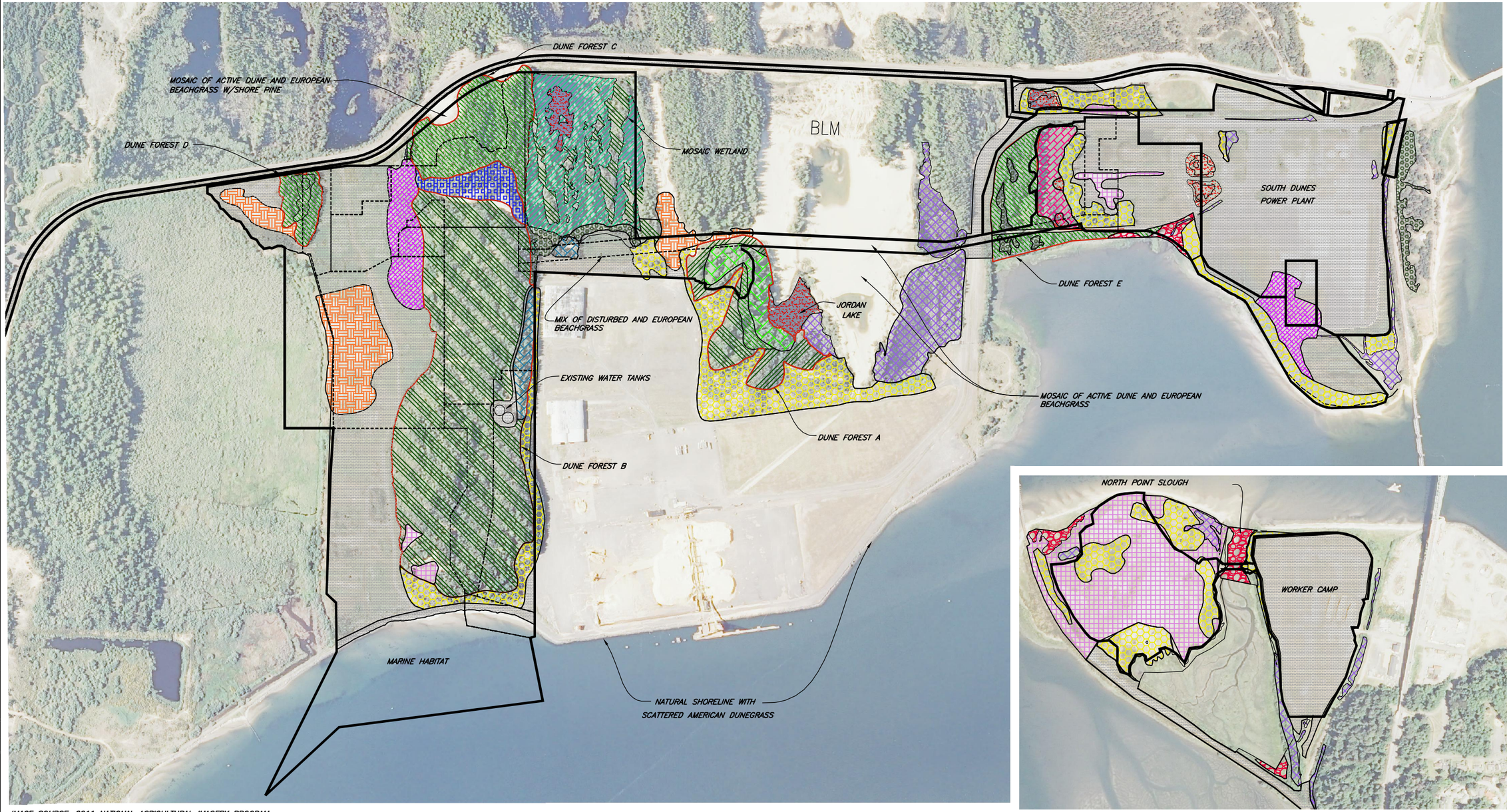


IMAGE SOURCE: 2011 NATIONAL AGRICULTURAL IMAGERY PROGRAM

FOREST ASSOCIATIONS

- SHORE PINE–DOUGLAS FIR/ WAX MYRTLE–EVERGREEN HUCKLEBERRY (EVERGREEN,UPLAND)
- SHORE PINE–SITKA SPRUCE/ EVERGREEN HUCKLEBERRY (EVERGREEN,UPLAND)
- PORT ORFORD CEDAR/ EVERGREEN HUCKLEBERRY (EVERGREEN,UPLAND)
- SHORE PINE/SLOUGH SEDGE (EVERGREEN,SEASONALLY FLOODED)
- RED ALDER/SALMONBERRY/SLOUGH SEDGE–SKUNK CABBAGE (DECIDUOUS, SATURATED)
- SHORE PINE/SCOTCH BROOM/ EUROPEAN BEACHGRASS (EVERGREEN,UPLAND)

WOODLAND ASSOCIATIONS

- SHORE PINE/BEARBERRY (EVERGREEN,UPLAND)
- SHORE PINE/HAIRY MANZANITA (EVERGREEN,UPLAND)

SHRUBLAND ASSOCIATIONS

- HOOKER WILLOW–CRABAPPLE/ SLOUGH SEDGE–SKUNK CABBAGE (DECIDUOUS,SATURATED)

HERBACEOUS ASSOCIATIONS

- EUROPEAN BEACHGRASS (PERENNIAL,UPLAND)
- RED FESCUE–SALT RUSH (PERENNIAL,UPLAND)
- AMERICAN DUNEGRASS (PERENNIAL,UPLAND)
- POND LILY (PERENNIAL, SEMIPERMANENTLY FLOODED)
- LYNGBY SEDGE REGULARLY FLOODED TIDAL (TIDALLY FLOODED)

OTHER

- DISTURBED–HERBACEOUS DOMINATED W/SCATTERED SHRUBS
- OPEN WATER/ COMMON CATTAIL
- DUNE FOREST BOUNDARY
- VEGETATION TYPE BOUNDARY
- FACILITY AREA BOUNDARY
- PROJECT AREA BOUNDARY

NOTE:
ASSOCIATIONS USED ARE BASED ON USDA PUBLICATION NATIONAL VEGETATION CLASSIFICATION SYSTEM (NVCS).

1"=400'
0 400

Consulting Engineers & Geologists, Inc.

Jordan Cove Energy Project
Botantical Resources Assessment Report
Coos County, Oregon

Vegetation Associations

611048.131

May 2013 | 611048-VEGETATION-ASSOC | Figure 3

\\Coosbay\projects\2011\611048-Project-Management\131-ResourceRpts\Dwgs, SAVED: 5/14/2013 3:45 PM FKNOX, PLOTTED: 5/14/2013 3:50 PM, FELICIA KNOX

(*Tsuga heterophylla*), and scattered Port Orford cedar (*Chamaecyparis lawsoniana*). The shrub understory layer ranges from dense to nearly impenetrable and is dominated with evergreen huckleberry, salal (*Gaultheria shallon*), and wax myrtle, with scattered Pacific rhododendron (*Rhododendron macrophyllum*). The herbaceous layer varies from being depauperate (diminished) to moderately covered with candy-stick (*Allotropa virgata*), rattlesnake plantain (*Goodyera oblongifolia*), and bracken fern along edges or gaps in the overstory. Dune Forest B, the largest dune forest identified within the LNG terminal portion of the Project site**,** occurs within this association and consists of a mix of shore pine, Sitka spruce, and Douglas fir.

Forests within the panhandle mitigation site are dominated by coniferous species, generally along the toe of slopes and low lying areas adjacent to shrublands, and most closely fit this association. Forests found in the site are dominated by shore pine, with scattered Sitka spruce, and western hemlock. The shrub layer in the wetland forest sites ranges from dense to nearly impenetrable and is dominated with evergreen huckleberry, salal, and wax myrtle, with scattered Pacific rhododendron. The herbaceous layer is dominated by slough sedge (*Carex obnupta*), which is found along the edge of the tree line throughout the panhandle mitigation site area.

Shore Pine/Scotch Broom/European Beachgrass (Evergreen, Upland)

Although this association at the Project site contains shore pine, it is usually observed as a shrubland due to the high density of shrubby species, including Scotch broom, with limited distribution of shore pine due to the abundance of non-native species. This association is relatively widespread throughout the LNG terminal portion of the Project area and is associated with roads and other disturbed areas. The overstory within this association is generally open, averaging less than 50 percent cover of shore pine in most areas. Scotch broom cover varies from moderately dense to very dense in areas that lack a substantial canopy cover.

The herbaceous layer varies from depauperate, where there is a significant cover of Scotch broom, to moderately vegetated in areas that lack dense shrub cover. Dominant herbaceous species include European beachgrass, red fescue (*Festuca rubra*), tall fescue (*Festuca arundinaceae*), silver hairgrass, hairy cat's ear, and sheep sorrel. This association occurs west of the South Dunes Power Plant, north of the Roseburg Forest Products facility, along previous road cuts for the Trans Pacific Parkway, and at the temporary worker camp site.

Port Orford Cedar/Evergreen-Huckleberry (Evergreen, Upland)

The Port Orford cedar and evergreen huckleberry association is described by Christy et al. (1998) as unique. It occurs in all aspects and slopes on narrow, dry stabilized dune ridges, troughs, and seasonally dry deflation basins at the southern end of the Oregon Dunes National Recreation Area immediately north of the Project site.

Port-Orford-cedar (POC) root rot disease is caused by the fungus *Phytophthora lateralis*. The disease was first discovered in POC's natural range in 1952 and since has spread throughout the POC's (host) range. The fungus invades the roots of POC and eventually colonizes the entire root system until the tree eventually dies from girdling. POC root rot disease affects both seedlings and mature trees. Evidence of infected trees includes lighter colored foliage that eventually turns red to brown. It also dyes and discolors the inner bark. The spores live in the soil and are spread through contact with contaminated soil or via free water. The disease is primarily spread through soil disturbance and spread of the disease may occur over long distances.

A small component of a well-developed Port Orford cedar/evergreen huckleberry association is located upslope from the southwestern shore of Jordan Lake, in the center of the Project site. Port Orford cedar observed at this location includes two trees upslope from the existing access trail that travels from the Roseburg Forest Products facility to Jordan Lake. Additionally, 23 Port Orford cedars were observed at sites located adjacent to Jordan Lake, in areas that will be preserved as part of the Project. Dune Forest A occurs partially within this association. Of note, the plot plan for the Project is different from that of the previously proposed LNG import terminal. The area to be disturbed by the Project now avoids this plant association.

Shore Pine/Slough Sedge (Evergreen, Seasonally Flooded)

This wetland forest association occurs in depressions on deflation plains and on ancient marine terraces. It was observed in the north central wetland mosaic north of the Roseburg Forest Products facility and is the predominant wetland type observed in the wetland forested sites found scattered throughout the panhandle mitigation site. The understory on mounds in and around depressions is dominated by shrub species, including wax myrtle, salal, and evergreen huckleberry. Slough sedge is the single dominant herbaceous species and was observed growing in depressions and open water habitats throughout the North Spit locations of the Project.

Red Alder/Salmonberry/Slough Sedge-Skunk Cabbage (Deciduous, Saturated)

Red alder/salmonberry/skunk cabbage forests occur in wetland habitats adjacent to upland forested habitats, and in low flat areas adjacent to inundated wetlands. In this association, the overstory consists entirely of red alder (*Alnus rubra*) around wet areas, but transitions to shore pine in adjacent areas. Canopy cover varies from moderate to closed (more than 50 percent). Scattered clusters of dense shrubs that include salmonberry (*Rubus spectabilis*) and Hooker willow (*Salix hookeriana*) are located under the canopy. Herbaceous coverage is generally found in wet areas and consists almost entirely of slough sedge, with scattered skunk cabbage (*Lysichiton americanus*). This association has been documented in low spots in forests east of Jordan Cove Road and along the southern edge of the wetland mosaic located in the northwest part of the LNG terminal portion of the Project area.

4.2 Woodland Associations

Woodland associations are defined as open stands, usually without crowns touching, and generally form 25 to 60 percent cover (sometimes less). They occur on all aspects of dry, well-drained, partially stabilized dune ridges, slopes, and flats between the sand and the forest edge (Christy et al, 1998). Three woodland associations occur within the LNG terminal portion of the Project site, but are not well represented. They are described below.

Shore Pine/Bearberry (Evergreen, Upland)

The overstory for this association consists entirely of shore pine. The shrub layer is dominated by the low growing shrub bearberry (*Arctostaphylos uva-ursi*), with hairy Manzanita in scattered patches. The shore pine/bearberry association has small portions scattered throughout the LNG terminal site, with the most substantial occurrence on the stabilized dune ridge northwest of the Roseburg Forest Products facility between Dune Forest B and C.

Shore Pine/Hairy Manzanita (Evergreen, Upland)
The shore pine/hairy manzanita association successionally replaces the shore pine/bearberry association. The overstory is moderately open and is dominated by shore pine with scattered Douglas fir trees. The shrub layer varies from moderately dense to dense in areas where the canopy is patchy. Hairy manzanita is the dominant shrub species with scattered evergreen huckleberry and bearberry along the edges. A small area of this association can be found along the eastern boundary of Dune Forest B.

4.3 Shrubland Associations

Communities that consist of shrubs greater than 0.5 meter tall with generally greater than 25 percent cover and generally less than 25 percent tree cover are classified as shrubland associations. Deciduous shrubland generally has greater than 75 percent deciduous species shrub cover. The density and distribution of the shrubland association is correlated to hydrology and topography. One of the major characteristics of the shrubland association is minor variation in topography, which affects the distribution of herbs and shrubs. The lowest lying areas are frequently inundated with water and, depending on the frequency and duration of inundation, they may be dominated with emergent hydrophyte species that generally grow partly or totally submerged in water.

Shrublands within the panhandle mitigation site are referred to as scrub-shrub wetlands, with variations in species composition and abundance throughout the site. Extensive shrublands were observed in the areas bordering open water throughout the panhandle mitigation site and were observed dominating the landscape from the edge of the forest community to emergent wetland sites. The overstory within this shrubland varies from patchy to dense and is dominated by Hooker willow, Sitka willow (*S. sitchensis*), and Douglas spiraea (*Spiraea douglasii*), with scattered twinberry (*Lonicera involucrata*). Coniferous trees are for the most part absent in the shrubland community but may include scattered shore pine and Sitka spruce. Slough sedge is the most abundant herbaceous species.

Hooker Willow-Crabapple/Slough Sedge-Skunk Cabbage (Deciduous, Saturated)
Scrub-shrub communities identified for the Project site most closely resemble Hooker willow-crabapple/slough sedge-skunk cabbage association, minus the skunk cabbage. Minor variations in hydrology and topography may change the species composition drastically. This association is further described as having dwarf shrubland with shrubs less than two feet tall that provide generally greater than 25 percent cover. Tree cover is generally less than 25 percent.

The overstory within this association varies from patchy to dense and is dominated by Hooker willow, Sitka willow, and Douglas spiraea, with scattered twinberry. Evergreen (coniferous) trees are for the most part absent in the shrubland community, but may include scattered shore pine and Sitka spruce. Slough sedge is the most abundant herbaceous species. Other species include spreading rush (*Juncus effuses*), dagger-leaved rush (*Juncus ensifolius*), toad rush (*J. bufonius*), western bent-grass (*Agrostis exarata*), creeping bent-grass (*A. stolonifera*), reed canary grass (*Phalaris arundinacea),* northern willowherb (*Epilobium ciliatum*), tall mannagrass (*Glyceria elata*), and lowland cudweed (*Gnaphalium palustre*).

Hooker willow/slough sedge shrubland and Douglas spiraea saturated shrubland were observed extensively throughout wetlands west of Jordan Cove Road and southwest of Jordan Lake. In

addition, this alliance is the dominant vegetation association observed in the scrub-shrub wetland habitat located in the panhandle mitigation site.

4.4 Herbaceous Associations

Communities that have generally less than 25 percent tree and shrub cover with generally greater than 25 percent herbaceous vegetation (graminoids, forbs, and ferns) are defined as herbaceous associations. Perennial vegetation for this association generally has greater than 50 percent of total herbaceous cover.

Herbaceous associations are the most variable of all the vegetation associations located in the Project site. They range from being dominated by plants that are adapted for sand burial and desiccating winds, to species that are emergent or submergent hydrophytes. They are widespread throughout the Project site, including areas that have some active sand movement and/or anthropogenic (human) disturbance. Effects from anthropogenic disturbances are reflected in the nonnative herbaceous species composition. Vegetation communities occurring in sand dune areas of the Project site are composed almost entirely of herbaceous species of plants, with no persistent woody stems above ground.

Numerous special status plant species are known to occur in herbaceous associations and are included Section 3.1.4 for unique and special status species. Federal and State-listed threatened and endangered plant species known to occur in herbaceous associations found in coastal habitats include: pink sand verbena (*Abronia umbellate,* ssp. *breviflora*), Point Reyes bird's-beak (*Cordylanthus maritimus,* ssp. *palustris*), silvery phacelia *(Phacelia argentea)*, western lily (*Lilium occidentale*), and Wolf's evening primrose *(Oenothera wolfii)*. These species and their potential to occur in or near the Project are discussed further in Section 3.4.

Plant communities that occur in herbaceous associations at the Project site are described below.

European Beachgrass (Perennial, Upland)

Vegetation located on the active to semi-stable sand dunes is consistent with common herbaceous dune species. Dominant dune species include European beachgrass, red fescue, silver burweed (*Ambrosia chamissonis*), sand pea (*Lathyrus japonicus*), seashore lupine (*Lupinus littoralis*), beach silvertop (*Glehnia littoralis*), and beach evening primrose (*Camissonia cheiranthifolia*).

In degraded habitats such as where fill material has been deposited in the past, and near roadsides or other industrial sites, this association includes patchy non-native shrubs species, including Scotch broom. It can begin to resemble the shore pine/Scotch broom/European beachgrass association. At these sites the herbaceous vegetation is being displaced by encroaching invasive species, including European beachgrass and Scotch broom.

This association was observed in the western part of the LNG terminal portion of the Project site in the dredge spoils fill site (also known as Ingram Yard) where the slip will be located and at the construction worker camp site. It was also observed in patchy distribution throughout open dune lands located north of Jordan Lake where the access/utility corridor is proposed.

Red Fescue-Salt Rush (Perennial, Upland)

In grasslands found on sand or fill material, red fescue is the single dominant species. Scattered red fescue was observed west of the South Dunes Power Plant site (on fill) and north of the Roseburg Forest Products facility (on sand). At the South Dunes Power Plant site, in an area surrounded by scattered red fescue, a portion of a small dune contained the single dominant species salt rush (*Juncus lesuerii*). Red fescue-salt rush was also observed at sites where sand burial by wind driven forces limits species diversity, including in the Ingram Yard east of Henderson Marsh.

American Dunegrass (Perennial, Upland)

This association includes dune lands with the single dominant species American dunegrass (*Leymus mollis*). It can be found on beaches and in foredunes, and to a lesser extent on open deflation plains and in upper estuaries. Continual sand burial and inputs of salt spray seem necessary for American dunegrass to thrive. Stands in most locations have been overrun by European beachgrass, but American dunegrass often persists in patches among the European beachgrass, which is the case of the grasses occurring on the western half of the construction worker camp site. Scattered American dunegrass was also observed west of Dune Forest B, in the Ingram Yard grassland habitat east of Henderson Marsh on previous fill deposits. Continual sand burial at this site limits competing vegetation and inputs of salt spray create the conditions necessary for this species to thrive.

Pond Lily (Perennial, Semi-permanently Flooded)

Other herbaceous associations are dominated by emergent hydrophytes, as described in the shrubland association section. Dominant species in semi-permanently flooded areas include yellow pond lily (*Nuphar lutea ssp. polysepala),* floating water-pennywort *(Hydrocotyle ranunculoides),* floating-leaved pondweed (*Potamogeton natans*), parrotfeather (*Myriophyllum aquaticum*), water shield (*Brasenia schreberi*), and common bladderwort (*Utricularia macrorhiza*). Pond lily habitat was observed in deep freshwater wetlands located in the South Dunes Power Plant and LNG terminal sites. This includes wetlands immediately west of Jordan Cove Road where the access/utility corridor is proposed (Wetland 2012-2 and 2013-6) and in the southern portion of Wetland E.

4.5 Other Plant Associations

Maintained Grasslands

Maintained grassland habitats observed throughout the Kentuck wetland mitigation site include native and non-native grasses and other herbaceous species associated with manicured grasslands. This site is dominated by red fescue, Kentucky bluegrass (Poa pratensis), reed canary grass (*Phalaris arundinacea*), common rush (*Juncus effuses*), and orchard grass (*Dactylis glomerata*). Wetland habitats were observed in the drainage that flows out of the levee situated along East Bay Drive at the western edge of the site. Dominant species include common rush and common cattail (*typha latifolia*). Reed canary grass, an invasive plant species, was observed in patchy distribution in areas that bordered forest sites. Tree species were planted throughout the site and include ornamental species such as blue spruce (*Picea pungens*) and poplar (*Populus trichocarpa*), as well as native tree species such as western hemlock, Sitka spruce, and Douglas fir.

Common Cattail/Open Water

This association includes wetland fringe sites observed adjacent to open bodies of water. These sites are limited in species diversity due to competition from common cattail which displaces other

emergent vegetation. This association was observed in wetlands surrounding the existing sludge ponds at the South Dunes Power Plant site and the wetlands observed south of the Trans Pacific Parkway in the eastern portion of the Project.

Wetlands that occur in the Project area include emergent, scrub-shrub, forested, and estuarine intertidal, as shown in Figure 4 and described briefly below:

- Herbaceous emergent wetland habitat is located in low lying areas throughout the Project area. Vegetation is typically dominated by sedges, rushes, and grasses, with wetter portions of this habitat type consisting of aquatic floating and emergent plants in relatively shallow seasonally or perennially inundated areas.
- Scrub-shrub wetland habitat is commonly dominated by Hooker willow, with salmonberry and other common coastal wetland species such as slough sedge and skunk cabbage.
- Forested wetland habitat consists of wetlands that have remained undisturbed long enough to develop a consistent tree canopy. It is dominated primarily by red alder, with some areas of tree-size Hooker willow. The shrub layer is dominated by common coastal wetland species.
- Estuarine intertidal wetlands occur along the shore of Coos Bay at the mouth of the proposed slip and in an intertidal mudflat area associated with Wetland H.

Approximately 32.3 acres of wetlands that occur within the Project footprint will not be disturbed by construction or operation activities and will be preserved. Construction of the facility and associated access and utility corridor will result in the loss of approximately 1.8 acres of forested, scrub-shrub, emergent, and ponded wetlands. Compensation for the loss of these wetlands will be addressed through the implementation of an approved compensatory wetland mitigation plan that will preserve special high value wetlands under threat of development and convert other areas owned by the JCEP to emergent freshwater wetlands.

Salt Marshes

Salt marshes are located along the vegetated shoreline adjacent to Jordan Cove, towards the western end of the Kentuck wetland mitigation site in areas where tidal influence occurs, and at the construction worker camp site. Dominant species include pickleweed (Salicornia virginiana), Lyngby sedge (*Carex lyngby*), salt grass (*Distichlis spicata*), and hairgrass (*Deschampsia caespitosa*). At Jordan Cove, a small occurrence of salt marsh species were observed along the LNG Terminal slip shoreline, as well as in the lightly vegetated mudflat area associated with Wetland H (see Resource Report 2) that drains from the South Dunes Power Plant site into the bay.

4.6 Dune Forests

In addition to the above vegetation associations, dune forests that occur within these associations at the Project site have been classified as A through E. Dune Forest B is the largest and is slated for removal to create the access channel and slip for the LNG facility. Dune Forest C is smaller and is located north of Dune Forest B, immediately south of the TransPacific Parkway. There is a sand trail that separates the two. Dune Forest A, the highest in dune forest habitat value, is located west of Jordan Lake and runs approximately 800 feet down from the utility corridor. It consists of Port Orford cedar and shore pine-Sitka spruce communities.

WETLAND PAN–C
WETLAND PAN–B
WETLAND PAN–A
WETLAND 2012–4
WETLAND 2012–3
WETLAND 2012–6
WETLAND 2012–5
WETLAND L
TRANS-PACIFIC PARKWAY
WETLAND 2012–7
WETLAND I
WETLAND F
WETLAND G
WETLAND E
WETLAND H (EAST)
WETLAND H (WEST)
WETLAND K
WETLAND 2013–3
WETLAND 2013–4
WETLAND 2013–2
WETLAND 2013–1
WETLAND 2013–5
WETLAND 2013–6
WETLAND 2012–2
JORDAN LAKE
OPEN WATER
WETLAND 2012–1
JORDAN COVE ROAD
WETLAND A
WETLAND D
WETLAND B
WETLAND C
WETLAND J

EXPLANATION

- DELINEATED WETLAND
- OPEN WATER
- WETLAND DELINEATION STUDY AREA BOUNDARY

N

0 800

1"=800'

SOURCE: NAIP IMAGERY, NOVEMBER 2011

SHN Consulting Engineers & Geologists, Inc.

Jordan Cove Energy Project Botanical Resources Assessment Report Coos County, Oregon		Wetland Delineations SHN 611048.131
May 2013	611048-WETLAND-MASTER	Figure 4

\\Coosbay\projects\2011\611048-Project-Management\121-WetlndDelin\Dwgs , SAVED: 4/26/2013 12:15 PM, WWHITE, PLOTTED: 5/14/2013 4:32 PM, FELICIA KNOX

Additional dune forests D and E occur in shore pine/Douglas fir associations. Dune Forest D is located on the northwestern tip of the overall site, immediately south of the Trans Pacific Parkway. Dune Forest E is located in the western portion of the South Dunes Power Plant site, immediately east of Jordan Cove Road.

Dune forests also occur in areas that will not be impacted by the Project, including in the forested wetland mosaic complex (east of Dune Forest C and north of the Roseburg Forest Products facility) and in upland forest sites along the ridgelines throughout the complex. These dune forests are interspersed among the wetlands and consist of shore pine-Sitka spruce, shore pine-Douglas fir, and shore pine/slough sedge.

5.0 Unique and Special Status Species

Special status native vegetation classifications used for this analysis are based on the Oregon Wetland Explorer At Risk Wetland Associations Database (ORBIC 2009) and the Classifications of Native Vegetation of Oregon (ORBIC 2004). Rare vegetation classifications include both state rank (S) and global rank (G) for ORBIC Natural Heritage Ranking and are given the following numerical codes:

1. Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation (gone from a portion of its former range), typically with 5 or fewer occurrences.
2. Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction or extirpation, typically with 6-20 occurrences.
3. Rare, uncommon, or threatened; but not immediately imperiled, typically with 21-100 occurrences.

Rare forest associations observed in the Project area include the shore pine-Douglas fir/wax myrtle-evergreen huckleberry (G3S3), shore pine-Sitka spruce/evergreen huckleberry (G3S3), and critically imperiled Port Orford cedar/evergreen huckleberry (G1S1). As previously noted, two Port Orford cedars are known to occur within the Project area that would be impacted. The Port Orford cedar/evergreen huckleberry forest association is sensitive because it is being decimated throughout its limited range by the POC root rot disease. In addition, the forested wetland (shore pine/slough sedge) east of Dune Forest C and the northern portion of Dune Forest B is considered rare/uncommon in ORBIC.

The shore pine/bearberry woodland association is sensitive due to its limited distribution, which is restricted to a thin band adjacent to the coastline, and the fact that it is easily damaged by human disturbances. Rare woodland associations include shore pine/bearberry (G1S1) and shore pine/hairy manzanita (G1S1). Both associations are found in limited distribution at sites associated with Dune Forest B where openings occur within the forest canopy. These associations were also observed in the panhandle mitigation site, most notably at the interface between dune and forest habitats.

Rare herbaceous associations include red fescue-salt rush (G3S3) and American dunegrass (G1S1). Both of these rare associations were observed on significantly disturbed habitat associated with the dredge spoils fill site located east of the Henderson Marsh.

A list of the individual special status botanical species that have the potential to occur within forested, woodland, shrubland, and herbaceous associations referred to above is included in Table 1 (below), including numerous lichen species. The list includes BLM special rankings and ORBIC state and global rankings. Federal and State-listed threatened or endangered species observed or with the potential to occur in or near the Project vicinity are not included in the list, as they discussed in detail in Section 6.0.

Table 1
Special Status Botanical Species with the Potential to Occur
Jordon Cove Energy Project

Common Name	Species Name	Status
Bay horsehair lichen	*Sulcaria badia*	BA
Dwarf brodiaea	*Brodiaea terrestris*	BA
Elegant fringe lichen	*Heterodermia leucomelos*	BA, G4, S2, S3
Horsehair lichen	*Bryoria pseudocapillaris*	BS
Liverwort	*Calypogeia sphagnicola*	None
Liverwort	*Diplophyllum plicatum*	BA, G4, S3
Mouse ears	*Erioderma sorediatum*	BA, G4, S2
Niebla lichen	*Niebla cephalota*	G3/G4, S2
Northern adder's-tongue	*Ophioglossum pusillum*	BA
Northern bog clubmoss	*Lycopodiella inundata*	G5, S2
Oregon timwort	*Cicendia quadrangularis*	BA
Sea lavender	*Limonium californica*	BA, G4, S1
Spoonwort	*Cochlearia officinalis*	BA
Treepelt lichen	*Leioderma sorediatum*	BA
Western marsh-rosemary	*Limonium californicum*	G4, S1
Whorled marsh pennywort	*Hydrocotyle verticillata*	BA

Bureau of Land Management (BLM) Ranking:
BA = Bureau Assessment
BS = Bureau Sensitive

Note: Threatened and Endangered Species are included in Table 3.4-1.

ORBIC Natural Heritage Ranking (OCT 2012):
G3 = Rare, threatened, or uncommon throughout its range
G4 = Not rare, apparently secure throughout its range
G5 = Widespread, abundant, and secure throughout its range
S1 = Critically imperiled in Oregon
S2 = Imperiled in Oregon
S3 = Rare, threatened, or uncommon in Oregon

6.0 Threatened and Endangered Species Analysis

Five federal and state-listed plant species were identified as having the potential to occur in the Project vicinity. The western lily is the only federally-listed species. State-listed species include the pink sand verbena, Point Reyes bird's-beak, silvery phacelia, western lily, and Wolf's evening primrose. Only one state-listed species (Point Reyes bird's-beak) has been detected within the Project area. The five species were included in the previous botanical investigations (SHN 2006a, SHN 2006b) and are described below.

6.1 Pink Sand Verbena (Federal Species of Concern, State Endangered)

The pink sand verbena (*Abronia umbellata ssp. breviflora*) is the only pinkish-purple-flowered coastal *Abronia* species in Oregon. The historic range of pink sand verbena occurs from California to British Columbia, Canada (USFWS 2006). Its present range is predominantly from Cape Blanco (Curry County) in southern Oregon to Point Reyes National Seashore in Marin County, California; however, they sporadically occur along Oregon's northern and central coast. In the northern portion of its range, most populations occur on broad beaches and/or near the mouths of creeks and rivers. The species usually occurs on beaches in fine sand between the high-tide line and the driftwood zone, and in areas of active sand movement below the foredune. Associate species include sea rocket (*Cakile maritina*), silver burweed, European beachgrass, beach silvertop, and yellow sand verbena (*Abronia latifolia)*.

Suitable habitat for the species was found along the eastern portion of the terminal site in areas of actively moving dunes and European beachgrass. Surveys conducted on the Project site in 2006 for the majority of the Project area (LNG Terminal and South Dunes Power Plant sites) and in 2012 and 2013 in previously unsurveyed areas for the Project, including the construction worker camp site, did not result in the detection of any individuals (SHN 2006b; SHN 2012). The Project is not expected to affect this species.

6.2 Point Reyes Bird's-Beak (Federal Species of Concern, State Endangered)

Point Reyes bird's-beak (*Chloropyron maritimum ssp. Palustre*, formerly *Cordylanthus maritimus ssp. palustris*) is an annual gray-green and purple-tinged herb that grows 4 to 16 inches tall and has few branched stems. Also referred to as salt marsh bird's beak, it occurs in coastal salt marshes, typically within the zone that is periodically or frequently inundated by high tides (ORBIC 2012b; Brian 2005). Point Reye's bird's-beak inhabits the upper end of maritime salt marshes and its habitat requirements are specific: approximately 7.5 to 8.5 feet above mean lower low water (MLLW), sandy soils with soil salinity of 34 to 55 parts per thousand (ppt), and less than 30 percent bare soil in summer (ODA 2013). It flowers from June to October. Associate species include those that are tolerant of high salinity levels such as salt grass, pickleweed, fleshy jaumea (*Jaumea carnosa*), sea lavender (*Limonium californicum*), and dodder (*Cuscuta salina*). Point Reyes bird's-beak occurs along the Pacific Coast from Tillamook County, Oregon, south to Santa Clara County, California. In Oregon, the species is restricted to Netarts Bay, Yaquina Bay, and Coos Bay, with the majority of known occurrences located in Coos Bay.

Several occurrences of Point Reyes bird's-beak are located in the vicinity of the Project area (ORBIC 2012). Multiple occurrences within Jordan Cove have been observed (ORNHIC 2005; SHN 2012), as shown in Figure 5. The closest known occurrence to the Project site is located within Jordan Cove along the shoreline east and west of the old Weyerhaeuser linerboard mill site (proposed South Dunes Power Plant). Potential habitat for this species has also been observed along the shoreline south of the former mill site. This habitat contains an abundance of the associated species, including pickleweed. Prior to construction, an additional survey for Point Reyes bird's-beak will be conducted during the appropriate blooming period in the area defined as potential habitat for the species.

6.3 Silvery Phacelia (Federal Species of Concern, State Threatened)

Silvery phacelia (*Phacelia argentea*) is a hairy, fleshy perennial herb with thick leaves that are coated in long, straight, silvery hairs. They occupy open sand above the high tide line, open and partly stabilized sand dunes further inland, and coastal bluffs. They flower from late May to early August. Silvery phacelia occurs in Coos and Curry counties along the Oregon coast and Del Norte County in California, from the vicinity of Bandon, Oregon, south to the Crescent City, California. There is one historic collection of the species from Clatsop County, Oregon, to the north in 1933, but there have been no reports of it from that area since. The majority of occurrences are in Oregon (ODA 2013).

Suitable habitat for silvery phacelia exists at the Project site in areas with active or semi-stabilized dunes and upper beach habitat where European beachgrass and red fescue-salt rush herbaceous vegetation associations occur. Surveys conducted on the Project site for the majority of the Project area did not result in the detection of silvery phacelia (SHN 2006b; SHN 2012). The Project is not expected to affect this species.

6.4 Western Lily (Federal Endangered, State Endangered)

The western lily (*Lilium occidentale*) is a member of the perennial lily family (Liliaceae) and grows up to 5 feet tall with nodding red (sometimes deep orange) flowers. The species was federally-listed as endangered on August 17, 1994, and a final recovery plan was released four years later (USFWS 1998c). It inhabits 31 small, widely separated populations in freshwater marshes and swamps, coastal scrub and prairie, and openings in coastal coniferous forest (Sitka spruce dominated) along the coast of southern Oregon and northern California. It occurs within four miles of the coast, generally on marine terraces below 300 feet above mean sea level (MSL; CNDDB 2005). The western lily is considered a bog plant and grows in areas with perched water tables which are associated with one or two soil types. Occurrences within the Coos Bay area are reported to occur in Blacklock soils (ORNHIC 2005), which are deep, poorly drained soils high in organic content (Hagen 1989); however, it also grows in soils that are well drained that have a significant layer of organic soil.

The wetlands where Western lilies occur are not what people often associate with wetlands. They're in areas where the marsh is flooded in the winter but is typically very dry in the summer. The species emerges in Oregon in late March or early April and flowers in late June or July (USFWS 1998). Species typically associated with western lily include Sitka spruce, Pacific reed grass, willows, false lily-of-the-valley, and evergreen huckleberry (Imper 2003).

\\Coosbay\projects\2011\611048-Project-Management\131-ResourceRpts\Dwgs , SAVED: 5/14/2013 3:45 PM FKNOX, PLOTTED: 5/14/2013 4:19 PM , FELICIA KNOX

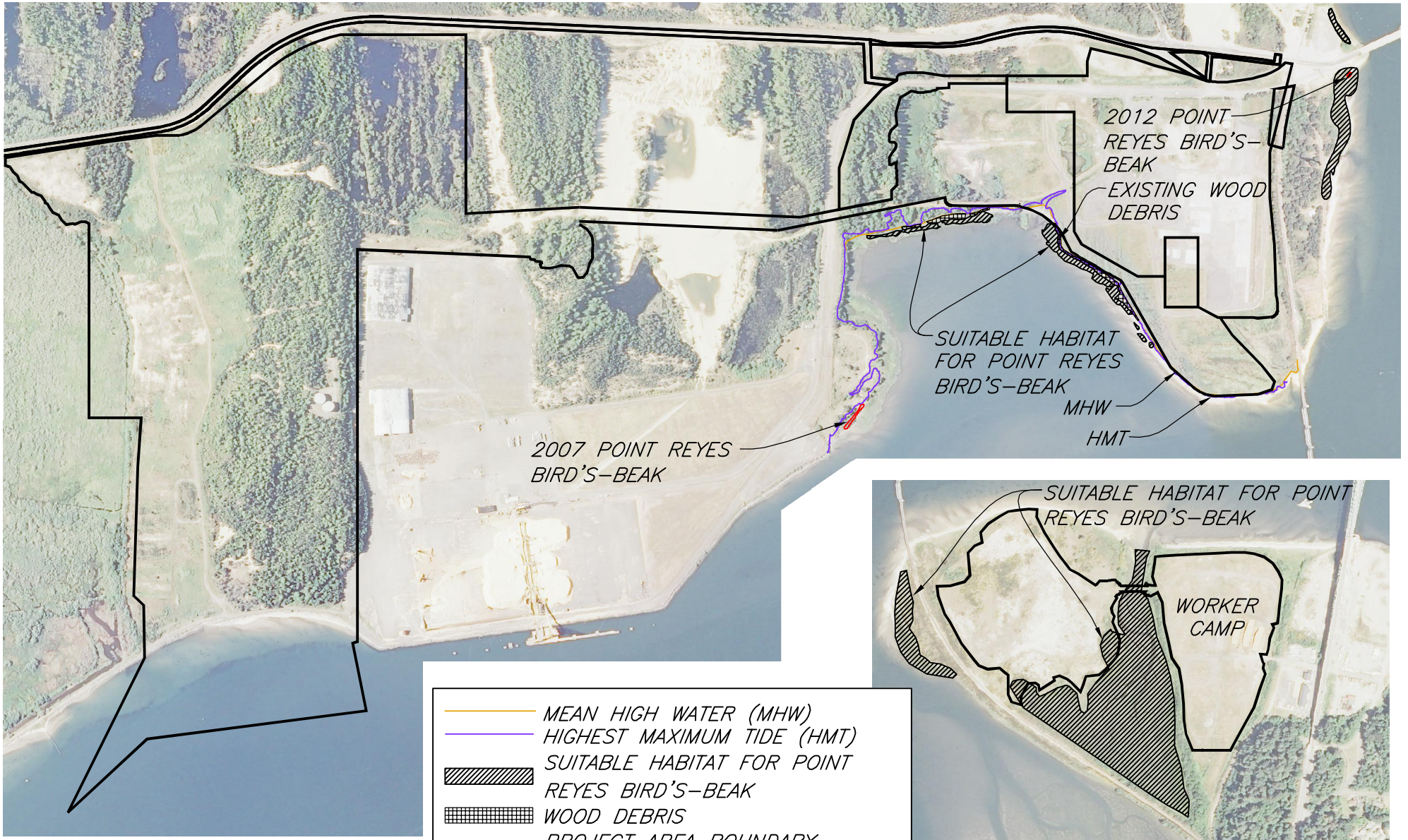


IMAGE SOURCE: 2011 NATIONAL AGRICULTURAL IMAGERY PROGRAM

N

0 400

1"=400'

Consulting Engineers & Geologists, Inc.

Jordan Cove Energy Project
Botanical Resources Assessment Report
Coos County, Oregon

Point Reyes Bird's-Beak

SHN 611048.131

May 2013 | 611048-VEGETATION-ASSOC | Figure 5

The closest known western lily occurrence to the Project site is approximately 5.5 miles northeast at Hauser Bog (ORNHIC 2005). There are not any records of the western lily north of Hauser and the USFWS typically considers Hauser the northern extent along the Oregon Coast for the species (Vander Heyden pers comm. 2013). Surveys were conducted at the Project site in 2006 for the majority of the Project area and again in 2012. The surveys did not result in the detection of western lily (SHN 2006b, SHN 2012).

An additional focused survey will be conducted from mid-June to mid-July to definitively determine its presence or absence of this species on the Project site. While suitable habitat is located along the terrestrial portion of the LNG carrier transit route in Coos Bay, marine traffic is not expected to affect the western lily.

6.5 Wolf's Evening Primrose (Federal Species of Concern, State Threatened)

Wolf's evening primrose (*Oenothera wolfii*) is a rare species of flowering plant in the evening primrose family. It occurs in well-drained sandy soil in coastal strands, roadsides, and coastal bluffs (ODA 2013). This species is associated with a high disturbance regime and several occurrences in California are located along roadsides with sandy soil (CNDDB 2005). Wolf's evening primrose is typically associated with low elevation coastal habitats, but there have been reported occurrences in lower montane coniferous forest in California, at elevations greater than 2,500 feet above MSL (Tibor 2001).

The current range of Wolf's evening primrose is from Curry County in southern Oregon to the northern California coast. The closest known occurrence to the Project site is in Port Orford, Oregon, approximately 60 miles to the south of the Project. The species is included in this analysis as suitable habitat exists within the Project site. Surveys conducted on the Project site did not result in the detection of wolf's evening primrose (SHN 2006b, SHN 2012). The Project is not expected to affect this species.

Detailed plant descriptions for threatened and endangered plants that could be potentially present is found within the previously completed SHN report (2006a and 2006b).

7.0 Impact Analysis to Threatened and Endangered Species

Pink Sand Verbena (*Abronia umbellata* ssp. *breviflora*).
Suitable habitat within the study area for pink sand verbena is located throughout the site in the areas delineated as a mosaic of actively moving dunes and European beachgrass. This habitat suitability is low because pink sand verbena typically occurs on fine sand along the beach or below the foredune on actively moving sand (BLM 2006). Potential habitat is not located directly along the beach. Previous focused surveys have not detected pink sand verbena within portions of the study area (SHN 2006a, SHN 2006b) and occurrences have not been reported by the ORBIC (ORBIC 2012).

There is a successful population that was introduced to the Coos Bay north spit within the Western Snowy Plover Habitat Restoration Area. This is approximately 2.58 miles away from the study area

(ORBIC 2011). In the active dune areas to the east of Jordan Lake (approximately 0.25 miles from the closest location to Coos Bay), yellow sand verbena was observed in October 2012. Not all species observed were flowering. Pink sand verbena is not likely to occur in the Project area due to the distance from the coast, but this species is an annual and could occur in a portion of the study area where it was not previously detected.

This species has no legal protective status in Oregon because it is listed as a federal species of concern and as state endangered. Federal species of concern does not require federal ESA consultation. No state regulation applies to this species, because the project is on private property.

Point Reyes Bird's-Beak (*Chloropyron maritimum* ssp. *palustre)*
Suitable habitat within the study area for Point Reyes bird's-beak is located within the portion of the site subject to tidal influences (Figure 5). The salt marsh habitat is restricted to the southeastern corner of the study area because the remainder of the site consists of steeper slopes and/or an armored shoreline that lacks a broad intertidal zone conducive for the development of salt marshes. There is marginal habitat located in areas adjacent to Henderson marsh in the southwest corner of the study area. Salt marsh habitat also extends beyond the study area boundary throughout Jordan Cove.

In 2006, a focused botanical survey was conducted for Point Reyes bird's-beak within all suitable habitats within the study area (SHN 2006a and 2006b), but the study area along the coast has expanded since this previous investigation. This occurrence was approximately 200 plants. All plants were in flower with less than half of the individuals being mature. The occurrence extends approximately 150 feet in length, varies from 30 to 50 feet in width, and is located within a portion of the salt marsh with tidal influence. Dominant species include pickleweed (*Salicornia virginica*), fleshy jaumea (*Jaumea carnosa)*, dodder (*Cuscuta salina)*, and seaside plantain (*Plantago maritima*). Associate species include another special status species, seaside lavender, in addition to saltgrass (*Distichlis stricta*), sandspurry (*Spergularia macrotheca)*, spearscale (*Atriplex patula)*, and seaside arrow grass (*Triglochin maritima)*. The greatest numbers of Point Reyes bird's-beak plants are located in the center of the occurrence where there is bare ground. Pickleweed and fleshy jaumea are replaced by Lyngbye's sedge (*Carex lyngbyei*), meadow barley (*Hordeum jubatum*), seaside arrow grass, and American bulrush (*Scirpus americanus)* within the easternmost portion of the salt marsh in the study area. The change in dominant species composition correlates to the eastern extent of Point Reyes bird's-beak occurrence within the study area.

Additional areas have been added to the study area since the date of the previous botanical investigations. During wetland investigations (SHN 2012) and a focused survey on August 1, 2012, Point Reyes bird's beak was observed in the southeastern edge and near the Trans Pacific Parkway Bridge. In the study area, a robust population, estimated at 100 plants was observed (refer to Figure 5 for location). The area was approximately 100 feet by 25 feet. The plant composition was similar to what was reported in 2006 by SHN, but the Point Reyes bird's-beak was restricted to areas with pickleweed. During field investigations in October (an appropriate time to see blooming species), only a few species were observed in areas where more robust populations were previously observed. As a reference, the area near the Trans-Pacific Parkway Bridge also did not include blooming species in October.

The absence of previously identified species in October is attributed to the time of year in which the survey was conducted. Thus, areas with pickleweed were professionally surveyed as potential habitat. The suitable Point Reyes bird's beak habitat can naturally vary due to wood debris accumulating in proximity to the mean high water of the shoreline. Wood debris is currently deposited at the shoreline covering potential habitat. Elevation changes along the shoreline also limit potential habitat. The changes to the elevation and shoreline from the tide affect the ability of pickleweed to colonize.

Based on the current location of development at the site, a small area of potential habitat for Point Reyes bird's-beak will be removed. No state regulation applies to this species, because the project is on private property and this species is not federally listed.

Western Lily (*Lilium occidentale*). The project is not located within an identified recovery area, but there is suitable habitat in the study area for western lily. This habitat is limited due to a lack of appropriate substrate and early successional habitats (USFWS, 2009). Western lily occurs within mineral soils that remain moist during the growing season or organic marsh soils (USFWS, 1998). The soil types on site are identified as dune land, Heceta fine sands, Waldport fine sands, and Waldport-Heceta fine sands (USDA NRCS, 2012). All of these soils are derived from Eolian deposits, rather than marine terrace deposits. Based on soil types present within the study area and western lily moisture requirements, suitable habitat within the study area is limited to the freshwater wetlands on site that have an organic layer within the soil profile. Review of historical photos from the 1930s and 1950s indicates most of the study area is comprised of actively moving dunes or forested areas. Areas that are not forested, dune, or wetland have been altered by current or historical disturbance due to industrial uses.

Western lily was not detected within portions of the suitable habitat that was surveyed for during the floristically appropriate season in 2005, but additional areas have been included into the study area since 2005. The forested areas east of Jordan Cove Road were reviewed on August 1, 2012, to determine potential habitat for western lily. This investigation was outside of the floristically appropriate time pursuant to the USFWS survey protocols. Except for the wetland at the corner of Jordan Cove Road and Trans-Pacific Parkway, the canopy ranges from mostly closed to a little open in wet areas. Shrub and herbaceous species are located near the wetlands. Dominant tree species include Shore pine and Douglas fir. A few red alders were observed. Mostly shrub and herbaceous species were observed near the wetlands. Shrub species include evergreen huckleberry, bearberry, shallon, Hooker's willow, and salmon berry. Herbaceous species include slough sedge. Soils observed in the wetland delineation include saturation and ponding soils with organic material in the soil horizon (DEA, 2010). This habitat is unlikely to support western lily due to the amount of canopy cover and soil composition. Additionally, during fieldwork in October 2012, saturation was observed indicating these wetlands are ponded almost year round, which the species does not appear to tolerate (USFWS, 2009).

Even though the habitat is unlikely, seasonally timed protocol surveys are necessary in order to proceed with Endangered Species Act consultation with USFWS. Surveys should include areas previously surveyed and results should be documented in a biological assessment that meets the requirements of the USFWS for use by the Federal Energy Regulatory Commission in consultation with the USFWS.

Wolf's Evening Primrose (*Oenothera wolfii*). Suitable habitat for Wolf's evening primrose is scattered throughout the study area, in areas that lack dense vegetation and have a sandy substrate. This includes portions of the disturbed habitat, which is only considered marginally suitable to support this species. Moderate to high quality habitat for Wolf's evening primrose is located above the tidal zone along the natural shoreline, throughout the semi-stabilized dunes in the eastern portion of the site, and edges of the Shore pine/Scotch broom forest.

This species has no legal protective status in Oregon because it is listed as a federal species of concern and as state threatened. "Federal species of concern" is an informal term that does not require federal ESA consultation. No state regulation applies to this species, because the project is on private property.

Silvery Phacelia (*Phacelia argentea*). Suitable habitat within the study area for silvery phacelia is located throughout the actively moving and/or semi-stabilized dune land, which includes the European beachgrass and scattered red fescue herbaceous vegetation associations (Figure 4). This habitat is considered moderate to highly suitable for supporting an occurrence of silvery phacelia.

Previous focused surveys have not detected silvery phacelia within portions of the study area (SHN, 2006a; SHN 2006b) and occurrences have not been reported by the ORBIC (ORBIC 2012). No basal rosettes were observed during the survey in October 2012.

This species has no legal protective status in Oregon because it is listed as a federal species of concern and as state threatened. "Federal species of concern" is an informal term that does not require federal ESA consultation. No state regulation applies to this species, because the project is on private property.

8.0 Analysis of Vegetation Impacts

Impacts to vegetation associations are confined to upland habitat types and do not include any impacts to the shrubland association or herbaceous wetland associations. The majority of vegetation that will be impacted by the proposed project is forested associations, the majority of which is a mix of shore pine/Sitka spruce and shore pine/Douglas fir on Dune Forest B. Table A-2 in Appendix A lists a summary of vegetation impacts based on the vegetation associations shown on Figure 3.

Direct impacts to botanical resources are at a minimum expected to remove a small portion of the overall coniferous dune forest habitat on the North Spit and a portion of the dune forest habitat within the study area. The removal of this habitat is not expected to have a significant impact on vascular species because these species are relatively common and widespread throughout the study area and in its vicinity. No special status vascular species were encountered in Dune Forest B or adjacent to it. The most substantial direct impact to botanical resources within Dune Forest B is a reduction in the quantity and diversity of nonvascular plant species that occur in the study area.

Direct impacts to botanical resources are at a minimum expected to remove a small portion of the overall coniferous dune forest habitat on the North Spit and a portion of the dune forest habitat within the study area. The removal of this habitat is not expected to have a significant impact on vascular species because these species are relatively common and widespread throughout the study

area and in its vicinity. No special status vascular species were encountered in Dune Forest B or adjacent to it. The most substantial direct impact to botanical resources within Dune Forest B is a reduction in the quantity and diversity of nonvascular plant species that occur in the study area.

Removal of a portion of the dune forest is expected to result in a change in species composition within the remainder of coniferous forest because vegetation will be subject to more wind exposure and salt spray. Salt-spray tolerant species, such as, silk tassel may be more abundant and there will likely be a decline in western hemlock and Port Orford cedar. These actions will inevitably alter natural vegetation succession.

Additional focused surveys, as discussed in previous sections, should be conducted prior to ground disturbing activities within the herbaceous associations west of Dune Forest B to ensure that there are no listed species within these areas.

9.0 Invasive Species

A review of the "100 most dangerous invaders to keep out" by the Oregon Invasive Species Council and ODA Noxious Weed Policy and Classification System was conducted. The aquatic species encountered during SHN's surveys are parrotfeather (*Myriophyllum aquaticum*) and cordgrass (*Spartina* sp.). Parrotfeather is a dominant species in the yellow pond lily herbaceous association. An unidentified cordgrass species was observed in the salt marsh in the eastern portion of the study area, but was not a dominant species in that habitat (SHN 2006a).

Non-aquatic invasive species include Scotch broom (*Cytisus scoparius)*, French broom (*Cytisus scoparius),* poison hemlock (*Conium maculatum),* pampas grass *(Cortaderia jubata),* and Armenian (Himalayan) blackberry (*Rubus armeninacus).* These species were found in areas that were historically disturbed. Other species not reported by the Oregon Invasive Species Council or ODA include non-native grasses that could impact the habitat quality. Specifically, European beach grass (*Ammophila arenaria)* was observed. This species has the potential to stabilize existing dunes.

10.0 Recommendations

Of the potential botanical species that were identified for the proposed project, only the western lily requires additional surveys. Additional surveys from mid-June to mid-July shall be conducted and results documented in a biological assessment, in order to proceed with consultation with USFWS. If any western lily is observed in the study area, the results should be reported the USFWS and a specific biological assessment should be prepared to conduct consultation with USFWS. Currently, there is no federal prohibition under the ESA for the take of listed plants on nonfederal lands, but the USFWS must issue a permit with the effects analyzed.

Other federal species of concern and listed as state threatened and endangered that could be present in the study area include pink sand verbena, Wolf's evening primrose, and silvery phacelia. Additional surveys for these species are recommended even though they are not required by any state or federal regulations. Voluntary actions help prevent further declines of species populations and help to avoid the potential need for future listing. Actions such as these may be highly regarded by regulators and may help to offset significant impacts to biological resources that the

proposed project cannot avoid. Surveys for these species should be conducted during the middle of July to ensure that all species that may potentially be present are surveyed during the floristically appropriate season. If the survey finds an occurrence of any state threatened or endangered species, the results should be reported.

Suitable habitat for the Point Reyes bird's-beak is located within an area proposed to be disturbed. While not required by state or federal regulations, it is recommended that a relocation plan be developed that identifies a relocation area and monitoring program to determine success. The Point Reyes bird's-beak is a hemi-parasite that attaches to a host plant and any relocation efforts should propose removing the area around existing plants.

The previous botanical reports included a review of Port–Orford-cedar (POC), but surveys for POC root rot disease were not conducted. Based on what is known about the disease it is likely to be present in the Coos Bay area regardless if infected trees are visible. The spores live in soil and are spread through contact with contaminated soil or via free water. The disease is primarily spread through soil disturbance and moving water. Furthermore, spread of the disease over long distances occurs from contaminated equipment and livestock. Prior to removal of any trees on site, a review of POC root rot should be conducted. Evidence of infected trees includes lighter colored foliage that eventually turns red to brown and dies and discolored inner bark. Prior to and during construction, precautions should be taken to minimize the spread of the disease. These measures include:

- Determine the extent of the disease within the project area to assess risk.
- Locate, map, and monitor all known sources of infection, including contaminated streams and sites where water accumulates.
- Limit soil disturbance operations to the dry weather season.
- Review potential sources that could be brought to the site.

It is recommended that guidelines to limit the spread of POC root rot disease prepared by the BLM and the US Forest Service be implemented as a standard practice during grading and soil moving operations.

The proposed project has the potential to increase the risk of aquatic and terrestrial invasive plant species at the project site due to the amount of ground disturbance, heavy equipment use, and potential off-site vectors (equipment used in other locations). A plan to address the spread of invasive species should be prepared prior to construction. The plan should outline steps to avoid spread of invasive species during construction and any off-site location material is moved.

11.0 Qualifications

Hilary Sundeen and Rosalind Litzky have conducted the fieldwork and report preparation. Ms. Sundeen has more than eight years of botany-related experience throughout the Pacific Northwest. She specializes in botany--including vegetation inventories and rare plant surveys. Ms. Litzky also has an extensive background in environmental planning and permitting, including environmental impact analyses pursuant to the National Environmental Policy Act. Ms. Sundeen and Ms. Litzky have developed numerous sensitive species assessments, habitat evaluations, and impact analyses

for projects in both rural and urban habitats throughout northern California and Southern Oregon. The experience also extends to coordinating with regional, state, and federal agencies.

12.0 References Cited

Baldwin, B.G., D.H. Goldman, D.J. Keil, R. Patterson, T.J. Rosatti, D.H. Wilken, eds. (2012). *The Jepson Manual: Vascular Plants of California, second edition*. Berkeley:University of California Press, Berkeley.

Christy J. A., J. S. Kagan, and A. M. Wiedemann. (1998). *Plant Associations of the Oregon Dunes National Recreation Area, Siuslaw National Forest, Oregon*. Technical Paper R6-NR-ECOL-TP-09-98. 123 pp.NR: USDA, Forest Service Pacific Northwest Region.

Currin, Rebecca. (November 2012). Email correspondence between Rosalind Litzky and Rebecca Currin, Botanist about ODA regulations about state endangered and threatened species.

David Evans and Associates, Inc. (June 2007). "Wetland Delineation Report, Liner Board Mill Site, Gateway Marine Terminal Project." Portland: DEA.

Meinke, Robert J., PhD. (2005) ODA. Discussion with the Program Supervisor, Oregon Department of Agriculture, Plant Division, Native Plant Conservation Program regarding special status plant species. Salem:ODA.

Oregon Biodiversity Information Center. (2010). *Rare, Threatened and Endangered Species of Oregon. Institute for Natural Resources*. Portland: Portland State University.

---. (December 20, 2011). *The Distribution and Reproductive Success of the Western Snowy Plover along the Oregon Coast – 2011.* NR:Portland State University.

---. (October 19, 2012). data request results. NR: Portland State University.

Oregon Invasive Species Council. (Accessed 2012). "100 Most Dangerous Invaders to Keep Out." Accessed at: http://www.oregon.gov/oisc/Pages/most_dangerous.aspx

Oregon Department of Agriculture. (2012). "Noxious Weed Policy and Classification System." Portland: ODA.

Oregon Secretary of State. (2011). "Oregon Revised Statutes (ORS 564)." Salem: OSS.

---. (October 15, 2012). "Administrative Rules, Department of Agriculture, Division 73, Plants: Wildflowers and Endangered, Threatened, and Candidate Species." Salem: OSS.

Oregon State University. (2012). "Oregon Flora Project." Corvallis:OSU.

SHN Consulting Engineers & Geologists, Inc. (August 2006a). "Addendum No. 1 to Jordan Cove Energy Botanical Resources Assessment Report." Coos Bay:SHN.

---. (October 2006b). "Jordan Cove Energy Botanical Resources Assessment, Addendum No. 2." Coos Bay:SHN.

---. (April 2012). "Wetland Delineation, Jordan Cove Energy Project." Coos Bay:SHN.

U.S. Department of Agriculture, Natural Resources Conservation Service. (Accessed March 2012). Web Soil Surveys (2.1) http://websoilsurvey.nrcs.usda.gov/app/.

---. WETS, Database, (accessed April 2012). North Bend FAA Airport, 6073. Accessed at: http://www.wcc.nrcs.usda.gov/climate/wets_doc.html

United States Department of Interior Bureau of Land Management Coos Bay District, United States Department of Agriculture Forest Service Siuslaw National Forest, Oregon Parks and Recreation Department. (July 2006). *Conservation Strategy for Pink Sand-verbena (Abronia umbellata ssp. breviflora).* Coos Bay:BLM.

U.S. Fish & Wildlife Service. (1973). *Federal Endangered Species Act of 1973*, as amended. NR: USFWS.

---. (September 23, 1996). "Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants." Sacramento:USFWS.

---. (March 1998). "Recovery Plan for the Endangered Western Lily (*Lilium occidentale*)." prepared for Region 1. Portland:USFWS.

---. (September 10, 2008). "Western Lily Survey Protocol." Arcata: USFWS.

---. (January 2009). *Lilium occidentale* (Western lily) 5-Year Review: Summary and Evaluation. Arcata: USFWS.

Appendix A
Species List

Table A-1 Species List Jordan Cove Energy Project, Coos Bay, OR			
Latin Name	**Common Name**	**Presence** **(1=tree, 2=shrub, 3=herb)**	**Native (N) or Exotic (E)**
Alnus rubra	red alder	1	N
Chamaecyparis lawsoniana	Port Orford Cedar	1	N
Malus fusca	Oregon crab apple	1	N
Picea sitchensis	Sitka spruce	1	N
Pinus attenuata	knobcone pine	1	O[1]
Pinus contorta ssp. *contorta*	beach pine	1	N
Pseudotsuga menziesii	Douglas fir	1	N
Rhamnus purshiana	cascara	1	N
Tsuga heterophylla	western hemlock	1	N
Arctostaphylos columbiana	hairy manzanita	2	N
Arctostaphylos uva-ursi	bearberry	2	N
Arctostaphylos x media	manzanita	2	N
Baccharis pilularis	coyote bush	2	N
Berberis aquifolium	tall Oregon-grape	2	N
Ceanothus thyrsiflorus	blue blossom	2	N
Cortaderia jubata	pampas grass	2	E
Corylus cornuta var. *californica*	California hazelnut	2	N
Cytisus scoparius	Scotch broom	2	E
Garrya elliptica	coast silk-tassle	2	N
Gaultheria shallon	salal	2	N
Genista monspessulana	French broom	2	E
Holodiscus discolor	oceanspray	2	N
Lonicera involucrata var. *ledebourii*	twinberry	2	N
Myrica californica	wax myrtle	2	N
Oemleria cerasiformis	Indian plum	2	N
Rhododendron macrophyllum	California rose-bay	2	N
Rosa sp.	rose	2	-[2]
Rubus armeniacus	Himalayan blackberry	2	E
Rubus leucodermis	white-stemmed raspberry	2	N
Rubus parviflorus	thimbleberry	2	N
Rubus spectabilis	salmonberry	2	N
Salix hookeriana	Hooker willow	2	N
Salix scouleriana	Scouler's willow	2	N
Salix sitchensis	Sitka willow	2	N
Salix sp.	willow	2	N
Sambucus racemosa var. *racemosa*	red elderberry	2	N
Spiraea douglasii	Douglas spiraea	2	N
Symphoricarpos albus var. *laevigatus*	common snowberry	2	N
Vaccinium ovatum	evergreen huckleberry	2	N

Table A-1 Species List Jordan Cove Energy Project, Coos Bay, OR			
Latin Name	**Common Name**	**Presence** **(1=tree, 2=shrub, 3=herb)**	**Native (N) or Exotic (E)**
Vaccinium parvifolium	red huckleberry	2	N
Abronia latifolia	yellow sand verbena	3	N
Achillea millefolium	common yarrow	3	N
Acrosiphonia coalita	algae	3	N
Adenocaulon bicolor	trail plant	3	N
Agrostis exarata	western bent-grass	3	N
Agrostis stolonifera	creeping bent-grass	3	E
Aira caryophyllea	silver hairgrass	3	E
Aira praecox	little hairgrass	3	E
Allotropa virgata	sugar-stick	3	N
Ambrosia chamissonis	silver burweed	3	N
Ammophila arenaria	European beachgrass	3	E
Anagallis arvensis	scarlet pimpernel	3	E
Anaphalis margaritacea	pearly everlasting	3	N
Anthoxanthum odoratum	sweet vernal grass	3	E
Anthriscus caucalis	bur-chervil	3	E
Asarum caudatum	wild ginger	3	N
Aster chilensis	common California aster	3	N
Atriplex patula	spearscale	3	N
Avena fatua	wild oat grass	3	E
Bellis perennis	English daisy	3	E
Bidens frondosa	leafy beggarticks	3	N
Blechnum spicant	deer fern	3	N
Boschniakia strobilacea	California ground cone	3	N
Brasenia schreberi	water shield	3	N
Brassica nigra	black mustard	3	E
Briza maxima	large quaking or rattlesnake grass	3	E
Bromus hordeaceus	soft chess	3	E
Bromus sp.	brome grass	3	-
Cakile maritima	sea rocket	3	E
Calamagrostis nutkaensis	Pacific reed grass	3	N
Calandrinia cilata	red maids	3	N
Calystegia soldanella	beach morning glory	3	N
Camissonia cheiranthifolia	Beach evening primrose	3	N
Cardamine californica	California toothwort or milk maids	3	N
Cardamine oligosperma	western bittercress	3	N
Cardionema ramosissimum	sand mat	3	N
Carduus pycnocephalus	Italian thistle	3	E

Table A-1 Species List Jordan Cove Energy Project, Coos Bay, OR			
Latin Name	**Common Name**	**Presence** **(1=tree, 2=shrub, 3=herb)**	**Native (N) or Exotic (E)**
Carex deweyana ssp. *leptopoda*	short-scaled sedge	3	N
Carex lyngbyei	Lyngby sedge	3	N
Carex obnupta	slough sedge	3	N
Carex sitchensis	Sitka sedge	3	N
Carex sp.	sedge	3	N
Centaurium muhlenbergii	Monterey centaury	3	N
Cerastium arvense	field chickweed	3	E
Chamomilla suaveolens	pineapple weed	3	E
Cichorium intybus	chicory	3	E
Cicuta douglasii	Douglas' water-hemlock	3	N
Cirsium arvense	Canada thistle	3	E
Cirsium sp.	thistle	3	E
Claytonia perfoliata	miner's lettuce	3	N
Claytonia sibirica	Siberian candyflower	3	N
Collomia heterophylla	varied-leaf collomia	3	N
Conium maculatum	poison hemlock	3	E
Cordlylanthus maritimus ssp. *palustris*	Point Reyes bird's-beak	3	N
Cuscuta salina	dodder	3	N
Cynosurus echinatus	hedgehog dogtail grass	3	E
Cyperus eragrostis	nut-grass or tall flat-sedge	3	N
Cyperus strigosus	False nutsedge	3	N
Dactylis glomerata	orchard grass	3	E
Daucus carota	wild carrot or Queen Anne's lace	3	E
Deschampsia cespitosa ssp. *cespitosa*	hairgrass	3	N
Digitalis purpurea	foxglove	3	E
Distichlis spicata	Salt grass	3	N
Eleocharis sp.	Spike-rush	3	-
Elymus glaucus	blue wildrye	3	N
Epilobium ciliatum	northern willowherb	3	N
Equisetum arvense	common horsetail	3	N
Erechtites minima	toothed coast fireweed	3	E
Festuca arundinacea	tall fescue	3	E
Festuca rubra	red fescue	3	N
Foeniculum vulgare	sweet fennel	3	E
Fragaria chiloensis	beach strawberry	3	N
Fritillaria affinis var. *affinis*	checker lily	3	N
Fucus gardneri	algae	3	N
Galium sp.	Bedstraw	3	-

Table A-1 Species List Jordan Cove Energy Project, Coos Bay, OR			
Latin Name	**Common Name**	**Presence** **(1=tree, 2=shrub, 3=herb)**	**Native (N) or Exotic (E)**
Galium trifidum	trifid bedstraw	3	N
Geranium dissectum	cut-leaved geranium	3	E
Geranium molle	dovefoot geranium	3	E
Geranium sp.	Geranium	3	E
Glehnia littoralis	beach silvertop	3	N
Glyceria elata	tall mannagrass	3	N
Gnaphalium palustre	lowland cudweed	3	N
Gnaphalium sp.	Cudweed	3	-
Goodyera oblongifolia	rattlesnake plantain	3	N
Grindelia stricta	gumweed	3	N
Hedera helix	English ivy	3	E
Hemitomes congestum	gnome plant	3	N
Heracleum lanatum	cow parsnip	3	N
Hieracium albiflorum	white hawkweed	3	N
Holcus lanatus	common velvet grass	3	E
Hordeum jubatum	foxtail barley	3	N
Hydrocotyle ranunculoides	floating water-pennywort	3	N
Hypericum anagalloides	bog St. John's-wort or tinker's-penny	3	N
Hypericum perforatum	Klamath weed or common St. John's-wort	3	E
Hypochaeris radicata	hairy cat's ear	3	E
Iris tenax	Oregon iris	3	N
Juncus articulatus	joint leaf rush	3	N
Jaumea carnosa	fleshy jaumea	3	N
Juncus bolanderi	Bolander's rush	3	N
Juncus bufonius	common toad rush	3	N
Juncus effuses	spreading rush	3	N
Juncus leseurii	rush	3	N
Juncus nevadensis	Nevada rush	3	N
Lathyrus japonicas	sand pea	3	N
Lathyrus palustris	marsh pea	3	N
Lathyrus sp.	Pea	3	-
Lemna sp.	Duckweed	3	-
Leucanthemum vulgare	ox-eye daisy	3	E
Leymus mollis	American dunegrass	3	N
Limonium californicum	seaside lavender	3	N
Linum bienne	western blue flax	3	E
Lobaria sp.	Lungwort	3	N
Lolium multiflorum	Italian ryegrass	3	E

Table A-1 Species List Jordan Cove Energy Project, Coos Bay, OR			
Latin Name	**Common Name**	**Presence** **(1=tree, 2=shrub, 3=herb)**	**Native (N) or Exotic (E)**
Lolium perenne	perennial ryegrass	3	E
Lotus corniculatus	birdfoot trefoil	3	E
Lotus micranthus	rose-flowered lotus	3	N
Lupinus arboreus	tree lupine	3	N
Lupinus littoralis	seashore lupine	3	N
Maianthemum dilatatum	false lily-of-the-valley	3	N
Marah oreganus	coast man-root	3	N
Melilotus alba	white sweetclover	3	E
Melilotus officinalis	yellow sweet clover	3	E
Mentha arvensis	field mint	3	N
Mentha pulegium	pennyroyal	3	N
Menyanthes trifoliata	buckbean	3	N
Montia perfoliata	Miner's lettuce	3	N
Myriophyllum aquaticum	parrotfeather	3	E
Navarretia squarrosa	skunkweed	3	N
Nemophila menziesii	baby blue eyes	3	E
Nuphar lutea ssp. *polysepala*	yellow pond lily	3	N
Oenanthe sarmentosa	Pacific water-parsley	3	N
Parentucellia viscosa	yellow parentucellia	3	E
Paspalum distichum	knotgrasss	3	N
Phalaris arundinacea	reed canary grass	3	N
Plantago lanceolata	English plantain	3	E
Plantago major	common plantain	3	E
Plantago martitima	seaside plantain	3	N
Plectritis brachystemon	pink plectritis	3	N
Poa macrantha	seashore bluegrass	3	N
Polgonum sp.	knotweed	3	-
Polygonum arenastrum	common knotweed	3	E
Polypodium sp.	leather-leaf fern	3	-
Polystichum munitum	sword fern	3	N
Polytrichum sp.	moss	3	-
Potamogeton nutans	floating-leaved pondweed	3	N
Potentilla anserina	silverweed	3	N
Potentilla palustris	marsh cinquefoil	3	N
Prunella vulgaris	self-heal	3	N
Psilocarphus sp.	woolly-heads or woolly marbles	3	-
Pteridium aquilinum var. *pubescens*	bracken fern	3	N
Ranunculus aquatilus	water buttercup	3	N
Ranunculus repens	creeping buttercup	3	E

Table A-1 Species List Jordan Cove Energy Project, Coos Bay, OR			
Latin Name	**Common Name**	**Presence** **(1=tree, 2=shrub, 3=herb)**	**Native (N) or Exotic (E)**
Ranunculus uncinatus	little buttercup	3	N
Raphanus sativus	wild radish	3	E
Rorippa nasturtium-aquaticum	water cress	3	N
Rubus ursinus	Pacific bramble or California blackberry	3	N
Rumex acetosella	sheep sorrel	3	E
Rumex crispus	curly dock	3	E
Salicornia virginica	pickleweed	3	N
Sanicula crassicaulis	Pacific snakeroot	3	N
Scirpus acutus	hardstem bulrush	3	N
Scirpus americanus	American bulrush	3	N
Scirpus microcarpus	small-flowered bulrush	3	N
Scirpus validus	soft-stem bulrush	3	N
Scrophularia californica	coast figwort	3	N
Senecio vulgaris	common butterweed	3	E
Sisyrinchium bellum	blue-eyed-grass	3	N
Sonchus asper ssp. *asper*	prickly sow thistle	3	E
Sparganium sp.	bur-reed	3	-
Spartina sp.	cordgrass	3	-
Spergularia macrotheca	sand spurry	3	N
Sphagnum sp.	peat moss	3	-
Spirodela polyrhizza	greater duckmeat	3	N
Stachys ajugoides	hedge nettle	3	N
Stellaria sp.	chickweed	3	-
Tanacetum camphoratum	dune tansy	3	N
Taraxacum officinale	dandelion	3	E
Trientalis latifolia	Pacific star flower	3	N
Trifolium dubium	hop clover or shamrock clover	3	E
Trifolium microcephalum	maiden clover	3	N
Trifolium repens	white clover	3	E
Trifolium willdenovii	tomcat clover	3	N
Triglochin maritima	seaside arrow grass	3	N
Trillium ovatum	western trillium	3	N
Typha latifolia	common cattail	3	N
Ulex europaeus	gorse	3	E
Utricularia macrorhiza	common bladderwort	3	N
Verbascum thapsis	woolly mullein	3	E
Veronica americana	American brooklime	3	N
Vicia americana var. *americana*	American vetch	3	N
Vicia sp.	vetch	3	-

Table A-1 Species List Jordan Cove Energy Project, Coos Bay, OR			
Latin Name	**Common Name**	**Presence** **(1=tree, 2=shrub, 3=herb)**	**Native (N) or Exotic (E)**
Vinca major	greater periwinkle	3	E

1 O: other native to Oregon, but not Coastal Oregon
2 -: unknown whether species is native or exotic because it was only identified to the genus level

Appendix B

Vegetation Impacted

Table B-1 Vegetation Impacted (Acres) by the LNG Export Terminal Project			
	Land Area (acres)	**Land Temporarily Affected by Construction (acres)**	**Land Permanently Affected by Operation (acres)**
PROJECT FACILITIES			
Terminal Site Access (1)	**3.9**	**3.9**	**3.9**
Shore Pine-Douglas Fir/Wax Myrtle-Evergreen Huckleberry	1.7		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	2.2		
Refrigerant Storage Area (2)	**1.9**	**1.9**	**1.9**
Shore Pine-Sitka Spruce/Evergreen Huckleberry	0.9		
American Dunegrass	1.0		
Marine Access Pipeway (3)	**8.8**	**8.8**	**8.8**
Shore Pine-Sitka Spruce/Evergreen Huckleberry	8.8		
Liquefaction Process Area (4)	**20.2**	**20.2**	**20.2**
Shore Pine-Sitka Spruce/Evergreen Huckleberry	18.2		
Red Alder/Salmonberry/Slough Sedge-Skunk Cabbage	0.1		
Shore Pine/Hairy Manzanita	1.4		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	0.3		
Shore Pine/Scotch Broom/Evergreen Beach Grass	0.2		
Laydown Area (4F)	**21.3**	**21.3**	**0.0**
Shore Pine-Douglas Fir/Wax Myrtle-Evergreen Huckleberry	6.1		
Shore Pine-Sitka Spruce/Evergreen Huckleberry	3.4		
Shore Pine/Bearberry	4.1		
American Dunegrass	2.6		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	5.0		

Table B-1, Vegetation Impacted (Acres) by the LNG Export Terminal Project, continued			
	Land Area (acres)	**Land Temporarily Affected by Construction (acres)**	**Land Permanently Affected by Operation (acres)**
LNG Tank Area (5)	**27.3**	**27.3**	**27.3**
Shore Pine-Douglas Fir/Wax Myrtle Evergreen Huckleberry	5.9		
Red Fescue-Salt Rush	8.6		
American Dunegrass	2.3		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	10.5		
Fire Water Ponds (6)	**3.7**	**3.7**	**3.7**
American Dunegrass	0.2		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	3.5		
Flare Area (7)	**1.0**	**1.0**	**1.0**
Shore Pine-Sitka Spruce/Evergreen Huckleberry	0.9		
American Dunegrass	0.1		
Construction Dock (8)	**2.9**	**2.9**	**2.9**
Shore Pine/Scotch Broom/European Beachgrass	0.3		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	0.8		
Marine Habitat	1.8		
Gas Processing Area (9)	**13.2**	**13.2**	**13.2**
Shore Pine-Douglas Fir/Wax Myrtle-Evergreen Huckleberry	0.1		
Shore Pine/Scotch Broom/European Beachgrass	0.7		
European Beachgrass	0.3		
Lyngby Sedge Regularly Flooded Tidal	0.7		
Hooker Willow-Crabapple/Slough Sedge-Skunk Cabbage	0.1		
Open Water/Common Cattail	0.8		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	10.5		

Table B-1, Vegetation Impacted (Acres) by the LNG Export Terminal Project, continued			
	Land Area (acres)	**Land Temporarily Affected by Construction (acres)**	**Land Permanently Affected by Operation (acres)**
Laydown Area (10)	**3.8**	**3.8**	**0.0**
Disturbed-Herbaceous Dominated w/Scattered Shrubs	0.5		
European Beachgrass	0.8		
Shore Pines/Scotch Broom/European Beachgrass	0.3		
Red Fescue-Salt Rush	2.2		
Stormwater Pond Laydown (11)	**11.5**	**11.5**	**11.5**
Disturbed-Herbaceous Dominated w/Scattered Shrubs	4.8		
Shore Pine/Scotch Broom/European Beachgrass	4.4		
Hooker Willow-Crabapple/Slough Sedge-Skunk Cabbage	<0.1		
American Dunegrass	2.3		
PCGP Meter Station	**2.9**	**2.9**	**0**
Shore Pine/Scotch Broom/European Beachgrass	1.5		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	1.4		
Fill Area (12)	**7.3**	**7.3**	**7.3**
Shore Pine-Douglas Fir/Wax Myrtle-Evergreen Huckleberry	1.8		
Red Fescue-Salt Rush	2.1		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	3.4		
Slip and Access Channel (13)	**66.0**	**66.0**	**66.0**
Shore Pine-Sitka Spruce/Evergreen Huckleberry	13.3		
Shore Pines/Scotch Broom/European Beachgrass	1.8		
European Beachgrass	0.9		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	20.7		
Marine Habitat	29.3		

Table B-1, Vegetation Impacted (Acres) by the LNG Export Terminal Project, continued			
	Land Area (acres)	**Land Temporarily Affected by Construction (acres)**	**Land Permanently Affected by Operation (acres)**
Access/Utility Corridor (R1)	**10.8**	**10.8**	**10.8**
Shore Pine- Sitka Spruce/Evergreen Huckleberry	0.9		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	2.4		
Red Alder/Salmonberry/Slough Sedge-Skunk Cabbage	0.4		
Shore Pine/Hairy Manzanita	0.5		
Shore Pine/Scotch Broom/European Beach Grass	1.1		
Red Fescue-Salt Rush	1.1		
Port Orford Cedar/Evergreen Huckleberry	0.1		
Mosaic of Active Dune and European Beachgrass	3.0		
Hooker Willow-Crabapple/Slough Sedge-Skunk Cabbage	0.6		
Shore Pine-Douglas Fir/Wax Myrtle-Evergreen Huckleberry	0.5		
Pond Lily	0.2		
Control Building/Plant Warehouse/Maintenance Building (R1A)	**8.1**	**8.1**	**8.1**
Shore Pine- Sitka Spruce/Evergreen Huckleberry	1.4		
Red Alder/Salmonberry/Slough Sedge-Skunk Cabbage	0.1		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	2.7		
Shore Pine/Scotch Broom/European Beach Grass	1.4		
Red Fescue-Salt Rush	0.4		
Port Orford Cedar/Evergreen Huckleberry	1.8		
Shore Pine-Douglas Fir/Wax Myrtle-Evergreen Huckleberry	0.3		
Sand Dune Area (E2)	**6.5**	**0**	**0**
Shore Pine-Douglas Fir/Wax Myrtle-Evergreen Huckleberry	5.9		
Mosaic of Active Dune and European Beachgrass w/Shore Pine	0.6		

Table B-1, Vegetation Impacted (Acres) by the LNG Export Terminal Project, continued			
	Land Area (acres)	**Land Temporarily Affected by Construction (acres)**	**Land Permanently Affected by Operation (acres)**
LNG Loading Berth Dune (E4)	**15.2**	**15.2**	**0**
Shore Pine-Sitka Spruce/Evergreen Huckleberry	9.2		
Shore Pine/Scotch Broom/European Beachgrass	2.2		
Shore Pine/Hairy Manzanita	1.8		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	6.9		
Construction Worker Camp Bridge	**0.3**	**0.3**	**0.3**
Shore Pine/Scotch Broom/European Beachgrass	.1		
Lyngby Sedge Regularly Flooded Tidal	.1		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	.1		
Industrial Wastewater Pipeline Relocation	**12.8**	**12.8**	**4.7**
Disturbed-Herbaceous Dominated w/Scattered Shrubs	12.8		
Water/Raw Water	**2.5**	**2.5**	**1.1**
Disturbed-Herbaceous Dominated w/Scattered Shrubs	2.5		
Subtotal Project Facilities	**251.9**	**245.4**	**192.7**
UNDISTURBED AREAS ON LNG TERMINAL SITE			
Preserved Wetlands Area (E1)	**27.6**	**0**	**0**
N/A- No Impacts			
Preserved Wetlands Area (E3)	**10.9**	**0**	**0**
N/A- No Impacts			
Preserved Wetlands Area (E5)	**6.9**	**0**	**0**
N/A- No Impacts			
Subtotal Undisturbed Areas	**45.4**	**0**	**0**
TOTAL LNG TERMINAL PROJECT	**297.3**	**245.4**	**192.7**

Table B-1, Vegetation Impacted (Acres) by the LNG Export Terminal Project, continued			
	Land Area (acres)	**Land Temporarily Affected by Construction (acres)**	**Land Permanently Affected by Operation (acres)**
NONJURISDICTIONAL FACILITIES			
South Dunes Power Plant	**56.0**	**56.0**	**56.0**
Shore Pine/Scotch Broom/European Beachgrass	0.8		
Hooker Willow-Crabapple/Slough Sedge-Skunk Cabbage	0.7		
American Dunegrass	0.7		
Open Water/Common Cattail	0.9		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	52.9		
Southwest Oregon Resource Security Center (SORSC)	**8.2**	**8.2**	**8.2**
Red Alder/Salmonberry/Slough Sedge-Skunk Cabbage	0.6		
Shore Pine-Douglas Fir/Wax Myrtle-Evergreen Huckleberry	4.5		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	2.4		
European Beachgrass	0.3		
Shore Pine/Scotch Broom/European Beachgrass	0.3		
Open Water/Common Cattail	0.1		
TOTAL NONJURISDICTIONAL FACILITIES	**64.2**	**64.2**	**64.2**
TEMPORARY CONSTRUCTION AREAS			
Offices (A, B)	**1.4**	**1.4**	**0**
Disturbed-Herbaceous Dominated w/Scattered Shrubs	1.4		
Laydown (K, L)	**13.1**	**13.1**	**0**
Disturbed-Herbaceous Dominated w/Scattered Shrubs	13.1		
Parking (D)	**0.9**	**0.9**	**0**
Disturbed-Herbaceous Dominated w/Scattered Shrubs	0.9		

Table B-1, Vegetation Impacted (Acres) by the LNG Export Terminal Project, continued			
	Land Area (acres)	**Land Temporarily Affected by Construction (acres)**	**Land Permanently Affected by Operation (acres)**
Craft Areas (F, G)	**0.7**	**0.7**	**0**
Disturbed-Herbaceous Dominated w/Scattered Shrubs	0.7		
Warehouse/Storage (E, H, J)	**1.4**	**1.4**	**0**
Disturbed-Herbaceous Dominated w/Scattered Shrubs	1.4		
Fabrication (M1, M2, M3, M4)	**3.7**	**3.7**	**0**
Disturbed-Herbaceous Dominated w/Scattered Shrubs	3.7		
Open Areas	**10.5**	**10.5**	**0**
Disturbed-Herbaceous Dominated w/Scattered Shrubs	10.5		
Field Supervision Trailers (C)	**-**		
Tank Roof Fabrication (M5)	**-**		
Tank Staging Area (N)	**-**		
Process Staging Area (P)	**-**		
Concrete Batch Plant Area (Q)	**-**		
Construction Laydown (R)(2)	**-**		
Construction Laydown (S)(2)	**-**		
Laydown – South Dunes (T)(2)	**-**		
Excavated Materials Haul Road	**-**		
Heavy Equipment Truck Haul Road	**8.2**	**8.2**	**0**
Disturbed-Herbaceous Dominated w/Scattered Shrubs	8.2		
Slurry/Decant Water Pipeline Route	**1.2**	**1.2**	**0.0**
Disturbed-Herbaceous Dominated w/Scattered Shrubs	1.2		
Construction Worker Camp	**48.6**	**48.6**	**0.0**
Shore Pine/Scotch Broom/European Beachgrass	6.7		
European Beachgrass	19.3		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	22.6		

Table B-1, Vegetation Impacted (Acres) by the LNG Export Terminal Project, continued			
	Land Area (acres)	**Land Temporarily Affected by Construction (acres)**	**Land Permanently Affected by Operation (acres)**
Worker Loading Platform Area	**1.2**	**1.2**	**0**
Shore Pine/Scotch Broom/European Beachgrass	0.4		
Disturbed-Herbaceous Dominated w/Scattered Shrubs	0.8		
TOTAL TEMPORARY CONSTRUCTION AREAS	**90.9**	**90.9**	**0.0**
TOTAL PROJECT AREA	**452.4**	**400.5**	**256.9**

Appendix C

Vegetation Association Photos

Appendix C
Vegetation Communities

The following photos depict some of the vegetation communities, or habitat types, identified in the Study Area. The photos are grouped into one of the four vegetation communities: forest, woodland, shrubland, and herbaceous. Not all the associations described in the report are depicted below.

Forested



Photo 1. This photo shows the shore pine/scotch broom/European beachgrass forest.



Photo 2. This photo shows the shore pine/slough sedge seasonally flooded forest. Note the watermark on the shore pine trunk, a primary wetland hydrology indicator.



Photo 3. This photo shows a mix of shore pine/hairy manzanita and shore pine/bearberry woodland associations



Photo 4. This photo shows a mix of shore pine/Sitka spruce and shore pine/Douglas fir forested associations



Photo 5. This photo shows the shore pine/Douglas fir forested association.

Shrubland



Photo 6. This photo shows the hooker willow/slough sedge and Douglas spiraea shrubland. Note the presence of the herbaceous combination association intermixed in the Palustrine scrub-shrub. Dune Forest C is located in the background.



Photo 7. This photo shows the hooker willow/slough sedge and Douglas spiraea shrubland. Note the bare ground within portions of the understory.

Herbaceous



Photo 8. Disturbed habitat adjacent to current Roseburg chip facility operations.



Photo 9. Disturbed habitat located between Henderson Marsh and Dune Forest B. Dune forest B is shown in the background.



Photo 10. This photo shows the pickleweed/saltgrass and algal vegetation association and armored shoreline located along a portion of the waterfront in the Study Area. This vegetation type is also classified as estuarine wetland.



Photo 11. This photo shows the floating pondweed herbaceous association. This photo was taken at Jordan Lake and depicts the Port Orford cedar forested association in the background.



Photo 12. This photo shows a mix of floating pondweed and herbaceous combination associations located in the North Central Wetland (Figure 5).



Photo 13. This photo shows a number of associations including a mosaic of active dune and European beachgrass and scattered red fescue herbaceous association.

APPENDIX P-4

SHN 2013 Wildlife Assessment Survey Report

Wildlife Assessment and Survey Report

Jordan Cove Energy Project
Coos Bay, Oregon

Prepared for:

Jordan Cove Energy

Consulting Engineers & Geologists, Inc.

275 Market Avenue
Coos Bay, OR 97420-2220
541-266-9890

January 2013
611048.131

CONSULTING ENGINEERS & GEOLOGISTS, INC.
275 Market Ave. Coos Bay, OR 97420-2228 • 541-266-9890 • FAX: 541/266-9496 • coosbayinfo@shn-engr.com

Reference: 611048

January 22, 2013

Mr. Bob Braddock
Jordan Cove Energy Projects, LLC
123 W. Central Avenue, Ste. 380
Coos Bay, OR 97420

Subject: Wildlife Assessment and Survey Report, Jordan Cove Energy Project, Coos County, Oregon

Dear Mr. Braddock:

Attached is the wildlife assessment and survey report for the Jordan Cove Energy Project in Coos County, Oregon. The purpose of this report is to document the following updates to wildlife surveys previously conducted in Jordan Cove:

- An updated wildlife survey for areas previously reviewed in 2005-2006, and additional areas not previously covered that may be impacted by project development.
- An updated wildlife assessment for federally and state listed species in areas previously reviewed in 2005-2006, to document any changes in site conditions and/or additions to listed species potentially present in the project area, and in areas not previously reviewed.
- Mitigation for limiting impacts to special status wildlife species.

The findings in this report shall be used to facilitate ongoing permitting for wildlife resources at the Jordan Cove Energy Project and will be included as part of resource report 3. This report documents the methods, results, and conclusions, as well as gives recommendations to limit impacts to protected wildlife.

If you have any questions about this report, please feel free to contact me at our Eureka, California office at 707-441-8855.

Sincerely,

SHN Consulting Engineers & Geologists, Inc.

Hilary Sundeen, Biologist

HAS:dkl

Enclosure: Wildlife Assessment and Survey Report

Reference: 611048.131

Wildlife Assessment and Survey Report

Jordan Cove Energy Project
Coos County, Oregon

Prepared for:

Jordan Cove Energy

Prepared by:

Consulting Engineers & Geologists, Inc.
275 Market Avenue
Coos Bay, OR 97420-2228
541-266-9890

January 2013

QA/QC:MSC___

Table of Contents

Page

Abbreviations and Acronyms iii

1.0 Introduction 1
- 1.1 Project Location 1
- 1.2 Current Land Use 1

2.0 Methods 5
- 2.1 Literature Review 5

2.2 Special Status Species Analysis 5
- 2.4 Site Investigation Methods 19
- 3.1 Listed Species 20
  - 3.1.1 Marbled Murrelet (*Brachyramphus marmoratus*): Federal and State Threatened 20
  - 3.1.2 Aleutian Canada Goose (*Branta canadensis leucopareia*): Federally Delisted, BLM Sensitive 21
  - 3.1.3 Western Snowy Plover (*Charadrius alexandrinus nivosus*): Federal and State Threatened 21
  - 3.1.4 American Peregrine Falcon (*Falco peregrinus anatum*): Federally Delisted, BLM Sensitive 21
  - 3.1.5 Bald Eagle (*Haliaeetus leucocephalus*): Federally Delisted, State Threatened 22
  - 3.1.6 California Brown Pelican (*Pelecanus occidentalis californicus*): Federally Delisted, State Endangered 22
  - 3.1.7 Northern Spotted Owl (*Strix occidentalis caurina*): Federal and State Threatened 22
  - 3.1.8 Fisher, West Coast DPS (*Martes pennanti*): Federal Candidate for Listing, State Sensitive–Critical 23
- 3.2 Special Status Species 23
  - 3.2.1 Special Status Bird Species 23
  - 3.2.2 Special Status Herptofauna 23
  - 3.2.3 Special Status Mammals 24
- 3.3 Additional Species Observed 24
  - 3.3.1 Breeding Birds 24
  - 3.3.2 Mammals 25
  - 3.3.3 Herptofauna 25

4.0 Conclusions 25
- 4.1 Special Status Wildlife Species 26
- 4.2 Nesting Birds 26

5.0 Mitigation 26
- 5.1 Mitigation Measure 1–Snowy Plover 26
- 5.2 Mitigation Measure 2–Listed Avian Species 27
  - 5.2.1 American Peregrine Falcon 27
  - 5.2.2 Bald Eagles 28
- 5.3 Mitigation Measure 3 – Special Status Avian Species 28

Table of Contents, Continued

5.4 Mitigation Measure 4–Special Status Herptofauna....29
6.0 References Cited....30

Appendices

A. Species List
B. Previous Report

List of Illustrations

Figures **Follows Page**

1. Site Map....1

Tables **Page**

Table 1 Habitat Category Descriptions....3
Table 2 Potential Regionally Occurring Sensitive Wildlife Species from Jordan Cove, Oregon....7

Abbreviations and Acronyms

AMPF	American peregrine falcon
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
C	federal candidate for listing as threatened or endangered
CABP	California brown pelicans
CFR	Code of Federal Regulations
CH	critical habitat
D	federally delisted
DEA	David Evans and Associates
DPS	distinct population segment
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
JCEP	Jordan Cove Energy Project
LE	state or federally listed endangered
LT	state or federally listed threatened
MAMU	marbled murrelets
MBTA	Migratory Bird Treaty Act
NR	not referenced
NSO	northern spotted owls
OAR	Oregon Administrative Rules
OBIC	Oregon Biodiversity Information Center
ODFW	Oregon Department of Fish and Wildlife
PE	state or federal proposed as an endangered species
PT	state or federal proposed as a threatened species
SC	state sensitive–critical
SHN	SHN Consulting Engineers & Geologists, Inc.
SOC	federal species of concern
SV	state sensitive–vulnerable
U.S. EPA	U.S. Environmental Protection Agency
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Services
WSPL	western snowy plover

1.0 Introduction

SHN Consulting Engineers & Geologists, Inc. (SHN) has conducted literature reviews and site investigations to determine impacts to potential federal and state listed wildlife species (Oregon Administrative Rules 603-073), and additional species at the request of Oregon Department of Fish and Game (ODFW), at Jordan Cove in Coos County, Oregon for the Jordan Cove Energy Project (JCEP). This wildlife assessment and survey report is an update to pre-construction wildlife surveys conducted in Jordan Cove during 2005-2006 by LBJ Enterprises. This report does not address fish or other marine resources, those species were addressed separately in previous documents. A species list is provided in Appendix A, and a copy of the 2005-2006 report is included as Appendix B. The findings in this report shall be used to facilitate ongoing permitting for the JCEP.

1.1 Project Location

The JCEP is on the north shore of Coos Bay, in Coos County, Oregon, within Sections 3, 4, and 5 of Township 25 South, Range 13 West, Willamette Meridian; North Bend and Empire 7.5 minute U.S. Geological Survey topographic quadrangle (Figure 1). South of the project area, across the open water of Coos Bay, is the Southwest Oregon Regional Airport. Directly north of the project area is the Trans-Pacific Parkway and railroad. To the north of the Trans-Pacific Parkway are mitigation wetlands created by the Weyerhaeuser Company and the Oregon Dunes National Recreation Area administered by the U.S. Forest Service. Within the northwest corner of the project area is Bureau of Land Management (BLM)-administered land including a special recreation management area and an area of critical environmental concern. Henderson Marsh borders the western boundary of the project area.

1.2 Current Land Use

The project area is privately owned by the Jordan Cove Energy Projects, LLC, Roseburg Forest Resources, and Weyerhaeuser Company. Roseburg Forest Resources currently operates a chip facility along a section of the waterfront portion of the project area. Facilities include a dock for mooring ships, infrastructure for loading ships, large chip piles with associated heavy equipment used for moving the piles, and a few office buildings with parking spaces. Chip trucks enter the project area by way of the Trans-Pacific Parkway to Jordan Cove Road and unload at the Roseburg facility. Part of the project area in the sand dunes east of Jordan Lake is used to distribute dredge spoils from the Roseburg facility.

1.3 Project Area Habitats

Habitat within the plan area includes developed and non-developed sites. Below is a list of common habitats found in the project area and the associated habitat type and habitat categories based on the Oregon Administrative Rule habitat categorization protocol (OAR 635-415-0025). Habitat types and categories have been defined by David Evans and Associates (DEA), and will be submitted with the associated habitat maps as a separate report. For ease of reference, the habitat categories are shown below in Table 1.

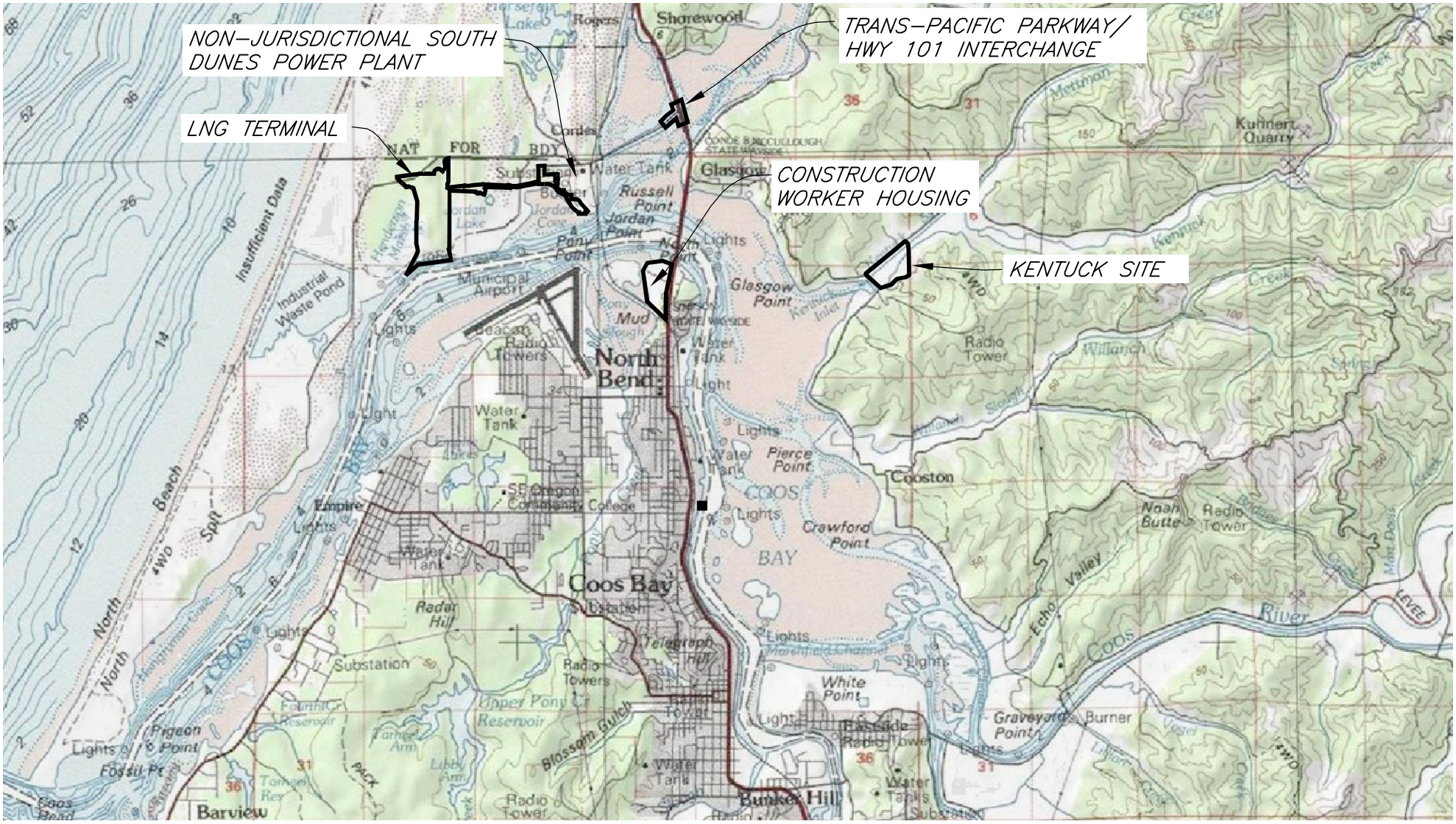


IMAGE SOURCE: USA TOPO MAP

0 500

1"=500'

Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Project Wildlife Assessment and Survey Report Coos County, Oregon	Site Location SHN 611048.131
	January 2013 | 611048HABITAT	Figure 1

Table 1 Habitat Category Descriptions (OAR 635-415-0025)	
Habitat Category	**Habitat Included**
Category 1	Irreplaceable, essential and limited habitat
Category 2	Essential and limited habitat
Category 3	Essential habitat, or important and limited habitat
Category 4	Important habitat
Category 5	Habitat having high potential to become either essential or important habitat
Category 6	Habitat that has low potential to become essential or important habitat

1.3.1 Upland Habitats

Coastal Dune Forest Habitat. Coniferous dune forest consists of remnant patches of early to mid-seral tree forest. Dominant species include Sitka spruce (*Picea sitchensis*) and shore pine (*Pinus contorta*), with scattered Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and Port Orford cedar (*Chamaecyparis lawsoniana*). The patchy canopy promotes vigorous shrub growth and cover, ranging from dense to nearly impenetrable. Dominant shrubs are evergreen huckleberry (*Vaccinium ovatum*), salal (*Gaultheria shallon*), bearberry (*Arctostaphylos uvaursi*), and Pacific rhododendron (*Rhododendron macrophyllum)* with scattered California wax myrtle (*Myrica californica*). Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), and English ivy (*Hedera helix*) are common along the edges of the forest. The understory is generally lacking herbaceous species due to dense canopy cover. The habitat is classified as Category 3 because it is essential to wildlife but is not limited. More than 10 great blue heron were seen roosting in the forest adjacent to the wetland near the center of the study area.

Riparian Forest Habitat. Riparian forest consists of a small patch of early to mid-seral forest along the northern shore of Jordan Cove. Portions of the forest lie below the mean higher high water line, which influences the plant composition. The forest is distinct from coastal dune forest because of the canopy, which is dominated by red alder (*Alnus rubra*) and willow (*Salix* sp.), with scattered Sitka spruce and California wax myrtle. Understory vegetation is generally similar to coastal dune forest habitat, and Himalayan blackberry and English ivy (*Hedera helix*) are similarly common along the edges of the forest. The habitat is classified as Category 3 because it is essential to wildlife, but is not limited.

Unvegetated Sand Upland. The unvegetated sand upland habitat type includes areas of moving sand that have not been colonized by vegetation, except for very scattered herbaceous pioneer species such as European beachgrass (*Ammophila arenaria*) and very scattered trees and shrubs that were included due to their isolation within the community. Although the habitat formed by these dunes is generally devoid of vegetation, it still provides important and essential, though not limited, habitat for a variety of wildlife and is, therefore, classified as Category 4.

Herbaceous Upland. The herbaceous upland habitat type is found in historically leveled areas that were planted with pasture species and have retained primarily herbaceous cover. Dominant species

include tall fescue (*Festuca arundinacea*), sweet vernal grass (*Anthoxanthum odoratum*), Queen Ann's lace (*Daucus carota*), and hedgehog dogtail grass (*Cynosurus echinatus*). Himalayan blackberry and scattered trees and shrubs (cultivated as well as native) are present in some places along the edges of the habitat, and have been included in this habitat type due to the low cover value they provide. The habitat is classified as Category 4 because it is not essential, or limited, but is important to wildlife.

Herbaceous/ Shrub Upland. The herbaceous/ shrub upland habitat type is found in historically leveled areas that were planted with pasture species and have retained herbaceous cover, but have been invaded by shrubs, primarily Scotch broom, trailing blackberry, and Himalayan blackberry. Overall shrub cover is 10% or less in this community. Dominant species include primarily tall fescue, with less cover by European beachgrass, velvet grass (*Holcus lanatus*), English plantain (*Plantago lanceolata*), yarrow (*Achillea millefolium*), pearly everlasting (*Anaphalis margaritacea*), tall orchardgrass (*Dactylis glomerata*), colonial bentgrass (*Agrostis capillaris*), hairy catsear (*Hypochaeris radicata*), small-head clover (*Trifolium microcephalum*), American dunegrass (*Elymus mollis*), hop clover (*T. dubium*), and red and white clover (*T. pratense and repens*), and Queen Anne's lace, among others. The habitat is classified as Category 4, because it is not essential or limited, but is important to wildlife.

Shrub Upland. This community is located on stabilized dunes that were not leveled historically, but appear to have been cleared of dune vegetation and subsequently colonized by shrubs and young trees, primarily Scotch broom and scattered young lodgepole pine. Overall shrub cover is 20% or more in this community. Himalayan blackberry is present in some areas, especially upslope of wetland areas. The herbaceous species include a variety of common dune species, as well as a variety of grasses. Dominant species included European beachgrass, sweet vernal grass, and colonial bentgrass, among others. The habitat is classified as Category 4, because it is not essential or limited, but is important to wildlife.

Developed. Developed areas include portions of the site that have been significantly disturbed by development or other land use activities (such as, roadsides, unvegetated cut slopes, and maintenance building footprints). This includes both paved roads and parking lots, and gravel roads. They have limited potential to become important or essential in the foreseeable future, and are therefore classified as Category 6.

1.3.2 Fresh Water Wetland Habitats

Emergent Wetland. The herbaceous emergent wetland community is located in low-lying areas throughout the study area. This habitat type is used by various amphibians, birds, and invertebrates. Vegetation is typically dominated by slough sedge (*Carex obnupta*), spreading rush (*Juncus patens*), water parsley (*Oenanthe sarmentosa*), and Pacific silverweed (*Potentilla anserina*), and salt grass (*Distichlis spicata*), among others. Wetter portions of this community consisted of aquatic floating and emergent plants in seasonally or perennially inundated areas, including pond lily (*Nuphar polysephalum*), water parsley, cattail (*Typha latifolia*), and small-fruited bulrush (*Scirpus microcarpus*). Emergent wetland habitat is classified as Category 2 because it is essential for wildlife, and limited, but can be replaced through mitigation.

Open Water. Open water was present within deeper portions of emergent wetland areas, where no vegetation was present. The habitat is classified as Category 2, because it is essential for wildlife and limited, but can be replaced through mitigation.

Forested Wetland. The forested wetland community was interspersed with upland forest east of Jordan Cove Road. The tree canopy was primarily red alder, with some areas of tree-size Hooker willow (*Salix hooeriana*). The shrub layer was dominated by salmonberry (*Rubus spectabilis*) and other common coastal wetland species such as slough sedge and skunk cabbage (*Lysichiton americanus*). The habitat is classified as Category 2, because it is essential for wildlife and limited, but can be replaced through mitigation.

1.4 Previous Investigation

This wildlife assessment and survey report is an update to pre-construction wildlife surveys conducted in Jordan Cove during 2005-2006 by LBJ Enterprises (Appendix B). This report includes the addition of sites adjacent to the Weyerhaeuser mill site, as well as a reassessment of areas previously surveyed during 2005-2006 to determine if any changed conditions had occurred.

2.0 Methods

The methodology used to assess potential impacts to wildlife resources is consistent with Federal Energy Regulatory Commission's (FERC) requirements for evaluating wildlife species listed pursuant to the Endangered Species Act of 1973. Methods used to evaluate special status species potentially impacted by project implementation and guidance to proceed with surveys for these species includes literature review, special status species analysis, target species list, and site investigations methods.

2.1 Literature Review

Pertinent literature for the Coos County and Oregon Coast area was reviewed in combination with earlier reports prepared for the Jordon Cove site (refer to Section 1.4). Literature consisted of federal and state database searches, reports documenting research by others in the general area, species accounts for known and suspected species that may be present at the site, published works (including field guides), unpublished works by others, and in-house information from SHN staff. Relevant literature used in this report is documented in "Section 6.0: References Cited."

2.2 Special Status Species Analysis

Prior to conducting fieldwork, a review of information related to wildlife species that could potentially use the site was conducted. This includes a review of existing literature regarding sensitive wildlife species that have the potential to occur within the site. Resources for this determination included:

1. Oregon Department of Fish and Wildlife (ODFW) Sensitive Species (ODFW, 2008).

2. U.S. Fish and Wildlife service (USFWS) federally listed, proposed, candidate, delisted species and species of concern for Coos County (USFWS, 2012).

3. Oregon Biodiversity Information Center (OBIC) rare, threatened and endangered species of Oregon (vertebrates) in Coos County (OBIC, 2012).

4. BLM, Coos Bay District, Final North Spit Plan (BLM, 2005).

Table 2 (beginning on the next page) includes all wildlife species reported from the above queries and literature, their preferred habitat, and whether there is suitable habitat present within the study area for the species.

The potential for occurrence of those species included on the list were then evaluated based on the habitat requirements of each species relative to the conditions observed during the field surveys.

Each species was evaluated for its potential to occur on the study area according to the following criteria:

1. **None**. Species listed as having "none" are those species for which:
   - there is no suitable habitat present in the study area (that is, habitats on the study area are unsuitable for the species requirements [for example, elevation, hydrology, plant community, disturbance regime, etc.]).
2. **Low**. Species listed as having a "low" potential to occur in the study area are those species for which:
   - there is no known record of occurrence in the vicinity; and
   - there is marginal or very limited suitable habitat present within the study area.
3. **Moderate**. Species listed as having a "moderate" potential to occur in the study area are those species for which:
   - there are known records of occurrence in the vicinity; and
   - there is suitable habitat present in the study area.
4. **High**. Species listed as having a "high" potential to occur on the study area are those species for which:
   - there are known records of occurrence in the vicinity (there are many records and/or records in close proximity); and
   - there is highly suitable habitat present in the study area.
5. **Present**. Species listed as "present" in the study area are those species for which:
   - the species was observed in the study area.

2.3 Target Species

Based on information gathered from the queries and described in Table 2, a list of potential target species for the study area was compiled. The target species list contains wildlife species included in Table 2 with moderate to high (or present) potential to occur within the project vicinity, or a known population occurs near the project area. Target species include the sub-categories of "Listed" and "Non-listed" species. Listed species, for the purposes of this report, include recently delisted or

Table 2 Potential Regionally Occurring Sensitive Wildlife Species from Jordan Cove, Oregon				
Species Latin Name	**Common Name**	**Status (Federal/State/OBIC) or BLM[1,2,3]**	**General Habitat Requirements**	**Potential for Occurrence**
Invertebrates				
Algamorda newcombiana	Newcomb's littorine snail	SOC/-/-	Estuarine habitat loss and pollution and *Spartina alternifolora* overcrowding are the greatest threats to this species. The species could be significantly impacted by habitat loss from destruction or modification of tidelands and tidal wetlands.	High
Anodonta californiensis	California floater mussel	SOC/-/-	A freshwater mussel. This is a low elevation species that is found in both lakes and lake-like stream environments.	Moderate
Gilabates oregonius	Salamander Slug	BLM Sensitive	Moist coniferous forest with leaf litter.	Moderate
Propgysaon vanattae pardalis	Spotted Tail-dropper	BLM Sensitive	Moist mature forests.	Moderate
Herptofauna				
Actinemys marmorata marmorata	Northern Pacific pond turtle	SOC/SC/2	Habitat includes permanent and intermittent waters of rivers, creeks, small lakes and ponds (including human-made stock ponds and sewage-treatment ponds; marshes, unlined irrigation canals, and reservoirs. Sometimes this turtle is found in brackish water.	High
Aneides ferreus	Clouded salamander	-/SV/4	Moist coniferous forests (redwood, Douglas fir, western hemlock, Port Orford cedar forests); in forest edge, forest clearings, talus, and burned over areas. Usually found under bark, in rotten logs, or in rock crevices. May aggregate in decayed logs in summer. Requires large (greater than 20 inches in diameter) down logs of mid-decay classes with sloughing bark	Moderate

Table 2 Potential Regionally Occurring Sensitive Wildlife Species from Jordan Cove, Oregon				
Species Latin Name	**Common Name**	**Status (Federal/State/OBIC) or BLM[1,2,3]**	**General Habitat Requirements**	**Potential for Occurrence**
Ascaphus truei	Pacific tailed frog	SOC/SV/4	A small frog with a tail-like appendage in males. Found in clear, cold swift-moving mountain streams with coarse substrates. Primarily in older forest sites. May be found on land during wet weather near water in humid forests or in more open habitat. During dry weather stays on moist stream-banks.	None
Batrachoseps attenuatus	California slender salamander	-/-/2	Grasslands with scattered trees, chaparral, woodlands, redwood forests; occurs under leaf litter, rotten logs, and surface debris when the surface is moist; retreats to rodent burrows and other cavities in the soil during the dry season.	Moderate
Crotalus oreganus	Western rattlesnake	-/SC/4	This snake occupies a wide diversity of habitats, from shrubby coastal dunes to timberline, from shrubby basins and canyons to open mountain forests.	High
Plethodon elongatus	Del Norte salamander	SOC/SV/4	Strongly associated with moist talus and rocky substrates, in redwood or Douglas fir forests, including riparian zones.	Low
Rana aurora aurora	Northern red-legged frog	SOC/SV/4	Habitat includes the vicinity of permanent waters of stream pools, marshes, ponds, and other quiet bodies of water. This frog regularly occurs in damp woods and meadows some distance from water, especially during wet weather.	Present
Rana boylii	Foothill yellow-legged frog	SOC/SC,SV/2	This species inhabits partially shaded, rocky streams at low to moderate elevations, in areas of chaparral, open woodland, and forest	Low
Rhyacotriton variegatus	Southern torrent (seep) salamander	SOC/SV/4	Coastal coniferous forests in small, cold (usually 5.8-12.0 C), clear, high-gradient mountain streams and spring seepages, especially in gravel-dominated riffles with low sedimentation.	Low

Table 2 Potential Regionally Occurring Sensitive Wildlife Species from Jordan Cove, Oregon				
Species Latin Name	**Common Name**	**Status (Federal/State/OBIC) or BLM[1,2,3]**	**General Habitat Requirements**	**Potential for Occurrence**
Birds				
Accipiter gentilis	Northern goshawk	SOC/SV/4	Nests in a wide variety of forest types including deciduous, coniferous, and mixed forests. Has a complexity of habitat needs in the breeding season, which vary among forest types and region. Typically nests in mature or old-growth forests	None
Aechmophorus clarkii	Clark's grebe	-/-/4	Marshes, lakes, and bays; in migration and winter also sheltered seacoasts, less frequently along rivers.	Present
Aechmophorus occidentalis	Western grebe	-/-/4	Marshes, lakes, and bays; in migration and winter also sheltered seacoasts, less frequently along rivers.	Present
Brachyramphus marmoratus	Marbled murrelet	CH,LT/LT/2	Nests often are in mature/old growth coniferous forest near the coast: on large mossy horizontal branch, mistletoe infection, witches broom, or other structure providing a platform high in mature conifer (Douglas fir, mountain hemlock). Most nesting occurs in large stands of old growth.	Low
Bartramia longicauda	Upland sandpiper	SOC/SC/2/	Restricted primarily to extensive, open tracts of short grassland habitat. Nest in native prairie, dry meadows, pastures, domestic hayfields, short-grass savanna, plowed fields, along highway rights-of-way and on airfields, and (in the north) peatlands and scattered woodlands near timberline	High
Branta canadensis leucopareia	Aleutian Canada goose	D/-/2	During migration and on wintering grounds, the geese are commonly found in marshes, pastures and grass crops, harvested agriculture fields and flood-irrigated and nonirrigated land	Present
Branta Canadensis occidentalis	Dusky Canada goose	BLM Sensitive	Open grasslands, wet meadows	Moderate
Bucephala albeola	Bufflehead	-/-/2	Found in lakes, ponds, rivers, and seacoast. Breeds in tree cavities in mixed coniferous-deciduous woodland near lakes and ponds	Present

Table 2 Potential Regionally Occurring Sensitive Wildlife Species from Jordan Cove, Oregon				
Species Latin Name	**Common Name**	**Status (Federal/State/OBIC) or BLM[1,2,3]**	**General Habitat Requirements**	**Potential for Occurrence**
Cerorhinca monocerata	Rhinoceros auklet	-/SV/2	Nests in burrow mainly on grassy or shrubby sea-facing slope or level area near edge of island; small numbers of nests on cliffs or steep slopes; also recorded nesting in caves in Oregon and California.	Low
Charadrius alexandrinus nivosus	Western snowy (coastal) plover	CH LT/LT/2	Found on beaches, dry mud or salt flats, sandy shores of rivers, lakes, and ponds.	Low
Chordeiles minor Common	nighthawk	-/SC/4	Habitats include mountains and plains in open and semi-open areas: open coniferous forests, savanna, grasslands, fields, vicinity of cities and towns. Nesting occurs on the ground on a bare site in an open area.	Moderate
Contopus cooperi	Olive-sided flycatcher	SOC/SV/4	Olive-sided flycatchers prefer openings with dead standing trees; these areas are naturally found near water (mountain tarns, backwaters of lakes and rivers, beaver flows), burns (both natural and those set by aboriginal peoples), and blowdowns.	Present
Cygnus buccinator	Trumpeter swan	BLM Sensitive	Mars, wet meadows, bogs, ponds	Moderate
Dolichonyx oryzivorus	Bobolink	BLM Sensitive	Grasslands, open areas	Moderate
Dryocopus pileatus	Pileated woodpecker	-/SV/4	Prefers woods with a tall closed canopy and a high basal area. Most often in areas of extensive forest or minimal isolation from extensive forest.	Moderate
Elanus leucurus	White-tailed kite	-/-/2	Savanna, open woodland, marshes, partially cleared lands and cultivated fields, mostly in lowland situations.	Present
Empidonax traillii brewsteri	Little willow flycatcher	-/SV/4	Breeding distribution is west of the Cascades and in the Sierra Nevada from southwestern California to southwestern British Columbia. Strongly tied to brushy areas of willow (SALIX spp.) and similar shrubs. Found in thickets, open second growth with brush, swamps, wetlands, streamsides, and open woodland.	Present

Table 2 Potential Regionally Occurring Sensitive Wildlife Species from Jordan Cove, Oregon				
Species Latin Name	**Common Name**	**Status (Federal/State/OBIC) or BLM[1,2,3]**	**General Habitat Requirements**	**Potential for Occurrence**
Falco peregrinus anatum	American Peregrine falcon	D/SV/2	Various open situations from tundra, moorlands, steppe, and seacoasts, especially where there are suitable nesting cliffs, to mountains, open forested regions, and human population centers.	Present
Falco peregrinus tundris	Arctic peregrine falcon	BLM Sensitive	Cliffs, may perch in trees	Low
Fratercula cirrhata	Tufted puffin	-/SV/2	Nonbreeding: primarily pelagic. Can be found well out to sea all year; summer observations probably immature nonbreeders. Nests on offshore islands or along the coast.	None
Haliaeetus leucocephalus	Bald eagle	D/LT/4	Breeding habitat most commonly includes areas close to (within 4 km) coastal areas, bays, rivers, lakes, reservoirs, or other bodies of water that reflect the general availability of primary food sources including fish, waterfowl, or seabirds.	Present (non-breeding)
Haematopus bachmani	Black oystercatcher	SC/SV/4	Breeding habitat is exclusively associated with the high tide margin of the inter-tidal zone, and includes mixed sand and gravel beaches, cobble and gravel beaches, exposed rocky headlands, rocky islets, and tidewater glacial moraines.	Moderate
Histrionicus histrionicus	Harlequin duck	SC/-/2	Nests along fast-moving rivers and mountain streams on rocky islands or banks. Streams are braided to reticulate with many riffles and rapids.	None
Icteria virens	Yellow-breasted chat	SOC/SC/4	Nests in bushes, brier tangles, vines, and low trees, generally in dense vegetation less than 2 meters above ground.	High
Melanerpes formicivorus	Acorn woodpecker	SOC/SV/4	Found near oaks, either in unmixed open woodland or mixed with conifers	Moderate
Melanerpes lewis	Lewis' woodpecker	SOC/SC/2	Distribution closely associated with open ponderosa pine forest in western North America, and is strongly associated with fire-maintained old-growth ponderosa pine.	None

Table 2 Potential Regionally Occurring Sensitive Wildlife Species from Jordan Cove, Oregon				
Species Latin Name	**Common Name**	**Status (Federal/State/OBIC) or BLM[1,2,3]**	**General Habitat Requirements**	**Potential for Occurrence**
Oreortyx pictus	Mountain quail	SOC/SV/4	Brushy mountainsides, coniferous forest, forest and meadow edges, dense undergrowth, and in more arid conditions in sagebrush, pinyon, and juniper.	Present
Patagioenas fasciata	Band-tailed pigeon	SOC/-/4	In Oregon, most abundant in western third of the Coast Range in association with distribution of Pacific red elder and cascara buckthorn.	Present
Pelecanus occidentalis	Brown pelican	D/LE/2	Brown pelicans inhabit mainly coastal waters and rarely are seen inland or far out at sea. They feed mostly in shallow estuarine waters, less often up to 40 miles from shore.	Present
Phoebastria albatrus	Short-tailed albatross	LE/-/-	This is a pelagic bird that often occurs in regions of high marine productivity. It nests on the ground on small oceanic islands; on volcanic ash slopes with sparse vegetation, formerly on level open areas adjacent to tall clumps of the grass.	None
Podiceps auritus	Horned grebe	-/-/2	Marshes, ponds, and lakes, occasionally along sluggish streams (breeding), bays, estuaries, and seacoasts, and in migration commonly in inland freshwater habitats, especially lakes and rivers (nonbreeding). Nest on small and large lakes and ponds (about 0.1 hectare or larger), in calm waters of marshes, along rivers and streams.	Present
Podiceps grisegena	Red-necked grebe	-/SC/2	Winters along seacoasts, bays, and estuaries. In migration, found on lakes, ponds, and rivers. Nests mainly on shallow, freshwater lakes (larger than 2 hectares) or shallow protected marsh areas and secluded bays of larger lakes.	Present
Pooecetes gramineus affinis	Oregon vesper sparrow	SOC/SC/2	Habitats include plains, prairies, dry shrublands, savannas, weedy pastures, fields, sagebrush, arid scrub, and woodland clearings.	Moderate
Progne subis	Purple martin	SOC/SC/2	A wide variety of open and partly open situations, frequently near water or around towns.	Present

Table 2 Potential Regionally Occurring Sensitive Wildlife Species from Jordan Cove, Oregon				
Species Latin Name	**Common Name**	**Status (Federal/State/OBIC) or BLM[1,2,3]**	**General Habitat Requirements**	**Potential for Occurrence**
Ptychoramphus aleuticus	Cassin's auklet	-/SV/2	Nonbreeding: mostly pelagic, less frequently along rocky seacoasts. Nests on offshore islands, mostly in areas with low vegetation.	None
Sialia mexicana	Western bluebird	-/SV/4	Habitat includes open woodlands, farmlands, orchards, savanna, riparian woodlands, and burned woodlands, also deserts in winter. Nests are in natural tree cavities, abandoned woodpecker holes, or bird nest boxes, usually 5-40 feet (1.5-12 meters) above ground.	Moderate
Strix occidentalis caurina	Northern spotted owl	CH LT/LT/1	Generally found in old growth (at least 150-200 years old), but sometimes they occur in younger forests that include patches of older growth.	Low
Sturnella neglecta	Western meadowlark	-/SC/4	Habitat includes grasslands, savannas, cultivated fields, and pastures, in lowland and mountain valleys, foothills, and open mountains.	Present
Mammals				
Arborimus albipes	White-footed vole	SOC/-/4	This vole has been found along small, alder-lined streams in redwood forest. Very small clearings, created by fallen timber, and supporting herbaceous growth may be important habitat. In the southern Cascade Range of western Oregon, encounters with this species were correlated less with distance to water than with basal area and density of alder (*Alnus rubra*) and percent cover of hazel (*Corylus cornuta* v. *californica*).	Moderate
Arborimus longicaudus	Red tree vole	SOC/SV/4	Red tree voles inhabit mixed evergreen forests; optimum habitat consists of wet and mesic old-growth Douglas fir forest and various other mesic habitats, including those dominated by grand fir, Sitka spruce, or western hemlock	Moderate

Table 2 Potential Regionally Occurring Sensitive Wildlife Species from Jordan Cove, Oregon				
Species Latin Name	**Common Name**	**Status (Federal/State/OBIC) or BLM[1,2,3]**	**General Habitat Requirements**	**Potential for Occurrence**
Bassariscus astutus	Ringtail	-/SV/4	Typically in rocky areas with cliffs or crevices for daytime shelter; desert scrub, chaparral, pine-oak, and conifer woodland. Usually within 0.5 miles of water. Dens usually in rock shelter; also in tree hollow, under tree roots, in burrow dug by other animal, in remote building, underbrush pile.	Low
Canis lupus	Gray wolf	LE/LE/2	Holarctic distribution; survives in wilderness that is not subject to human population pressures; extirpated from most of contiguous U.S. due to human-caused direct mortality. Recently, 21 individuals have been detected in Oregon after successful reintroduction of the species in the Rocky Mountains. These individuals have been located in Eastern Oregon and at this time have not been detected on the coast.	None
Corynorhinus townsendii townsendii	Townsend's western big-eared bat	SOC/SC/2	Habitats in western Oregon include pine-fir-hemlock-broadleaf deciduous forest.	High
Enhydra lutris	Sea otter	-/LT/2	Extirpated and unsuccessfully reintroduced in Oregon.	None
Eumetopias jubatus	Northern sea lion	LT/-/2	Marine habitats include coastal waters near shore and over the continental slope; sometimes rivers are ascended in pursuit of prey. The most commonly used terrestrial habitat types are rookeries and haulouts. Rookeries are areas where adults congregate for breeding and pupping. These habitats generally occur on beaches of remote islands with difficult access for humans and other mammalian predators	Low
Lasionycteris noctivagans	Silver-haired bat	SOC/SV/4	Habitat is primarily forested (frequently coniferous) areas adjacent to lakes, ponds, or streams, including areas that have been altered by humans.	High

Table 2 Potential Regionally Occurring Sensitive Wildlife Species from Jordan Cove, Oregon				
Species Latin Name	**Common Name**	**Status (Federal/State/OBIC) or BLM[1,2,3]**	**General Habitat Requirements**	**Potential for Occurrence**
Martes americana	American marten	-/SV/4	A medium-sized mustelid. Found in dense deciduous, mixed, or (especially) coniferous upland, and lowland forest. May use rocky alpine areas. When inactive, occupies hole in dead or live tree or stump, abandoned squirrel nest, conifer crown, rock pile, burrow, or snow cavity. Often associated with coarse woody debris.	Moderate
Martes pennanti	Fisher	PS:C/SC/2	Found in forest stands with late-successional characteristics, Including, high canopy closure, large trees and snags, large woody debris, large hardwoods, multiple canopy layers. Fishers also occupy and reproduce in some managed forest landscapes and forest stands not classified as late-successional that provide some of the habitat elements important to fisher, such as relatively large trees, high canopy closure, large legacy trees, and large woody debris, in second-growth forest stands.	Low
Myotis californicus	California myotis	-/SV/4	Western lowlands: sea coast to desert, oak-juniper, canyons, riparian woodlands, desert scrub, and grasslands. Often uses man-made structures for night roosts. Uses crevices of various kinds, including those in buildings, for summer day roosts. May roost also on small desert shrubs or on the ground. Hibernates in caves, mines, tunnels, or buildings. May form small maternity colonies in rock crevices, under bark, or under eaves of buildings	Moderate
Myotis evotis	Long-eared myotis bat	SOC/-/4	Mostly forested areas, especially those with broken rock outcrops; also shrubland, over meadows near tall timber, along wooded streams, over reservoirs. Often roosts in buildings, also in hollow trees, mines, caves, fissures, etc.	Moderate

Table 2 Potential Regionally Occurring Sensitive Wildlife Species from Jordan Cove, Oregon				
Species Latin Name	**Common Name**	**Status (Federal/State/OBIC) or BLM[1,2,3]**	**General Habitat Requirements**	**Potential for Occurrence**
Myotis thysanodes	Fringed myotis bat	SOC/SV/2	Roosts in caves, mines, rock crevices, buildings, and other protected sites. Nursery colonies occur in caves, mines, and sometimes buildings.	Low
Myotis volans	Long-legged myotis bat	SOC/SV/4	Uses caves and mines as hibernacula, but winter habits are poorly known. Roosts in abandoned buildings, rock crevices, under bark, etc.	Low
Myotis yumanensis	Yuma myotis bat	SOC/-/4	More closely associated with water than most other North American bats. Found in a wide variety of upland and lowland habitats, including riparian, desert scrub, moist woodlands and forests, but usually found near open water.	Moderate
Sciurus griseus	Western gray squirrel	-/SV/4	Fairly open oak and pine-oak forests primarily in the Upper Sonoran and transition life zones; also in riparian woods and in lowland groves of native walnuts in California. Arboreal and terrestrial. Nests made of sticks, twigs, and leaves are built in tree cavities or on the limbs of trees.	Moderate
Ursus arctos horribilis	Grizzly bear	LT/-/2-Extinct	Now found mostly in arctic tundra, alpine tundra, and subalpine mountain forests. Once found in a wide variety of habitats including open prairie, brushlands, riparian woodlands, and semidesert scrub. Ranges widely at the landscape level. Most populations require huge areas of suitable habitat.	None

Table 2
Potential Regionally Occurring Sensitive Wildlife Species from Jordan Cove, Oregon

Species Latin Name	Common Name	Status (Federal/State/OBIC) or BLM[1,2,3]	General Habitat Requirements	Potential for Occurrence

1. OBIC: Oregon Biodiversity Information Center
2. BLM: Bureau of Land Management
3. OBIC Abbreviations:

FEDERAL STATUS

LE: Listed as an Endangered Species
LT: Listed as a Threatened Species
PE: Proposed as an Endangered Species
PS:
PT: Proposed as a Threatened Species
C: Candidate for Listing as Threatened or Endangered
CH: Critical habitat
D: Delisted
SOC: Species of Concern–Taxa for which additional information is needed to support a proposal to list under the ESA

STATE STATUS

LE: Listed as an Endangered Species
LT: Listed as a Threatened Species
PE: Proposed as an Endangered Species
PT: Proposed as a Threatened Species
SC: Sensitive–Critical
SV: Sensitive – Vulnerable

HERITAGE LISTS

1: Threatened or Endangered Throughout Range
2: Threatened, Endangered or Extirpated from Oregon, but Secure or Abundant Elsewhere
3: Review
4: Watch
2-ex: Extirpated in Oregon
1-X: Presumed extinct

candidate species or have a federal or state listed status (threatened, endangered). Non-listed species addressed in this report are state and federal species of concern or have been listed by OBIC.

2.3.1 Listed

Target species that have been listed (including deslisted and candidate) by the federal government and the State of Oregon includes the following:

- Marbled Murrelet (Brachyramphus marmoratus)
- Aleutian Canada Goose (Branta canadensis leucopareia)
- Western Snowy Plover (Charadrius alexandrinus nivosus)
- American Peregrine Falcon (Falco peregrinus anatum)
- Bald Eagle (Haliaeetus leucocephalus)
- California Brown Pelican (Pelecanus occidentalis californicus)
- Northern Spotted Owl (Strix occidentalis caurina)
- Fisher, West Coast Distinct Population Segment (DPS) (Martes pennanti)

2.3.2 Non-listed

Non-listed target species that consist of federal and state species of concern, or have been listed by the OBIC include the following:

- Upland sandpiper (Bartramia longicauda)
- Common nighthawk (Chordeiles minor)
- Olive-sided flycatcher (Contopus cooperi)
- Pileated woodpecker (Dryocopus pileatus)
- Little willow flycatcher (Empidonax traillii brewsteri)
- Black oystercatcher (Haematopus bachmani)
- Yellow-breasted chat (Icteria virens)
- Acorn woodpecker (Melanerpes formicivorus)
- Mountain quail (Oreortyx pictus)
- Band-tailed pigeon (Potagioenas fasciata)
- Red-necked grebe (Podiceps grisegena)
- Oregon vesper sparrow (Peoecetes gramineus affinis)
- Purple martin (Progne subis)
- Western bluebird (Sialia mexicana)
- Western meadowlark (Sturnella neglecta)
- Northern Pacific pond turtle (Actinemys marorata)
- Clouded salamander (Aneides ferreus)
- Western rattlesnake (Crotalus oreganus)
- Northern red-legged frogs (Rana aurora aurora)
- White-footed vole (Arborimus albipes)
- Red tree vole (Arborimus longicudus)
- Townsend's western big-eared bat (Corynorhinus townsendii townsendii)

- Silver haired bat (Lasionycteris noctivagans)
- American martin (Martes Americana)
- California myotis (Myotis californicus)
- Long-eared myotis bat (Myotis evotis)
- Yuma myotis bat (Myotis yumanensis)
- Western gray squirrel (Sciurus griseus)

2.4 Site Investigation Methods

The following site investigation methods, based on the 2005-2006 pre-construction surveys, were developed for conducting wildlife field surveys in Jordan Cove. Field investigations were conducted on October 9, 10, 11, and 12, 2012.

- **Wildlife Habitat Evaluation (Listed Species)–**A habitat evaluation was conducted in the project area for all wildlife species listed (Threatened, Endangered) and candidate species protected under the ESA, and by ODFW. All new areas included in the project area were assessed for listed species; areas previously surveyed were reassessed to document any changes or include any newly listed species.
- **Area Searches (Avian)–**Searches were conducted for avian species throughout all portions of the project area. Searches consisted of slow methodical investigation by a single observer using binoculars and recording all wildlife species seen and heard, noting detection type (visual or auditory) and distinguishing between those within the search area and those without. During area searches large trees were scanned using binoculars, to check for any historical nests. All nest trees were mapped for further investigation.
- **Area Searches (Herptofauna)–**Focused amphibian and reptile searches were conducted in areas identified as wetland habitats. Wetland areas were intensively searched by visually scanning open bodies of water, and searching around the edges of water bodies and adjacent areas for any detections or sign including egg masses, prints or burrows. In addition to searches in wetland areas, all portions of the project area were (less intensively) surveyed for herptofauna.
- **Area searches (Mammal)–**Focused terrestrial and arboreal mammal searches were conducted throughout all portions of the project area. A search for resin ducts, prints, scat, and other mammal sign was conducted throughout the project area. Any listed or special status species observed was mapped for further investigation.
- **Bay Scan–**Multiple fixed points on the shoreline of the property were identified and subsequently visited for approximately 45 minutes. During this time all wildlife species observed (using binoculars) were recorded, noting detections type (visual or auditory) and distinguishing between those on adjacent properties. Any listed or special status species observed was mapped for further investigation.
- **Raptor Scan–**Multiple fixed points in open sites that permitted a broad scan of the horizon were identified throughout the property. These sites were visited for 45 minutes, during this time all wildlife species observed (using binoculars) were recorded s, noting detections type (visual or auditory) and distinguishing between those on adjacent properties. Any listed or special status species observed was mapped for further investigation.

3.0 Assessment and Survey Results

Field investigations to evaluate the presence or absence of habitat necessary for listed and special status wildlife species, as well as a survey for wildlife species within the project area was conducted by SHN in coordination with Land and Water Environmental Consultants on October 9, 10, 11, and 12, 2012. Because the assessment occurred in October (which is outside of the biologically acceptable periods when nesting species are considered likely to be present), the verification for presence/absence of nesting species is not possible.

The two objectives of the assessment and survey included updating the following information:

1. Evaluate the project area for state and federally listed wildlife species including areas not previously covered in the 2005-2006 pre-construction wildlife surveys and document any listed species or any habitat for these species present in the project area.

2. Document all wildlife species observed (detection or sign) to add to the comprehensive species list (Appendix A).

Information presented in this section was gathered from the 2005-2006 pre-construction wildlife survey report (Appendix B); SHN's 2012 investigations published habitat requirements for each species; and professional knowledge and experience with several of the species and their habitat requirements, disturbance issues, and distribution in southwestern Oregon.

Detailed habitat and range descriptions for each of the targeted species shown below can be found in Appendix B. No further habitat information is provided in this report, unless an update on the status and habitat of a species is warranted.

3.1 Listed Species

3.1.1 Marbled Murrelet (*Brachyramphus marmoratus*): Federal and State Threatened

No detections of marbled murrelets (MAMU) occurred during the 2012 surveys or in the 2005-2006 pre-construction surveys in the JCEP area, and no suitable MAMU nesting habitat was observed in the project area. It is unlikely that this species would nest in or around Jordan Cove due to the lack of suitable nesting habitat, the closes known of which is many miles to the east of the area. Possible flyover and stopover sites exist along the entire coastline in Oregon, including the project area, as MAMU fly east to nesting sites found in mature stands of trees, with structural components (platforms) necessary for nesting. Designated critical habitat for the species is located approximately 14 miles southeast, in Daniels Creek watershed.

Current research suggest corvids, including stellers jays (*Cyanocitta stelleri*), American crow (*Corvus brachyrhynchos*), and raven (*Corvus corax*), pose the greatest predatory threat to MAMU at nest sites where eggs and young are taken (USFWS, 2009). Because there is no nesting habitat at the JCEP site, no impact from nest predators is anticipated. The literature also indicates an increasing predation on MAMU from peregrine falcons and bald eagles, both protected species that are known to exist in the Jordan Cove area. However, direct impact to this species is unlikely due to lack of

primary habitat components at the project site for nesting and feeding, which occur in the ocean. Predation near the project site by peregrine falcons and bald eagle are likely to continue, but would be unaffected by the JCEP activities.

3.1.2 Aleutian Canada Goose (*Branta canadensis leucopareia*): Federally Delisted, BLM Sensitive

No detection of Aleutian Canada goose occurred during the 2012 surveys. During the 2005-2006 surveys, a flock of seven flew over the project area, and multiple Aleutian Canada geese were observed at the airport on two occasions. (The airport is approximately 0.5 miles south of Jordan Cove.) This species nests in Alaska on the Aleutian and Semidi Islands. Although flyover is possible, the species is unlikely to use habitat in the project area due to the lack of appropriate feeding habitats (pasture and croplands), and will not be affected by the JCEP.

3.1.3 Western Snowy Plover (*Charadrius alexandrinus nivosus*): Federal and State Threatened

No detections of western snowy plover (WSPL) occurred during the 2012 surveys or in the 2005-2006 pre-construction surveys in the JCEP area. Critical habitat has been designated for the Pacific coast population of the western snowy plover (USDI, 1999) and a recovery plan for this species has been developed by the USFWS (USFWS, 2007b). Critical habitat has been designated in the north spit, which includes the ocean beach from Horsefall to the jetty and all federal lands at the south end; this excludes the Jordan Cove area, and the lands encompassed by the JCEP. Information in the recovery plan and updated information from OBIC documents the closest nest site as 2.57 miles from JCEP (OBIC, 2010). It is unlikely that this species would nest in or around Jordan Cove due to the lack of the species primary habit, which includes expansive open sand beaches. It is possible that an occasional individual may use the mudflat areas adjacent to Jordan Cove for foraging, but breeding is unlikely. Direct impact to this species is unlikely, based on the lack of habitat at the JCEP site.

The JCEP may have an indirect impact to the WSPL by increasing the numbers of predatory species in the area. Some of the predatory species known to effect coastal Oregon WSPL populations include American crow, common raven, red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), black rat (*Rattus rattus*), and feral cat (*Felix catus*) (OBIC, 2011; USFWS, 2007b). These species generally are more concentrated in developed landscapes due to human generated trash and refuse, and their ability to occupy and nest near human activities. Mitigation measures have been developed to address potential indirect impacts to the WSPL from increased predator populations in the project area, through trash and refuse control. Refer to Mitigation Measure 1 in section 5.0.

3.1.4 American Peregrine Falcon (*Falco peregrinus anatum*): Federally Delisted, BLM Sensitive

No detections of American peregrine falcon (AMPF) occurred during the 2012 surveys. During the 2005-2006 pre-construction surveys there were seven sightings of this species, including several in the project area. The 2005-2006 pre-construction survey report states that peregrines use Jordan

Cove for foraging only; no nest sites have been observed. It is unlikely that AMPF would use Jordan Cove for nesting, due to the lack of appropriate nesting habitat (cliff edges). Due to the potential for this species to occur in the project area, mitigation measures have been developed to implement pre-construction surveys. Refer to Mitigation Measure 2 in Section 5.0.

3.1.5 Bald Eagle (*Haliaeetus leucocephalus*): Federally Delisted, State Threatened

When the bald eagle was delisted on July 9, 2007 (72 Fed. Reg. 130:37345-37372), legal protections provided to the bald eagle switched to the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA) and new guidelines were developed (USFWS, 2007). The most substantive change in the guidelines was a reduction in the distance between activities and an occupied nest from 0.5 mile to 660 feet when the activity is visible from the nest (line-of-sight).

No bald eagle was detected during the 2012 surveys. During the 2005-2006 pre-construction surveys multiple sightings were recorded. The 2005-2006 pre-construction survey report states that bald eagles use Jordan Cove for foraging only; no nest sites have been observed. The closest known nest site for this species is found approximately 3 miles from Jordan Cove on Mettman ridge near Glasgow. It is unlikely that bald eagles would use Jordan Cove for nesting, due to the lack of appropriate nesting trees (large, prominent trees and snags), and the JCEP is unlikely to have any effect on nesting for this species.

Due to the documented presence of this species in and around the project site, mitigation measures have been developed that provide for pre-construction surveys to document potential use of sites by eagles. Refer to Mitigation Measure 2 in Section 5.0.

3.1.6 California Brown Pelican (*Pelecanus occidentalis californicus*): Federally Delisted, State Endangered

During the 2012 surveys California brown pelicans (CABP) were regularly seen foraging along the shoreline adjacent to Jordan Cove. Multiple occurrences were recorded during bay scan surveys (2012). This species was also observed in moderate numbers during pre-construction surveys in 2005-2006 (Attachment B). Because CABPs breed in nesting colonies on offshore islands, and appear unaffected by industrial activity already taking place in and around the bay, no impact to this species from the development of the JCEP is anticipated.

3.1.7 Northern Spotted Owl (*Strix occidentalis caurina*): Federal and State Threatened

No detections of northern spotted owls (NSO) occurred during the 2012 surveys or in the 2005-2006 pre-construction surveys of the JCEP. It is unlikely that this species would nest in or around Jordan Cove due to the lack of suitable nesting habitat observed. Nesting areas for the NSO generally require stands of mature forests, with mixed successional characteristics. Trees and associated habitat within Jordan Cove are limited in size and complexity due to their occurrence on stabilized sand dunes. Although the stands appear mature, the stunted nature of the trees and location immediately adjacent to the bay, suggest limited foraging habitat and no nesting habitat for NSOs. No impact to this species is anticipated from the JCEP.

3.1.8 Fisher, West Coast DPS (*Martes pennanti*): Federal Candidate for Listing, State Sensitive–Critical

Fishers use habitat with high canopy closure, large trees and snags, large woody debris, large hardwoods, and multiple canopy layers. Theyavoid areas lacking overhead canopy cover and disturbance by humans. Fishers also occupy and reproduce in some managed forest landscapes and forest stands not classified as late-successional that provide some of the habitat elements important to fisher, such as, relatively large trees, high canopy closure, large legacy trees, and large woody debris, in second-growth forest stands (USFWS, 2004). Although no fisher was observed, moderate habitat for this species was found in the forested hillside and riparian areas within the study area.

3.2 Special Status Species

Special status species include those listed as a federal species of concern or state sensitive/critical and state sensitive/vulnerable.

3.2.1 Special Status Bird Species

Special status bird species that have been observed or are considered likely to occur (moderate to high potential for occurrence) in the project area include upland sandpiper (*Bartramia longicauda*), common nighthawk (*Chordeiles minor*), olive-sided flycatcher (*Contopus cooperi*), pileated woodpecker (*Dryocopus pileatus*), little willow flycatcher (*Empidonax traillii brewsteri*), black oystercatcher (*Haematopus bachmani*), yellow-breasted chat (*Icteria virens*), acorn woodpecker (*Melanerpes formicivorus*), mountain quail (*Oreortyx pictus*), band-tailed pigeon (*Potagioenas fasciata*), red-necked grebe (*Podiceps grisegena*), Oregon vesper sparrow (*Peoecetes gramineus affinis*), purple martin (*Progne subis*), western bluebird (*Sialia mexicana*), and western meadowlark (*Sturnella neglecta*). Refer to the previous pre-construction survey for habitat summary of these species (Appendix B). All native bird species have protection under the MBTA (addressed in Section 6.1). Mitigation measures to ensure protection of nests and reduction in nest abandonment from construction activities have been developed ; refer to Mitigation Measure 3 in section 6.0. No further recommendations for special status bird species is warranted at this time.

3.2.2 Special Status Herptofauna

Special status herptofauna includes reptiles and amphibians. These groups are combined due to similarities of habitats in which most are found (wetlands). Special status herptofauna that have been observed or are considered likely to occur (moderate to high potential for occurrence) in the project area include; northern pacific pond turtle (*Actinemys marorata*), clouded salamander (*Aneides ferreus*), western rattlesnake (*Crotalus oreganus*), and northern red-legged frogs (*Rana aurora aurora*). Refer to the previous pre-construction survey for habitat summery of these species (Appendix B).

Protection of special status herptofauna will be undertaken by implementing mitigation measures for the location and removal of these identified herptofauna species prior to construction. These mitigation measures are necessary due to the presence of high-quality wetlands in the project area. Refer to Mitigation Measure 4 in Section 5.0.

3.2.3 Special Status Mammals

Special status mammals that are considered likely to occur (moderate to high potential for occurrence) in the project area include; white-footed vole (*Arborimus albipes*), red tree vole (*Arborimus longicudus*), Townsend's western big-eared bat (*Corynorhinus townsendii townsendii*), silver haired bat (*Lasionycteris noctivagans*), American martin (*Martes Americana*), California myotis (*Myotis californicus*), long-eared myotis bat (*Myotis evotis*), Yuma myotis bat (*Myotis yumanensis*), and western gray squirrel (*Sciurus griseus*). Refer to the previous pre-construction survey for habitat summery of these species (Appendix B).

In previous surveys, none of these special status mammal species has been observed in the JCEP area, most likely due to the elusive nature and typical nighttime foraging of these species. After discussions with ODFW, we have determined that the American martin may be present at the project site. Although not regularly encountered in this region, the American martin is believed to occur, based on the incidence of this species as road kill on nearby highways, and sightings in areas near the JCEP (ODFW, 2012). Local studies have been conducted in Coos Bay on nearby BLM land using remote cameras to detect mammals during night foraging (Bennett, 2006). Remote cameras will be placed strategically in forested sites thought out JCEP that is determined to be appropriate habitat for the American marten. Baits and lures, survey season, survey duration, preparations for the field and defining the survey area will follow protocols developed by the US Forest Service for detecting carnivores including the American marten from the forest service general tech report (USDA, 1995). Mitigation measures have been developed to reduce the potential impact to this species from the development of this project; refer to Mitigation Measure 5 in Section 5.0.

3.3 Additional Species Observed

3.3.1 Breeding Birds

A single active osprey (*Pandion haliaetus*) nest was detected during surveys conducted in 2005-2006. This site was revisited during the 2012 site visit, however, because the survey was conducted outside of the nesting season, we searched for inactive nests was performed by looking for the remains of old nests. Three nest structures were found on light fixtures and machinery in the Roseburg site, these nests appear to be the same as those observed during surveys conducted in 2005-2006. The nests appear to have been occupied in the last few years. Because this site is part of an active industrial complex, and the birds have habituated to the noise of active operations, no further action is warranted.

An historic great blue heron (*Ardea herodias*) rookery, located near the beginning of Jordan Cove Road (about 1,970 feet from the project site), has been receiving ongoing reviews by ODFW and BLM biologists and was previously described in the 2005-2006 pre-construction wildlife surveys (Appendix B). The nests were abandoned during BLM assessment of the site, as stated in the Coos Bay annual program summary and monitoring report (BLM, 2012). Concern was raised that if the rookery is reactivated by great blue herons, it would be disturbed by traffic associated noise from the proposed JCEP construction and operations, because it is less than 330 feet from the road. SHN's 2012 survey was not conducted during the nesting season for this species, therefore no additional information is available for this report regarding the use of the rookery.

As stated in the 2005-2006 report, in the event that revival of the rookery occurs, potential impact avoidance or mitigation measures will be evaluated in coordination with other responsible parties (Appendix B). Review of this site related to potential construction impacts from the JCEP activities is included as Mitigation Measure 6, found in Section 5.0.

3.3.2 Mammals

Mammal sign (tracks and/or scat) was observed throughout the project area. Species detected include those that you would typically find in the habitats present in the project area, including wooded, wetland, grassland, and industrial areas. Common mammal species detected in the project area include: Raccoon (*Procyon lotor*); black-tailed deer (*Odocoileus hemionus*), American black bear (*Ursus americanus*), and Virginia opossum (*Didelphis virginiana*). Evidence of rodents and other small mammals was also observed throughout the project area.

Mountain lion (*Felis concolor*) sign (a print), was observed in the forested dune habitats found in the western portion of the project area, potential mountain lion scat was collected for further analysis. Roseburg Forest Resources workers provided additional anecdotal information about the status of mountain lions in the project area, by stating that numerous mountain lions have been observed around the Roseburg Forest Resources site.

Beaver (*Castor canadensis*) and beaver sign, including felled trees and tooth marks, were observed in wetlands found throughout the project area. The greatest concentration of this species was observed in the deflation plains, where the water table was evident.

Roosevelt Elk (*Cervus canadensis roosevelti*), sign was observed in a grass field north of the Roseburg site. Multiple elk tracks and a large bedding area was observed, but no elk was present at the time of our survey. The site appears to be used regularly by the north spit elk population.

No species specific mitigation measures are required for these species.

3.3.3 Herptofauna

High concentrations of northern red-legged frogs (*Rana aurora*) were observed in multiple freshwater wetland sites throughout the project area during SHN's 2012 survey. American bullfrogs (*Rana catesbeiana)* were observed during surveys in wetlands conducted in 2005-2006, but were not observed in 2012. Though not observed, this species is a long-lived and highly adaptive species that is an opportunistic predator of small animals, including other herptofauna. The American bullfrog is a known predator of the northern red-legged frog. Mitigation measures for the protection of the northern red-legged frog have been developed as part of Mitigation Measure 4 found in Section 5.0.

4.0 Conclusions

SHN has conducted literature reviews, site investigations to determine potential impacts to federal and state listed wildlife species, and an updated survey for wildlife species at the JCEP site. The

development of JCEP has the potential to effect some local populations of federal and state listed and special status species indirectly. Activities at the JCEP are not anticipated to have any direct impacts on these species. Mitigation measures have been developed that provide for preconstruction surveys and relocation of some species from areas that may be impacted. These mitigations can be found in Section 5.0.

4.1 Special Status Wildlife Species

Of the 66 special status wildlife species potentially occurring in the area, 37 wildlife species have either been detected in the project area or have moderate to high potential to occur within the site (ODFW, 2012a; OBIC, 2012). Of these 37 species, only one listed species, the western snowy plover, has the potential to be indirectly impacted by project activities due to possible increases in predator species following project implementation.

Non-listed special status species that warrant mitigation include avian species, herptofauna, and American marten. Mitigation measures for minimizing or avoiding impacts to these special status wildlife species are addressed in Section 5.0.

4.2 Nesting Birds

Bird species may potentially nest within the project area. Nesting birds are protected by the MBTA and nests of native birds are protected, under code (16 USC 703) and other state laws. Project implementation may not directly destroy nests, or indirectly cause nest failure through project activities, without mitigation being developed and approved by regulatory agencies prior to the activity. Mitigation measures for the protection of nesting birds are provided for in the mitigation measures found in Section 5.0.

5.0 Mitigation

Mitigation measures are necessary to avoid or limit potential impacts to regulated wildlife species occurring in or near the JCEP. The mitigation measures listed below provide species-specific items that will allow both regulatory agencies and project managers tools to identify and reduce potential impacts to wildlife species of concern.

5.1 Mitigation Measure 1–Snowy Plover

SHN recommends that the following mitigation measure be implemented for the protection of the western snowy plover that occurs near, but not on, the JCEP site. The purpose of this mitigation is to reduce human litter and refuse that attract known predators for the plover.

1. To avoid attracting additional predators (American crow, common raven, red fox, raccoon, striped skunk, black rat, and feral cat) for this species to nearby nest sites, SHN recommends that that animal- and vandalism-proof permanent trash receptacles be installed near areas with concentrated human use, including temporary and permanent worksites, rest areas, and parking facilities. The trash receptacles may be top loading, such

as, those that are used at state parks, and will be made from heavy-duty, vandalism-proof materials that cannot be destroyed by animal (bear) attacks.

5.2 Mitigation Measure 2–Listed Avian Species

SHN recommends that the following mitigation measure be implemented for the detection and associated protection of listed avian species (both recently delisted federal and current listed state). Mitigation measures are shown for each species and can be implemented concurrently. The purpose of this mitigation is to identify if this species is present at or near construction sites prior to site disturbance and construction activities occur, in order to eliminate or reduce potential impacts to these species.

5.2.1 American Peregrine Falcon

Focused surveys for the American peregrine falcon will be conducted by a qualified biologist prior to the onset of constructions activities.

Surveys shall consist of the following:

A. Two focused preconstruction surveys shall be conducted within 14 days of vegetation removal or grading activities during the nesting season (January 1-September 1). Surveys shall be conducted several days apart and during times of the day that are conducive to detection of the species.

    1. If no peregrine falcon nest is located within or adjacent to the project activity site, then vegetation removal or grading activities may commence without additional requirements, as long as activities are continuous.

    2. If vegetation removal or grading activities cease for a period of more than two weeks, then preconstruction surveys will be required again prior to vegetation and grading activities commencing within the nesting season.

    3. If a peregrine falcon nest is located adjacent to, or within, the areas of vegetation removal and grading, then these activities shall be delayed until one of the following occurs:

        a. the nesting season is over and the individuals have either successfully raised young and they have fledged and left the nest site; or

        b. nest abandonment has been determined by the appropriate state or federal regulatory agency, and authorization for work has been given within the nesting season.

5.2.2 Bald Eagles

Focused surveys for the bald eagle will be conducted by a qualified biologist prior to the onset of constructions activities. Surveys shall consist of the following:

A. Two focused preconstruction surveys shall be conducted within 14 days of vegetation removal or grading activities during the nesting season (January 1-September 1). Surveys shall be conducted several days apart and during times of the day that are conducive to detection of the species.

B. A search for active nest sites and foraging areas should be conducted in appropriate habitat in areas in and adjacent to Jordan Cove that may provide nesting habitat.

C. If a bald eagle nest is located, the following will occur:

   1. For a nest site more than 660 feet (line of sight) to the project activity, the nest site will be located, documentation of the activity will be recorded, and information forwarded to the appropriate regulatory agency for their records and use. Construction activities may proceed without additional restrictions.

   2. For a nest site located within 660 feet (line of sight) of project activities, the project actions will be suspended or delayed until one of the following has occurred:

      a. the nesting season is over and the individuals have either successfully raised young and they have fledged and left the nest site;

      b. nest abandonment has been determined by the appropriate state or federal regulatory agency, and authorization for work has been given within the nesting season; or

      c. project activities are relocated more than 660 feet (line of sight) from the active nest.

5.3 Mitigation Measure 3 – Special Status Avian Species

SHN recommends that the following mitigation measure be implemented for activities at the JCEP that will remove vegetation or have ground disturbing activities that may impact nesting birds in compliance with the MBTA and other state regulations.

A. To avoid impacts to nesting birds and/or raptors, one of the following should be implemented: conduct vegetation removal and other ground disturbance activities associated with any construction activities during mid-August through January, when birds are not nesting; or,

B. if vegetation removal or ground-disturbing activity is to take place during the nesting season (February 1 to August 31 for most birds), a qualified biologist shall conduct a pre-construction nesting bird survey (Pre-construction surveys for nesting pairs, nests, and eggs

shall occur within the construction limits and within 100 feet [200 feet for raptors] of the construction limits.)

1. If active nests are encountered within the limits of the survey, construction and vegetation removal activities shall be suspended until the nesting season is over, or a qualified biologist has determined that the individuals have fledged from the nest.

2. If no active nest is encountered within the limits of the survey, then construction and vegetation removal activities may proceed without further restrictions for special status avian species.

5.4 Mitigation Measure 4–Special Status Herptofauna

This mitigation measure provides preconstruction surveys and relocation of the northern Pacific pond turtle, northern red-legged frog and the clouded salamander that are known to occur in the area. This mitigation measure will be implemented for construction and vegetation removal activities that may impact freshwater wetlands, including ponds, ditches, and other freshwater habitats that provide habitat for these species.

A. Prior to construction activities, JCEP and the ODFW will consult regarding the location of freshwater habitats for the relocation of herptofauna discovered during preconstruction surveys at the JCEP site. These habitats will provide areas for species relocation outside of construction areas where habitats are either being removed, modified, or managed for JCEP needs. Areas identified will be mapped and agreed to prior to construction.

B. Prior to construction (including vegetation removal, grading and filling actions) in suitable herptofauna habitat, a qualified biologist will survey the construction sites 30 days prior to proposed activities to determine if the northern pacific pond turtle, northern red-legged frog, or the clouded salamander are in the activity area and could be impacted by construction activities. Surveys will be in accordance with current species protocols. Suitable habitat that will be impacted by construction activities will be identified for further preconstruction surveys. Areas that do not contain suitable habitat for these species will be released for construction without additional herptofauna requirements.

C. Immediately prior to construction (within 4 hours) a qualified biologist will conduct surveys in advance of construction activities for the northern pacific pond turtle, northern red-legged frog, and the clouded salamander. Species that are found during the survey will be captured and transported to suitable habitats outside of the construction areas, as pre-determined in consultation with the ODFW. Appropriate permits for capture and collection will be secured by the biologist prior to preconstruction surveys.

5.5 Mitigation Measure 5–American Marten

Studies using remote cameras will be conducted in forested sites considered suitable for American marten, following the survey protocol outlined in the Forest Service General Tech Report PSW-GTR-157.

A. An implementation plan will be developed by January 1, 2013, defining the study area and methods as outlined in the protocol for JCEP. This implementation plan will be reviewed by ODFW before initiation of the study.

B. If a detection of American marten is observed during photo review, information will be forwarded to the appropriate regulatory agency. Potential avoidance and/or mitigation measures will be evaluated in coordination with other responsible parties.

5.6 Mitigation Measure 6–Great Blue Heron Rookery

This mitigation measure provides for ongoing survey of the currently abandoned great blue heron rookery near the JCEP. Although the rookery has been documented to be abandoned, reuse by this species can occur.

A. Visual surveys of the great blue heron rookery located near Jordan Cover Road will be surveyed annually during construction to determine if great blue herons have reactivated use of the rookery. Surveys will be conducted during seasonally appropriate nesting periods, and may be conducted during other preconstruction avian species surveys. If coordination with the ODFW and BLM determines that these agencies are conducting rookery surveys, JCEP may suspend their surveys and use the results of these agency surveys.

B. If the great blue heron rookery is being used for nesting during construction periods, JCEP will notify the ODFW and consultation will begin regarding current management direction for this species habitat.

6.0 References Cited

Bennett, Greg. (2006). "Remote Camera Surveys for Forest Carnivores on Lands Managed by the Coos Bay BLM." Cave Junction:Siskiyou Research Group.

Bureau of Land Management, Coos Bay District. (2005). "Final North Spit Plan, An update to the Coos Bay Shorelands Plan of 1995." NR:Umpqua Field Office, BLM

---. (2012). Coos Bay District Annual Program Summary and Monitoring Report. Coos Bay:BLM

Oregon Department of Fish and Wildlife. (2008). "Sensitive Species List." NR:ODFW.

Oregon Biodiversity Information Center. (2010). "The Distribution and Reproductive Success of the Western Snowy Plover along the Oregon Coast." Portland:Portland State University.

---. (2012). "Rare Threatened and Endangered Species of Oregon." Portland:Portland State University.

United Stated Department of Agriculture (1995). "General Technical Report PSW-GTR-157. American Marten, Fisher, Lynx and Wolverine: Survey Methods for Their Detection." Forest Service:Pacific Southwest Research Station.

U.S. Department of the Interior. (1999). "Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the Pacific Coast Population of the Western Snowy Plover; Final Rule. 50 CFR Part 17." NR:USDI.

U.S. Fish and Wildlife Service. (2007a). "National Bald Eagle Management Guidelines." 23 pp. NR:USFWS.

---. (2007b). "Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (Charadrius alexandrines nivosus)." 2 Volumes. xiv + 751 pages. Sacramento: USFWS.

---. (2009). "Final 2009 5-Year Review for the Marbled Murrelet." Washington, D.C:USFWS.

---. (1997). Recovery Plan for the Threatened Marbled Murrelet (Brachyramphus marmoratus) in Washington, Oregon, and California. Portland:USFWS. 203 pp.

---. (1918). Migratory Bird Treaty Act of 1918, as amended. 16 USC (703-711), 50 CFR Part 21, and 50 CFR Part 10. Washington, D.C.:USFWS

---. (2004). "12-month Finding for a Petition to List the West Coast Distinct Population Segment of the Fisher (Martes pennanti); Proposed Rule. Federal Register 69(68):18769-18792. Washington D.C.:Federal Register

Personal Communication

Stewart Love, Wildlife Biologist, Oregon Department of Fish and Wildlife, Charleston field office, (November 2012). Conversation regarding special status species.

Appendix A
Species List

Jordan Cove Ranch Wildlife Species List				
Latin Name	**Common Name**	**2005-2006 Survey**	**2012 Survey**	**Status Federal/State/OBIC[1]**
Herptifauna				
Elgaria coerulea	Northern Alligator Lizard	X	X	
Lithobates catesbeianus	American Bullfrog	X	X	
Pseudacris regilla	Northern Pacific Chorus Frog		X	
Rana aurora	Northern Red-legged Frog	X	X	SOC/SV/4
Thamnophis ordinoides	Northwestern Garter Snake		X	
Avian				
Accipiter cooperii	Cooper's Hawk	X	X	
Accipiter striatus	Sharp-shinned Hawk	X		
Actitis macularius	Spotted Sandpiper	X		
Aechmophorus clarkii	Clark's Grebe	X		-/-/4
Aechmophorus occidentalis	Western Grebe	X	X	-/-/4
Agelaius phoeniceus	Red-winged Blackbird	X		
Aix sponsa	Wood Duck	X		
Anas acuta	Northern Pintail	X	X	
Anas americana	American Wigeon	X		
Anas crecca	Green-winged Teal	X		
Anas clypeata	Northern Shoveler	X		
Anas penelope	Eurasian Wigeon	X		
Anas platyrhynchos	Mallard	X	X	
Anthus rubescens	American Pipit	X		
Ardea alba	Great Egret	X	X	
Ardea herodias	Great Blue Heron	X	X	
Arenaria melanocephala	Black Turnstone	X		
Aythya marila	Greater Scaup	X		
Botaurus lentiginosus	American Bittern	X		
Bombycilla cedrorum	Cedar Waxwing	X	X	
Branta bernicla	Brant	X		
Branta canadensis	Canada Goose	X	X	
Branta hutchinsii leucopareia	Aleutian Canada Goose	X		D/-/2
Bucephala albeola	Bufflehead	X		-/-/2
Buteo jamaicensis	Red-tailed Hawk	X	X	
Buteo lineatus	Red-shouldered Hawk	X	X	
Butorides virescens	Green Heron	X		
Calidris alba	Sanderling	X		
Calidris alpina	Dunlin	X		
Calidris mauri	Western Sandpiper	X		
Calidris minutilla	Least Sandpiper	X		
Callipepla californica	California Quail	X		
Calypte anna	Anna's Hummingbird	X		
Cardellina pusilla	Wilson's Warbler	X		
Carpodacus mexicanus	House Finch	X		

Jordan Cove Ranch Wildlife Species List				
Latin Name	**Common Name**	**2005-2006 Survey**	**2012 Survey**	**Status Federal/State/OBIC[1]**
Carpodacus purpureus	Purple Finch	X	X	
Cathartes aura	Turkey Vulture	X	X	
Catharus guttatus	Hermit Thrush	X	X	
Catharus ustulatus	Swainson's Thrush	X		
Cepphus columba	Pigeon Guillemot	X		
Certhia americana	Brown Creeper	X	X	
Chaetura vauxi	Vaux's Swift	X		
Chamaea fasciata	Wrentit	X	X	
Charadrius semipalmatus	Semipalmated Plover	X		
Charadrius vociferus	Killdeer	X	X	
Chordeiles minor	Common Nighthawk	X		
Chroicocephalus philadelphia	Bonaparte's Gull	X		
Circus cyaneus	Northern Harrier	X	X	
Cistothorus palustris	Marsh Wren	X		
Colaptes auratus	Northern Flicker	X	X	
Columba livia	Rock Pigeon	X		
Contopus cooperi	Olive-sided Flycatcher	X	X	SOC/SV/4
Contopus sordidulus	Western Wood-Pewee	X	X	
Corvus brachyrhynchos	American Crow	X	X	
Corvus corax	Common Raven	X	X	
Cyanocitta stelleri	Steller's Jay	X	X	
Elanus leucurus	White-tailed Kite	X		-/-/2
Empidonax traillii brewsteri	Little willow flycatcher	X		
Falco peregrinus	Peregrine Falcon	X		D/SV/2
Falco sparverius	American Kestrel	X		
Fulica americana	American Coot	X	X	
Gallinago delicata	Wilson's Snipe	X		
Gavia immer	Common Loon	X		
Gavia pacifica	Pacific Loon	X		
Gavia stellata	Red-throated Loon	X		
Geothlypis trichas	Common Yellowthroat	X		
Haliaeetus leucocephalus	Bald Eagle	X		
Hirundo rustica	Barn Swallow	X		
Hydroprogne caspia	Caspian Tern	X		
Icterus bullockii	Bullock's Oriole	X		
Ixoreus naevius	Varied Thrush		X	
Junco hyemalis	Dark-eyed Junco	X	X	
Larus argentatus	Herring Gull	X		
Larus californicus	California Gull	X		
Larus canus	Mew Gull	X		
Larus delawarensis	Ring-billed Gull	X		
Larus glaucescens	Glaucous-winged Gull	X		
Larus heermanni	Heermann's Gull	X		
Larus hyperboreus	Glaucous Gull	X		

Jordan Cove Ranch Wildlife Species List				
Latin Name	**Common Name**	**2005-2006 Survey**	**2012 Survey**	**Status Federal/State/OBIC[1]**
Larus occidentalis	Western Gull	X	X	
Limnodromus sp.	Dowitcher	X		
Limosa fedoa	Marbled Godwit	X		
Lophodytes cucullatus	Hooded Merganser	X		
Loxia curvirostra	Red Crossbill	X		
Megaceryle alcyon	Belted Kingfisher	X	X	
Melanitta fusca	White-winged Scoter	X		
Melanitta perspicillata	Surf Scoter	X		
Melospiza lincolnii	Lincoln's Sparrow	X		
Melospiza melodia	Song Sparrow	X	X	
Mergus serrator	Red-breasted Merganser	X		
Molothrus ater	Brown-headed Cowbird	X	X	
Numenius phaeopus	Whimbrel	X		
Oreortyx pictus	Mountain Quail	X		SOC/SV/4
Oreothlypis celata	Orange-crowned Warbler	X		
Oxyura jamaicensis	Ruddy Duck	X		
Pandion haliaetus	Osprey	X		
Passerculus sandwichensis	Savannah Sparrow	X		
Passerella iliaca	Fox Sparrow	X		
Patagioenas fasciata	Band-tailed Pigeon	X		SOC/-/4
Pelecanus occidentalis californicus	California Brown Pelican	X	X	D/LE/2
Petrochelidon pyrrhonota	Cliff Swallow	X		
Phalacrocorax auritus	Double-crested Cormorant	X	X	
Phalacrocorax pelagicus	Pelagic Cormorant	X		
Phalacrocorax penicillatus	Brandt's Cormorant	X		
Phalaropus lobatus	Red-necked Phalarope	X		
Philomachus pugnax	Ruff	X		
Picoides pubescens	Downy Woodpecker	X		
Picoides villosus	Hairy Woodpecker	X		
Pipilo maculatus	Spotted Towhee	X		
Piranga ludoviciana	Western Tanager	X		
Pluvialis squatarola	Black-bellied Plover	X		
Podiceps auritus	Horned Grebe	X		-/-/2
Podiceps grisegena	Red-necked Grebe	X		-/SC/2
Podilymbus podiceps	Pied-billed Grebe	X		
Poecile atricapillus	Black-capped Chickadee	X	X	
Poecile rufescens	Chestnut-backed Chickadee	X		
Porzana carolina	Sora	X		
Progne subis	Purple Martin	X		SOC/SC/2
Psaltriparus minimus	Bushtit	X	X	
Rallus limicola	Virginia Rail	X		
Regulus calendula	Ruby-crowned Kinglet	X		

Jordan Cove Ranch Wildlife Species List				
Latin Name	**Common Name**	**2005-2006 Survey**	**2012 Survey**	**Status Federal/State/OBIC[1]**
Regulus satrapa	Golden-crowned Kinglet	X		
Sayornis nigricans	Black Phoebe	X	X	
Setophaga coronata	Yellow-rumped Warbler	X		
Setophaga petechia	Yellow Warbler	X		
Setophaga townsendi	Townsend's Warbler	X		
Sitta canadensis	Red-breasted Nuthatch	X	X	
Spinus tristis	American Goldfinch	X	X	
Stelgidopteryx serripennis	Northern Rough-winged Swallow	X		
Sturnus vulgaris	European Starling	X		
Tachycineta thalassina	Violet-green Swallow	X		
Thryomanes bewickii	Bewick's Wren	X		
Tringa melanoleuca	Greater Yellowlegs	X		
Tringa semipalmata	Willet	X		
Troglodytes hiemalis	Winter Wren	X	X	
Turdus migratorius	American Robin	X	X	
Uria aalge	Common Murre	X		
Vireo huttoni	Hutton's Vireo	X		
Zenaida macroura	Mourning Dove	X		
Zonotrichia albicollis	White-throated Sparrow	X		
Zonotrichia atricapilla	Golden-crowned Sparrow	X		
Zonotrichia leucophrys	White-crowned Sparrow	X		
Mammals				
Castor canadensis	Beaver		X	
Cervus canadensis roosvelti	Roosevelt elk		X	
Didelphis virginiana	Virginia Opossum	X	X	
Erethizon dorsatum	North American Porcupine	X	X	
Felis concolor	Mountain lion		X	
Neotamias townsendii	Townsend's Chipmunk	X		
Odocoileus hemious	Black-tailed deer		X	
Phoca vitulina	Harbor Seal	X		
Procyon lotor	Raccoon		X	
Tamiasciurus douglasii	Douglas' Squirrel	X	X	
Ursus americanus	American black bear		X	

1. OBIC: Oregon Biodiversity Information Center
2. OBIC Abbreviations:

FEDERAL STATUS

LE: Listed as an Endangered Species
LT: Listed as a Threatened Species
PE: Proposed as an Endangered Species
PS: Partial Status
PT: Proposed as a Threatened Species

Jordan Cove Ranch Wildlife Species List				
Latin Name	**Common Name**	**2005-2006 Survey**	**2012 Survey**	**Status** **Federal/State/OBIC[1]**

C: Candidate for Listing as Threatened or Endangered
CH: Critical habitat
D: Delisted
SOC: Species of Concern–Taxa for which additional information is needed to support a proposal to list under the ESA

STATE STATUS

LE: Listed as an Endangered Species
LT: Listed as a Threatened Species
PE: Proposed as an Endangered Species
PT: Proposed as a Threatened Species
SC: Sensitive–Critical
SV: Sensitive – Vulnerable

HERITAGE LISTS

1: Threatened or Endangered Throughout Range
2: Threatened, Endangered or Extirpated from Oregon, but Secure or Abundant Elsewhere
3: Review
4: Watch
2-ex: Extirpated in Oregon
1-X: Presumed extinct

Appendix B

Previous Report

This Appendix B Previous Report is provided in
Exhibit P as Appendix P-2

2005-2006 PRE-CONSTRUCTION WILDLIFE SURVEYS FOR PROPOSED JORDAN COVE LIQUEFIED NATURAL GAS PLANT, COOS BAY, OREGON

Prepared by LBJ Enterprises
Eureka, CA

Robert Hewitt, Project Director
Kenneth M. Burton, Wildlife Program Manager
Steven J. Tucker, Associate Wildlife Biologist

For SHN Consulting Engineers
Coos Bay, Oregon

May 10, 2006
Revised December 26, 2006

APPENDIX P-5

Alice Berg 2006 Fisheries Report, Relevant Excerpts

Jordon Cove

Fisheries Report

October 2006
Figure Revisions February 2013

Prepared for:

SHN Consulting Engineers & Geologists, Inc.
275 Market Avenue
Coos Bay, OR 97420

Prepared by:

Alice Berg & Associates, LLC
Consulting Fisheries Biologists
989 Milton Ave. Suite 3C
Ferndale, CA 95536

TABLE OF CONTENTS

1.0 Coos Bay 1
1.1 Habitat Subsystems 4
1.1.1 Marine Subsystem 4
1.1.2 Lower Bay Subsystem 5
1.1.3 Upper Bay Subsystem 6
1.1.4 Slough Subsystems 7
1.1.5 Riverine Subsystems 8
2.0 Species Account-Fish 9
2.1 Chinook Salmon 9
2.2 Coho Salmon 12
2.3 Steelhead 13
2.4 Coastal Cutthroat Trout 15
2.5 Sturgeon 16
2.6 Striped Bass 19
2.7 American Shad 20
2.8 Lamprey 21
2.9 Surfperch 22
2.10 Rockfish 22
2.11 Greenlings 23
2.12 Sculpin 24
2.13 Surf Smelt 25
2.14 Pacific Herring 25
2.15 Sole 25
2.16 Starry Flounder 26
2.17 Other Fishes 26
2.18 Fish Species in the Proposed Dredging Area 28
2.19 Ichthyoplankton 29
3.0 Formal Habitat Designations 32
3.1 Pacific Salmonid Critical Habitat 32
3.2 Essential Fish Habitat 32
4.0 Species Account-Invertebrates 33

4.1 Clams 33
4.2 Oysters 35
4.3 Crabs 37
4.4 Shrimp 38
4.5 Diatoms 38
4.6 Invertebrates in the Proposed Dredging Area 38
5.0 Commercial and Recreational Fisheries 39
6.0 Environmental Consequences 42
6.1 Species Affected 42
6.2 Dredging 42
6.3 In-water Development 49
6.4 Facility Development 50
6.5 Operations 50
6.5.1 LNG and Fuel Spills 51
6.5.2 Facility Water Quality Impacts 52
6.5.3 LNG Ballast Water 52
7.0 Essential Fish Habitat Assessment 57
7.1 Proposed Action 57
7.2 Coos Bay EFH and the Project Area 58
7.3 Assessment 58
7.3.1 Effects to Fish Managed by the PFMC 58
7.3.2 Riparian Zones and Streams 59
7.3.3 Marsh Habitats 59
7.3.4 Submerged Aquatic Vegetation 60
7.3.5 Impacts to Salmon 61
7.3.6 Impacts to Groundfish 61
7.3.7 Marine Environment 63
7.3.8 Shoreline Habitats 64
7.3.9 Kelp Forests 65
7.4 EFH Conservation Measures 66
7.5 EFH Determination 67
8.0 Habitat Mitigation 68
9.0 References 70

Appendices

A Fish Captured in Coos Bay by ODFW, 1996-2000
B Catch of Juvenile Chinook salmon by ODFW, 1978-2000
C Catch of Cutthroat Trout by ODFW, 1978-2000
D ODFW Estimated Recruitment of Striped Bass, 1978-2000
E Catch of Juvenile American Shad by ODFW, 1978-2000
F Groundfish Managed by the PFMC
G Figures 1-12

List of Illustrations

Figures Page

1. Coos Bay Project Area and Habitat Subsystems ..... Appendix G
2. ODFW Seining Locations ..... Appendix G
3. Habitat Types in the Proposed LNG Terminal* ..... Appendix G
4. Gaper Distribution in Coos Bay ..... Appendix G
5. Cockle Distribution in Coos Bay ..... Appendix G
6. Butter and Littleneck Clam Distribution in Coos Bay ..... Appendix G
7. Softshell Clam Distribution in Coos Bay ..... Appendix G
8. Macoma Distribution in Coos Bay ..... Appendix G
9. Miscellaneous Clam Distribution in Coos Bay ..... Appendix G
10. Shrimp Distribution in Coos Bay ..... Appendix G
11. Detailed View of Terminal* ..... Appendix G
12. Native Oyster Distribution in Coos Bay ..... Appendix G

*Figures 3 and 11 of this report have been revised based on the 2012 JCEP LNG Terminal Design

Acronyms and Abbreviations

BRT	Biological Review Team
CFR	Code of Federal Regulations
CIR	Color Infrared
DEQ	Oregon Department of Environmental Quality
DPS	Distinct Population Segment
DMEF	Dredge Material Evaluation Framework
DSL	Division of State Lands
DO	Dissolved Oxygen
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FMP	Fisheries Management Plan
LWD	Large Woody Debris
LNG	Liquefied Natural Gas
MLLW	Mean Lower Low Water
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
ODFW	Oregon Department of Fish and Wildlife
NTU	Nephelometric Turbidity Unit
PFMC	Pacific Fishery Management Council
PPT	Parts per Thousand
PSMFC	Pacific States Marine Fisheries Commission
RM	Rivermile
SAV	Submerged Aquatic Vegetation
SMU	Species Management Unit
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

1.0 COOS BAY

A Liquefied Natural Gas (LNG) terminal is proposed for Coos Bay (Figure 1), Oregon. Coos Bay is a complex bay system with a surface area of approximately 10,000 acres (Percy et al. 1974) and 30 tributaries. Approximately 50% of the surface area of the bay is tidelands, 50% is submerged (below mean low water) and tidal marshes extend above the tidelands and account for at least another 1,000 acres (Hoffnagle and Olson 1974).

Tidal influence is a limiting factor for many estuarine species; estuarine biological communities vary according to the degree of tidal influence. The physiography of the Coos Bay estuary has been significantly altered. Prior to alterations, the channel across the bar at the entrance was 10 feet deep and 200 feet wide (USACE 1975). The channel would wind to the north with a depth of about 11 feet and width of 200 feet to the town of North Bend, then gradually decreased in width to 50 feet and was 6 feet at Marshfield (ODFW 1979). From 1920 to 1970, diking of tidelands converted 2,000 acres to agricultural land, and filling created another 1,500 acres of new land (ODFW 1979). Salt marshes in Coos Bay have been reduced by as much as 90% due to diking and filling. Extensive filling and diking in the main bays, sloughs and tributaries have changed the form and function of the estuary. Channel shifts and areas of accelerated erosion and deposition have been noted (Dicken et al. 1961; Aagard et al. 1971). Other alterations include the north and south jetties and the Charleston small boat basin.

The USACE had conducted dredging to deepen the Coos Bay shipping channel, and dredging is thought to have altered saltwater intrusion characteristics of the Coos Bay system (Moore et al. 2000). ODFW (Moore et al. 2000) studied salinity and temperature in the estuary and the affects of changes in salt water intrusion on reproduction and recruitment into the Coos Bay striped bass population. This study concluded that the deepened channel (dredging from 1950 on has increased the depth of the Coos Bay bar by 36 feet) has allowed a profusion of more saline water earlier in the season, than was likely experienced sixty years ago, and the current salinity regime during the striped bass spawning period is detrimental to striped bass egg and larval survival. Moore et al. (2000) reported that salinity profiles show a gradual increase at all stations over the course of the summer and a gradual upstream movement of higher salinity water, consistent with a decrease in freshwater input due to reduced precipitation and an increase in ocean water intrusion.

Currently, the USACE maintains a dredged shipping channel from the entrance of Coos Bay to Rivermile (RM) 15, near Isthmus Slough. The channel is approximately 45-50 feet deep and 700 feet wide at the entrance bar and decreases to 35-37 feet deep and 300 feet wide at RM 1. These dimensions continue to RM 9. From there, the channel is 40-50 feet deep, 400 feet wide to RM 15. Two wide turning basins and an anchorage basin are located at North Bend, near the mouth of Coalbank Slough and at RM 5.5 respectively. Shallower channels are also dredged by the USACE in the Coos River and in the South Slough connecting the Charleston boat basin to the Coos Bay channel. Private entities maintain other channels as well.

Tideflats have very high productivity and play a role in temperature regulation and nutrient cycling. Shallow intertidal bar habitats provide important habitat for burrowing and opportunistic species. Tidal Marsh habitats are characterized by rooted herbaceous or woody

hydrophytes, and are some of the most productive ecosystems. Tidal marsh generally occurs from lower high tide to the line of non-aquatic vegetation and includes both salt marsh and tidally influenced fresh marsh. Prior to human alteration, vast marshes occupied the upper bay and slough systems. It has been estimated (Hoffnagle and Olsen 1974) that 90% of the salt marshes have been diked or filled. Marshes serve as a buffer between shorelands and estuarine waters, preventing or minimizing erosion, flooding and pollution.

Head of tide has been recorded for some of the sloughs and tributaries of Coos Bay. In some sloughs, the extent of saltwater intrusion is limited by tidegates. Head of tide is 37 miles from the mouth of the estuary on the South Fork Coos River and 34 miles from the mouth of the estuary on the Millicoma River (Kraeg 1979). Head of Tide is 10 miles above the entrance to the bay on Catching Slough (Wilsey and Ham 1974). On Isthmus Slough, head of tide is 12 miles above the entrance to Coos Bay (Wilsey and Ham 1974). The USACE estimates that mean tidal range is 6.7 feet above Mean Lower Low Water (MLLW) at the entrance to Coos Bay and 6.9 feet above MLLW at the city of Coos Bay. Arneson (1976) hypothesized that tidal ranges are greater due to fill placed in the bay. Large fills have been placed on the tidelands of the upper bay, near the airport and at Eastside. Both high and low tides occur progressively later upbay from the mouth. The USACE estimated that the average tidal current at Coos Bay is 2.0 knots and that flood currents of 3.5 knots have been reported.

Coos Bay is considered a drowned river valley estuary, with a "V" shaped cross section, a relatively shallow and gently-sloping bottom, and a fairly uniform increase in depth toward the mouth (Baker 1978). Burt and McAllister (1959) classified the bay as well mixed for all months except November, when the estuary is partly mixed. They also included a secondary classification of "partly mixed" for January, March and June. Arneson (1976) found a consistent change in mixing patterns occurring between RM 14 and 15 in Marshfield Channel not far from the entrance of Coos River into the wide, shallow tidal flat area of the bay. There was also a change at RM 8-9. Arneson (1976) also calculated flushing times for several points in the estuary, and reported that they range from 13.4 days at a time of high river flow and tidal range to 48.5 days at low flow and low tidal range.

Major freshwater contributions to Coos Bay come from the Coos and Millicoma rivers, Catching, Isthmus, Pony, South, North and Kentuck Sloughs and Haynes Inlet. Estimated annual discharge at the mouth of Coos Bay is 2.2 million acre-feet of fresh water (Percy et al. 1974). The U.S. Army Corps of Engineers (USACE) estimated that freshwater inflow ranges from 100,000 cubic feet per second (cfs) in winter to 100 cfs in summer. Gradients of principle tributaries/sloughs are low allowing tidal effects to extend a considerable distance (Oregon State Water Resources Board 1963). Approximately 85% of the Coos River watershed is commercial forest.

The South Slough National Estuarine Research Reserve (NERR) encompasses 4,771 acres in the South Slough of Coos Bay. The South Slough NERR's monitoring program tracks short-term variability and long term changes in water quality parameters including turbidity, temperature, salinity, pH, dissolved oxygen (DO), water level and conductivity at Charleston Bridge in Coos Bay (refer to http://www.ccalmr.ogi.edu/nanoos/data/publicarch/).

Water temperatures in Coos Bay undergo both seasonal and diurnal fluctuations. Freshwater inflow and tidal currents are main factors influencing temperature distribution. Coastal upwelling causes offshore surface temperatures to be coldest during summer (Bourke et al. 1971). River temperatures are coldest in winter and warmest in summer and fall. Seasonal temperature

fluctuations are greater upbay then near the mouth of the estuary (Arneson 1976), reflecting more extreme fluctuations from and within tributaries than those of the ocean.

Arneson (1976) showed large longitudinal variations in water temperatures in September and June when freshwater contributions were warmest. June profiles showed vertical gradients due to a greater amount of freshwater entering at that time. High tide profiles also showed a significant increase at RM 8, which Arneson (1976) attributed to solar heating of the shallow water over the large tideflats of the upper bay. In December and March, Oregon Department of Environmental Quality (DEQ 1978) data showed that freshwater temperatures may be much colder than ocean temperatures. In summer, low streamflows and poor circulation cause high temperatures in some areas of the bay. Arneson also sampled DO and reported that DO concentrations were slightly higher in December and March than in June and September. Lowest levels were recorded for Isthmus Slough. Lower levels may have been associated with low freshwater inputs in the fall, waste loading caused by offshore upwellings of low DO water and inputs of organic material from industry.

Arneson (1976) found that, with a few exceptions, low tide turbidity levels were higher than high tide levels. He interpreted this to mean that the primary cause of turbidity in Coos Bay is the sediment carried in by freshwater entering the bay. High tide turbidities increase from the mouth upstream during all seasons although this increase is very slight during times of low runoff. The South Slough NERR's monitoring program provides information on turbidity levels at Charleston: turbidity peaked in 2002 at >600 NTU during the months of June, July and December; turbidity peaked in 2003 at >800 NTUs in March, April, May and December, and; turbidity peaked in 2004 at >400 NTUs during May.

DEQ maintains a water quality monitoring program for Oregon estuaries. In 1998, Coos Bay was listed on the 303(d) List for fecal coliform within RM 7.8 to 12.3, which includes the Jordon Cove area. Other parameters identified by DEQ as being a potential concern for this area included tributylin (TBT), copper, chromium, lead, nickel and zinc. An advisory had been made against eating clams harvested from Jordon Cove including all tideland between Jordon Point and the northern point of North Spit due to elevated levels of (TBT) in clams, crabs and fish. Advisories, which had been in place since early 1994, warn against harvesting or eating shellfish from most of North Spit, Jordan Cove and, more recently, anywhere in Catching Slough. The advisories in all three of these areas were removed in 1997 because the Environmental Protection Agency has revised their assessment criteria for TBT in food. The new advisory criteria adopted by the federal agency raises the assumed "safe" level in shellfish tissue from 112 parts per billion to 1120 parts per billion (1.12 parts per million), a ten-fold increase. TBT is a manmade compound that has been used for many years as a pesticide additive in industrial and marine paints to prevent fungal growth and to discourage barnacles and other underwater pests. It has been used on boats, buoys, fishing equipment and other marine structures and is still found on many of these structures, as well as in sediments in bays throughout the nation. It is long-lived in the environment and bioaccumulates in fish and other species of animals in the ocean and in bays. Its uses were restricted nationally and in Oregon in the late 1980's but it is still used industrially and on some boats. The highest TBT level found so far in shellfish from Coos Bay is 457 parts per billion, which is less than half of the newly adopted health screen level. The DEQ, ODFW and the Health Services continue to test and evaluate findings from Coos Bay.

The Coos Basin contains tributaries and sloughs on the 303(d) List for various parameters and for specific seasonal periods or year round: Burnt Creek (temperature); Catching Slough (fecal

coliform); Cedar Creek (temperature); Coalbank Slough (fecal coliform); Elk Creek (iron); Haynes Inlet (fecal coliform); Isthmus Slough (dissolved oxygen, fecal coliform and manganese); Joey Ney Slough (fecal coliform); Kentuck Slough (fecal coliform); Larson Slough (fecal coliform); Millicoma River (dissolved oxygen); North Slough (fecal coliform); Pony Creek (fecal coliform); Pony Slough (fecal coliform); South Fork Coos River (dissolved oxygen); South Slough (fecal coliform); Stock Slough (fecal coliform); Tioga Creek (temperature); Willanch Slough (fecal coliform); Williams River (temperature).

Coos Bay is considered an aggrading system. More sediment enters the bay than is removed (USACE 1975). Sediments entering the bay include from erosion of drainage basins of tributary streams, marine sands carried into the bay by littoral drift, dune sands that are blown into the bay and sands from wind erosion of the sandstone cliffs of the lower bay and South Slough. Thus, material from the entrance to RM 12 is predominantly fine sand, and from RM 12 to RM 15 silts, clays and organic fines (ODFW 1979). Sedimentation is controlled by hydrology, and known areas of deposition include the entrance to Charleston channel, the area adjacent to the disposal islands west of the North Bend Airport, Jordon Cove, east of the upper Coos Bay Channel, and at the mouths of Pony Slough, North Slough and Haynes Inlet.

Studies of sediment chemistry have been conducted in Coos Bay (Slotta et al. 1973; Arneson 1976) and previous sediment evaluations have included collection of samples from stations within and near the planned dredge area for the Project (USACE 1998, 1999 and 2005). The Sediment Sampling and Analysis Plan (SHN 2006a) prepared for the Project summarizes information from these studies and characterizes sediment to be dredged for chemical and physical parameters, and assesses the impact associated with the discharge of dredged material. Results from the 2005 sediment evaluation report indicate low levels of analytes with all levels below their respective Dredge Material Evaluation Framework (DMEF) screening levels. In 1999, sampling occurred following a petroleum spill north of the channel entrance and two samples were collected near the Project Area. No hydrocarbons were detected and dredged material from this area is acceptable for unconfined aquatic disposal. Results from 1998 sampling also indicate sediments were acceptable for unconfined disposal and upland disposal with no adverse ecological consequences expected relative to sediment toxicity. A 1993 study by the USACE for a turning basin expansion at RM 12 indicated that near shore material was suitable for unconfined aquatic disposal.

1.1 HABITAT SUBSYSTEMS

Researchers (ODFW 1979) have divided the estuary into subsystems consisting of marine, bay, riverine and slough subsystems (Figure 1). Subsystem categories are based on sediments, habitat types and geographic locations. Currently, Oregon Division of State Lands, Estuarine and Coastal Science Division is mapping habitat in Coos Bay using hydroacoustic methods (Pers. Comm. Steve Rumrill July 2005). This information has not been released.

1.1.1 Marine Subsystem

The marine subsystem is defined as the area between the mouth of the Coos Bay estuary and RM 2.5. Wave action and tidal surge helps to create and maintain unique habitats in this subsystem. Salinities are generally higher, although at low tide and during heavy winter flows salinities can be low. Sediments are courser and composed of sands of marine origin. Rocky substrates are more common and a relatively smaller portion of the marine subsystem is intertidal. The marine subsystem has a variety of habitats including sandy shores and flats, narrow cobble-lined

shorelines, the artificial boulder-lined shores of the jetty, bedrock shorelines; sand and sand-mud flats; algal beds on unconsolidated bottoms and on bedrock; eelgrass beds; and subtidal unconsolidated bottom. The eastern shore of the marine subsystem has the largest naturally occurring rock habitat in the estuary. This high salinity, protected bedrock is unique and supports a high diversity of plants and animals resembling protected outer coast algal and invertebrate communities (Rosenkeeter et al. 1970). Along with numerous species of algae and invertebrates, fish commonly associated with open coastal waters are found in the marine subsystem. Fossil Point is exposed to wave action and provides habitat for diverse invertebrates and fishes and is an important spawning site for herring. The south jetty is one of the most popular areas for sport angling and offers the most varied species to anglers including redtail surfperch, striped seaperch, Pacific tomcod, starry flounder and kelp greenling. Anglers also target Chinook and coho salmon from the jetties in late summer. Rockfish, tomcod, coho salmon and crab are taken in large numbers in the marine subsystem by boat anglers.

Alterations to the marine subsystem have included changes in width and depth and construction of jetties (in the 1890s). In general, water quality of the marine subsystem is considered good. Temperatures are similar to ocean waters and are somewhat influenced by freshwater inflow at low tide (Arneson 1976). Low DO has been measured by DEQ near the mouth associated with wastewater from seafood processors and upwelling of offshore waters low in DO (Arneson 1976).

1.1.2 Lower Bay Subsystem

The Project Area is located within the lower bay (west of Jordon Cove), a subsystem that is the transition zone between marine and freshwater. The lower bay subsystem extends along the main channel from RM 2.5 to the railroad bridge at RM 9. The lower bay subsystem experiences substantial oceanic influence, but is not strongly affected by wave action. Habitat has considerable bearing on the type of fish present, and generally this area is relatively protected from turbulence. Marsh and eelgrass habitat are more common in this subsystem and these vegetated areas appear to exhibit greater species diversity and are preferred by aquatic species. Many species are also found in great numbers over sandy substrates. Most fish species of Coos Bay utilize the flats of the lower bay at some time during the year (Cummings and Schwartz 1971).

Sediments of the lower bay are predominately sand. Subtidal habitats include unconsolidated bottom substrates of the dredged ship channel and adjacent areas and aquatic beds in shallower areas. Major alterations include dredging and in-bay spoil disposal including at RM 3, between RM 4 and 5, below RM 6 and between RM 8 and 9. Jefferts (1977) reported that dredging has a relatively minor influence on the fauna of the lower reaches of the estuary, which primarily reflects the course sediment type rather than the effects of mechanical disturbance. Dredged materials have been dumped in the bay and marshes and flats have been filled to provide for development. The southwestern portion of the lower bay has been altered by disposal of dredge spoils, which form Clam Island.

Eelgrass beds occur in all of the bay subsystems (described below) and are considered to be the most productive of shallow, sedimentary environments. The greatest variety of algae are found near the mouth of the estuary where hard substrates provide attachment sites and moderate wave action. Along the channel there is a change from marine to brackish water flora. Both ***Zostera marina*** (eelgrass) and ***Ruppia*** sp. (ditchgrass) occur in Coos Bay (USACE 1975). Eelgrass beds are some of the most productive habitat for recreational clamming. A substantial portion of recreational use occurs in the lower bay, including clam harvest (Gaumer et al. 1973).

Above RM 6 the narrow sandy shore drops off quickly into the subtidal zone. Currents through this portion of the bay are swift and scour the shores so that attached vegetation is absent. Five pile dikes have been installed along the shore to retard erosion (USACE 1973). This area is an important feeding area for English sole, topsmelt, surfsmelt, herring, southern anchovy and coho and Chinook salmon. Fish feed on material in the water column from adjacent productive areas. Gut contents of salmonids seined in sandy areas (reported by ODFW for August 1978) showed larval fishes were the main diet.

The west shore of the lower bay includes Jordon Cove, which contains mud flats, eelgrass beds and a fringe of marsh. Jordon Cove, just upbay from the Project Area, provides habitat for recreationally important ghost shrimp that live on mud flats and eel grass beds. Clams are not common in the Project area. However, clam island, on the western side of the lower bay, has the highest densities of intertidal clams in the bay. Herring spawn at the Roseburg Lumber Co. dock and on grass beds in Jordon Cove. West of the railroad bridge at Jordon Point is a sandy area where ODFW has seined large numbers of fish. Below Sitka Dock on the east side of the lower bay there are broad algal beds on a sand-mud substrate in an area that has been subject to dredge spoils disposal. High density of marine species, primarily rockfish, have been seined by ODFW near cobble substrates in this area. Gaumer et al. (1973) reported that the lower bay may be the most popular boat angling area including for Dungeness crab, black rockfish, red rock crab, perch species and kelp greenling. Crab harvesting by boat anglers is very productive along the western side of the lower bay. The eastern side of the lower bay is subject to some of the highest recreational effort for bay clams (ODFW 2006).

DO measured at DEQ sites have been above minimum standards. Two sewage discharge sites exist in the east side of the lower bay near Empire and near Pony Slough. Coliform counts have exceeded standards. Pollutants discharged in the lower bay may not be rapidly flushed through the estuary. Flushing times ranged from 6.2 days in December to 19 days in June (7.6 miles from the mouth; Arneson 1976).

1.1.3 Upper Bay Subsystem

In the upper bay subsystem, Coos Bay broadens into a complex of wide shallow tidal flats adjacent to the main dredged ship channel. It extends from the railroad bridge at RM 9 to RM 17 (Bull Island). In general, the upper bay intertidal area is inhabited by fewer species than either the lower bay or marine subsystems. The physiological stresses of salinity and temperature changes as well as the presence of pollution and mechanical disturbance may influence community structure. Although fewer species may be present, individuals may be numerous and are important to overall estuarine food chains. For example, ***Corophium spinicorne,*** the dominant upper bay amphipod, is abundant and is important in the diet of juvenile salmonids during their seaward migration.

Major alterations have occurred in the upper bay because industrial activity for the Port of Coos Bay is centered there. The channel ranges from 40-50 feet deep and 400 feet in width. A large turning basin 35 feet deep and 800 feet wide by 1000 feet in length is located at RM 12. Filling of tidelands has occurred along the western shore and on tideflats. This area also receives industrial wastes. Sediments are primarily sand, shell or mud. The areas adjacent to the city of Coos Bay is the area of most active deposition of river sediments (Aagard et al. 1971). A tendency for channel migration has been reported (Aagard et al. 1971) near Bull Island and changes in hydrographic conditions such as major dredging, may have unpredicted effects on channel location.

Losses of marshland in the upper bay have been extensive due to diking and filling for agriculture, industry and dredge spoil disposal. Subtidal areas of the upper bay include the deep draft dredged ship channel; the shallowly dredged Marchfield, Cooston and East channels; and the smaller channels draining the tidal flats. Maintenance dredging, prop wash and anchor drag frequently resuspend sediments so that little attached vegetation can grow (Parr 1974). The benthic fauna consists of species adapted to frequent disruption. Seining near the channel in the 1970's revealed that shiner perch, silver surfperch, American shad and English sole use the area in addition to a number of less frequently captured species. Anglers catch pile perch, striped seaperch and white seaperch from the Coos Bay waterfront. A fall Chinook bank fishery also occurs from the Coos Bay waterfront. It is thought that many fish feed over the tidal flats and congregate in the channels at low tide. Softshell clams are taken recreationally in the upper bay and small cockles. Lugworms and ghost shrimp are sought by recreationists as well. The upper bay tidal flats are important feeding areas for shad and striped bass (Cummings and Schwartz 1971). Adult shad may spend several weeks there and bass can be found there most of the year. Juvenile salmonids also use the area for feeding. The most numerous fish found in the upper bay are shiner perch, silver surfperch, shad, topsmelt, starry flounder and English sole (Hostick 1975).

1.1.4 Slough Subsystems

Isolated arms or sloughs formed in minor drainages entering Coos Bay. These slough subsystems vary in the type of habitat they provide depending on location and amount of freshwater inputs. Salinity and other characteristics vary with proximity to the estuary mouth and the volume of freshwater entering sloughs. South Slough is relatively marine whereas Catching Slough is brackish. Sloughs are generally protected and have fine organic sediments. Often sloughs are shallow with a high percentage of intertidal area. In general, sloughs provide habitat for a number of estuarine fishes, commercial shellfish and invertebrates, many of which are important food sources for salmonids. Many marshes bordering sloughs have been diked, restricting tidal flush and flow of nutrient-rich organic material into the estuary.

South Slough enters the main channel of Coos Bay less than two miles from the estuary mouth. Because of its proximity to the ocean, it receives more marine influence than the other slough subsystems. Its north-south orientation makes it susceptible to strong north-northwest winds. The upper reaches have been set aside as a research sanctuary. South Slough is an area of sediment deposition. The marine influence, course sediments and relatively undisturbed nature of the upper portion provide habitat for more species of invertebrates and fish than are found in other slough subsystems. There is a high shoreline to surface area ration resulting in diverse habitats. Commercial oyster culture is a major commercial use in South Slough.

Pony Slough, across the bay from the Project Area (between RM 8 and 9), has been altered by filling. Sediments are mostly mud and mixed sand-mud with marsh edges. Habitats include subtidal areas with unconsolidated bottoms, intertidal mud flats, sand-mud flats, eelgrass beds, algal beds and marshes. Eelgrass is distributed along the intertidal areas near the slough entrance and through part of the main channel. Mud flats are populated by burrowing mudflat organisms including ***Corophium spinicorn,*** an important amphipod in the diet of juvenile salmonids. Tideflat users harvest softshell clams and ghost shrimp. The slough is an important striped bass feeding area.

The North Slough subsystem extends approximately three miles north from the main body of Coos Bay at RM 9, near the Project Area. The Jordon Cove causeway separates the slough from full exposure to the main bay, and the diked system reduces tidal circulation. Water quality sampling has shown high temperatures, high coliform counts and excessive turbidity. Low summer stream flows, incomplete mixing, livestock and log storage and waste were thought to contribute to degraded water quality. Ghost shrimp and lugworms are collected from the North Slough flats by recreationists. American shad, shiner perch, staghorn sculpin and starry flounder were found during sampling in the slough (Cummings and Schwartz 1971). Boat and shore angling for striped bass occurs in the slough during May through September and previously, there was an upstream fishery for coho salmon, which spawn in North Creek.

Coos Bay also includes Haynes Inlet, Isthmus Slough and Catching Slough, all located upbay from the Project Area.

1.1.5 Riverine Subsystems

Major riverine subsystems include the Coos River, South Fork Coos River and the Millicoma River. Riverine subsystems include the upper tidewater portions of larger tributaries entering the estuary. Much of the subsystem is subtidal along narrow, deeper river channels. Salinities are low most of the year. Large seasonal variations in river flow have a dramatic influence on this portion of the estuary. During low flows flushing times may be very long and during peak flows, erosion and high turbidity are common and can impact lower sections of the estuary. Salt marshes may extend along the borders of the riverine subsystem, grading into fresh marshes or shrub wetlands beyond saltwater influence (ODFW 1979). Fringing marsh habitat binds sediments, prevent streamside erosion and provide shallow water habitat for fish and waterfowl in the upper estuary.

Riverine subsystems of Coos Bay provide important habitat for fish including shad, coho salmon, steelhead, Chinook salmon and cutthroat trout. Coho salmon and steelhead smolts migrate through, spawn and rear in tributaries to Coos Bay. The lower portions of rivers provide habitat for starry flounder and staghorn sculpin. Riverine subsystems provide spawning habitat for American shad and striped bass in spring and summer, and in winter, habitat for adult striped bass. Other species utilizing habitat in riverine subsystems include sculpins, shiner perch, large scale sucker, red-sided shiners, largescale suckers, which are important food for striped bass. Recreational users fish rivers for shad (May-July), striped bass (year-round), cutthroat (August-October), coho and Chinook salmon (September-November) and steelhead (November-March). No commercial fishing is allowed in riverine habitat.

2.0 SPECIES ACCOUNT-FISH

Both adult and juvenile salmon spend time in the Coos Bay estuary on their migrations to and from the ocean. Estuaries are important migration habitat for adult salmonids, providing the necessary transition habitat and holding areas for fish before they migrate up their natal rivers. Estuaries are crucial for juvenile salmonid survival providing a food rich environment that promotes growth and increased survival, refuge from predators in shallow water habitat and submerged vegetation and a mixed salinity environment that allow salmonids to make physiological transition between fresh and salt water habitat.

The following information summarizes species information for many of the fish utilizing habitat in the Coos Bay system. Appendix A contains a list of fish species captured by ODFW in Coos Bay during 1996-2000 seining efforts. The list in Appendix A is not comprehensive. In 1987 ODFW listed 80 species of fish known to occur in the Coos River Basin, with more than 70 species utilizing the estuary. ODFW (Moore et al. 2000) reported that over the 1996-2000 seining period, the number of fish species increased as sampling moved down river through the estuary towards the ocean. These findings are similar to findings of previous studies in Coos Bay (Cummings and Schwartz 1971), who attributed this trend to increased salinity and nutrient levels in the lower bay, which allowed marine species to utilize this area in addition to estuarine species.

The Coos Bay system provides habitat for the following Evolutionarily Significant Units (ESUs) of Pacific salmonids, none of which are listed under the Endangered Species Act (ESA):

> Oregon Coast Chinook salmon (***Oncorhynchus tshawytscha***) – State Sensitive Critical for South Coast Fall Run stocks, south of Bandon ;
> Oregon Coast Coho salmon (***O. kisutch***) – federally delisted but under evaluation for relisting; State Sensitive-Critical;
> Pacific Coast Chum salmon (***O. keta***) – State Sensitive-Critical
> Oregon Coast Steelhead (***O. mykiss)*** – federal Candidate species; State Sensitive-Vulnerable;
> Oregon Coast Coastal Cutthroat trout (***O. clarki clarki***) – federal Candidate species; State Sensitive-Vulnerable.

In addition to salmonids listed above, Pacific lamprey (***Lampetra tridentata)*** and green sturgeon (***Acipenser medirostris)*** occur in Coos Bay and are proposed for listing under the ESA.

2.1 CHINOOK SALMON

Coos Bay provides rearing and migration habitat for fall-run Chinook salmon adults and juveniles on their way to and from the ocean. Adult Chinook salmon enter Coos Bay in the fall and quickly move upstream to spawning grounds, however, access to habitat is flow-dependent. Spawning occurs throughout the basin from mid-October to mid-December, with peaks in November. Fry emerge in late winter to early spring. Juvenile Chinook salmon may spend several months rearing in freshwater followed by up to six months in the estuary. Estuary utilization by juvenile Chinook salmon has been well documented (Healey 1982; Kjelson et al. 1982; Simensted et al. 1982). Estuaries provide an environment for productive foraging, physiological transition, refuge from predators and affects the size and numbers of fish entering the ocean. Ocean-type Chinook salmon utilize estuaries to a greater extent than do other salmonids relative to length of residency, growth obtained within estuaries and life history dependency (Reimers 1971). Recht (1999) reported that Chinook salmon juveniles in Yaquina and Alsea bays may spend between 6-189 days in the estuary,

though most individuals spend a few months in the estuary. Recht (1999) reported that Chinook fry and subyearlings prefer salt marsh areas, tending to reside primarily in marsh channels upon first entering estuaries. They tend to prefer those areas with lower salinity, moving from the edges of marshes during high tide to protected tidal channels and creeks during low tide, although venture into less-protected areas at night. Chinook fingerlings take up residence in deeper-water estuarine habitats. Reimers (1967) concluded that juvenile Chinook salmon that spent three or more months residing in the Sixes River estuary before migrating to the ocean returned as adults in greater relative numbers than fish with another life history pattern.

Coastal Fall Chinook (ODFW 2005a) includes 18 populations between Necanicum and Sixes basins. The Coos River population passed all of ODFW's (2005a) conservation criterion indicating that the near term sustainability of the population is not at risk. ODFW (2005) also reported that trapping data from the Coos and Coquille indicate that the percentage of hatchery fish among natural spawners is low.

The following life history information is summarized or excerpted from Myers ***et al.*** (1998):

> Chinook salmon mature between 2 and 6+ years of age (Myers et al. 1998). Fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of the rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991). Post-emergent fry seek out shallow, near-shore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and aquatic crustaceans. The optimum temperature range for rearing Chinook salmon fry is 50°F to 55°F (Rich 1997; Seymour, 1956), fingerlings is 55°F to 60°F (Rich 1997) and smoltification and seaward migration is 50°F to 55°F (Rich 1997). Chinook salmon spend between one and four years in the ocean before returning to their natal streams to spawn (Myers et al. 1998). Chinook salmon addressed in this document exhibit an ocean-type life history, and smolts out-migrate predominantly as subyearlings, generally during April through July. Some Chinook salmon return from the ocean to spawn one or more years before full-sized adults return, and are referred to as jacks (males) and jills (females).
>
> The diet of outmigrating ocean-type Chinook salmon varies geographically and seasonally, and feeding appears to be opportunistic (Healey 1991). Aquatic insect larvae and adults, ***Daphnia***, amphipods (***Eogammarus*** and ***Corophium spp***.), and ***Neomysis*** have been identified as important food items (Healey 1991; Kjelson et al. 1982). Rivers with well-developed estuaries are able to sustain larger ocean-type populations than those without (Levy and Northcote 1982). Juvenile Chinook salmon growth in estuaries is often superior to river-based growth (Reimers 1971; Rich 1920).
>
> The most significant process in the juvenile life history of Chinook salmon is smoltification, the physiological and morphological transition from a freshwater to marine existence. The emigration from river to ocean is thought to have evolved as a consequence of differences in food resources and survival probabilities in the two environments (Gross 1987). Ocean-type juveniles enter saltwater during one of three distinct phases. "Immediate" fry migrate to the ocean soon after yolk resorption at 30-45 mm in length (Healey 1991; Lister et al. 1971). In most river systems, however, fry migrants, who migrate at 60-150 days post-hatching, and fingerling emigrants, who migrate in the late summer or autumn of their first year, represent the majority of ocean-type emigrants. When environmental conditions are not

conducive to subyearling emigration, ocean-type Chinook salmon may remain in fresh water for their entire first year.

Ocean-type Chinook salmon tend to utilize estuaries and coastal areas more extensively for juvenile rearing. In general, the younger (smaller) the juveniles are at the time of entering the estuary, the longer they stay there (Healey 1991; Kjelson et al. 1982; Levy and Northcote 1982). Brackish water areas in estuaries also moderate physiological stress during parr-smolt transition. The development of the ocean-type life-history strategy may have been a response to the limited carrying capacity of smaller stream systems and glacially scoured, unproductive watersheds, or a means of avoiding the impact of seasonal floods in the lower portion of many watersheds (Miller and Brannon 1982). Ocean-type Chinook salmon may also use seasonal flood cycles as a cue to volitionally begin downstream emigration (Healey 1991). Migratory behavior in ocean-type Chinook salmon juveniles is also positively correlated with water flow (Taylor 1990a).

Historically, large numbers of fall Chinook salmon spawned and reared in the Coos River system. Hatchery reared fall Chinook salmon have been released into the Coos River basin since 1900. Populations were affected by a gillnet fishery until 1946 and by splash dams until 1957 and remained low through the 1960s. ODFW (1990) estimated that 60% of naturally spawning fall Chinook occur in the South Fork Coos River, 30% in the East Fork Millicoma and 10% in the West Fork Millicoma. Spawning ground surveys indicate that abundance increased from the 1970s to the early 1980s. At one time the fall Chinook salmon fishery was primarily in upper tidewaters, but currently there is a significant fishery in the bay and fish are much brighter when harvested.

Spring Chinook salmon may have been native to the Coos River basin based on hatchery records of broodstock (ODFW 1990). ODFW (2005) reported that the Coastal Spring Chinook Species Management Unit (SMU) includes nine populations between Tillamook Bay and Coquille River, and that the Coos River population of spring-run Chinook salmon is extinct. Rogue River spring Chinook salmon were introduced to the Coos River basin in 1978 and since 1982 all releases of spring Chinook salmon in Coos Bay have been a stock from the Rogue River released by Anadromous, Inc., which had a spring Chinook ocean salmon ranching program on the North Spit that has been discontinued. Coos River fall Chinook spawn from mid-October through December and spring Chinook spawn from mid-September through November. Thus, there could be some overlap, however spring runs may not survive to spawn in all years due to flows and temperatures (ODFW 1990). Fall Chinook salmon in Coos Bay is a popular fishery. However, there is not a productive spring Chinook salmon population in Coos Bay and anglers do not target spring Chinook. Hence there is no spring-run Chinook salmon recreational fishery in Coos Bay.

ODFW (Moore et al. 2000) reported on relative abundance of juvenile wild Chinook salmon during ODFW's Annual Recruitment Surveys over the last 23 years. ODFW catch data for Chinook salmon juveniles in the Coos River system from 1978-2000 are given in Appendix B. ODFW (Moore et al. 2000) reported that the general trend appears to indicate relatively stable recruitment of juvenile Chinook salmon over the long term, however relative abundance was low in most of the recent samples (2000, 1999, 1997 and 1996). During the summer, Chinook abundance was far greater in the lower bay compared to other areas that were sampled by ODFW. Chinook abundance drops off dramatically in the Millicoma and South Coos Rivers in early July while abundance in the lower bay is relatively high at this time. By mid July during most of ODFW's sampling seasons, temperatures in the Millicoma and South Coos had reached 70°F or higher while temperatures in the lower bay ranged from 57°F to 63°F (Moore et al. 2000). Higher river temperatures may force

juvenile Chinook down into cooler estuary waters during the summer (Reimers 1973). Moore et al. (2000) also reported that there appeared to be downward trend in average fish length from the lower bay to upriver during the summer, possibly attributed to poorer feeding conditions in those areas relative to the estuary, and the presence of young fish upriver.

ODFW (1990) has also reported that the Coos River basin is limited by spawning habitat rather than rearing habitat. ODFW (1990) reported that the estuary is large and is estimated to rear enough juveniles to produce as many as 38,000 returning spawners, however the lack of spawning habitat in the riverine systems has limited production.

2.2 COHO SALMON

Coos Bay provides rearing and migration habitat for adult and juvenile coho salmon on their way to and from the ocean. Adult coho salmon begin migrating into coastal streams and rivers with the first freshets in the fall-typically between September and February. Spawning begins in November, peaks in December or January, and may continue into March (Lawson et al. 2004). Generally, coho salmon spawn in smaller streams than do Chinook salmon. Fry emerge from gravels between March and May, and seek out shallow water along stream margins where they form schools. Juveniles set up territories, seek out protected areas from high flows and spend a second winter in freshwater before migrating to the ocean as smolts in March through June (Lawson et al. 2004). Rearing areas used by juveniles are low-gradient coastal streams, sloughs, side channels, estuaries beaver ponds and other slackwaters. Smolts begin migrating out to the ocean in late March or April. The amount of time coho salmon juveniles spend in estuarine environments is variable. When coho enter estuary waters, they may be two years old and relatively large. As larger smolts, coho may pass quickly through estuaries migrating to the ocean. In some cases, the transition to the ocean may be prolonged. Recht (1999) reported that coho juveniles may spend from several days to several weeks in the estuary before they migrate to sea, and, during their fresh-water phase of life, coho salmon juveniles may use brackish-water estuarine areas in summer and migrate upstream to freshwater to over-winter. Recht (1999) reported that coho salmon in Yaquina and Alsea bays are found in both intertidal and deeper habitats, with deep, marine-influenced habitats preferred.

Oregon Coast Coho Salmon are caught primarily in Oregon marine waters and have a slightly earlier adult run timing then populations farther south. This ESUincludes naturally produced coho from rivers south of the Columbia River and north of Cape Blanco. There were seven hatchery stocks propagated within this ESU, including in Coos Bay. Each hatchery along the Oregon coast has released just over 1 million coho salmon annually between 1987 and 1991. The hatchery program in Coos Bay collected broodstock from local returns and this hatchery stock is integrated with the local natural population and is included as part of the ESU. Private aquaculture facilities were discontinued in Coos Bay in the 1990's. Anadromous Inc. in Coos Bay began coho salmon production using primarily Puget Sound stocks (Weitcamp et al. 1995). The number of natural fish spawning throughout the Coos basin has improved in recent years. Spawning surveys have shown that hatchery fish represent less than 10% of the spawning population. The number of natural spawners was estimated to be over 30,000 in 2001-2003. In a summary of ESU viability, the National Oceanic and Atmospheric Administration's (NOAA) Biological Review Team (BRT; 2003) reported that the lowest risk factor was in the abundance category and the highest risk factor was low productivity. The BRT (2003) also reported that the number of natural-origin coho salmon spawners increased substantially from 2001 through 2003 compared to the lowest counts on record in the 1990s. For the first time on record since 1950, the 1997-1999 returns of coho salmon did not

replace themselves. Productivity rates in subsequent years have increased due to increased survival rates. The long-term productivity rate for this ESU is negative. Over-all, recent improvements in spawner abundance from 2001 through 2003 have decreased the extinction risk of the ESU, however, recent abundances are still probably less than 25% of historical abundances (BRT 2003).

The Coos River system has always supported a substantial population of wild coho salmon (Wagoner et al. 1990). This population was likely heavily affected by a gillnet fishery until 1946 and by splash damming until 1957. Currently, populations of coho salmon are affected by habitat quality, annual variations in freshwater and ocean conditions, and by harvest regulations. Factors including summer streamflow, temperature, amount of cover and water withdrawal have all affected natural production. Spawning surveys have been conducted in the Coos River system since the 1950s. ODFW (data reported on May 20, 2005 at http://oregonstate.edu/Dept/ODFW/spawn/reports.htm) reported annual estimates of wild coho salmon spawner abundance in coastal river basins within the Oregon Coastal ESU from 1990-2004. Estimates were 24,116 wild coho spawners in the Coos Bay and Big Creek systems for 2004. For the period reported by ODFW, abundance was greatest in 2001 (43,301) for this system.

The Coos Bay hatchery coho program has been eliminated (ODFW 2006). However, hatchery stocks had previously been released into the Coos River system since 1933 (Wagoner et al. 1990). Angling is permitted under Special Regulations as promulgated by ODFW. A limited recreational fishery has occurred in tidal portions of the South Coos, Coos, Millicoma rivers. A large recreational fishery developed in 1982 in lower Coos Bay in the vicinity of a private hatchery on the North Spit. Currently, anglers are allowed to take adipose fin-clipped coho salmon in specific areas within Coos Bay from August 1 through December 31 (up to Chandler Bridge). Isthmus Slough is open for angling of adipose fin-clipped coho salmon to the tidegate for the entire year (excluding Coal Bank and Davis Slough).

Wagoner et al. (1990) reported that winter habitat may be a limiting factor for coho salmon production in the Coos River basin. Winter habitat includes areas where young coho can take refuge from strong currents and floods during the rainy season. Large trees and branches in the stream, log jams, flooded wetlands, side channels and pools, and beaver ponds all can provide refuge. Without such areas, the young salmon get washed downstream and have reduced survival.

ODFW (2005) reported that the Coastal Coho SMU in the Coos River system met all conservation criterion. Implementation of selective fisheries for marked hatchery fish and abundance based limits on incidental impacts have reduced ocean harvest rates of wild fish from 80% as late as the 1980's to 5-15 % today (ODFW 2005a). An extended period of poor ocean conditions dropped numbers in the 1990's to record low levels. However, numbers, distributions and productivity have rebounded for most of the 19 populations in the last four years following improved ocean productivity (ODFW 2005a).

2.3 STEELHEAD

Coos Bay provides migration habitat for adult and juvenile steelhead migrating to and from the ocean. Winter steelhead are native to the Coos River system and are widely distributed. Winter steelhead migrate upstream toward freshwater spawning areas from late fall through early spring (November through May), spawn in winter and spring (December to June), and emerge from spawning gravels as fry in late spring. Juveniles spend from one to three years rearing in

freshwater, generally preferring tributary streams and areas with complex cover, before making a springtime migration to the estuary as smolts. Smolts move through the estuary relatively quickly and out to sea. Recht (1999) reported that steelhead generally spend only a few days in the estuary, moving quickly into the marine environment (in Yaquina and Alsea bays).

The Oregon Coast ESU is part of the coastal group and are primarily winter-run steelhead. Native summer steelhead occur only in the Siletz and Umpqua River basins. Most rivers on the Oregon coast are relatively short, drain the Coast Range Mountains, have a single peak in flow in December or January, and relatively low flows during summer and early fall. Upwelling off the Oregon coast is much more variable and generally weaker than in areas south of Cape Blanco. Factors for decline (NMFS 1996) of this species include logging, genetic introgression with hatchery fish, agricultural development, minor habitat blockages, historic flooding exacerbated by timber harvest and development, and over harvest.

The following life history information was excerpted or summarized from Busby et al. (1996):

> California steelhead generally spawn earlier than those in areas to the north; both summer and winter steelhead in California generally begin spawning in December, whereas most populations in Washington begin spawning in February or March. Relatively little information on spawn timing is available for Oregon and Idaho steelhead populations. Among inland steelhead, Columbia River populations from tributaries upstream of the Yakima River spawn later than most downstream populations.
>
> Steelhead from British Columbia and Alaska most frequently smolt after 3 years in fresh water (Narver 1970; Sanders 1985; Withler 1966). In most other populations for which there are data, the modal smolt age is 2 years. Hatchery conditions usually allow steelhead to smolt in 1 year; biologists use this difference to distinguish hatchery and wild steelhead. North American steelhead commonly spend 2 years (2-ocean) in the ocean before entering fresh water to spawn. Populations in Oregon and California have higher frequencies of age-1-ocean steelhead than populations to the north, but age-2-ocean steelhead generally remains dominant.
>
> For most steelhead populations, total age at maturity can be estimated by adding the smolt age and saltwater age. However, summer steelhead (especially in the Columbia River Basin) enter fresh water up to a year prior to spawning, and that year is generally not accounted for in the saltwater age designation; for example, a 2-ocean steelhead from the Yakima River may actually have 3 years between smolting and spawning.
>
> Most steelhead in Alaska and British Columbia are 3/2 (smolt age/ocean age) and have a total age of 5 years at first spawning. For coastal steelhead in Washington, Oregon, and northern California, the modal total age at maturity is 4 years (2/2).

As noted above, most species of salmon die after spawning, whereas steelhead may spawn more than once. The frequency of multiple spawning is variable both within and among populations. For North American steelhead populations north of Oregon, repeat spawning is relatively uncommon, and more than two spawning migrations is rare. In Oregon and California, the frequency of two spawning migrations is higher, but more than two spawning migrations is still unusual.

Steelhead in the Coos River system were affected by a gillnet fishery until 1946 (Cleaver 1951) and by splash dams until 1957, which created migration barriers and degraded rearing habitat. Wild stocks in the Coos basin have been supplemented by hatchery releases since 1925. Currently, angling is allowed for adipose fin-clipped steelhead in Coos Bay year-round. ODFW does not have estimates of angler effort on steelhead, but recreation catches have ranged from 300 to 3,300 annually from 1966 through 1988. Wagoner et al. (1990) reported that winter habitat may be a limiting factor for steelhead production in the Coos basin as well as competition between wild and hatchery stocks.

ODFW (2005) reported that the Coastal Winter Steelhead SMU in the Coos River system passed all conservation criterion except reproductive independence, placing near-term sustainability potentially at risk. This assessment is based on presence/absence of hatchery releases.

2.4 COASTAL CUTTHROAT TROUT

Resident and anadromous cutthroat trout are native to the Coos River system and are widely distributed throughout the freshwater and estuarine portions of the drainage (Wagoner et al. 1990). Sea-run cutthroat trout move into Oregon's estuaries in late August and early September, feeding as they migrate towards freshwater to spawn. Cutthroat trout in the Coos River system may exhibit three life history patterns: anadromous, potadromous and non-migratory resident populations. The coastal cutthroat trout may spawn more than once. Adults feed on the eggs from other salmon. Spawning can occur from December through May, dependent upon the water conditions. The female cutthroat may lay from 200 to 4,400 eggs, which hatch in about 1 month. The young spend 1-2 weeks in the gravel before emerging. Cutthroat trout can spend from 1- 9 years in fresh water before they migrate to the estuaries and ocean in the spring. Recht (1999) reported that cutthroat trout spend varying lengths of time in estuaries, some up to a few months while others may spend almost their entire life in the estuary. Coastal cutthroat trout usually spend less than one year in salt water before returning to spawn. Age of adults can range from 2-10, with first time spawners usually being 3-4 years old. After spawning, the 'spent' or spawned adults, return to salt water in late March or early April. Juveniles and adults are carnivorous, feeding mostly on insects, crustaceans, and other fish throughout their lives. During the estuarine or ocean phase of life, the cutthroat trout utilizes tidal sloughs, marshes, and swamps as holding areas and feeding grounds. These tidal areas are also very important for the survival of the prey fishes that the cutthroat depends on for food. Healthy estuaries with abundant supplies of small schooling fishes and young crustaceans are necessary for survival.

The following information is summarized from Johnson et al. (1999):

> Coastal cutthroat trout are found in the coastal plains of western North America from southeastern Alaska to northern California (Trotter 1989). This species rarely overwinter in the sea and do not usually make extensive oceanic migrations. Unlike Pacific salmon, coastal cutthroat trout adults have been known to spawn each year for more than 6 years (Trotter 1989).
>
> Interior and coastal cutthroat trout subspecies historically represented one of the most broadly distributed salmon species in western North America (Behnke 1979; 1992). The distribution of coastal cutthroat trout is broader, however, than any other subspecies. It extends along the Pacific coast from the Eel River in northern California (DeWitt 1954) to Prince William Sound in Alaska, extending out to the Kenai Peninsula (Behnke 1992; Scott and Crossman 1973). The eastern range of the subspecies rarely extends farther inland than

99 miles and usually is less than 62 miles. The eastern range appears to be bounded by the Cascade Mountain Range in California, Oregon, and Washington, and by the Coast Range in British Columbia and southeastern Alaska. This subspecies appears highly adapted to the coastal temperature areas such that even when fish have access to areas further inland (e.g., the Columbia River) they will move only a limited distance inland (Sumner 1972; Trotter 1987; 1989).

Cutthroat trout were not affected by the historic gillnet fishery as their small size allowed them to pass through the nets (Wagoner et al. 1990). Splash dams likely affected migration and habitat losses associated with sluicing of gravel and logging/splash dam activity also affected these populations. Wild cutthroat have been supplemented by hatchery releases beginning in the 1950s, and all stocking ended in 1985 (Wagoner et al. 1990). The historical hatchery releases of legal-sized cutthroat trout provided a short-term fishery in the spring time and contributed to a fishery in the upper estuary and lower Coos and Millicoma Rivers. The fishery for sea-run cutthroat trout occurs from July through October.

ODFW (Moore et al. 2000) reported relative abundance of cutthroat trout based on seining surveys in Coos Bay since 1978. Appendix C contains ODFW catch data for yearling and older cutthroat trout from 1978-2000 in the Coos River system. The general index trend indicates abundance was relatively stable, but at very low levels throughout the study.

2.5 STURGEON

Both white sturgeon (***Acipenser transmontanus***) and green sturgeon (***Acipenser medirostris***) are known to be present in the Coos River system although populations appear to be fairly small (Wagoner et al. 1990). Some natural reproduction may occur in the Coos River basin but is perceived to be low, if any (Wagoner et al. 1990). White and green sturgeon were caught in Coos Bay in commercial gillnet fisheries (1923-1949; Wagoner et al. 1990). Relatively few sturgeon are caught by recreational anglers, however numbers of anglers and annual catches are increasing each year (Wagoner et al. 1990). For the years 1986 through 1988 estimated annual catches for Coos Bay were 42 white and 7 green in 1986; 77 white and 7 green in 1987; and 140 white and 5 green in 1988. Sturgeon are caught in the Coos River, Isthmus Slough, lower Coos Bay, and other areas. Currently, there is a targeted recreational sturgeon fishery in Coos Bay, primarily near the Highway 101 Bridge and the upper Coos River, with low to moderate effort (ODFW 2006).

Oregon White Sturgeon are not listed under the ESA. ODFW (2005) considers this species "potentially at risk," as three of the seven populations failed productivity criterion (refer to ODFW 2005a) primarily due to inconsistent seasonal water flows and a corresponding lack of available, suitable spawning habitat on impounded rivers.

The following information was summarized from Pacific States Marine Fisheries Commission (PSMFC; 1996) and Wagoner et al. (1990):

> White sturgeon (***Acipenser transmontanus, acipense)*** are the largest freshwater fish in North America and can weigh over 1,500 pounds, be 20 feet in length, and live for over 100 years. In North America, white sturgeon are found from Ensenada, Mexico to Cook Inlet, Alaska. Found in most estuaries along the Pacific coast, white sturgeon prefer estuaries of large rivers. However, it is rare to find white sturgeon in Puget Sound or Hood Canal, Washington.

The white sturgeon is an anadromous, primitive, bottom dwelling fish characterized by its large body size, large head and mouth, and long cylindrical body. It has four barbels located in front of its large, wide and toothless mouth, located on the bottom (ventral) side of its head. It has no scales, but "scutes" along its body for protection. Scutes are actually large modified scales that serve as a type of armor or protection. White sturgeon have 11-14 scutes in front of their single dorsal fin, no scutes behind the dorsal, 38-48 scutes on the side, and 9-12 bottom (ventral) scutes. Dorsal color is dark to light gray, pale olive, or gray-brown. The white sturgeon's ventral or bottom surface is white. The scutes are lighter than the body in color, and the fins are dusky to opaque gray. The white sturgeon is a slow growing and late maturing, spawning in large rivers in the spring and summer months and young remain in fresh water. Older juveniles and adults are commonly found in rivers, estuaries, and marine environments.

Anadromous white sturgeon most commonly move into large rivers in the early spring, and spawn April through June. Males mature at approximately 12 years of age at a length of 4 feet, and females mature at 15 to 20 years of age at a length of 5.5 to 6 feet. Spawning usually takes place in swift current with a rocky bottom, near rapids. White sturgeon can spawn multiple times during their life, and apparently spawn every 4-11 years as they grow and mature. Females can produce from 100,000 to several million eggs each. Older white sturgeon produce more eggs and wait longer times between spawns. Adults apparently broadcast spawn in the water column and the fertilized eggs sink and attach to the bottom to hatch. Research shows that eggs can hatch in 4 days to 2 weeks, depending on water temperature.

Young white sturgeon primarily feed on algae and aquatic insects while remaining in rivers and estuarine environments. White sturgeon primarily feed on fish, shellfish, crayfish, and on various aquatic invertebrates, clams, amphipods, and shrimp.

The building of dams has negatively impacted white sturgeon by creating landlocked populations and destroying spawning grounds by altering water flow. White sturgeon do not normally use fish ladders, so bypass mitigation measures tend to be unsuccessful. Because of its long life span white sturgeon tend to concentrate pollutants in their flesh. Bioaccumulation of PCBs and other contaminants inhibit sturgeon growth and decrease egg and larval survival. As a result, industrial pollutants as well as chemicals washing off farm, forest, urban, and residential lands all negatively impact white sturgeon.

A significant economic and cultural resource throughout the Northwest, white sturgeon recently became a popular target fishery with major commercial landings in the Columbia River. In fact, Columbia River sturgeon production, with its valuable roe for caviar, is second only to the former Soviet Union's production. The Columbia River is also the site of an intense sport fishery, as is the San Joaquin Delta in California and the Willapa Bay in Washington. Strict size and catch limits are enforced in Oregon. The annual catch limit for sturgeon is five, and the daily catch limit is one. The white sturgeon is also an important fish for Native American fishermen on the Columbia and Klamath rivers.

White sturgeon seem to rely on estuaries much more than green sturgeon spending most of their lives in estuaries. Feeding migrations vary from one locale to another and can be influenced by forage species. For example, when schools of smelt, herring or other forage species migrate into the estuary, sturgeon move in from the ocean to feed on them.

Lampreys and ghost shrimp are desired food items as well as sculpins, sticklebacks, suckers and sturgeon. Oregon enforces strict size and catch limits for sturgeon and permits anglers to keep two sturgeon per day.

Northern Green Sturgeon are a Proposed Species of Concern under the ESA (no state designation). NOAA's Biological Review Team (Adams et al. 2002) determined that green sturgeon is comprised of two Distinct Population Segments (DPS) that qualify as species under the ESA: a northern DPS consisting of populations in coastal watersheds northward of and including the Eel River in California ("Northern DPS") and a southern DPS consisting of coastal and Central Valley (California) populations south of the Eel River, with the only known population in the Sacramento River. At that time NMFS also determined that neither DPS warranted listing under the ESA (68 FR 4433; January 23, 2003). On April 6, 2005, a Proposed Rule to list the Southern DPS of green sturgeon as threatened under the ESA was published (70 FR 17386). At that time NMFS reaffirmed that the Northern DPS does not warrant listing under the ESA, but recommended it remain on NMFS Species of Concern List (69 FR 199975) due to remaining uncertainties about its status and threats.

The green sturgeon is a large, anadromous fish and in North America, the green sturgeon ranges from Alaska to Mexico in marine waters and forages in estuaries and bays ranging from San Francisco Bay to British Columbia. The green sturgeon has been aged to 42 years old, but this may be an underestimate and ages of 60 to 70 are more likely. Males mature sexually sometime after they reach 120 cm, or approximately 17 years old. Females mature after attaining 145 cm, or approximately 21 years old and may return to spawn every 3 to 7 years. Males spawn more frequently.

Sturgeon species worldwide have experienced population declines because they are a long-lived, late-maturing species that have low fecundity and spawn only periodically, a combination of traits that makes them particularly susceptible to over-fishing and habitat degradation (Musick 1999). Spawning green sturgeon are highly vulnerable to over-fishing because they tend to hold in deep, cold pools in rivers, thus concentrating the spawning population. In a recent review paper, Musick et al. (2000) cited evidence that green sturgeon populations have declined by 88 % throughout much of its range, and there appears to have been recent declines in green sturgeon in the Umpqua River in Oregon and the Fraser River in Canada. Each of the known or suspected spawning populations of green sturgeon presently contain at most a few hundred mature females (Musick et al. 2000).

The current spawning range of green sturgeon in North America has contracted from its historic range, and they now spawn in only a limited number of large river systems. Green sturgeon historically spawned in the Eel, the South Fork Trinity, and the San Joaquin Rivers in California, but apparently no spawning occurs there currently. The only known remaining spawning populations of the North American green sturgeon are in the Sacramento and Klamath River basins in California, with more spawning apparently occurring in the Klamath River basin. It is also possible that spawning occurs in the Rogue River in Oregon since running-ripe adults and young of the year have been observed in the Rogue River, but exact spawning locations have not been confirmed. The contraction in spawning range, and the reduction in the number and size of green sturgeon spawning populations, could represent a significant reduction in the spawning area and potential for the species. Since North American green sturgeon spawning is limited to low numbers of spawners in a very few rivers, they are vulnerable to local

changes in flow and temperature resulting from water diversions, increased sedimentation, entrainment in pumping facilities, and contaminant loading.

The green sturgeon in North America may face ongoing threats from the loss and/or degradation of habitat, particularly in those river systems where they are known or thought to spawn (e.g. Klamath and Sacramento River basins), and impacts to the species from harvest in sport fisheries or as bycatch in other fisheries (e.g. white sturgeon fishery). Specific concerns regarding habitat loss and degradation cited include the construction of dams and operation of large scale water projects in the Sacramento and Klamath Rivers and other coastal systems, and logging agriculture, mining, road construction and urban development in coastal watersheds. Some fisheries that occur in coastal Washington and the Columbia River that target white sturgeon or salmon take green sturgeon as bycatch. Some of this bycatch is in areas where green sturgeon spawning does not occur, suggesting that green sturgeon harvest in some areas is supported by the limited number of known spawning populations (e.g. Klamath and Sacramento River basins).

The life history of green sturgeon is poorly documented. Spawn timing is similar to that of white sturgeon. Adults are opportunistic carnivores that feed on spawning or spawned out fish, sculpins, lamprey, young sturgeons, shellfish and other benthic invertebrates.

The harvest of green sturgeon in Oregon has, until recently, been managed without the benefit of a comprehensive statewide investigation of population status. Most green sturgeon harvest occurs in the lower Columbia River, Oregon and Washington, and in Willapa Bay and Gray's Harbor, Washington. Sport harvest averaged less than 350 fish annually between 1985-1997 (San Francisco Bay to Gray's Harbor) while commercial and tribal harvests averaged almost 3,150 fish.

Staff of ODFW's Columbia River Management section collected green sturgeon tissues as part of tagging efforts for green and white sturgeon in Oregon coastal estuaries. In 2000, one green sturgeon was captured in Coos Bay; in 2001, eight green sturgeon were captured in Coos Bay; and, in 2002 two green sturgeon were captured in Coos Bay. ODFW obtained historical data that documented green sturgeon presence (as incidental Catch) in Coos Bay during spring gillnet sampling. Incidental green sturgeon catches occurred from Isthmus Slough for the months of April-June and from 1980-1992. ODFW reported that many of these fish were probably younger than 3 years old based on their size and that this data may indicate some spawning in the Coos Bay system or at least the importance of the bay for juvenile rearing habitat. Gill-net sampling for green sturgeon and white sturgeon was conducted in June and July 2003, between RM 7 and RM 9, in Isthmus Slough, and at the mouth of the Millicoma River. An underwater camera was also used at the mouth of the Millicoma River. ODFW gillnetted primarily in Isthmus Slough in areas that green sturgeon had been noted previously (Farr and Rien 2002). One adult/subadult was captured in 2003.

2.6 STRIPED BASS

Striped bass (***Morone saxatilis***) are native to the Atlantic and Gulf coasts, but migrated to Oregon after they were introduced to San Francisco Bay in 1879 (Scholfield 1931). The first reported striped bass in Coos Bay was in 1914 (Wagoner et al. 1990). Since then, natural reproduction has occurred and this species has become established in Coos Bay. A commercial fishery had become established by the 1920s and a recreational fishery was developing. Striped bass have added to the diversity of

recreational angling in the Coos Bay area (Wagoner et al. 1990). The striped bass fishery consists of a combination of boat and bank angling.

Striped bass are anadromous and utilize riverine habitat for spawning in early spring and summer. Striped bass are pelagic spawners that spawn in tidal portions of the Coos, South Fork of the Coos and Millicoma rivers. Due to temperature requirements, a high percentage of spawning occurs over a short period of a few days during periods of optimal temperatures (Wagoner et al. 1990). Striped bass are broadcast spawners, releasing their eggs directly into the water column. Egg incubation, hatching, and yolk absorption occur over a 6 to 8 day period. The critical period of development for striped bass is the first 30 to 60 days after spawning. ODFW studies have shown very low recruitment of juveniles since 1979 (Wagoner et al. 1990).

Striped bass use almost all habitat types in the Coos River estuary at one time or another during their life. Tidal portions of the South Fork Coos, Coos and Millicoma rivers provide habitat for 1+ to 5 year old striped bass. Older fish use the entire estuary during different times of the year (Wagoner et al. 1990). Striped bass feed on a wide variety of fishes and invertebrates, including salmonids. Large samples of striped bass stomachs collected over many years indicate that consumption of salmonid smolts is greatest in early spring in tidewater of the Coos and Millicoma rivers. Some predation of smolts also occurs in mid-bay, associated with some tributary streams entering at mid-bay (Wagoner et al. 1990).

ODFW's annual seining in Coos Bay indicates that striped bass recruitment is low. Moore et al. (2000) reported that the abundance of striped bass young-of-the-year recruits has remained low for the last twenty years. Appendix D contains ODFW's estimated recruitment data of naturally produced young-of-the-year striped bass in the Coos River system and releases of hatchery young-of-the-year and yearling striped bass from 1978-2000 (hatchery releases were made in August or September for fingerlings and May or June for yearlings).

As mentioned above, Moore et al. (2000) assessed the effects of deepening the shipping channel on striped bass (and other species) since it is known that eggs and larval stages are sensitive to salinity levels. The study indicated that recruitment of striped bass in the Coos Bay system during the five years of study has been relatively unsuccessful and that there is high mortality from egg to fingerling stages. These researchers reported that every year of the study, striped bass eggs and larvae were transported to areas with lethal salinity levels. Dredging activities from the 1950s have increased the depth of Coos Bay by 36 feet. The deepened channel allowed a profusion of more saline water earlier in the season than was experienced sixty years ago and the salinity regime that occurs during the striped bass spawning period is detrimental to eggs and larvae.

2.7 AMERICAN SHAD

American shad (***Alosa sapidissima***) is an anadromous fish indigenous to the Atlantic coast from the St. Lawrence River to Florida, and spends most of its life at sea in large schools. Shad enter natal freshwater rivers to spawn. Shad were successfully introduced to the Pacific coast in the late 1800s when they were stocked in the Sacramento and Columbia rivers. Shad undertake extensive ocean migrations and have a reported ocean distribution ranging from Southern California to Cook Inlet, Alaska and Kamchatka, USSR. As the shad migrates from salt water to fresh, its cloak of large, easily-shed scales dulls from blue-green to brown. During an average life span of five years at sea, the American shad may migrate more than 12,000 miles. Adult shad enter Coos Bay in the spring and spawning (at age four to six years old) generally occurs in May and June in the tidal portions of

the South Coos, Coos and Millicoma rivers. Shad are pelagic spawners that usually spawn on the surface of the water. Migrations and spawning correspond to favorable river water temperatures (57°F and 72°F in Wagoner et al. 1990). Spawning usually takes place between sunset and midnight. A female lays up to 600,000 eggs, while several hovering males fertilize them. Shad usually migrate without feeding and move far enough upstream for the eggs to drift downstream and hatch before reaching saltwater. After spawning, adults either die or return to the sea. Female American shad may live as long as 10 years, but repeat spawners are rare. The eggs mature rapidly and transform into young fish in three to four weeks. The young of the year remain in fresh to brackish water, feeding on copepods and insect larvae until early fall before entering the sea. Juvenile shad begin moving downstream in the Coos system in early August and have appeared in the lower estuary as early as mid-August, and most juveniles enter apparently enter the ocean in late summer and fall (Wagoner et al. 1990). Some shad remain in the upper tidewater areas until the following summer before migrating to the ocean (Wagoner et al. 1990). Some juveniles do not enter the sea and instead overwinter in deep holes. The first months of life are the most hazardous; about 70% die before reaching the sea. While at sea young shad join other young shad schools and begin an impressive three to five years of coastal migration. While at sea they feed on plankton, small crustaceans and small fishes. After four to six years they reach sexual maturity and begin to return to their natal rivers to spawn.

Recreational fishing for shad occurs in the South Coos, Coos and Millicoma rivers from April through June. Angling is by trolling from boats and from shore. A 1970 study (Macleod 1970) estimated the recreational fishery at 10,362 angler hours. Wagoner et al. (1990) reported that the current recreational fishery is probably much larger then reported in the 1970s.

ODFW (***in*** Wagoner et al. 1990) conducted annual juvenile recruitment surveys in Coos, South Coos and Millicoma rivers and reported that shad were the most abundant species caught from mid-July through October and that recruitment appeared to be relatively stable (relative to Chinook salmon and striped bass, which tend to fluctuate from year to year). Appendix E contains ODFW's catch data for American shad in the Coos River system from 1978-2000. Wagoner et al. (1990) also reported on commercial landings of shad in the Coos system from 1923 through 1982. Commercial catches peaked in the 1940s with the maximum landing of 373,000 pounds occurring in 1946. From 1979 until 1983, the commercial seasons remained open but no fishing occurred in Coos Bay. The 1983 legislature closed the commercial fishery for shad in the Coos River system.

Abundance of young of the year shad appears to be relatively stable in Coos Bay since 1978 (Moore et al. 2000). Shad abundance has remained near the twenty-year average of 153.3. fish/haul. The index in 2000 was very low at 27.7 fish/haul, which is the lowest catch per unit effort since 1978.

2.8 LAMPREY

The Oregon Pacific lamprey (***Lampetra tridentata)*** population includes three population units in Oregon: coastal, lower Columbia/Willamette and interior Columbia (ODFW 2005a). Pacific lamprey are widely distributed throughout Oregon, but both distribution and abundance have decreased in recent years (ODFW 2005a). Pacific lamprey are not listed under the ESA but are a State sensitive species.

Pacific Lamprey range from Baja California to the Bering Sea in Alaska and Asia, and is anadromous. Like salmon, lamprey are born in freshwater streams, migrate out to the ocean, and return to fresh water as mature adults to spawn. Mating pairs of lamprey construct a nest by

digging together using rapid vibrations of their tails and by moving stones using their suction mouths. Lamprey enter streams from July to October; spawning takes place the following spring when water temperatures are between 50°F and 60°F. They ascend rivers by swimming upstream briefly, then use their suction mouths to stick to rocks and rest. Spawning takes place in low gradient sections of water, with gravel and sandy bottoms. Adults die within four days of spawning, after depositing about 10,000 to 100,000 extremely small eggs in their nest. The young hatch in 2-3 weeks and swim to backwater or eddy areas of low stream velocity where sediments are soft and rich in dead plant materials. They quickly burrow into the muddy bottom where they filter the mud and water, eating microscopic plants (mostly diatoms) and animals. The juvenile lamprey will stay burrowed in the mud for 4 to 6 years, moving only rarely to new areas. After a two month metamorphosis, triggered by unknown factors, they emerge as adults averaging 4.5 inches long. Then during high water periods, in late winter or early spring the new adults migrate to the ocean. During its ocean phase of life the Pacific lamprey are scavengers, parasites, or predators on larger prey such as salmon and marine mammals. After 2 to 3 years in the ocean they will return to freshwater to spawn. While in their 4-6 year larval stage lamprey filter microscopic plants and animals from the bottom sediments in stream systems. They are prey for a wide variety of species including salmonids and birds. Lamprey have similar freshwater habitat requirements as salmonids, therefore they have encountered similar habitat problems. Though absolute historical population sizes of the lamprey are not known, it is clear that the fish, once a significant tribal subsistence food, have shown severe decline. The first 4 to 6 years of the Pacific lamprey's life are critical times. Animals that filter water and mud for food are very susceptible to pollutants in the water column and sediments. Lamprey may be impacted by pollutants from urban and agricultural runoff that can concentrate in the sediments. Because this species depends on muddy bottoms, backwater areas, and low gradient areas during its juvenile life stage, it is susceptible to loss of wetlands, side channels, back eddies, and beaver ponds resulting from agricultural, forestry or urban development practices or channelization for flood control. High stream temperatures and lack of stream cover can also reduce the lampreys' food supply.

2.9 SURFPERCH

The surfperch family has contributed largely to recreational angling in the Coos River estuary. The leading surfperch species are shiner perch (***Cymatogaster aggregata***), redtail surfperch (***Amphistichus rhodoterus***), striped seaperch (***Embiotoca lateralis***), white seaperch (***Phanerodon furcatus***) and pile perch (***Rhacochilus toxotes***). The small shiner perch is one of the most commonly caught and kept species (Wagoner et al. 1990). Surfperch are taken mainly in the mid to lower bays from February through the summer months. Surfperch bear live young and spawn by releasing well-developed young fish. Spawning occurs in the mid to lower estuary during late spring and summer months. All of the surfperch species have been observed in spawning or near-spawning condition in estuaries and long the open coast (Wagoner et al. 1990). Wagoner et al. (1990) reported that fish present in Coos Bay are likely part of a larger ocean stock.

2.10 ROCKFISH

Salinity is higher in the summer and early fall in Coos Bay causing the saltwater boundary to migrate further up-bay and allowing estuarine and marine fish to move further up the bay. Lingcod, cabezon and rockfish, normally associated with offshore reefs, may move into the bay during summer months to feed. Young lingcod and rockfish may also move up into the estuary in search of food.

The black rockfish (***Sebastes melanops***) is the only member of the rockfish family (Scorpaenidae) that is consistently caught in Coos Bay by anglers (Wagoner et al. 1990). The copper, blue, grass and canary rockfishes and the bocaccio are occasionally caught. The estuary fishery takes rockfishes mainly during the late spring and summer months in the lower areas of Coos Bay (Wagoner et al. 1990). Black rockfish are not known to spawn in estuaries. Black rockfish and cabezon were the most abundant juvenile rockfish species captured within Coos Bay, near the entrance, between June 2003 and December 2005 (Schlosser and Bloeser 2006). Trap sites were located in eelgrass beds, along dock pilings and in sandy bottom habitat near the entrance to Coos Bay. Juvenile chilipepper, copper, grass and yellowtail rockfish as well as kelp greenling were captured.

The following information was obtained from California Department of Fish and Game at http://www.dfg.ca.gov/mrd/rockfish/black.html:

> Adult rockfish frequently occur in loose schools above shallow rocky reefs, but individuals may be observed resting on bottoms or schooling over midwater over deeper reefs. In California, age at first maturity for males is 3 years or 9.8 inches total length. For females, age at maturity is 5 years or 11.8 inches. Mating generally occurs between September and November. Eggs mature in December or January and larvae develop within 30 days. Eyed larvae are spawned from late January to May, peaking in February off California. Larvae are planktonic for three to six months where they are dispersed by currents, advection, and upwelling. They begin to reappear as young-of-the-year fish in shallow, nearshore waters by May, but the major recruitment event usually occurs from July to August. As larvae, black rockfish feed on nauplii, invertebrate eggs and copepods. As adults, they remain primarily planktivorous, feeding on small fishes (including juvenile blue and other rockfishes) as well as crustaceans, polychaetes, cephalopods, chaetognaths and jellyfish. Black rockfish are commonly associated with other nearshore fish species, particularly other rockfishes. Key habitat for black rockfish include pelagic habitat (larvae stages), nearshore habitat (young-of-the-year), particularly shallower portions of kelp beds, kelp forests, seagrass beds, midwater column habitat and high relief rocky reefs.

2.11 GREENLINGS

Greenlings in Coos Bay include lingcod (***Ophiodon elongates)***, kelp greenling (***Hexagrammos decagrammus***) and rock greenling (***Hexagrammos lagocephalus)***. Lingcod are a highly sought after species for sport anglers in the lower bay, primarily angling for them off of the jetties. Lingcod and greenlings have comprised 5% of the fish taken from offshore reefs and near Coos Bay (time period not given; Wagoner et al. 1990). Mature lingcod travel from deeper water to shallow water reefs and rocky shore areas during the winter to spawn. Tagging studies have documented some north and south movement of lingcod. Wagoner et al. (1990) reported that the in-bay population of lingcod and greenling in Coos Bay are likely dependent upon migration of fish from outside the estuary.

Lingcod spawn from November through April. Females generally produce 60,000 to 500,000 eggs, and fertilized eggs are attached to the rocky substrate, usually in large masses. Males can spawn with more than one female in the same egg mass. The male guards the nest and apparently fans or moves water over the eggs with his tail. The eggs commonly hatch in six weeks, and sexual maturity is commonly reached in 2-3 years. Lingcod begin life in near-surface marine waters and estuarine areas. As juveniles lingcod primarily use estuaries, while adults are usually found in marine waters of 100-150 M deep. Lingcod lay eggs requiring well-oxygenated water in rocky,

marine sub-tidal areas in crevices and overhangs. Larvae are found in the near-surface marine waters and estuarine areas. In this life-stage, lingcod feed primarily on copepods, eggs, and other crustaceans. As it matures, lingcod are commonly found in shallow, inter-tidal areas of bays near algae and seagrass beds. Mature lingcod feed primarily on other fish and smaller lingcod.

2.12 SCULPIN

Several species of sculpin are targeted by anglers in Coos Bay. Cabezon ***(Scorpaenichthys marmoratus)*** and red Irish lord (***Hemilepidotus hemilepidotus)*** are considered targeted food fish, however, ODFW sampling (no dates given; Wagoner et al. 1990) indicated that up to 20% of the total fish retained are Pacific staghorn sculpin (***Leptocottus armatus)***. Red Irish lord eat hermit and tanner crabs, small fish, worms, crustaceans and adults reach 20 inches in length. A typical lifespan is about six years. Red Irish lords gather in spawning areas once a season. It is likely that the same pairs come to the same spawning areas year after year. The fish guard their eggs in rocky, high-current beds during the day.

The cabezon is the largest member of the cottid family and Populations range along the eastern Pacific coast from Point Abreojos, Baja California to Sitka, Alaska. Cabezon normally occur nearshore and their depth range extends from the intertidal to 335 ft. As fish get older and larger they tend to migrate into deeper water. In shallower water they migrate in and out with the tide to feed. Cabezon have been aged to a maximum age of 17 yr for males and 16 yr for females. Total lengths corresponding to these ages were 25.5 in. and 28.5 in., respectively. The largest recorded size is 39 in. in length and over 25 pounds. Limited information available on age at sexual maturity suggests in central California males begin to mature in their third year and all are mature by their fourth year. The smallest mature male cabezon observed measured from 13.3 to 13.5 in. total length, and the smallest mature female cabezon observed measured 17.5 in. TL. Some females begin to mature in their fourth year between 15 and 20 in. in length, and by the sixth year all females are sexually mature. In California, spawning commences in late October, peaks in January and continues until March. Females are oviparous, meaning they lay or spawn eggs. Females spawn their eggs on intertidal and subtidal, algae-free rocky surfaces, primarily in crevices and under rocks. Masses of the pale green or reddish eggs are up to18 in. in diameter and up to two to four inches thick. Males fertilize the eggs after spawning by the female, and the male guards the nest during the 2-3 week period that the eggs mature. Fish are very protective of the nests for the two to three weeks it takes the eggs to develop and hatch. Larvae are approximately 0.1 to 0.2 in. long at hatching and begin to settle out of the plankton at 0.6 to 0.9 inches. Cabezon can be aptly described as sit and wait predators. Their mottled coloration lets them blend in with their surroundings as they sit motionless to wait for their next meal. With large, robust pectoral fins set low on the body and a powerful tail, they quickly lunge after unwary prey, engulfing it in their large mouth. Adult fish eat crabs, small lobsters, mollusks (abalone, squid, octopi), small fish (including rockfishes), and fish eggs. Juveniles are taken by rockfishes and larger cabezon, as well as by lingcod and other sculpins. Based on co-occurrence with adult and juvenile cabezon, demersal fishes associated with kelp beds and reef structure likely to compete with cabezon for food and space would include lingcod, greenlings, and rockfish species such as grass, gopher, black-and-yellow, China, quillback, copper, and vermilion. Fish frequent subtidal habitats in or around rocky reef areas and under kelp beds. Usually solitary, juveniles and adults both are common on any rocky bottom area with dense algal growth. They are often in the vicinity of kelp beds, jetties, isolated rocky reefs or pinnacles, and in shallow tide pools. Most of their time is spent sitting in holes, on reefs, in pools, or on kelp blades beneath the canopy, but not actively swimming.

2.13 SURF SMELT

Surf smelt (***Hypomesus pretiosus***) are also taken by anglers in Coos Bay. Surf smelt spawn year round on high intertidal beaches of sand and gravel. Under only a few inches of slack water on the high tide, the female surf smelt deposits her eggs, fertilized in unison by a male. The small, sticky surf smelt eggs adhere to sand grains. Depending on beach temperatures, incubation may take from 2-8 weeks until, at another high tide, the larvae emerge and join the plankton, drifting in nearshore environment. Although the movements of juveniles and adults are not well known, surf smelt are thought to return as adults in their second year to spawn where they hatched and may return seasonally thereafter for up to five years - if not consumed as prey. Juvenile surf smelt rear in nearshore areas while feeding on plankton. Little is known about the movements of adult surf smelt, until their return to spawning grounds at the age of one or two years. Surf smelt are the food source for a variety of other marine species such as salmon, seals and birds. The condition of forage fish populations are vital to the health of other marine species populations.

2.14 PACIFIC HERRING

Pacific herring (***Clupea pallasi***) is a pelagic species found in the inshore and offshore waters of the Northeastern Pacific from California to the Beaufort Sea. Herring are a small, relatively short-lived finfish, with a maximum age of 15 years. The herring population is highly dynamic, tending to fluctuate rapidly. Herring mature and recruit to the spawning stock predominantly between the ages of two and five. During part of the year, Pacific herring are abundant in the Coos River estuary (Wagoner et al. 1990). No estimate of historical or current biomass is available. Based on Pearcy and Myers (1974) study in Yaquina Bay, Oregon, early life stages of Pacific herring were the only species of commercial interest that appeared to use the estuary extensively as both spawning and a nursery ground. Several different runs of spawning fish enter Coos Bay from January through April, with the largest numbers seen in February and March (Wagoner et al. 1990). Herring come into the bay and wait up to a few weeks while their eggs mature prior to spawning. The adhesive eggs are deposited on substrates including rocks, vegetation, logs, pilings and boats. Spawning has been observed in many areas of Coos Bay, from the jetties upstream to the city of Coos Bay waterfront (Wagoner et al. 1990). The eggs hatch in 10 to 15 days, and the resulting larvae are present in the estuary for several months (Wagoner et al. 1990). Most anglers catch Pacific herring in lower Coos Bay during spring months use these fish for bait and food.

2.15 SOLE

English sole (***Pleuronectes*** or ***Parophrys vetulus)*** rely on tidal currents to move into and out of estuaries. English sole generally spawn during January through April at depths of 50-70 m over soft mud bottoms. Richardson and Pearcy (1977) reported that the coastal area from 2-28 km offshore is important as a spawning area for English sole. Females usually produce 150,000 to over 1 million pelagic or free-floating eggs. The fertilized eggs commonly hatch in about 1 week and the young English sole usually mature in 2 to 4 years. The young depend heavily on inter-tidal areas, estuaries, and shallow near-shore waters for food and shelter. Adults are found in near-shore coastal waters and make only limited migrations. English sole is found from Mexico to Alaska and relies heavily on estuaries for rearing. The English sole is a carnivorous feeder that generally feeds on amphipods, mollusks, crustaceans and polychaetes.

English sole is very susceptible to environmental changes and impacted by pollution and habitat alteration. Contaminants in bay waters accumulate in the tissue of English sole, resulting in high levels of contaminants, which can cause disease, tumors and reduced reproductive success. English sole is an important commercial fish, caught primarily by trawlers.

2.16 STARRY FLOUNDER

Starry flounder (***Platichthys stellatus)*** spawn near river mouths and sloughs; juveniles are found exclusively in estuaries. This species often finds its way up river, but it is estuarine dependent. Richardson and Pearcy (1977) reported that the coastal area from 2-28 km offshore is important as a spawning area for starry flounder. Adults can be found in marine waters up to 375 m in depth. The starry flounder is found throughout the eastern Pacific ocean from the Santa Ynez River in California, to the Bering and Chukchi Seas in Alaska, to Bathurst Inlet in Arctic Canada. Starry flounder feed primarily on zooplankton, copepods, crustaceans, and amphipods. To reduce predation, the starry flounder will change its coloration to blend in with the bottom. Nonetheless, it falls prey to birds and marine mammals. Starry flounder are impacted by wetland draining and filling for shoreline developments, by polluted run-off from urban and agricultural lands, and by municipal and industrial waste discharges. Additionally, the starry flounder has a demonstrated tendency to accumulate many contaminants it is exposed to in its environment, which can impair reproductive success. Juvenile starry flounder are found upstream as far as the head of tide. Sampling in the upper bay from 1979 to 1990 showed that young-of-the-year flounder are present at least in the spring and summer months (Wagoner et al. 1990). Starry flounder abundance is reduced compared with abundance observed in the early to mid-1970s (Wagoner et al. 1990).

2.17 OTHER FISHES

Coos bay also provides habitat for other marine fishes including sand sole (***Psettichthys melanostictus)***, big skate (***Raja binoculata)*** and topsmelt. Sand sole require a sand-mud-eelgrass type of habitat. Big skate occur nearshore and occasionally in the bay (Wagoner et al. 1990). When Coos Bay had shrimp plants, topsmelt would congregate around outfalls in great numbers and were targeted by anglers. Currently a limited recreational fishery exists (Wagoner et al. 1990). Incidental catches of tomcod and sand sole have occurred associated with starry flounder fisheries (Wagoner et al. 1990). Almost all of the species described above move between the ocean and estuary and the estuary provides important habitat that influences juvenile recruitment.

The Coos Bay estuary provides habitat for the following marine species that are not dependent on estuaries for completion of their life cycle, but that occasionally occur in Coos Bay: leopard shark (***Triakis semifasciata***), spiny dogfish (***Squalus acanthias***), longnose lancetfish (***Alepisaurus ferox***), white seabass (***Atractoscion nobilis***), high cockscomb (***Anoplarchus purpurescens***), snake prickleback (***Lumpoenus sagitta***), wolf-eel (***Anarrhichthys ocellatus***), Pacific pompano (***Peprilus simillimus***), Pacific sandfish (***Trichodon trichodon***), padded sculpin (***Artedius fenestralis***), mosshead sculpin (***Clinocottus globiceps***), buffalo sculpin (***Enophrys bison***), tidepool sculpin (***Oligocottus maculosus***), fluffy sculpin (***Oligocottus snyderi***), silverspotted sculpin (***Blepsias cirrhosus***), tubenose poacher (***Pallasina barbata***), northern clingfish (***Gobiesox maeandricus***) and whitebait smelt (***Allosmerus elongaues***). In addition, the following species are considered estuarine and occur in Coos Bay in low abundance (Wagoner et al. 1990): bay pipefish (***Syngnathus leptorhynchus***), penpoint gunnel (***Apodichthys flavidus***), saddleback gunnel (***Pholis ornata***), arrow goby (***Clevelandia ios***), bay goby (***Lepidogobius lepidus***), tube-snout

(***Aulorhynchus flavidus***), speckled sanddab (***Citharichthys stigmaeus***) and Pacific sand lance (***Ammodytes hexapterus***).

The bay goby lives in estuarine tideflats in the burrows of the ghost shrimp. The bay goby and bay pipefish are found throughout the length of the estuary. The tubenose poacher, speckled sanddab, and Pacific sandfish prefer sandy bottoms located predominantly in the lower bay. Buffalo sculpin, tubesnout, bay pipefish, penpoint gunnel, saddleback gunnel, arrow goby, bay goby and snake prickleback are more commonly found on tideflats in association with eelgrass beds in the lower bay. The abundance of fish in the lower bay increases in the summer due to higher salinity. Higher salinity and rocky substrates along the jetties and shoreline off of Fossil Point in the lower bay also provide favorable conditions for species such as the wolf eel, sculpins and northern clingfish. Leopard shark, spiny dogfish, whitebait smelt, northern anchovy and Pacific sand lance range throughout the water column and can be found at times over tideflats as well as in channels of the lower bay.

Longfin smelt (***Spirinchus thaleicthys***) is anadromous and spawns from October to December in freshwater streams close to the ocean. Most adults die after spawning although some may survive to a second spawn. These fish feed on small crustaceans in brackish or salt water, and young fish in freshwater feed on shrimp.

Pacific tomcod ***(Microgadus proximus)*** occur in coastal waters off Washington, Oregon (winter and spring months) and San Francisco Bay (January through June). Larvae have occasionally been documented in estuaries (Misitano 1977). Tomcod prefer a sandy, near-shore environment, although caught out to 700-foot depths. When schools of tomcod move in, anglers fish with pile worms, a small strip of anchovy, or a small strip of squid. Pacific tomcod is not a commercial species because of its small size, but is often taken by sport fisherman.

Northern anchovy (***Engraulis mordax***) are distributed near shore and in bays and estuaries, from Queen Charlotte Islands, British Columbia, to Magdalena Bay, Baja California, and are managed by the PFMC. Northern anchovy are small, short-lived fish typically found in schools near the surface. Northern anchovy eat phytoplankton and zooplankton by either filter feeding or biting, depending on the size of the food. Anchovy spawn during every month of the year, but peak in late winter and early spring. In the Oregon to Vancouver Island region northern anchovy must overwinter in upper mixed layer temperatures as low as 8-9^{o}C. Eggs and larvae are found near the surface and in the same areas as spawning adults. Densities of juvenile anchovy in near shore areas were about ten times higher than other habitat areas (Methot 1981; Smith 1985) and these researchers concluded that near shore habitats support at least 70% of the juvenile population. The northern subpopulation supports a small bait fishery off of Oregon and Washington. Anchovy are subject to natural predation throughout all life stages and are fed upon by salmon, birds, numerous fishes, mammals and invertebrates (eggs and larvae). Fleming (1999) found that anchovies followed a predictable pattern of seasonal abundance in the San Francisco estuary. Anchovies move in from the ocean during spring and summer, with peak abundance occurring in late spring and fall. The size and proximity of ocean schools to the estuary depend on ocean conditions. Immigration to estuaries may be in response to the higher temperatures found in estuaries that may allow earlier spawning opportunities than would be possible in the ocean (Fleming 1999).

Chum salmon have only occasionally been seen in Coos Bay indicating low production from the Coos Bay system. The Coos River is on the extreme southern range of the distribution of chum salmon, and because of unknown limiting factors, chum salmon may never be more than a remnant

population in the basin (Wagoner et al. 1990). Chum salmon are not listed under the ESA or by the State. Private hatchery releases have been unsuccessful. Juvenile chum salmon rear from 1-4 weeks in fresh and estuarine waters before migrating to the ocean, and chum salmon have a wider ranging ocean distribution than other Pacific salmonids. Chum salmon return to spawn primarily as 3 and 4 year old fish and return to rivers from October through January (Cleaver 1951). The spawning distribution of chum salmon includes tidewater areas of tributaries. A small, natural run of a few pairs of fish appear in Marlow Creek in most years, and an occasional chum salmon has appeared in Morgan and Daniels Creek (Wagoner et al. 1990). Chum salmon may spend between 4-32 days in the estuary, with most spending only a few weeks (Recht 1999).

Eulachon (***Thaleichthys pacificus;*** common names include ***s***melt, candlefish and oilfish) is an anadromous species, leaving the ocean to ascend rivers and streams to spawn. Adults enter fresh water and spawn from February to mid-May. Typically, males enter the rivers first, followed shortly by the females. Most spawning eulachon are three years old though they can live up to five years. Spawning is done in large masses and usually during the night. The females' eggs and the males' sperm are dispersed together into the water column and the fertilized eggs quickly attach to gravel, wood or the sandy bottom of rivers. Most adults die shortly after spawning. The 7,000 to 60,000 eggs per female hatch in five to six weeks. Because of its small size the larval eulachon are rapidly swept downstream and out into the estuaries and open ocean. All life stages of the eulachon feed primarily on plankton. The eulachon play an important role as prey or food for other animals. It is heavily preyed upon during spawning migrations, or while schooled up, by spiny dogfish, sturgeon, Pacific halibut, whales, sea lions, and birds. In the ocean, it is also preyed on by salmon and other large predatory fishes. Young larval eulachon in estuaries and near shore ocean areas are sensitive to marine pollution and toxic runoff from agriculture and urbanization. Droughts and industrial pollution have been thought to heavily impact the species' ability to spawn. If conditions are not right, the eulachon will not return to spawn, and will instead stay in the ocean to return in another year when more desirable or favorable spawning conditions exist. A commercial fishery in the Pacific Northwest has existed for eulachon as far back as the 1800's. Commercial landings of the eulachon have been fairly stable for many years. The eulachon is a very popular food fish and supports commercial, recreational, and tribal fisheries throughout the Pacific Northwest. Native Americans have traditionally used the eulachon for food and for its very high oil content.

2.18 FISH SPECIES IN THE PROPOSED DREDGING AREA

ODFW 2005 seining data from stations (Figure 2) near Jordon Cove give a snapshot of the diversity of species that utilize habitat near the proposed LNG facility. Species seined in September and July of 2005 at McCullough Bridge (upbay from the Project Area) included Chinook salmon, shiner perch, walleye perch, northern anchovy, starry flounder, staghorn sculpin, speckled sanddab and saddleback gunnel. Species seined in July 2005 from the Trestle station (just upbay from the Project Area) included coho salmon, Chinook salmon, shiner perch, staghorn sculpin, sand sole, white seaperch, surf smelt and American shad. Species seined from the Pony Creek station (across the bay from the Project Area) in July 2005 included coho salmon, Chinook salmon, shiner perch, staghorn sculpin, sand sole, white seaperch, surf smelt, jack smelt and bay pipefish.

Juvenile salmonids may occur in the Project area from March through December, with peak runs occurring during spring and summer months. Adult salmonids may occur in Coos Bay from late summer through winter. The Project area is located in the upper reaches of the lower bay subsystem and marine species are not as common in this area relative to the lower bay. Starry

flounder have been captured near the Project area, and can tolerate a wide range of salinity. Salinity, in general, is higher in summer and early fall in Coos Bay, causing the saltwater boundary to migrate further up-bay and allowing estuarine and marine fish farther up the bay. Lingcod, cabezon and rockfish, normally associated with offshore reefs, may move into the bay during summer months to feed but have not been documented in the Project area.

2.19 ICHTHYOPLANKTON

Long-term complete data sets on ichthyoplankton abundance and density in Coos Bay are absent. ODFW (Moore et al. 2000) conducted plankton tows as part of a salinity intrusion study in Coos Bay. Plankton tows were made in spring and summer months from 1996-2000. Approximately 50% of the tows were made on the South Coos River, 37.5% were made on the Coos River and 12.5% were conducted on the Millicoma River. The following species and life stages were captured: Striped bass eggs and larvae, American shad eggs, staghorn sculpin larvae, bay goby eggs and larvae, bay pipefish larvae and prickly sculpin (***Cottus asper***) larvae. Information in Moore et al. (2000) is not sufficient to predict abundance or distribution trends of ichthyoplankton in or near Coos Bay, but reveals potential species that could be affected.

Strathman (1987) and others (Morris et al. 1980) reported that numerous shellfish species (refer to Section 4.0 below) spawn in bays, and feeding larvae may remain in the water column for a month or longer.

Miller and Shanks (2004) used high frequency light trap collections at two sites, outer coastal and estuarine (Coos Bay), to compare timing and magnitude of the relative abundance of juvenile fish and crab megalopae (larvae). Species collected included juvenile northern anchovy, Pacific sardine (***Sardinops sagax***), black and copper rockfish (***S. caurinus***), Dungeness crab (***Cancer magister***) megalopae, pygmy crab (***C. oregonensis***) megalopae, and red rock crab (***C. productus***) megalopae. Miller and Shanks (2004) did not collect data sufficient for predicting abundance or distribution trends in or near Coos Bay. Miller and Shanks (2004) indicate that both wind-driven and tidal transport may contribute to cross-shelf transport and estuarine ingress of organisms. Significant cross correlations between species abundance and physical variables indicative of wind-driven transport, both upwelling and downwelling-related, and tidal transport, specifically the spring-neap tidal cycle, were found at both the outer coast and estuarine sampling sites.

Pearcy and Myers (1974) surveyed planktonic fish larvae in Yaquina Bay estuary, Oregon, over an 11 year period and reported that the estuary is important as spawning or rearing habitat only for Pacific herring and a variety of small cottids (sculpins), gobies and stichaeids (small demersal fish). These researchers reported that, with the exception of Pacific herring, the estuary does not appear to be as important to the pelagic larvae of commercial fishes. Most of the larvae that were restricted to or were most common in the estuary were of small, non-food species of cottids, stichaeids and gobies. Larvae of all the pleuronectids (this family includes 93 species of flatfish including dover, sole, flounder, etc.) were more common offshore than inside of the estuary. Pacific herring was the only species of commercial interest that appeared to use the estuary extensively as both spawning and a nursery ground. However, researchers cautioned that planktonic surveys are not completely adequate to assess use of the estuary as a nursery ground since plankton nets are selective, and only weakly swimming pelagic larvae are effectively sampled.

Of the 44 types of larval fishes found by Pearcy and Myers (1974) in Yaquina Bay, Pacific herring and bay goby were co-dominant each year (1960-1970), comprising 90% of all larvae collected. Of

note, Jones and Bottom (1984) studied zooplankton and larval fishes in the Columbia River estuary and reported that ***Osmeridae*** (smelts) and prickly sculpin dominated the larval fish assemblage. Pearcy and Myers (1974) reported that maxima of planktonic fish eggs and goby larvae occurred in the summer; maxima of all larvae combined and most species of larvae occurred in the winter and spring. Jones and Bottom (1984) reported the same timing for peak densities of eggs (summer) and larvae (winter and spring). High densities of larval herring were found in February and March, and peak numbers appeared earlier in the lower than in the upper estuary. Larvae of Pacific herring, bay goby and prickly sculpin were common at all stations from 0.5 to 8 nautical miles up the estuary, but not in the adjacent open ocean. Larvae of many species that were found in the estuary in small numbers were more abundant in offshore waters. English sole and sanddab were rare in the bay as larvae, but juveniles were abundant. Pearcy and Myers (1974) reported that there was horizontal variation in the average number of larvae collected over all sampling stations, which spanned from eight miles up the estuary to ten miles out into the open ocean. As mentioned before, within the estuary, larvae of Pacific herring, bay goby and prickly sculpin usually ranked first, second and third in relative abundance over all estuary stations. Bay goby was the only common species restricted to the bay; it was the most numerous in the upper estuary. Larvae of Pacific herring were abundant in the bay and rare outside the bay. Some of the other species Pearcy and Myers (1974) considered as primarily bay forms were prickly sculpin, found in greatest numbers in the upper estuary, and buffalo sculpin, Pacific staghorn sculpin and saddleback gunnel**,** found mainly in the lower estuary. Many of the larvae found by Pearcy and Myers (1974) were found in greater numbers offshore. Larvae of surf smelt (***H. pretiosus)***, were sometimes abundant in the lower estuary where juvenile surf smelt were numerous. In general, Osmerids (smelt) were most abundant one mile offshore. Larvae of Pacific sand lance, ***Sebastes*** spp., pleuronectids (sole), gadids (pollack and cod) and cyclopterids (lump fish) were all found in higher numbers offshore than in the bay. English sole larvae were only found offshore. Northern anchovy larvae were found throughout the bay and to three miles offshore, but were not found 5 or 10 miles offshore. Both tidal and diel factors appeared to influence catches. Highest catches of eggs and larvae in the bay occurred during periods of low water. Similarly, highest catches of herring larvae coincided with low water. Pearcy and Myers (1974) believed that high catches associated with low water were caused by tidal excursion of water with high density of eggs or larvae. Pearcy and Myers (1974) summarized results of their study stating that Yaquina Bay, like many estuaries, is an important nursery for young of several species of marine fishes, but that this was not apparent from their survey of planktonic larvae. Only the larvae of Pacific herring, a species that spawns in bays, were abundant in the plankton samples. Although the pelagic larvae of flatfishes were much more common in offshore than estuarine waters, the juvenile of several species move into the estuary in large numbers.

Richardson and Pearcy (1977) sampled ichthyoplankton offshore of Newport, Oregon, over a 1.5 year period and collected 23,578 individuals in 90 taxonomic groups. These researchers found a marked inshore-offshore separation of larval fish assemblages. Larvae designated as "coastal" were collected within 28 km of shore, dominated by Osmeridae, English sole, butter sole (***Isopsetta isolepsis)*** and Pacific tomcod. Larvae designated as "offshore" were dominated by ***Sebastes*** spp., Northern lampfish (***Stenobrachius leucopsarus)***, blue lanternfish (***Tarletonbeania crenularis)***, slender sole (***Lyopsetta exilis)*** and northern anchovy were found beyond 28 km. The 28 km station consistently had low larval abundance, appeared to be a transitional area, and was located over mid-shelf where water depth was about 95 km rather than at the shelf break. Peak concentration locations of coastal and offshore larvae were reported as being related in part to the spawning location of adults. Circulation patterns also explained observed larval distributions. Larval distributions described by Pearcy and Myers (1974) as "bay" or "offshore" were generally

supported by Richardson and Pearcy (1977). Seasonal patterns of abundance were similar to the Yaquina Bay study with the peak occurring February to July in the coastal area studied. Richardson and Pearcy (1977) reported that the coastal area from 2-28 km offshore is important as a spawning area for starry flounder and English sole, which utilize Yaquina Bay estuary during part of their early life.

Richardson (1973) reported quantitative information on larval fishes in waters off Oregon at the Columbia River plume area. Deep water tows (from 200 m depth to surface) consistently yielded a greater number of taxa because they sampled more completely the vertical range of larval fishes. The taxa most frequently taken in shallow tows were northern anchovy, northern lampfish and speckled sanddab. In deep tows the most frequently taken species were northern lampfish, northern anchovy, ***Sebastes*** spp., Clyclopteridae (lumpfishes including Pacific spiny lumpsuckers), and blue lanternfish. During the sampling period (May 10 to October 31, 1969) abundance of larvae per 1,000 m^3 estimated from combined samples peaked in July-August and was lowest in October. A total of 28,489 fish larvae were taken from all deep tows: 68.4% were Engraulidae (anchovies); 25.3% Myctophidae (lanternfish); 4.2% Scorpaenidae (rock fish, scorpion fish); and, 0.4% Osmeridae (smelts). Numbers of larvae per 1,000 m^3 of total water filtered was as follows: June shallow water (43.55); June deep water (8.9); July-August shallow water (456.81); July-August deep water (390.05).

3.0 FORMAL HABITAT DESIGNATIONS

3.1 PACIFIC SALMONID CRITICAL HABITAT

The ESA defines critical habitat under section 3(5)(A) as "the specific areas within the geographical area occupied by the species, at the time it is listed… on which are found those physical or biological features that are essential to the conservation of the species and which require special management consideration or protection; and specific areas outside the geographical area occupied by the species at the time it is listed…upon determination by the Secretary that such areas are essential for the conservation of the species." Coos Bay is not currently part of any critical habitat designation for Pacific salmonids.

3.2 ESSENTIAL FISH HABITAT

Coos Bay provides Essential Fish Habitat (EFH) for coho and Chinook salmon as well as managed groundfish species (described below). Section 7.0 of this document provides an EFH Assessment for the Project. Section 303(a)(7) of the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.), requires that Fishery Management Councils include provisions in their fishery management plans that identify and describe EFH, including adverse impacts and conservation and enhancement measures. These provisions are addressed in the separate Fisheries Management Plans (FMPs) for species managed by the Pacific Fishery Management Council (PFMC).

The Pacific Council has authority over the fisheries in the Pacific Ocean seaward of the states of California, Oregon, Washington, and Idaho. The individual FMPs addressing EFH for managed species in these areas represent the Pacific Council's response to those requirements stated in Section 303(a)(7) of the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.). The FMPs are 1) Fishery Management Plan for the Groundfish in the Pacific; 2) Fishery Management Plan for Coastal Pelagic Species in the Pacific; and, 3) Fishery Management Plan for Salmon in the Pacific.

EFH is identified and described based on areas where various life stages of 90 managed species commonly occur. These include 82 species of groundfish (refer to list in Appendix F), five coastal pelagic species (four finfish: Pacific sardine; Pacific (chub) mackerel (***Scomber japonicus)***; northern anchovy, Jack mackerel (***Trachurus symmetricus);*** and, one invertebrate: market squid (***Loligo opalescens)***, and three species of salmon (Chinook, coho and pink salmon (***O. gorbuscha***)).

4.0 SPECIES ACCOUNT-INVERTEBRATES

Shellfish fisheries, predominantly clams, crabs, and shrimp, are of significant economic importance to the Coos Bay area. In addition to the commercial fisheries for shellfish, recreational clamming and crabbing bring year-round tourist income to the region. Commercial take of clams, crabs, and other invertebrates are monitored by ODFW, however, no information has been collected on the volume of the recreational catch since 1971.

The following descriptions are focused on invertebrate species harvested in Coos Bay for either recreational or commercial purposes. Information was obtained from scientific papers and government reports including information on species range, habitat and substrate preference, temperature tolerance, salinity tolerance, timing and duration of pelagic larval stage, larval tolerances, tolerance to and effects of pollutants, and other aspects of biology found to be pertinent. Many invertebrates have not been thoroughly studied and relevant information is not available. Figures 4-10 are reproduced from Gaumer et al. (1978) and are the best available information on shellfish distribution in Coos Bay. Current shellfish distribution maps are not available.

4.1 CLAMS

The number of shellfish harvesters participating in the Oregon recreational fishery was estimated at 100,000 in a 1985 survey conducted by U.S. Fish and Wildlife Service (USFWS; ODFW 2001). Assuming half of those harvesters are clam diggers and applying a recent estimated Oregon dollar value to the catch, recreational clam digging is estimated to be at least a 5 million dollar annual industry (ODFW 2001). Coos, Tillamook and Nehalem bays have shown the greatest commercial production of bay clams over the years, and gapers, native littleneck and cockle clams provided the greatest commercial bay clam harvest (ODFW 2001). Harvest methods have changed through the years. Harvest through the 1950's was by hand and in intertidal areas. Some mechanical harvest using dredges was allowed in Coos and Yaquina bays during the 1960s. Bay clams in subtidal habitat can still be harvested commercially using dive gear. Recreational clamming occurs in intertidal areas using hand methods.

All clams harvested in Coos Bay are primarily filter feeders. Most of the clam harvest occurs in the lower bay and South Slough, North Spit, Pigeon flats, and the area surrounding the Charleston Bridge. Each species is harvested both for food and bait. The percentage of each catch used for food depends on market fluctuations. In 2004, most of the clam harvest was used as food and very little used as bait. However, in most years, including 2005, clam harvest is primarily used for bait (Groth, S. pers. comm.).

Gaper clams (Empires, Blues, Horse, Horseneck, Blueneck, ***Tresus capax***) bury themselves up to 1 meter deep in sand and mud. They are common in bays and estuaries from Alaska to central California (Morris et al 1980). They may be found on the open coast in fine sand or muddy areas but are most common in estuary regions (Morris et al 1980). Within Coos Bay, gaper clams are found within the lower bay with the densest populations occurring just north of Pigeon Point (Roye 1979; Figure 4). No information on adult temperature, salinity, or pollutant tolerance was available. Spawning generally occurs between late January and March (Strathmann 1987) but may extend to July in Coos Bay (Groth, S. pers. comm). The feeding larvae remain in the water column for approximately one month (Strathmann 1987) and new recruits are commonly found in the early spring (Robinson and Breese 1982). Larvae develop normally between 5 and 15°C (41 and 59°F). At

20 °C (68°F) larval mortality is 100% (Bourne and Smith 1972). No information was found on larval salinity tolerance.

Cockles (basket cockles, steamers, heart cockle, ***Clinocardium nuttallii***) are found on top of or near the surface of mud or fine sand. They can be found in bays and offshore from the Bering Sea to San Diego and depths from the intertidal zone to 200 m depth (Morris et al 1980). In Coos Bay, cockles are found predominantly below the railroad bridge in the lower bay and South Slough with the largest populations north of Pigeon Point and northern South Slough (Roye 1979). No information was found on the temperature and salinity tolerance ranges of adults, or on pollutant effects. Spawning occurs between April and November and is probably triggered by an increase in water temperature (Strathmann 1987). No data was found on the length of larval period or larval temperature and salinity tolerance.

Butter clams (Washington, Quahog, Coney Island, Beef Steak, Giant Oregon Clam, Martha Washingtons, Marthas, ***Saxidomus giganteus***) are found buried between 25 and 30 cm deep in mud or gravel-muddy areas (Morris et al 1980) or near shells or sandstone (Groth, S. pers. comm.). They are most common in bays and protected beaches from the Aleutians Islands to San Francisco Bay, but they are rare south of Humboldt Bay (Morris et al 1980). Butter clams are found below the railroad bridge in the lower bay, concentrated around Pigeon Point (Roye 1979). No information on adult salinity, temperature, or pollutant tolerance was found. Spawning most likely occurs between March and June (Robinson and Breese 1982). The free-swimming, feeding larvae are in the water column for approximately six weeks before metamorphosis. No information was available for larval temperature or salinity tolerance.

Littleneck clams (steamers, butter clams, ***Protothaca staminea***) are most commonly found around 15 cm below the surface in gravel or coarse sediment, and rarely found in fine sediments. Populations are most common in the mid to low intertidal zone (–1 to +1.3 m from the mean lower low water). They are common in bays and outer coast beaches (Chew and Ma 1987) from the Aleutian Islands to Baja California (Morris et al 1980). Growth is highest in areas with high tidal currents. In Coos Bay, littleneck clams are most common at Pigeon Point and just north of Pigeon Point (Roye 1979). Spawning usually occurs between February and March. The free-swimming, feeding larvae are found in the water column for approximately three weeks before settling. No information on larval temperature or salinity tolerance was found. Over their range, littleneck clams experience temperatures ranging from 32-77°F. The optimum temperature range for maximum growth, measured in Newport, Oregon, is 50 to 59°F. The optimum salinity is between 27 and 32 ppt (Chew and Ma 1987). Ionic copper is known to be harmful to littleneck clams. The time taken to bury increased logarithmically with increasing copper concentrations within the sediment. Mortality in littleneck clams was 15% at a copper concentration of 18 µg/L, 86% at 39 µg/L, and 97% at 82 µg/L. Concentrated levels of other heavy metals have been found in littleneck clams, however, these concentrations are often lower than in other shellfish (Chew and Ma 1987). Oil-treated sediment can slow the growth rate of littleneck clams. Crude oil caused 15% mortality at 1,238 ppm. Oil dispersants, and the combination of dispersants and oil, had the effect of drastically reducing siphon activity more than oil alone (Chew and Ma 1987). The siphon is responsible for pumping water and food particles into the clam, so a reduction in siphon activity will mean a reduction in feeding rate of the clam.

Softshell clams (mud clams, bay clams, ***Mya arenaria***) are a species introduced from the Atlantic. They are found buried in sediment up to 25 cm deep in the upper reaches bays and, on the west coast, are found from southern Alaska to Elkhorn Slough, California (Morris et al 1980). They are

usually found in dark (anoxic) mud and can withstand anaerobic conditions for several days at a time. In Coos Bay, softshell clams are found above the railroad bridge in the upper bay (Roye 1979). In Washington, spawning occurs between May and September (Strathmann 1987). At 73°F, larvae settle after 10-35 days. Larvae will survive at temperatures between 57-75°F, but growth is slowed at the lower range. Optimal growth occurs between 64-73°F (Strathman 1987). The thermal limit for adult softshell clams is dependent on the temperature they are acclimated to. In the normal range of temperatures experienced by softshell clams, the LC50 temperature (temperature at which mortality of adults was 50%) was 88-94°F for juveniles and 86-91°F for adults (Kennedy and Mihursky 1971). The optimal salinity for larvae, usually between 10-32 ppt depends on the salinity experienced by the parents (Strathmann 1987). Softshell clams over 2 mm in length can withstand salinities as low as 1 ppt and as high as 30 ppt. Individuals can withstand daily fluctuations in salinity of 18 ppt (Matthiessen 1960). Softshell clams cease feeding during periods of high turbidity. This creates a tolerance to increased turbidity but causes starvation if turbidity does not decrease (Grant and Thorpe 1991).

Razor clams (***Siliqua patula***) are found on open coast sandy beaches in areas with high wave action (Morris et al 1980). Due to the shifting sands on such beaches, the razor clam does not form a permanent burrow and instead is relatively mobile. They are found in the intertidal zone down to the shallow subtidal from Alaska to Pismo Beach, California (Morris et al 1980). In Coos Bay, razor clams are found in small ephemeral patches below the railroad bridge (Groth, S. pers. comm.). Spawning occurs when water warms to approximately 13°C (55.4°F). The larvae spend most of their time on sediments before metamorphosing after 8 weeks (Morris et al 1980). The thermal tolerance of razor clams depends on the duration of exposure. At 79°F, 100% mortality occurred after four hours of exposure to elevated temperatures. At 84◦F, 100% mortality occurred after one hour of exposure (Sayce and Tufts 1972). The optimimum salinity for razor clam growth is 5-28 ppt.

Bentnose clams (***Macoma nasuta***) can be found offshore at depths up to 50 m, but are most common in bays. They are generally buried 10-20 cm below the surface in gravel, sand, mud, or muddy clay (Morris et al 1980). They are found from Alaska to Baja California (Morris et al 1980). In Coos Bay, Bentnose clams are found in South Slough and in high densities (> 5 individuals per square foot) both above and below the railroad bridge (Roye 1979). In Oregon, spawning occurs in the spring or early summer (Morris et al 1980). No information on temperature, salinity, or pollutant tolerance was found.

Piddock clams (***Zirfaea pilsbryi***) make permanent burrows in heavy mud, sticky clay, and soft shale in bays and estuaries from Alaska to Baja California (Morris et al 1980). If sedimentation occurs over burrows, the Piddock Clam can extend its siphons above the sediment to the water above, making them less susceptible to mortality due to sedimentation (Morris et al 1980). No information on salinity, temperature, or pollutant tolerances was available. The distribution within Coos Bay is not known.

4.2 OYSTERS

Ostrea conchaphila (native Olympia oysters) are the only oyster native to Oregon. A population of native oysters in Coos Bay, thought to be extinct in 1991, is currently rebuilding naturally in large numbers (ODFW 2001; Figure 12). These oysters are not harvested commercially or recreationally, nor do they have a listing status (life history information is given below). However, Coos Bay is one of only a few bays where they exist in Oregon. Olympia oysters are found subtidally and

intertidally from the North Bend Municipal Airport to Millington in Isthmus Slough. Restoration projects for these oysters are currently being federally funded.

Four species of imported oysters have been successfully cultivated in Oregon since the early 1930s, with Pacific oyster (***Crassostrea gigas)*** being the most successful. The Pacific oyster lives throughout the bay and is harvested from commercial oyster leases. In Oregon, Tillamook, Coos, Yaquina and Netarts bays have provided the bulk of cultured oysters.

Much of the tideland leased for oyster culture is not being utilized (ODFW 2001). Oregon Division of State Lands (DSL) oversees six oyster claims in the South Slough. Coos County and the Port of Coos Bay issue oyster leases near Silver Point, upstream of the Highway 101 Bridge. The Port of Coos Bay oyster lease areas encompass 200 acres on the east side of the channel near Silver Point. The County manages three separate leases that are also located in the Silver Point area. There are no commercial oyster lease areas near the Project Area.

The Pacific Oyster lives at water temperatures from 39-75°F and, during low tide, can withstand air temperatures as low as 25°F. Spawning will not occur until the water temperature reaches 66°F (Pauley et al 1988). However, mass mortality in bays with high nutrient levels have been observed when temperatures exceed 68°F (Perdue et al 1981). Larvae can withstand temperatures of up to 86°F. The length of the larval period, 18-30 days, depends on the water temperature. As water temperature increases, the larval period decreases (Pauley et al 1988). Pacific oysters rarely spawn in Coos Bay, and oyster farms are sustained by importing commercially produced oyster spat each year. The optimum salinity for oyster growth is 25-35 parts per thousand (ppt; Pauley et al 1988). As salinity decreases, the oyster closes its shell and the filtering rate decreases. Below 13 ppt, there is little water pumped over the gills. While a constant salinity between 16 and 34 ppt does not affect larval settling, fluctuation in salinity will prevent settlement (Pauley et al 1988). Larvae will not survive below 10 ppt (Pauley et al 1988). High levels of siltation can cause mortality in oyster beds. Oysters must either filter out suspended sediments or cease feeding. Due to this, high wave action can be detrimental for oysters due to an increase in turbidity (Pauley et al 1988).

Pollution can be extremely detrimental to oyster farms. Sewage, industrial waste, and pulp mill effluents can be concentrated in tissue, increasing the risks for human consumption (Pauley et al 1988). Large portions of Coos Bay with good conditions for oyster farming are unavailable because of high concentrations of coliform bacteria. Pulp mill effluent produces either sulphite waste liquor or kraft mill effluent, depending on the type of processing that occurs within the mill. Both are comprised of chemical waste and wood fibers, which can cause oyster mortality or decrease growth rates. Sulphite waste liquor in concentrations between 1000 and 10,000 ppm is lethal to some species of protozoans that are important sources of food for oyster feeding. As low as 2.5 ppm, sulphite waste liquor can decrease the growth rate of these protozoans. Kraft mill effluent between 10 and 40 ppm significantly decreases oyster quality. The organic components of pulp mill effluent require oxygen to decompose and the resulting decrease in oxygen concentrations in the water can kill benthic marine life. Wood fibers present in effluent can clog the gills of oysters (Pauley et al 1988). Heavy metals such as copper, zinc, and arsenic can be concentrated in oyster tissue. Copper concentrations higher than .1 mg/l can slow oyster growth (Pauley et al 1988).

Olympia Oyster (***Ostrea conchaphila***) can survive on the open coast but is most commonly found in the low intertidal zone in bays and estuaries from Alaska to Baja California (Morris et al 1980). They are found attached by one shell valve to rocks, oyster shells, and other hard surfaces (Morris et al 1980). The Olympia Oyster was extinct in Coos Bay prior to European settlement. However,

dredging in Coos Bay has restored pre-settlement salinity conditions in the bay, allowing the Olympia oyster to resettle (Baker and Terwilliger 1999). Over their range, Olympia Oysters are exposed to temperatures from 43 to 48°F in the winter and 64 to 68°F in the summer (Couch and Hassler 1989). Mortality was 100% for oysters held at 30 to 41°F. Temperatures of 86°F can be tolerated for short durations with minimal mortality (Baker 1995). Optimal salinity for Olympia Oysters is 25 ppt and above. However, they can tolerate short exposures to much lower salinities and may be exposed to freshwater flows at low tide. Mortality at a constant salinity of 15 ppt is 80% (Baker 1995). Spawning occurs when water temperature reaches 13 to 16°C (55 to 61°F) and may occur as either a single discrete event or spawning may extend over a longer period. The larvae are free-swimming and 11 to 16 days pass before metamorphosis (Couch and Hassler 1989).

Like the Pacific Oyster, sulphite waste liquor can cause mortality, a reduction in growth, and a decline in larval settlement (Couch and Hassler 1989). Olympia Oysters may be able to survive exposure to small amounts of petroleum by closing the shell. However, extended exposure will cause mortality (Couch and Hassler 1989).

4.3 CRABS

Crabs (red rock and dungeness) constitute 80% of the recreational shellfish catch in Coos Bay. The majority of this catch (77%) is Dungeness Crabs. Most crabs caught both commercially and recreationally are caught from the docks in Charleston or traps set by boats in the lower end of Coos Bay. The commercial fishery is primarily in the ocean outside the bay, but there is a small commercial fishery within the bay. The Dungeness crab fishery has a long history, with catch records going back to 1889 (ODFW 2001). The West Coast catch exceeded one million pounds for the first time in 1933 and showed a steady increase up to 1948 when ten million pounds were landed. Crab landings have fluctuated since then with an annual average of 9.0 million pounds (ODFW 2001). The bay crab fishery is shared between commercial and sport fishers.

Dungeness Crab (***Cancer magister***) can occur in sandy pools in the low intertidal, but are most common on subtidal sandy bottoms at depths up to 90 m (Morris et al 1980). They are found in bays and along the outer coast from the Aleutian Islands to Pismo Beach, California (Morris et al 1980). Hatching of larvae starts as early as December and reaches a peak in March. The larvae are free-swimming and are found predominately in the upper 20 m of the water column. The larval stage lasts between three and five months (Morris et al 1980). Adult dungeness crabs are somewhat tolerant of temperature and salinity changes and live at temperatures from 37-66°F (Pauley et al 1989). The optimal temperature range depends on season (i.e., recent acclimation) and developmental stage. During mating and egg brooding periods, temperatures of 50-54°F are best. After just 4 minutes at 68°F, 100% mortality was observed in eggs. The optimum temperature for larvae is 50-57°F. Adult thermal tolerance varies between 68-77°F (Pauley et al 1989). Like temperature, salinity tolerance is dependent on developmental stage.
Hatching will occur at salinities from 10 to 32 ppt, but the optimum salinity for larval growth is 25 and 30 ppt and the minimum salinity tolerated by larvae is 15 ppt. Adult Dungeness Crabs tolerate or live at salinities from 15.5 to 36.2 ppt (Pauley et al 1989).

Red Rock Crab (***Cancer productus***) are found in bays and estuaries as well as the open shore from the intertidal zone down to depths of 91 m. They can be found in coarse sands, mud, gravel, and rocky substrates from Alaska to San Diego, California (Morris et al 1980). The larval period can last as long as 100 days (Carroll and Winn 1989) and the rate of development depends on water temperature. Larvae develop normally at temperatures of 50-68°F for extended periods of time

with minimal mortality (Sulkin and McKeen 1994). No information on larval salinity tolerance was found. Survival at salinities below 13.1 ppt is low. Low salinities seem to impede the molting process in larvae (Carroll and Winn 1989). Toxicity of some metals was tested in the closely related Yellow Crab (***Cancer anthonyi***). Concentrations of barium and zinc were lethal to embryos at a concentration of 1 g/l (Carroll and Winn 1989).

4.4 SHRIMP

Ghost shrimp (***Neotrypaea californiensis,*** previously ***Callinanassa californiensis***) are found burrowing in intertidal sand or mud and in bays from Alaska to Baja California (Hornig et al 1989) and are harvested recreationally in Coos Bay for fishing bait. They are found throughout the lower bay and South Slough and in sparse densities above the railroad bridge (Roye 1979). The spawning peak occurs in late June and early July. Larvae spend between six and eight weeks in the water column and recruitment occurs in August. The recruitment of larvae to adult habitat may be facilitated by the flood tides of the fall (Hornig et al 1989). Ghost shrimp survive best at burrow temperatures of 50-55°F. In Yaquina Bay, natural burrows have a seasonal temperature range of 48-59°F. Juveniles are more common at shallower depths in the sediment where the water is warmer (Hornig et al 1989). Ghost shrimp can tolerate salinities from 9 to 41 ppt. Salinity from 8 to 9 ppt are lethal to 75 to 100% of ghost shrimp. Between 33 and 10 ppt, ghost shrimp activity decreases with decreasing salinity (Hornig et al 1989). The oxygen levels within ghost shrimp burrows can reach zero during low tides. In the laboratory, ghost shrimp can survive anoxia for 5.7 days due to their ability to lower metabolism when there is reduced oxygen in the environment (Hornig et al 1989).

Small amounts of spilled oil near ghost shrimp burrows has had little or no effect on the shrimp. However, if oil is stranded in the intertidal and covered by a layer of oil-free sediment, the layer of oil will prevent ghost shrimp burrowing (Hornig et al 1989).

4.5 DIATOMS

Diatoms are the principle component of the planktonic flora in Coos Bay and there may be a continuum of species from the ocean to the upper bay, with a transition zone near RM 5, where there have been found to be a high species diversity and productivity (McGowan and Lyons 1973). ***Chaetoceros***, ***Skeletonema*** and ***Thalassiosira*** predominate in the lower bay, while ***Melosira*** and ***Skeletonema*** are found in the upper bay. OIMB have taken quantitative measurements of phytoplankton in South Slough indicating seasonal and tidal changes in species composition.

4.6 INVERTEBRATES IN THE PROPOSED DREDGING AREA

Intertidal areas near the Project Area provide habitat for shrimp, softshell clams, bentnose clams and cockles (based on distribution maps by Gaumer et al. 1978; refer to figures 4-10). In addition, ODFW captured dungeness crab and red rock crab in this area during 2005 seining efforts.

5.0 COMMERCIAL AND RECREATIONAL FISHERIES

Species-specific information regarding recreational angling in Coos Bay was given above under individual species descriptions. No commercial fisheries for fish species exist in any of the estuary or freshwater habitats of Coos Bay. Ocean commercial fisheries for salmonids and marine species still occurs and commercial boats (trollers and trawlers) targeting tuna, salmon and groundfish still dock and sell their products in Coos Bay. There is a fisherman's market cooperative in Charleston and a small commercial salmon fleet.

The following information was obtained and summarized from personal communications with D. Ivy, Cultural Resources Program Coordinator for the Coquille Indian Tribe, in June 2005:

> Much of the recreational angling in Coos Bay occurs in late summer and fall for salmon. Salmon angling begins in late summer at jetty areas and moves up the bay as fish move in. Much of the boat angling for Chinook and coho salmon in the fall is concentrated upstream of the North Bend Bridge. Marshfield Channel can be an area of concentrated angling for fall salmon. Bank angler access on the North Spit is limited. Boat angling occurs throughout the bay. However, boat angling is limited in some areas at times by exposure to winds. For example, the Roseburg dock area gets less boat angling use due to exposure to wind and tidal action. Perch fishing occurs in Coos Bay in early March to late February, depending on freshwater runoff into the bay, but can go through July. Rocks around bridge abutments are targeted by anglers and on the outgoing tide. Recreational fishing for sturgeon occurs between the Railroad Bridge and North Bend Bridge and also above the North Bend Bridge. White sturgeon can be taken year round but the best angling is during December through March, and when there is a heavy freshwater plume in Coos Bay. Sturgeon anglers target areas upstream of the North Bend Bridge looking for "eddie effects", "tidal seams" or holes where sturgeon are holding. The world record for striped bass was taken in Coos Bay in the 1950's.

ODFW (2006) noted that the area around the railroad bridge and downstream, and up to the mouth of Catching Slough, has become a popular spot for boaters fishing for fall Chinook. This fishery is >1 mile from the proposed LNG berth. The Coos Bay waterfront area now supports a bank fishery for fall Chinook salmon.

Crabbing occurs in the main channel areas from the North Bend Municipal Airport to the mouth of the river at and around slack tides. Recreational crabbing occurs year-round while commercial crabbing occurs September through December (ODFW 2006a).

ODFW's most recent angler creel surveys within the Coos Basin were conducted in 1998 and 1999 during late summer and fall periods on the Coos/Millicoma/South Coos rivers and Isthmus Slough. The following information was excerpted or summarized from ODFW (1998; 1999). The goals of the survey were to estimate angler effort and angler catch of marked and unmarked fall Chinook salmon and coho salmon, sturgeon and other incidental species. The basin was surveyed from August 25 through November 30, 1998 and September 1 through November 30, 1999. Estimates of catch, catch rate and length frequency for each area in the basin can be found in ODFW's (1998; 1999) reports. To summarize, in 1998, samplers contacted 2,231 anglers who reported 8,495 hours of angling and an estimated 75,823 angler-hours were expended in this fishery for the period of August 25 through November 30. The estimated over-all catch rate for all Chinook was 0.028 fish per hour or approximately 35 hours per fish. The estimated overall catch rate for all

coho was 0.004 fish per hour, or 205 hours per fish. ODFW reported that most of this effort expended was targeted on Chinook salmon and that target species cannot be determined from the data of the Coos Creel census. The sampled catch only included four fin clipped coho salmon. Two unclipped coho salmon were kept out of 45 coho caught. Two coho were harvested from an area outside of Isthmus Slough, a violation of regulations that were in effect at that time. Most anglers are targeting Chinook salmon in the late summer-fall period.

In 1999, creel samplers in the Coos Basin contacted 2,668 anglers who reported 9,794 hours of angling. An estimated 110,847 angler-hours were expended in this fishery for the period of September 1 through November 30, 1999. The estimated overall catch rate for all Chinook salmon was 0.047 fish per hour, or approximately 21 hours per fish. The estimated overall catch rate for all coho salmon was 0.006 fish per hour, or 153 hours per fish. The estimated catch rate for fin-clipped coho salmon (legal to harvest in Isthmus Slough) was 0.00096 fish per hour, or 1,036 hours per fish. Most of the effort expended in this fishery was targeted on Chinook salmon, although target species cannot be determined from the data of the Coos Creel. In examining sampled catch, the compliance with wild coho protective regulations was high. Five unclipped (adipose) coho were kept of 56 total coho caught, for approximately a 9% violation rate. Those five coho represented 10% of the unclipped coho caught. In addition, two clipped coho were harvested from an area outside of Isthmus Slough, also in violation of the regulations. Fifty of 56 coho reported caught by anglers were unclipped. The contribution of hatchery coho to fall salmon fisheries has been poor in recent years.

The shellfish fisheries, predominantly clams, crabs, and shrimp are of significant economic importance to the Coos Bay area. In addition to the commercial fisheries for shellfish, recreational clamming and crabbing brings tourist income to the region. Commercial take of clams, crabs, and other invertebrates are monitored by ODFW but no information has been collected on the volume of the recreational catch in Coos Bay since 1971. Mud shrimp (***Upogebia pugettensis***) are commercially harvested from the lower bay. Clam Island, located on the western side of the lower bay, has the highest density of intertidal clams in the bay. The eastern side of the lower bay hosts some of the highest recreational effort for bay clams (ODFW 2006a). Crab harvesting by boat anglers is productive along the western side of the lower bay (ODFW 2006a).

The North Spit, including BLM and Weyerhauser lands adjacent to the Project area, provides recreational access including for bird watching, bank angling, boat launching and clamming.

No commercial fisheries for vertebrate fish species exist in any of the estuary or freshwater habitats of Coos Bay. Commercial ocean fisheries exist for salmonids and marine species and commercial boats (trollers and trawlers) targeting tuna, salmon and groundfish dock and sell their products in Coos Bay. A fisherman's market cooperative and a small commercial salmon fleet are located in Charleston. In 2004, the total value of the catch at the fisherman's level reported by ODFW (2006b) at Charleston was $25.3 million. This was comprised of $10.7 million for fish, $14.5 million for crab and shrimp, $38,220 for clams, and $28,400 for other invertebrates. Within the fish category, sablefish, chinook salmon, and albacore tuna were the highest valued catch of all the fish caught, at $1.5, $3.8, and $2.8 million, respectively.

The shellfish fisheries, predominantly clam, oyster, crab, and shrimp, are of significant economic importance to the Coos Bay area. In 2004, the ODFW (2006b) reported that Dungeness crab harvested from the ocean had a total value of $14.1 million at the fishermen's level. Pink shrimp had a value of $402,000 and cockle and gaper clams combined were $30,200. In addition to the

commercial fisheries for shellfish, recreational clamming and crabbing brings year-round tourist income to the region. Crabbing occurs in the main channel areas from the North Bend Municipal Airport to the mouth of the river around slack tides. Recreational crabbing occurs year-round while commercial crabbing occurs September through December.

6.0 ENVIRONMENTAL CONSEQUENCES

The following analysis is organized by proposed action including dredging/excavation of the proposed new shipping berth into the North Spit and associated access channel, placement of in-water structures, upland development and operations.

6.1 SPECIES AFFECTED

Species utilizing habitat in and near the Project area could be affected by construction activities and habitat alterations associated with dredging the new shipping berth into the North Spit. Habitat subsystems were described previously in Section 1.1. The Project area is within the Lower Bay Subsystem. Appendix A lists all fish species captured by ODFW in Coos Bay from 1996-2000. ODFW also conducted seining in and near the Project area in September 2004 and July 2005 and captured Chinook and coho salmon, shiner perch, walleye perch, northern anchovy, starry flounder, staghorn sculpin, speckled sanddab, saddleback gunnel, sand sole, white seaperch, surf smelt, American shad, jack smelt and bay pipefish. ODFW seining efforts near the Project area give a snap shot of the diversity of fish that could be affected, but sampling was limited temporally. Cummings and Schwartz (1971) reported that most fish utilize the flats of the lower bay at some time during the year. Thus, many fish listed in Appendix A could potentially be affected by the Project. Fish commonly associated with open coastal waters, such as rockfish, lingcod, etc. are primarily found in the Marine Subsystem, down bay from the Project area, and are less likely to be affected by the proposed construction activities.

Intertidal mudflats near the Project Area provide habitat for shrimp, softshell clams, bentnose clams and cockles (based on distribution maps by Gaumer et al. 1978; refer to figures 4-10). Thus, these invertebrates could be affected by the proposed dredging. Figure 12 shows habitat areas mapped in 1997 for native oysters (***O. conchapila)*** in Coos Bay. The proposed dredging area is within mapped "marginal habitat" and "non-habitat."

6.2 DREDGING

Dredging will occur west of Jordon Cove and the Roseburg Lumber Mill site, to create a ship berth and access channel. In order to create an appropriate ship berth and access channel, sediment will be dredged from an area north of the main shipping channel, and a portion of the North Spit will be removed. Periodic maintenance dredging of this area will also be required in the future. The new ship berthing facility would be built into the North Spit west of the Roseburg Lumber Mill and would be designed to accommodate large (1,000 feet) LNG tankers. The in-water facility would consist of a pier that is 1,800 feet long and 30 feet wide with moorings and off-loading facilities. The area to be dredged consists of 1.15 acres of eelgrass habitat, 6.14 acres of intertidal algal mud flats, 5.6 acres of intertidal unvegetated flat, and 19.4 acres of unvegetated mud slope habitat adjacent to the existing dredged channel along the North Spit, west of the Roseburg Lumber Mill site in Coos Bay, to create an access channel and berth for LNG ships. Water depths within the proposed access channel range from 16 feet near the shoreline of the North Spit to 47 feet within the existing navigational channel. Approximately 26 vertical feet of sediment would be removed from the North Spit to create the slip and turning basin. The slip area is currently dry land and will need to be excavated then dredged.

The Port has decided to place a portion of the excavated material in a stockpile to be located in an area adjacent to the JCEP site (outside of Henderson Marsh) and the remaining excavated and

dredged material within a confined disposal facility (CDF) at the industrial waste pond. The Coos Bay Site F for placement of dredged materials from maintenance dredging of the multi-user slip and access channel.

Mechanical or hydraulic dredging equipment would be used to remove bottom sediment and could include barge-mounted excavators with conventional buckets, barge-mounted excavators with bucket-closing mechanisms, open clamshell buckets, enclosed clamshell buckets and/or hydraulic dredges (plain suction dredges). Selection of dredging equipment would depend on physical characteristics of bottom sediments, quantities to be dredged, dredging depths, distance to disposal, the physical environment, methods of disposal, production rates required, types of dredges available and costs. The array of typical dredge equipment that may be used is discussed below since dredging equipment and operations resist precise categorization as a result of specialization, project site and cost requirements.

Potential environmental impacts resulting from dredging include removal of subtidal benthic species, removal of an eelgrass bed, removal of shallow mud and sand flat habitat, entrainment of aquatic species in dredge equipment, short-term increases in suspended sediment, settling of suspended sediments onto subtidal and/or adjacent intertidal communities, resuspension of contaminated sediments into the aquatic environment, physical changes to bathymetry and hydrodynamic processes including alterations of morphology and water currents.

All methods of dredging release suspended sediments into the water column during excavation and during the flow of sediments from hoppers and barges. In general, mechanical dredges generate suspended sediments through the impact of the bucket on bottom substrates and withdrawal from the bottom, washing of material out of the bucket as it moves through the water column and above the water surface, and additional loss when the barge is loaded. Clamshell buckets are widely used and, compared to other technologies, a relatively small amount of water is added to the sediment during dredging resulting in less slurry in disposal material. However, there is potential for subsurface sediment resuspension caused by sloughing of sidewalls of the excavation and from sediments that are washed out of the open bucket when it is lifted to the surface. It is relatively difficult to use clamshell buckets along slopes. Enclosed clamshell buckets are a modification used to minimize sediment resuspension, making the bucket nearly watertight or sealed in the closed position. This significantly reduces sediment resuspension in the water column. Sediments remain at a solids concentration near the in-situ concentration. Potential increases in turbidity would be minimized using this technology.

Dredging would cause turbidity to increase in the short-term in localized work areas and up or downstream depending on tidal action and currents. Dredging would create localized and short term increases in turbidity above background levels. Moffat and Nichol (2006) modeled turbidity for the proposed dredging and reported that turbidity generation would be a factor of dredge type, practices, sediment characteristics and environmental conditions such as currents. For the open clamshell dredge, during construction stage, the maximum modeled suspended sediment concentrations (primarily sand) were below 6,000 mg/l at the dredge location and rapidly decreased with distance to less than 50 mg/l at 200 m. For hydraulic cutterhead dredge the TSS levels were lower, with a maximum of 500 mg/l in the vicinity of the dredge and decreasing to 125 mg/l at 200 m. During the maintenance dredging period, the dredged material is expected to be primarily fines (mud, clay and silt) and the model predicted concentrations for the open clamshell dredge that were lower than during the construction stage, with a maximum of 500 mg/l in the

vicinity of the dredge. The TSS concentrations declined rapidly to a maximum of 14 mg/l by a distance of 60 m.

A suspended sediment plume associated with clamshell dredging at its maximum concentration (1,000 mg/L) may extend up to 1,000 m on the bottom (Havis 1988; LaSalle 1990; Collins 1995), although most dredging plumes are typically less than 500m (ERDC 2000). The rate of dredging operations would affect the temporal scale of exposure to elevated turbidity. An average advance rate is 12-18 m/hr for clamshell dredging projects in the USACE Mobile District (ERDC 2000), which can be used to estimate the duration of exposure that an organism existing within a 500-1,000 m radius of dredge operations may experience. The actual exposure experienced by sessile organisms may be highly variable depending on the hydrodynamic conditions of the site. For example, tidal flushing may alleviate exposure to a dredge plume for periods of hours.

Moffat and Nichol (2006) modeled the distribution of a potential dredge plume using bathymetric data, tidal levels and associated time variable currents. At slack tide a cloud of suspended sediment was generated at the dredge location and, with increasing flow velocities, this cloud was transported along the channel either upstream in a flood tide or downstream in an ebb tide. For an open clamshell dredge, the generated sediment plume (concentration higher than 150 mg/l) could move up to 1.2-1.9 miles from the dredging location at the highest ebb or flood current; however, the duration of such entrainment of a plume is limited to not more than a two hour period, and the time average concentrations do not exceed natural ambient concentrations of 10-30 mg/l outside of the dredge area.

Barge-mounted excavators with conventional buckets would have a relatively high potential for sediment resuspension caused by sloughing of side walls of the excavation and from sediments that are washed out of the open bucket when it is lifted to the surface. Resuspension potential could be reduced by modifying the excavator to include a bucket closing mechanism. This would reduce the amount of sediment washed out of the bucket on its way to the surface.

Hydraulic dredges typically incorporate dredge heads with design features that include special suction heads to reduce sediment resuspension. Hydraulic dredging typically creates less sediment resuspension than does mechanical dredging, thus further minimizes the level of increased turbidity and potential adverse effects associated with dredging. This technology works best with pipeline transport of spoils.

As mentioned earlier, the South Slough NERR's monitoring program provides information on turbidity levels at Charleston in Coos Bay: turbidity peaked in 2002 at >600 NTU during the months of June, July and December; turbidity peaked in 2003 at >800 NTUs in March, April, May and December, and; turbidity peaked in 2004 at >400 NTUs during May (for range of NTUs refer to http://www.ccalmr.ogi.edu/nanoos/data/publicarch/).

Concentration of suspended sediments alone is poorly correlated with the responses of salmonids to suspended sediments, whereas dosage (measured as mg hr l^{-1}) is more strongly correlated with fish response (Newcombe and MacDonald 1991). If salmonids are exposed to chronic, and moderate to high levels of turbidity for prolonged periods, a number of adverse effects could occur including behavioral changes, sub-lethal effects and increased mortality from predators. However, turbidity is elevated in all streams after storm events and within Coos Bay seasonally, and dredge generated turbidity is not expected to exceed those peak background levels reported by the South Slough NERR's monitoring program. Further, increases in suspended sediment would be localized

and for a limited duration. Juvenile and adult salmonids appear to be little affected (Sorenson et al. 1977) by transitory episodes. Effects of turbidity on mobile fishes are not expected due to the limited area affected and due to the short duration of the proposed dredging operations. Mobile fishes would likely avoid active work areas and the proposed in-water work window would minimize exposure of vulnerable life stages of salmonids to increased turbidity.

Dredging will occur within ODFW's preferred in-water work window (October 1-February 15), which is during a period of natural increases in background turbidity. Working within the preferred work window will minimize direct and indirect effects to juvenile and adult Pacific salmonids. Expected increases in turbidity associated with dredging would occur during the fall-winter season when background levels of turbidity can be elevated. Berth construction into the North Spit will be isolated from aquatic habitat until excavation is complete, and is not expected to generate turbidity.

Increased suspended sediment would affect filter-feeding organisms, including shellfish, through clogging and damaging feeding and breathing organs (Brehmer 1965; Parr et al. 1998). There are no commercial oyster beds in the immediate vicinity of proposed dredge areas. Sessile benthic organisms within areas to be dredged would be removed and killed. Other sessile benthic organisms living immediately adjacent to dredge areas would be subjected to periods of high turbidity, and settling of suspended sediments, which could bury, injure or kill these organisms.

Increases in turbidity can also reduce the depth that light penetrates in the water column which may affect submerged plants, such as eelgrass, and temporarily reduce productivity and growth rates (Parr et al. 1998). In many bays and estuaries, and seasonally, background turbidity levels are high and organisms are able to tolerate continuous exposure to high suspended sediment concentrations for much longer than would occur during dredging operations (Peddicord and McFarland 1978). Species living in areas where waters are normally clear, such as along rocky coasts, may be especially vulnerable to the effects of increases suspended sediments. Organisms in Coos Bay are adapted to and are exposed to periods of high to moderate turbidity during winter months.

The area proposed for dredging is adjacent to the existing shipping channel, which is subject to periodic maintenance dredging. Benthic communities in the area to be dredged have likely been subjected to off-site effects of periodic maintenance dredging in the main shipping channel such as transport and settling of suspended sediments. It is unknown whether well-developed benthic communities occur within the areas proposed for dredging. A review (Newell et al. 1998) of recovery rates in dredged areas around the world indicates that disturbed areas do recover and that there are variable recovery rates of benthic communities. Newell at al. (1998) reported that disturbed mud in Coos Bay recovered benthic communities in four weeks. In general, recovery rates were most rapid in highly disturbed sediments in estuaries that have opportunistic species. Thus, dredging would likely result in short-term reductions in benthic communities over approximately 1.15 acres of eelgrass habitat, 6.14 acres of intertidal algal mud flats, 5.6 acres of intertidal unvegetated flat, and 19.4 acres of unvegetated mud slope habitat adjacent to the existing dredged channel along the North Spit. Based on studies by Newell et al. (1998) it is likely that benthic communities would recolonize disturbed areas. The proposed dredge areas would be subject to periodic maintenance dredging in the future and the same cycle of disturbance and recolonization would occur, resulting in periodic short-term reductions in benthic communities followed by recolonization.

Soft bottom benthic communities experience obvious changes following dredging activities. Within the first few days following completion of dredging operations, the benthic community will be reduced in species richness, abundance and biomass. However, these effects are not long lasting, as polychaetes, oligochaetes and other similar species begin to quickly recolonize disturbed areas. Through natural processes and their rapid population growth, opportunistic species take advantage of unoccupied space created in newly exposed sediments, paving the way for later succession species. The time required for recovery has varied from study to study, but, as a general matter, substantial recovery takes place in a time frame of less than one year and the majority of studies found essentially complete recovery within time frames significantly shorter than maintenance dredging cycles. Lopez-Jamar (1988), studying recolonization of a muddy sediment infaunal community pre- and post-dredging, found that species number, density, and biomass initially increased following dredging, largely due to the rapid exploitation of the newly opened space by species with short life cycles, but subsequently returned to the dominant species from pre-existing conditions within one year following dredging. McCauley et. al., (1977), studying infauna during maintenance dredging in Coos Bay, Oregon found that, after a significant post-dredging decrease in benthic infaunal abundance, the community re-adjusted to pre-existing communities within 28 days of dredging. McCauley suggests that in areas with maintenance dredging, the benthic community adapts to frequent disturbances associated with ship movement and harbor activities. In studying benthic recovery following small scale dredging in a harbor in North Africa at depths of three and 16 meters (9 and 52.5 feet), Guerra-Garcia and Garcia-Gomez (2003), compared benthos using a BACI (Before, After, Control, Impacted) approach, with sampling occurring 3, 15, 30, 90 and 180 days following dredging. They found a maximum reduction in species richness 15 days after dredging while abundance was lowest 3 days after dredging, but that by 180 days the disturbed area had a reestablished sediment structure and macrobenthic community similar to the undisturbed area.

The Minerals Management Service (MMS) has performed a number of studies of dredging effects and recolonization, some associated with offshore sand mining operations. At least one of these studies (MMS 2004) provides an overview of this topic including some of the early work on succession theory in soft sediment benthos of Rhoads and Germano (1986). The MMS study reviews several studies by others, including Burlas et al. (2001) in which abundance, biomass, and richness declined immediately after dredging but recovered quickly and by the following spring (within 9 to 12 months of the end of dredging); the dredge areas showed no detectable differences between dredged and undisturbed areas. Abundance also recovered quickly after a second dredging operation, although biomass and richness remained reduced the next spring. In another report considered by MMS, Wilber and Stern (1992) indicate that some measures of infaunal communities, such as diversity or density may lead to inaccurate conclusions, and suggest that looking at functional guilds may be more appropriate for assessing impacts. Using this approach, they found that polychaetes and amphipods that recolonized borrow sites were small-bodied, surface feeding species while adjacent undisturbed areas had infaunal communities consisting of large-bodied organisms that feed deeper in the sediment, concluding that a successional stage community may exist for 2 to 3 years or longer.

Newell et al. (1998) assessed the impacts of aggregate dredging on benthic macrofauna off the coast of the United Kingdom and reported that typical benthic macrofauna had been replaced by large numbers of mobile opportunistic species that are able to rapidly recolonize sediments following episodic disturbance. One interesting result of the study is that there was actually a zone of enhanced biomass outside of the boundaries of the dredge site for a distance up to 2 km, and they reference a similar result reported for a site in Queensland, Australia. Newell et al. (1998) also

looked at different types of dredge equipment and methods and found that there was a range of results depending upon the equipment and methods, with some sites showing a suppression of biomass lasting in excess of 18 months while population densities at other sites returned to levels similar to reference locations within 80 days. They conclude that in general, species diversity was restored to within 70-80% of reference conditions within 100 days; population density was restored to within 60-80% within 175 days, but that restoration of biomass by growth of individuals was not complete even after 18 months.

Little information on post-dredging recovery of crustaceans and bivalves exists. Mud and sand flats along the North Spit would be modified post-project from shallow flats to deep, mud-silt bottom habitat resulting from the creation of the ship berth (Figure 3). The best available information on shellfish distribution in Coos Bay are included in Figure 4-11 (after Gaumer et al. 1978) and Figure 12 (after ODFW 2006). Based on Gaumer et al. (1978) softshell clams, razor clams, bentnose clams and shrimp may inhabitat the mud and sand flats in the proposed dredge area. Thus, these species would be displaced, and recovery rates are unknown. Based on ODFW (map received via email in 2006 based on a 1997 distribution study) native Pacific oyster habitat is "marginal" within the proposed dredge area. Available information on recovery rates of crustaceans and bivalves after dredging indicates that recovery is highly variable and dependant on species and habitat types dredged. Early succession of dredged areas may begin within a few days, involving larvae of opportunistic bivalves (MMS 2004). Populations have a better chance of a quick recovery in areas that are considered "sinks" for larvae, generally areas where shell has been deposited (Crowder et al 2000). There is evidence in oyster beds off Connecticut that repeated dredging events result in dense sets of shellfish, and the removal of fine sediments by dredging enhance larval sediment of many bivalve species (Rhealt 2002). Recovery of larger bivalves may be a slower process, taking up to several years for such species as geoducks (Nightingale and Simenstad at http://www.wdfw.wa.gov/hab/ahg/execdrg.pdf). Motile crustacean populations may be immediately impacted by dredging, but begin returning to the area soon after excavation (MMS 2004).

In addition to infauna, dredging can affect epifauna. In one study using trawls off Duval County Florida, the number of taxa and individuals greatly exceeded control areas four months after dredging and remained higher for up to 7-13 months (Applied Biology, Inc. 1979 ***in*** MMS 2004). In another study, no differences in pre- and post-dredging epifaunal communities were observed at 8 and 16 months post-dredging at a borrow site off Egmont Key in Florida (Blake et al. 1995 ***in*** MMS 2004).

The conclusion of this research is that benthic communities will repopulate dredged areas, whether they are muddy bottom or sandy bottom areas. The MMS study (2004), conducted off the Alabama coast at depths ranging from 28-60 feet concluded that effects on infaunal populations primarily occur through removal of individuals along with sediments and that effects are expected to be short-term and localized. MMS (2004) reported that early stage succession begin within days through larval recruitment dominated by opportunistic taxa, such as the polychaetes and bivalves. Later successional stages of benthic recolonization were reported to be more gradual and immigration of motile annelids, crustaceans, and echinoderms into impacted areas begin soon after excavation. The reviewed relevant studies found that the dredge zone will be recolonized and will become a functional benthic community similar to pre-dredge conditions or to adjacent reference locations on average in about 12 to 18 months, with initial recolonization commencing in a manner of days or weeks. There is variation in recolonization results depending upon water depths and corresponding natural sediment mobility, sediment grain size characteristics, water quality

conditions, time of year, and frequency of disturbance. For example, when studying benthic repopulation at depths of 16-19 feet and 33-49 feet in a ship channel on the east coast of Florida, MMS (1996) found that seasonal variation played a bigger role in the characteristics of the benthos than did human disturbances associated with dredging and removal of sediments.

The release of organic rich sediments during dredging or disposal can result in localized removal of oxygen from the water column, which can adversely affect aquatic organisms. This effect would be temporary and tidal exchange would be expected to replenish oxygen. In most cases, where dredging and disposal occurs in open coastal waters, estuaries and bays, localized removal of oxygen has little, if any, effect on aquatic organisms (Bray et al. 1997).

The resuspension of sediments during dredging and disposal may result in an increase in the levels of organic matter and nutrients available to aquatic organisms. The potential for algal blooms in estuarine waters is limited by turbidity and tidal flushing. Increased organic materials could increase productivity in a localized area as food for zooplankton and higher organisms is increased. This effect is expected to be insignificant based on the limited area to be affected.

Dredged material may have some level of contamination from historic origin. Most dredged silts will contain some contaminants arising from past industrial uses. Heavy metals, oil and other contaminants can be locked into bottom sediments and dredging and disposal can release contaminants into the water column. The likelihood of uptake by aquatic organisms would be dependent on the type and degree of sediment contamination, which is unknown at this time, and proximity to aquatic organisms. Young shellfish and crustaceans are more susceptible to the toxicity of contaminants than adults (Conner 1972). Studies of sediment chemistry have been conducted in Coos Bay (STR 1972; Slotta et al. 1973; Arneson 1976) and previous sediment evaluations have included collection of samples from stations within and near the planned dredge area for the Project (USACE 1989, 1998, 1999 and 2005). The Sediment Sampling and Analysis Plan (SHN 2006a) prepared for the Project summarizes information from these studies and characterizes sediment to be dredged for chemical and physical parameters, and assesses the impact associated with the discharge of dredged material. Results from the 2005 sediment evaluation report indicate low levels of analytes with all levels below their respective DMEF screening levels. In 1999, sampling occurred following a petroleum spill north of the channel entrance and two samples were collected near the Project Area. No hydrocarbons were detected and dredged material from this area is acceptable for unconfined aquatic disposal. Results from 1998 sampling also indicate sediments were acceptable for unconfined disposal and upland disposal with no adverse ecological consequences expected relative to sediment toxicity. A 1993 study by the USACE for a turning basin expansion at RM 12 indicated that near shore material was suitable for unconfined aquatic disposal. Remobilization of low levels of pollutants would likely occur but uptake of contaminants by aquatic organisms is more of a concern during major dredging operations. The proposed dredging would be of sediments that are within acceptable limits for contaminants and the limited extent and duration of dredging would result in a low potential for adverse effects to aquatic organisms.

Dredging will modify existing habitat types, specifically 1.15 acres of eelgrass habitat, 6.14 acres of algal mud flats, 5.55 acres of unvegetated flat and 17.94 acres of unvegetated mud slope habitat adjacent to the existing dredged channel. Primary habitat function of these areas that will be lost includes rearing, foraging and migration habitat for juvenile salmonids and other fish. The new construction will convert intertidal to subtidal habitat, and impact species assemblages that are adapted to existing conditions including light penetration/water depths, currents and substrate

regimes. ODFW has documented Chinook and coho salmon, shiner perch, walleye perch, northern anchovy, starry flounder, staghorn sculpin, speckled sanddab, saddleback gunnel, sand sole, white seaperch, surf smelt, American shad, jack smelt and bay pipefish in or near the Project area. Thus, loss of this shallow water habitat would adversely impact these species and potentially many of the species listed in Appendix A. The Port of Coos Bay has developed an eelgrass mitigation plan (David Evans & Associates 2007) that includes in-kind and in-proximity mitigation to off-set the loss of eelgrass.

Dredging into the North Spit would replace existing shallow water habitat along one side of the bay with a deep channel (ship berth) and potentially disrupt connectivity of shallow water habitat used by emigrating juvenile salmonids. Direct effects associated with construction would be minimized through adhering to ODFW preferred work windows. Adult salmonids could be migrating during the work window but would be able to migrate past the work area in the existing shipping channel and along the south side of it to avoid work areas.

Equipment, boats and barges operating in the work areas in the process of dredging are expected to deter most fish from holding in or near work areas. Specifically, noise and pressure waves from equipment dredging is expected to scare resident and migrating fish from attempting to enter work areas. Due to the instinct of most mobile species to avoid such disturbance, direct mortality or injury to fishes is not expected to occur.

Use of equipment over and in the water has the potential to kill or injure aquatic organisms if fuels and other petroleum products enter the water. To minimize the potential for a fuel spill and adverse effects to aquatic life and habitat, a pollution prevention and control plan will be formulated and implemented.

6.3 IN-WATER DEVELOPMENT

The Project includes construction of a new ship berth in the North Spit, designed to accommodate large (1,000-feet) LNG tankers, and would consist of a pier that is 1,800-feet long and 30-feet wide with moorings and off-loading facilities.

ODFW and the Port of Portland have conducted studies in Portland Harbor/lower Willamette River due to concerns about the effects of waterway developments on migration and survival of juvenile and adult Pacific salmonids. Nearshore and shoreline areas are important habitats for migrating juvenile salmonids. Riprap and pilings may provide low velocity areas for migrating salmonids but also may create habitat for predators of juvenile salmonids (Haines and Butler 1969 ***in*** ODFW 2003). ODFW reported the following information based on 1989 and 1990 data: migration of radiotagged Chinook yearlings and juvenile steelhead was in a random-like pattern in the Portland Harbor; changes in catches of juvenile Chinook salmon, coho salmon and steelhead were related to current velocity, depth and distance from shore; catches of northern pikeminnow (predator) were higher at undeveloped areas than at developed areas; and, predation on juvenile salmonids by northern pikeminnow did not differ between developed and undeveloped areas. Ward et al. (1994) studied similar factors and reported that juvenile salmonids were abundant in the spring and that radiotagged juvenile steelhead and yearling Chinook salmon usually migrated through the harbor in 1-3 days. Ward et al. (1994) did not detect any difference in the downstream migration of radiotagged fish or any difference in behavior of radiotagged fish among developments. More northern pikeminnow were captured in areas without development, and no

differences in the frequency of northern pikeminnow digestive tracts containing juvenile salmonids between developed and undeveloped areas was observed.

Construction of the ship berth into the North Spit would occur in an area that is currently dry land. Thus, this action would create additional aquatic habitat in Coos Bay, albeit an area that will be frequented by large ships, but that may function as additional lower velocity alcove type habitat. Adult and juvenile salmonids would not be expected to reside in the new berth area for long periods, but would likely move in and out with tides and utilize the berth area as short-term migrational habitat. Sturgeon and marine fish may inhabit this area for longer periods.

6.4 FACILITY DEVELOPMENT

The proposed shore-based LNG terminal would consist of a docking facility, two LNG storage tanks, LNG vaporization equipment, and vapor handling systems. Installation of linear features would also be required including roads, connector line and gas and water lines. Construction of these facilities would occur on the North Spit adjacent to the Roseburg Lumber Mill site. Much of the area proposed for construction of the LNG facility has been previously disturbed by mill operations. Construction of facilities on and near the Roseburg site is not expected to result in direct impacts to aquatic species in Coos Bay. Impacts to wetlands, marsh habitat and other upland vegetation associated with facility development are addressed in SHN (2006b). The Project's construction impacts would include noise and dust during excavation and construction. Noise and dust may potentially affect near shore habitat quality. Soil texture in the Project Area is sandy and particles are not expected to drift and dust pollution, soil erosion and runoff would be addressed through standard engineering practices implemented by contractors. Diesel burning construction equipment would also generate airborne pollutants and would result in small, short-term increases but to an extent that specific control measures would not be required.

6.5 OPERATIONS

The Coast Guard provides LNG ship and port security and has implemented a number of provisions for LNG shipments including inspection of security and tanker loading at port of origin, on-board escorts, 96-hour advanced notice of arrival, harbor escorts, suspension of overflights and enforcement of a safety/security zone around the LNG ship while in transit. A moving safety/security zone would impact vessel traffic periodically and temporarily in the Coos Bay navigation channel. Recreation and other boats would not be allowed to come along side LNG ships and would have to get out of the way, in the same way that they currently do for other deep draft ships transiting the bay. Provided there is adequate water depth, recreational and commercial boats could pass by LNG ships in transit at the berth. An exclusion zone would apply to the LNG ship while at berth. While the exclusion zone may extend into the access channel, it will not preclude other recreational and commercial ships from passing the slip. When the ship is not at berth, recreational angling may be allowed in the slip. Other similar projects have required a safety/security zone that are two miles ahead and one mile astern of the LNG ship while in transit to the berth. Disruptions to boaters in Coos Bay would be temporary and would be limited to when an LNG ship arrives and departs, and would last as long as it takes for the LNG ship to move through Coos Bay to the proposed new slip. The frequency of disruption would depend on the frequency of arriving LNG tankers, anticipated to be 80 ships per year. The actual safety/security zones while in transit and the exclusion area while at the berth will be determined by the US Coast Guard.

6.5.1 LNG and Fuel Spills

LNG hazards result from its properties including cryogenic temperatures, dispersion characteristics and flammability characteristics. The extreme cold of LNG can directly cause injury to life and property that come in direct contact with it. However, studies of impacts of a spill to fish and other subsurface species in open waters or bays have not been conducted. LNG is light: if a leak occurs underwater, it would surface quickly and may have negligible effects to species in the water column. When spilled onto water, LNG initially produces a negatively buoyant vapor cloud. As the cloud mixes with air, it warms up and disperses into the atmosphere. If not ignited, the flammable vapor cloud would drift downwind until the effects of dispersion dilute the vapors below a flammable concentration. Below 5% concentration, the cloud is too dilute for ignition and above a 15% concentration, the cloud is too rich for ignition (Hightower et al. 2004). The downwind distance that flammable vapors might travel is dependent on the volume of LNG spilled, the rate of spill and prevailing weather conditions. Impacts to fish and other aquatic species as a result of an LNG spill over water would be limited to cryogenic effects due to direct contact with the LNG. These potential effects are not known. LNG vapor clouds can ignite, however, to catch fire, the vapor cloud must encounter an ignition source otherwise the LNG vapor cloud will dissipate into the atmosphere. An ignited vapor cloud has tremendous radiant heat output and can cause extensive damage to life and property, however, potential impacts to subsurface species has not been modeled or documented. Management approaches to reduce risks and potential affects to the environment from LNG spills include operation and safety management, improved modeling and analysis, improvements in ship and security systems, establishment of safety zones, and advances in shipping and off-loading technologies. These advances reduce the potential for an LNG spill and adverse effects to aquatic species.

The LNG industry safety record over the last 40 years has been documented: since international commercial LNG shipping began in 1959, tankers have carried over 33,000 LNG shipments without a serious accident at sea or in port (Parfomak 2003). The favorable safety record is largely due to the double-hulled design: LNG tankers are less prone to accidental spills than typical crude oil, fuel, and chemical tankers.

The potential for oil and fuel spills associated with operation of LNG ships is expected to be low because owners and operators must prepare and submit oil spill contingency and prevention plans. Oil spill prevention plans must establish compliance with federal law and comply with a number of personnel and equipment requirements. Facilities conducting ship refueling are required to have containment and recovery equipment readily available and to State standards. Refueling will not be done at the proposed terminal.

On land, LNG tanks are designed with concrete shells around tanks that would contain at least 110% of a tank's volume in the event of a sudden, uncontrolled failure. Earthen berms are constructed around each tank that hold 100% of the tank's contents. Impoundments limit the spread of LNG spilled on land and reduce the surface area of the liquid pool, decreasing and controlling the size of a vapor cloud. Exhaustive tests have shown that safety dikes at LNG facilities would contain spilled LNG from a ruptured storage tank, and would limit the effects of any fire to the terminal grounds (Hager 2002).

6.5.2 Facility Water Quality Impacts

The primary source of air emissions associated with LNG facilities comes from on-site electrical generation, diesel generators used as emergency equipment for on-shore facilities, air pollution from docked LNG ships, and submerged combustion vaporizers. Coast Guard regulations require that LNG ships generate their own electric power when in port, therefore docked ships would emit air pollution from their diesel generators. Facility diesel generators would operate if electricity from on-site generation and the grid were interrupted. LNG facilities do not flare natural gas except during emergencies. Every effort is made to capture boil-off gas and use it either on board the LNG tanker or within a receiving facility's operations. Because emergency generators would operate infrequently, air emissions would be minimal and potential effects to aquatic resources are expected to be insignificant.

LNG plants are relatively clean industries in that most stormwater runoff is uncontaminated. If stormwater is partially contaminated, it would be treated to remove oil before release. Clean stormwater would be directed to a collection system that would be constructed to control discharge and minimize soil erosion. All wastewater would be subject to a water effluent monitoring program in order to comply with discharge permit criteria.

The LNG facility would include regasification facilities including several submerged combustion vaporizers and centrifugal booster pumps. The booster pumps increase the pressure of the LNG before feeding the LNG to the submerged combustion vaporizers, which are submerged in fresh water within containment structures, where the LNG is regasified. A heater unit is fueled by boil-off gas, and any boil-off gas not used for this purpose is diverted back into the gas delivery system. The submerged combustion vaporizers heat the LNG, resulting in regasification of the LNG into natural gas at a temperature of 41°F (5°C). The LNG and natural gas flow would be contained within process piping submerged in a water bath maintained at 86°F (30°C). The water bath would provide stable heat transfer from the LNG to the natural gas phases. Natural gas combustion provides the heat necessary for regasification during the submerged combustion vaporizer process. No sea or bay waters would be used for the water bath. Fresh water for the bath would be generated as a by-product of the combustion vaporizer units. Natural gas would be bubbled through the water bath, which consists of clean, distilled water. Bubbling of combustion gases through the water bath would cause the pH to drop, making the water slightly acidic. Any water discharged from the submerged combustion vaporizer operations would be treated to neutralize the pH before discharge.

6.5.3 LNG Ballast Water

Ballast water is held in the ballast tanks and cargo holds of LNG ships to provide stability and maneuverability during a voyage when ships are not carrying cargo, are not carrying enough cargo, or require more stability due to rough seas. All vessels would be required to comply with ballast water management requirements promulgated by U.S. Law (e.g. Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990; 1996 National Invasive Species Act) and agency programs (Department of Defense/EPA regulations at 40 CFR 1700, which implement §312(n) of the Clean Water Act), which set discharge standards for vessel ballast water.

LNG vessels take on ballast water and utilize cooling water while moored at berth. Ballast and cooling water will be withdrawn from Coos Bay at the proposed berth. It is conservatively estimated that an LNG vessels will take on 15 million gallons for ballast, and 42 million gallons for

cooling water per vessel visit, over a 24-hour period. Typically, the minimum amount of ballast water taken on board to maintain the stability of the LNG ship at the berth is approximately 50% of the weight of the LNG unloaded. One cubic meter of LNG is 0.46 metric tonnes (mt), which for the range of LNG ships anticipated to call on the LNG terminal (89,000 to 160,000 m^3) would be 40,940 to 73,600 metric tones of LNG, respectively per ship. Assuming seawater is 1.027 mt/m^3, the minimum amount of seawater required for ballast (50% of the weight of the LNG unloaded) would be 19,932 to 35,832 m^3. The maximum LNG unloading rate will be 12,000 m^3/hr. or 5,520 mt/hr., which translates to 2,687 m^3/hr. (1,584 cubic feet per minute) of seawater for minimum ballasting at the berth. Depending upon water quality at the berth, primarily related to suspended sediment loads, and upon vessel stability and offshore weather conditions, the vessels may take on anywhere between 0 and 15 million gallons for ballast at the berth. The use of 15 million gallons provides for a worse case situation. Similarly, depending upon the types of engines, the LNG vessels could use between 15 and 42 million gallons for engine cooling, while they are at the berth. LNG ships will pump water concurrently with cargo unloading. The LNG ship may take on additional ballast (to obtain up to 95% of the weight of the LNG unloaded) after clearing Coos Bay while outbound to address anticipated at-sea conditions.

Ballast water intake structures are located at approximately 35' depth and the typical LNG ship has three ballast water pumps each capable of 3,000 m^3/hr rated capacity. The ballast water intake pump is approximately 3.5 to 4.2 square meters covered by a screen with 4.5 millimeter bars, spaced every 25 millimeters. Intake velocities are typically <1.0 fps. As LNG is off-loaded from ships from 19,932-35,832 m^3 (5 to 9.5 million gallons) of water from Coos Bay would be pumped into ballast tanks per ship. There is projected to be 80 ships per year, or two ships per week. Each LNG ship may take on additional ballast water after clearing Coos Bay while outbound.

Early life stages of species dependent on the estuary could be entrained or impinged on intake screens. The intake velocities for the ballast water are low enough that it is not anticipated that any larger organisms (fish, marine mammals, reptiles or amphibians) will be impinged or entrained. To minimize the potential for entrainment of early life stages of fish at the proposed berth, suitable minimization measures and mitigation will be developed by Jordon Cove Energy in conjunction with federal and State agencies. For example, measures that minimize entrainment of juvenile salmonids in Coos Bay consistent with NOAA Fisheries' Screening Criteria (NMFS 1997) will be considered. Pre-screening of ballast water will be in compliance with NMFS criteria.

Long-term complete data sets on ichthyoplankton abundance and density in Coos Bay are absent and larval or egg density studies are lacking. Calculations of the number of eggs or larvae that could be entrained or impinged due to water pumping is not possible. As described earlier, ODFW (Moore et al. 2000) conducted plankton tows as part of a salinity intrusion study in Coos Bay. Early life stages of striped bass, American shad, staghorn sculpin, bay goby, bay pipefish and prickly sculpin were captured. Data was not sufficient to predict abundance or distribution trends of ichthyoplankton in or near Coos Bay, but reveals potential species that could be affected by water pumping. As described earlier, Miller and Shanks (2004) used high frequency light trap collections methods including at a site within Coos Bay. Species collected included early life stages of northern anchovy, Pacific sardine, black and copper rockfish, Dungeness crab, pygmy crab, and red rock crab. Data were insufficient to predict abundance or distribution trends of ichthyoplankton in or near Coos Bay or to provide a complete list of early life stages of species utilizing Coos Bay, but reveals some of the species that could be affected by water withdrawals for ballast or cooling.

Based on Pearcy and Myers (1974) study in Yaquina Bay, Oregon, early life stages of Pacific herring and a variety of small cottids (sculpins), gobies and stichaeids (small demersal fish) could be affected by ballast water intake. These researchers reported that, with the exception of Pacific herring, the estuary does not appear to be as important to the pelagic larvae of commercial fishes. Most of the larvae that were restricted to or were most common in the estuary were of small, non-food species of cottids, stichaeids and gobies. Larvae of all the pleuronectids (flatfish) were more common offshore than inside of the estuary. Pacific herring was the only species of commercial interest that appeared to use the estuary extensively as both spawning and a nursery ground.

The level of effects to early life stages of fish associated with ballast water intake may also vary seasonally. Pearcy and Myers (1974) reported that maxima of planktonic fish eggs and goby larvae occurred in the summer; maxima of all larvae combined and most species of larvae were captured in the winter and spring. Jones and Bottom (1984) reported the same timing for peak densities of eggs (summer) and larvae (winter and spring) in the Columbia River estuary. High densities of larval herring were found in February and March, and peak numbers appeared earlier in the lower than in the upper estuary. Both tidal and diel factors also appear to influence abundance of ichthyoplankton. The highest catches of eggs and larvae occurred during periods of low water.

Based on information reported by Pearcy and Myers (1974), intake of ballast water in Coos Bay may not have a significant effect on flatfish larvae. Pelagic larvae of flatfishes were much more common offshore than in estuarine waters. Proper screening of intake structures is expected to minimize impacts on juvenile fish including flatfish, rockfish and salmonids, which may move up or down into the estuary in large numbers.

Morris et al. (1980) and Strathman (1987) reported that numerous shellfish larvae feed and remain in the water column within bays for 3-6 weeks, primarily in spring and summer months. In Coos Bay, gaper clams, cockles, butter clams, littleneck clams, softshell clams, razor clams, bentnose clams and piddock clams spawn and produce feeding larvae in the water column. There are no estimates of larval densities in Coos Bay. Intake of ballast water would likely entrain larval stages of shellfish due to their small size. Commercial oyster producers import commercial oyster spat each year. Pacific oysters rarely spawn in Coos Bay. Native Olympia oysters spawn in Coos Bay when water temperatures reach 13-16°C, and spawning may occur either as a single event or extend over a longer period. Larvae are free-swimming and 11-16 days old before metamorphosis (Couch and Hassler 1989). Native oyster larvae could also be entrained by ballast water intake, however, estimates of larval densities in Coos Bay are not available. Larval ghost shrimp also spend between 6-8 weeks in the water column after spawning peaks in June and July, then recruit to adult habitat in August, and could be entrained by ballast water intake.

Presence/absence and abundance of larvae would be dependent on salinity, time of year and transport mechanisms. Typically, Coos Bay is a partially mixed estuary during the spring and becomes well mixed over the course of the summer (Percy et al. 1974). Salinity extremes recorded by DEQ in the Lower Bay Subsystem were 34.0 ppt and 10.7 ppt at a station ¼ mile north of Pigeon Point, compared to 34.2 ppt and 3.7 ppt at a station ¼ mile west pf the railroad bridge (near the Project area). During 1973-1974 surface salinity from Rm 2.9 to RM 8.3 (the area of the Lower Bay Subsystem), at one time differed as little as 0.3 ppt at high tide during periods of low flow to as much as 14.4 ppt at high tide during periods of high freshwater inflow (Arneson 1976). Surface salinity changed from 24.7 ppt to 11.5 ppt between high and low tides during high flow at RM 2.9 (at the lower end of the Lower Bay Subsystem). During times of low freshwater inflow, the Lower Bay Subsystem was well mixed and during time of high flow the subsystem was stratified at high

tide and partially mixed at low tide. During periods of intermediate flows (March), it was partially mixed at low tide and well mixed at high tide. As mentioned earlier, salinity profiles documented by Moore et al. (2000) showed a gradual increase at all stations in Coos Bay over the course of the summer and a gradual upstream movement of higher salinity water.

Clam distribution is enhanced or restricted by environmental conditions including temperature and salinity. Generally, larvae are more sensitive to environmental conditions. Based on salinity extremes recorded near the Project area, salinities could range from 3.7-34.2 ppt. Information on salinity tolerance for larvae of gaper clams, cockles, butter clams, razor clams, bentnose clams, and piddock clams is lacking. Optimal salinity for larvae of softshell clam growth is between 10-32 ppt, but depends on salinity experienced by the parents (Strathmann 1987). Optimal salinity for littleneck clams is 27-32 ppt. Optimal salinity for oyster growth is 25-35 ppt (Pauley et al. 1988). Optimum salinity for larval growth of crabs is 25-30 ppt and the minimum salinity tolerated by larvae is 15 ppt. Adult Dungeness Crabs tolerate or live at salinities from 15.5-36.2 ppt (Pauley et al. 1989). Although distribution and abundance information for invertebrate larvae is lacking, salinities within the Project area at least seasonally fall within the range of tolerance for some species of invertebrate larval stages, and these species could potentially be entrained by intake of ballast water in the Project area.

Aquatic Nuisance Species (ANS) are recognized as a serious problem in Oregon (Hanson and Sytsma 2001). There are currently over 134 nonindigenous aquatic species reported in Oregon. The Oregon Aquatic Nuisance Species Management Plan (Hanson and Sytsma 2001) established a program to address this issue. Management Class I (not known to be present but with a high potential to invade or reported but with limited populations) species include: Asian clam (***Potomocorbula amurensis***); Caulerpa (***Caulerpa taxifolia;*** green algae); Giant Salvinia (***Salvinia molesta;*** fern); Hydrilla (***Hydrilla verticallata***); Japanese Oyster Drill (***Ceratostoma inornatum***); Mitten Crab (***Eriocheir*** spp.); New Zealand Mud Snail (***Potamopyrgus antipodarum***); Round Goby (***Neogobius melanostomus***); Smooth Cordgrass (***Spartina alterniflora***); and, Zebra Mussel (***Dreissena polymorpha***). Management Class 2 species (present and established in Oregon with impacts that may be mitigated or controlled) include various aquatic plants (e.g. ***Egeria densa***; Parrotfeather milfoil (***Myriophyllum aquaticum***)) and Purple Loosestrife (***Lythrum salicaria***). Management Class 3 species (established throughout Oregon with impacts but no available or appropriate management techniques) include: European Green Crab (***Carcinus maenas***); nonindigenous fish (rainbow, brook and brown trout, American shad, common carp, bass, walleye, amphibians and other invertebrates); and, protozoan-Whirling Disease (***Myxobolus cerebralis***).

Species of recent particular concern include European green crab and Chinese mitten crab, both of which have been reported in Coos Bay (USFWS 2006). In the case of the recently arrived European green crab, Litle and Parrish (2003) note that it will likely damage populations of native crabs and clams through predation, as it has done in other West Coast estuaries.

LNG ships would arrive at Coos Bay full of LNG and do not discharge ballast water after arriving in a receiving terminal. Thus, LNG ships are not expected to import exotic species via ballast water discharges. Outbound LNG tankers bases do take on ballast water as they unload in bays and in open ocean waters offshore (as described above) and may introduce non-native marine organisms into waters at their return ports.

All vessels would be required to comply with ballast water management requirements promulgated by U.S. Law (e.g., Nonindigenous Aquatic Nuisance Prevention and Control Act of

1990; 1996 National Invasive Species Act) and agency programs (Department of Defense/EPA regulations at 40 CFR 1700, which implement §312(n) of the Clean Water Act), and establish discharge standards for vessel ballast water. JCEP has assumed that the provisions of this act apply both to the import and export of nuisance species, and by compliance with this act that the LNG shippers will not cause nuisance species to be introduced.

7.0 ESSENTIAL FISH HABITAT ASSESSMENT

The Magnuson-Stevens Fishery Conservation and Management Act requires Federal agencies to consult with NMFS and consider NMFS' Conservation Recommendations. The Project includes dredging in Coos Bay and because of the nature of dredging activities, EFH consultation is required. EFH is described and identified as everywhere that species managed by the Pacific Fishery Management Council (PFMC) commonly occur. For the Pacific salmon fishery, the PFMC identified EFH using U.S. Geological Survey (USGS) hydrologic units as well as habitat association tables and life history descriptions for each life stage (PFMC 1999; Appendix A Amendment 14 to the Pacific Coast Salmon Plan). These areas encompass all streams, lakes, ponds, wetlands, and other currently viable water bodies and most of the habitat historically accessible to salmon in Washington, Oregon, Idaho, and California. In estuarine and marine areas, EFH for Pacific salmon extends from the nearshore and tidal submerged environments within state waters out to the full extent of the Exclusive Economic Zone (EEZ; 200 nautical miles).

For the Pacific coast groundfish fishery, EFH descriptions are grouped into seven units called "composite" EFHs, which focus on the ecological relationships among species and between the species and their habitats (PFMC 1998b). These seven habitats include "estuarine", "rocky shelf", "non-rocky shelf", "canyon", "continental slope", "neritic zone", and "oceanic zone." The EFH determination is based on a series of presence/absence tables for all 82 species/life stages within each composite EFH in Section 11.5 of the West Coast Groundfish Amendment (EFH Core Team 1998) and life history descriptions and maps showing species distributions are also given.

7.1 PROPOSED ACTION

The proposed action includes dredging 1.15 acres of eelgrass habitat, 6.14 acres of intertidal algal mud flats, 5.6 acres of intertidal unvegetated flat, and 19.4 acres of unvegetated mud slope habitat adjacent to the existing dredged channel along the North Spit, west of the Roseburg Lumber Mill site in Coos Bay, to create an access channel and berth for LNG ships. In order to create an appropriate ship berth and turning basin, sediment will be dredged from the bay north of the existing shipping channel and a portion of the North Spit will be excavated. Periodic maintenance dredging of this area will also be required in the future. The new slip facility would be built into the North Spit and would be designed to accommodate large (1,000-feet) LNG ships. The in-water facility would consist of a pier that is 1,800-feet long and 30-feet wide with moorings and off-loading facilities. The area to be dredged covers approximately 1.15 acres of eelgrass habitat, 6.14 acres of intertidal algal mud flats, 5.6 acres of intertidal unvegetated flat, and 19.4 acres of unvegetated mud slope habitat adjacent to the existing dredged channel along the North Spit. The anticipated depth of the access channel and slip area is 42 feet below MLLW. Existing water depths within the proposed turning basin area range from 16'near the shoreline of the North Spit to 47'. Approximately 26 vertical feet of sediment would be removed to create the slip and turning basin. The slip area is currently dry land and will need to be excavated and dredged. Slopes of dredged areas will be at a 4:1 ratio from the slope toe to the contour in Coos Bay. Feasibility considerations and results of sediment characterization will assist in determining the appropriate disposal locations for dredged materials.

The proposed action also includes construction of a shore-based LNG terminal, which would consist of the docking facility described above, two LNG storage tanks, LNG vaporization equipment, and vapor handling systems. Installation of linear features would also be required including roads, connector line and gas and water lines. Construction of these facilities would

occur on the North Spit adjacent to the Roseburg Lumber Mill site. Some of the area proposed for construction of the LNG facility has been previously disturbed by mill operations. The proposed action also includes operation of the LNG facility including transport of LNG into Coos Bay via large ships from distant ports.

7.2 COOS BAY EFH AND THE PROJECT AREA

Based on species captured by ODFW from 1996-2000, Coos Bay provides EFH for the following groundfish species managed by the Pacific Fishery Management Council (PFMC): black rockfish (***Sebastes melanops***), bocaccio (***S. paucispinis***), brown rockfish (***S. auriculatus***), cabezon (***Scorpaenichthys marmoratus***), copper rockfish (***S. caurinus***), English sole (***Parophrys vetulus***), kelp greenling (***Hexagrammos decagrammus***), lingcod (***Ophiodon elongatus***), rex sole (***Glyptocephalus zachirus***), sand sole (***Psettichthys melanostictus***) and starry flounder (***Platichthys stellatus***). Coos Bay provides EFH for the following salmon managed by the PFMC: Chinook salmon (***Oncorhynchus tshawytscha***) and coho salmon (***O. kisutch***). Coos Bay provides EFH for the following coastal pelagic species managed by the PFMC: northern anchovy (***Engraulis mordax***) and Pacific sardine (***Sardinops sagax***). Coos Bay may provide EFH for additional species that utilize habitat in the bay but that have not been seined by ODFW.

Species that utilize habitat within or near the area to be dredged can be estimated based on ODFW's 2005 seining data from stations near Jordon Cove. Species that are managed by the PFMC and that were seined in September and July of 2005 at McCullough Bridge (upbay from the Project Area) included Chinook salmon, northern anchovy and starry flounder. Species that are managed by the PFMC and that were seined in July 2005 from the Trestle station (just upbay from the Project Area) included coho salmon, Chinook salmon and sand sole. Species managed by the PFMC and that were seined from the Pony Creek station (across the bay from the Project Area) in July 2005 included coho salmon and Chinook salmon. There may be other species that utilize habitat within or near the area to be dredged that have not been seined by ODFW.

7.3 ASSESSMENT

Estuarine eelgrass beds, algae, emergent marsh vegetation, marsh channels and tidal flats provide particularly important estuarine habitats for the production and retention of food for salmon and their prey, and estuarine marsh vegetation, overhanging riparian vegetation, eelgrass beds, and shallow turbid waters of estuaries provide cover to help salmon avoid predators (Recht 1999).

7.3.1 Effects to Fish Managed by the PFMC

The above groundfish and coastal pelagic species are not estuarine resident species and therefore utilize Coos Bay on a seasonal basis, primarily in summer months. During the summer, the estuary may be utilized as a forage area for juveniles and adults and as a nursery area for larvae and juveniles. Juvenile starry flounder have been found upstream as far as the head of tide in Coos Bay. Sampling in the upper bay from 1979 to 1990 showed that young-of-the-year flounder are present at least in the spring and summer months (Wagoner et al. 1990). Adult Chinook and coho salmon may utilize habitat in Coos Bay adjacent to the proposed berth for migration. Juvenile salmonids may use shallow water habitat proposed for a portion of the access channel for resting and foraging during emigration. Adult and juvenile fish are expected to avoid areas of disturbance are not expected to be directly affected by dredging.

Dredging of EFH, specifically shoreline and subtidal habitat, would result in a temporary loss of prey species (i.e. benthic invertebrates). A review (Newell et al. 1998) of recovery rates in dredged areas around the world indicates that disturbed areas do recover and that there are variable recovery rates of benthic communities. Newell at al. (1998) reported that disturbed mud in Coos Bay recovered benthic communities in four weeks. In general, recovery rates were most rapid in highly disturbed sediments in estuaries that have opportunistic species. Thus, dredging would likely result in short-term reductions in benthic communities over approximately 1.15 acres of eelgrass habitat, 6.14 acres of intertidal algal mud flats, 5.6 acres of intertidal unvegetated flat, and 19.4 acres of unvegetated mud slope adjacent to the existing dredged channel along the North Spit. Based on studies (Newell et al. 1998) it is expected that benthic communities would recolonize disturbed areas within the short- and over the long-term.

7.3.2 Riparian Zones and Streams

Riparian zones will not be affected by the Project but are included as EFH. Riparian zones are lands immediately adjacent to streams. Riparian ecosystems have distinctive vegetation and soils, and are characterized by the combination of species diversity, density, and productivity. Chinook and coho salmon (EFH managed species) spawn in streambeds in select areas such as pool tailouts, runs, and riffles during the fall or winter (Vronskiy 1972, Burger ***et al***. 1985, Healey 1991). Water quality within these areas is particularly important during larval stages and must be non-toxic, of suitable temperature, and contain an adequate supply of dissolved oxygen to ensure egg survival (PFMC 1999). Coho larvae (alevins) also inhabit streambeds during the winter and spring and may be found in rivers, streams, and lakes as adults. Freshwater juvenile Chinook salmon primarily inhabit pools and stream margins, particularly undercut banks and behind LWD. Once adult Chinook return to freshwater, they can be found in large, deep, low velocity pools with abundant LWD. These areas serve as refuge from high river temperatures and predators as well as resting sites prior to sexual maturation and spawning (PFMC 1999). An abundance of streams drain into Coos Bay from mixed-conifer forests and developed areas. Riparian zones are typically lined with red alder, willows and ferns.

Potential impacts

Project construction and operations would not impact riparian habitat or streams as the Project would occur on the North Spit and within estuarine habitat in the lower bay.

7.3.3 Marsh Habitats

Salt marshes exist on the transition zone between the land and the sea in protected low-energy areas such as estuaries, lagoons, bays, and river mouths (Copeland 1998). Marsh ecosystems, like all wetlands, are a function of hydrology, soil, and biota. Tidal cycles allow salty and brackish water to inundate and drain the salt marsh, circulating organic and inorganic nutrients throughout the marsh. Water is also the medium in which most organisms live. The marshes are strongly influenced by tidal flushing and stream flow, which affect the inundation and salinity regimes of salt marsh soils. In areas with enough runoff, salt marshes transition into brackish and freshwater marshes (Copeland 1998). Sand- and mudflats occur at extreme low water, whereas salt marsh vegetation develops where the soils are more exposed to the air than inundated by tides, usually above mean sea level. Sedges, salt grasses, beach grasses, and eel grasses dominate the shallow, subtidal and intertidal habitats. Salt marshes are of paramount ecological importance because they 1) export vital nutrients to adjacent waters; 2) improve water quality through the removal and

recycling of inorganic nutrients; 3) absorb wave energy from stops and act as a water reservoir to reduce damage further inland; and 4) serve an important role in nitrogen and sulfur cycling (Mitsch and Gosselink 1993; Thayer ***et al***. 1981). Coastal wetlands may provide rearing habitat for coho salmon and brackish-water estuarine areas may also be used by juvenile coho. The Coos estuary contains less than 10% of its original saltmarsh habitat, due to filling, dredging and other development. Significant portions of the saltmarshes remaining are in the South Slough.

Potential Impacts

ODFW (1979) documented two tidal marsh habitat units on the North Spit in the vicinity of the Project Area: one within Jordon Cove and one west of the Project Area at Henderson Marsh. These tidal marsh habitats would not be disturbed by dredging or the LNG facility development.

7.3.4 Submerged Aquatic Vegetation

Submerged grasses are important components of EFH. Previous studies (Akins and Jefferson 1973) reported that Coos Bay has 1,400 acres of lower intertidal and shallow subtidal tideflats covered by eelgrass meadows. ODFW (1979) conducted habitat mapping in Coos Bay and documented intertidal and subtidal aquatic beds. Near the Project Area, ODFW (1979) documented SAV in Jordon Cove and across the bay from the proposed LNG terminal in and near the mouth of Pony Slough. ODFW (1979) did not identify or map any SAV within the Project Area. In May 2005, the EPA obtained color infrared (CIR) aerial photos of Coos Bay and will provide more current maps of SAV distribution in the near future. Field surveys conducted in September 2006 verified the extent and species composition of SAV previously identified from aerial photography as occurring in the area of the multi-user slip. The narrow strip of SAV was found to be comprised of eelgrass (***Zostera marina***) and algae. The approximate areal extent of the SAV affected by the development of the multi-user slip is 7.3 acres of which 1.15 acres are eelgrass and 6.14 acres are algal flat.

The Port has developed an eelgrass mitigation plan (David Evans & Associates 2007) that includes field verified maps of eelgrass distribution in the area to be impacted by proposed dredging (1.15 acres). The largest and most contiguous beds of submerged grasses are located in both the lower and upper bay, in the North and South Sloughs, and in Haynes Inlet.

Submerged eelgrass meadows provide cover and food for a large number of organisms including burrowing, bottom-dwelling invertebrates; diatoms and algae, herring that deposit eggs clusters on leaves; tiny crustaceans and fish that hide and feed among the blades; and, larger fish, crabs and wading birds that forage in the meadows at various tides. Eelgrass provides shelter for a variety of fish and may lower predation, allowing more opportunity for foraging. The protective structure attribute of eelgrass is primarily for smaller organisms and juvenile life history stages of fishes. Orth et al. (1984) reported that shoot density, patchiness, leaf area, leaf morphology and the thickness, structure and proximity of the rhizome layer to the sediment surface are the primary characteristics that affect predation rates. Structural complexity is related to fish abundance and species richness (Phillips 1984). Fish diversity and eelgrass biomass were also significantly correlated in surveys conducted in Craig, Alaska (Murphy et al. 2000).

In the fall and winter, as much as 75% of the eelgrass blades die back and decompose, supplying estuarine food webs with essential nutrients. In spring and summer, eelgrass beds sprout and grow, renewing the annual cycle of production.

Potential impacts

The proposed berthing area would directly impact 1.15 acres of eelgrass along the North Spit (Figure 3). Submerged grasses are considered EFH associated with species managed by the PFMC. The following species managed by the PFMC have been captured by ODFW in Coos Bay: black rockfish, Cabezon, Chinook salmon, coho salmon, copper rockfish, English sole, lingcod, northern anchovy, sand sole and starry flounder. Of the species managed by PFMC and captured by ODFW in Coos Bay, the following species have been seined in or near the Project area: Chinook salmon, coho salmon, northern anchovy, starry flounder and speckled sanddab. Thus, impacts to 1.15 acres of Eelgrass could potentially impact these species through loss of eelgrass habitat.

7.3.5 Impacts to Salmon

Chinook salmon have been seined in or near the Project area. Estuary utilization by juvenile Chinook salmon has been well documented (Healey 1982; Kjelson et al. 1982; Simensted et al. 1982). Estuaries provide an environment for productive foraging, physiological transition, refuge from predators and affects the size and numbers of fish entering the ocean. Phillips (1984) suggested salmon were "transient" users of eelgrass for feeding and cover. Murphy et al. (2000) did not observe a significant association of juvenile salmon with eelgrass and suggested that the presence of fry in eelgrass may be related to physical factors such as reduced currents. Loss of 1.15 acres of eelgrass habitat would impact and reduce the amount of EFH available for juvenile Chinook salmon. Loss or alteration of eelgrass beds reduce cover, primary productivity and prey. Loss of 1.15 acres of eelgrass is expected to adversely affect juvenile Chinook salmon. Impacts are expected to be less than significant due to the small amount of acreage to be impacted (1.15 acres or 0.1% of available eelgrass habitat) and the in-kind mitigation proposed. ODFW (1990) has reported that the Coos River basin is limited by spawning habitat rather than rearing habitat. ODFW (1990) reported that the estuary is large and is estimated to rear enough juveniles to produce as many as 38,000 returning spawners, however the lack of spawning habitat in the riverine systems has limited production. The loss of eelgrass habitat would impact emigrating juvenile Chinook salmon to a minor extent due to the small area impacted, and the in-kind and in-proximity mitigation proposed. Impacts would not contribute to existing limiting factors for Chinook salmon production in Coos Bay.

Coho salmon have been seined in or near the Project area. Loss of 1.15 acres of eelgrass habitat would impact and reduce the amount of eelgrass available for coho salmon. Impacts are expected to be less than significant due to the small amount of acreage to be impacted (1.15 acres or 0.1% of available eelgrass habitat) and the in-kind mitigation proposed. Wagoner et al. (1990) reported that winter habitat (areas where young coho can take refuge from strong currents and floods during the rainy season including large trees, branches, log jams, flooded wetlands, side channels, pools and beaver ponds) may be a limiting factor for coho salmon production in the basin. Without such areas, the young salmon get washed downstream and have reduced survival. Thus, loss of eelgrass habitat would impact emigrating juvenile coho salmon to a minor extent, but would not contribute to existing limiting factors for coho salmon production in Coos Bay.

7.3.6 Impacts to Groundfish

Species harvested recreationally and commercially use eelgrass beds extensively including clams and shrimps, Dungeness crab, English sole and salmonids.

Starry flounder have been captured in or near the Project area and are known to spawn near river mouths and sloughs. Juveniles are found exclusively in estuaries. Sampling in the upper bay from 1979 to 1990 showed that young-of-the-year flounder are present at least in the spring and summer months (Wagoner et al. 1990). Flounder and sole are found in sandy or muddy substrate and juveniles are found in shallow water near rivers and in estuaries in eelgrass beds. Adults generally are found in deeper waters in the winter and migrate to shallower water in the spring. English sole juveniles depend heavily on inter-tidal areas, estuaries, and shallow near-shore waters for food and shelter. Loss of 1.15 acres of eelgrass habitat would impact and reduce the amount of eelgrass habitat available for juvenile starry flounder and sole. Impacts are expected to be less than significant due to the small amount of acreage to be impacted (1.15 acres) and the in-kind mitigation proposed.

The black rockfish is the only member of the rockfish family that is consistently caught in Coos Bay (Wagoner et al. 1990). The copper, blue, grass, canary rockfishes and bocaccio are occasionally caught. The estuary fishery takes rockfishes mainly during the late spring and summer months in the lower areas of Coos Bay (Wagoner et al. 1990). Black rockfish are not known to spawn in estuaries. Rockfish recruit to seagrass beds in shallow, soft bottom embayments (Love et al. 1991). Johnson et al. (2003) reported that juveniles of many commercially important species utilize eelgrass habitat in Southeastern Alaska. Rockfish juveniles settle into shallow, vegetated habitats for rearing. Vegetated habitats (eelgrass and kelp) provide refuge from predators and access to prey. Juvenile rockfish may also be closely associated with seagrass drift for both feeding and refugia while they move between pelagic and near shore habitat (Nightingale and Simenstad 2001). Rockfish have not been seined by ODFW in or near the Project area indicating that this area is not utilized by rockfish. Impacts are expected to be less than significant due to distribution (down bay from the Project area) and the in-kind mitigation proposed.

Black rockfish and cabezon were the most abundant juvenile rockfish species captured within Coos Bay, near the entrance, between June 2003 and December 2005 (Schlosser and Bloeser 2006). Trap sites were located in eelgrass beds, along dock pilings and in sandy bottom habitat near the entrance to Coos Bay. Juvenile chilipepper, copper, grass, yellowtail, and kelp greenling were also captured near the entrance. This habitat will not be disturbed by the proposed new construction, or operations.

Lingcod begin life in near-surface marine waters and estuarine areas. Juvenile lingcod primarily use estuaries, entering to feed, while adults are usually found in marine waters of 100-150 M deep. Lingcod lay eggs in rocky, marine sub-tidal areas. Larvae are found in the near-surface marine waters and estuarine areas. In this life-stage, lingcod feed primarily on copepods, eggs, and other crustaceans. As it matures, lingcod are commonly found in shallow, inter-tidal areas of bays near algae and seagrass beds. Lingcod have been seined by ODFW in Coos Bay, but not captured in or near the Project area. Impacts are expected to be less than significant due to distribution (down bay from the Project area) and the in-kind mitigation proposed.

Northern anchovy were described to be transient users of eelgrass by Phillips (1984). Eelgrass provides indirect benefits to these species as well through contributions to productivity in the estuary, and eelgrass drift may provide cover for coastal pelagic species (Nightengale and Simenstad 2001). Loss of 1.15 acres of eelgrass habitat would adversely affect northern anchovy in the short-term, to an insignificant level due to proposed in-kind mitigation.

Other species managed by the PFMC that occur in Coos bay include sand sole and big skate. Sand sole require a sand-mud-eelgrass type of habitat but have not been captured in or near the Project area. Big skate occur nearshore and occasionally in the bay (Wagoner et al. 1990). Loss of 1.15 acres of eelgrass would have insignificant adverse effects on these species due to distribution outside of the area of new construction and the proposed in-kind mitigation.

7.3.7 Marine Environment

In marine waters, EFH is described and identified as all marine waters and substrates (mud, sand, shell, rock, hardbottom, and associated biological communities) from the shoreline to the seaward limit of the EEZ.

Potential Impacts

Project construction would not directly impact marine waters or substrates outside of Coos Bay. There is a risk of impacts associated with operations, since ships would be transporting LNG into Coos Bay. If a spill occurred, the extreme cold of LNG can directly cause injury to life and property, however, impacts to aquatic species as a result of an LNG spill have not been modeled or documented. Although impacts are not known, impacts to the water column and associated species may be localized, near the water's surface since LNG vaporizes as it comes into contact with the heat of the water. The potential for an LNG spill in open water is low due to safety and design measures required of LNG ships (e.g. double hulled ships and other safety design features) and operations designed to minimize the potential for spills.

Marine waters and substrates within Coos Bay would be directly impacted in the proposed dredge area. Direct effects would be associated with dredging to the north of the existing shipping channel to create a new berth resulting in the loss of 1.15 acres of eelgrass habitat, 6.14 acres of algal mud flats, 5.6 acres of unvegetated sandy shallow water habitat, and 19.4 acres of unvegetated mud slope habitat adjacent to the existing dredged channel along the North Spit. Primary habitat function of these areas that will be lost includes foraging and resting habitat for juvenile fishes. ODFW has conducted seining in and near the Project area and has recovered the following species managed by the PFMC: Chinook and coho salmon, northern anchovy, starry flounder, sanddab and sole. Thus, loss of this shallow water habitat would adversely impact these species (and possibly others that were not captured by ODFW) and associated EFH. The Port has developed an eelgrass mitigation plan (David Evans & Associates 2007), including in-kind mitigation, to off-set the loss of eelgrass habitat. The mitigation plan also includes measures for mud flat habitat mitigation that will likely include out-of-kind mitigation in the form of tidal marsh restoration. This is preferred given the high functional value of tidal marsh habitat and the fact that mud flat habitat has increased over time due to dredge spoils dumping in Coos Bay.

Dredging into the North Spit would disrupt shallow water habitat along the North Spit and potentially disrupt connectivity of shallow water habitat that may be used by emigrating juvenile salmonids. Juveniles would likely emigrate past the new berth regardless. However, the proposed dredging of shallow water habitat to create an access channel would reduce the amount of shallow water habitat that may be used as resting and foraging habitat. Disruption of upstream migration of adult salmonids associated with construction would be minimized through adhering to ODFW preferred work windows. Adult salmonids tend to prefer deeper channels and would not be disrupted and would be able to migrate past the work area in the existing shipping channel.

Boat anchors are known to cause significant damage to seafloor habitats associated with dragging, or repeated anchoring in one area. LNG ships would not anchor off of Coos Bay or within Coos Bay. Ships notify ports-of-call 96 hours ahead of arrival and if there is any reason for delayed berthing, ships will remain at sea until cleared.

7.3.8 Shoreline Habitats

Shore environments vary from low-energy sheltered environments to more exposed coastline, subjected to high-energy wave and tidal action. Coastal areas contain EFH for a number of species managed by the Pacific Council. About 23 species of groundfish are found in coastal waters. Many of these species have designated EFH in the estuarine waters of Coos Bay. Juvenile and adult life stages of cabezon can be found in shallow water bays and estuarine areas. All life stages of kelp greenling and starry flounder are found in estuarine areas. Several species of rockfish occur in estuarine areas during their juvenile and adult life stages. These include black, brown, copper, and quillback rockfish that are usually found near kelp beds. Other groundfish species that may be found in estuarine and coastal areas include Pacific cod, Pacific whiting, sablefish, bocaccio, English sole, Pacific sanddab, and the rex sole, which utilize near-shore nursery areas.

A number of coastal pelagic species are also found within coastal areas. These include juvenile and adult life stages of Pacific mackerel, which occur off sandy beaches and in open bays, and eggs and paralarvae of market squid, which are found in shallow, semi-protected nearshore areas (PFMC, 1998a). Small jack mackerel are also abundant near the coast in the Southern California Bight. Pacific sardines are common along near shore and offshore areas along the coast. Most life stages remain off the California coast, but adults may migrate to feeding grounds off the Pacific Northwest and Canada. Juvenile Chinook and coho salmon occupy beaches and bays before emigrating to marine waters (PFMC, 1999).

Potential impacts

The shoreline in the vicinity of Coos Bay is dominated by geological features distinctive of the Klamath Mountain metamorphic province, as well as rocky shores of uplifted and tilted marine sediments. Rocky shore habitat exists south of Coos Bay including diverse intertidal habitat, shore-associated reefs, offshore reefs and offshore rocks and islands. The Cape Arago and Gregory Point Research Reserves provide coastal intertidal and kelp forest habitats. The coastline just north of Coos Bay is sandy beach habitat.

The Project would not directly impact rocky shore habitat or associated reefs or kelp forests outside of the bay. Within the bay, approximately 6.14 acres of intertidal algal mud flats and 5.6 acres of intertidal unvegetated flat along the bay shoreline will be lost as a result of Project construction (dredging and construction of the berthing facility into the North Spit). Unconsolidated sand habitat is limited in Coos Bay and many species utilize shore habitat with sandy substrates. Studies have indicated that most fish species of Coos Bay utilize the flats of the lower bay at some time during the year (Cummings and Schwartz 1971). Thus, Project construction would result in the conversion of shallow shoreline sand flat and sand/mud-flat habitat, which would adversely affect this type of EFH while creating additional deep water habitat adjacent to the shoreline.

7.3.9 Kelp Forests

Kelp forests are included as EFH and include subtidal marine communities dominated by algae (kelps) that form floating canopies on the surface of the sea. Kelp forests are highly productive and create a three-dimensional aspect to the nearshore environment, providing habitat and food for hundreds of other species of plants (algae) and animals. Kelp forest ecosystems include structure-producing kelps and their myriad associated biota such as marine mammals, fishes, crabs, sea urchins, mollusks, other algae and epibiota which collectively make this one of the most diverse and productive ecosystems in the world (Steneck et al. 2002). Some of the fish species associated with shallow rocky reefs with kelp beds include rockfish, cabezon, Bocaccio, greenlings, lingcod, perch flounder, sculpins, Brown Irish lord, Monkeyface prickleback, sanddabs, gunnels and Topsmelt.

Potential impacts

Kelp beds grow on many of Oregon's shallow rocky reefs on rocky substrates between 5 and 20 m of water, with some extending to 25 m (ODFW 2005b). While rocky reefs of this depth range exist all along the Oregon coast, the strip of coast from Cape Arago south contains approximately 92% of the state's kelp beds (ODFW 2005b). Kelp Forests are included as SAV in subtidal marine habitat, occurring across a wide depth range, from rocky intertidal habitats to depths of 40 meters, and for some species, broad latitudinal ranges. Distribution patterns are influenced by light, salinity, temperature, substrate type, and currents. Kelp forests supply many habitat functions, including: (1) support of large numbers of epiphytic organisms; (2) damping of waves and slowing of currents which enhances sediment stability and increases the accumulation of organic and inorganic material; (3) binding by roots of sediments, thus reducing erosion and preserving sediment microflora; and, (4) roots and leaves provide horizontal and vertical complexity to habitat, which, together with abundant and varied food sources, support densities of fauna generally exceeding those in unvegetated habitats (Wood ***et. al***., 1969; Thayer ***et. al***., 1984).

ODFW has surveyed some of the rocky reef habitat along the central and southern Oregon coastline, including investigations into the density and abundance of kelp forests. Reef studies have been conducted at Rogue, Humbug Mountain, Redfish Rocks, McKenzie's, Orford, Blanco, Bandon, Perpetua, Seal Rock and Siletz Reefs. This recent research has verified that many species are principally associated with rocky reefs. An abundance of rocky reef and kelp forest habitat exists just south of Coos Bay including at Gregory Point, Sunset Bay State Park, Rock Reef, Shore Acres State Park, Cape Arago and further south at Coquille Point.

Construction of the proposed LNG facility would occur within Coos Bay and would not directly impact rocky reef or kelp forest habitat. Operations have a low potential to impact kelp forests, and the potential for impacts would be limited temporally to when a ship is in transit from the open ocean to the berth. Potential impacts of a spill to kelp forests are unknown, but the potential for an LNG spill is low due to ship construction, safety precautions and operation methods. LNG ships carry petroleum products for their own use. Kelp forests would be vulnerable to spills of crude oil and refined petroleum products, because floating oil is more likely to impact plants and animals on the water's surface than those in the water column. Operations would involve transport of LNG using large tanker ships that carry fuel for their own use, but would not be transporting bulk crude oil or refined petroleum products.

7.4 EFH CONSERVATION MEASURES

The following measures will be implemented to minimize impacts to EFH:

1. Minimize construction work during salmonid migrations by using ODFW preferred work windows (October 1-February 15) for all in-water work.

2. Conduct monitoring before, during, and after project implementation to ensure compliance with project design.

3. Implement LNG, oil and fuel Spill Prevention Measures.

4. Implement the eelgrass mitigation plan (David Evans & Associates 2007) to off set the loss of eelgrass at the new shipping berth.

5. Minimize the potential for effects to aquatic species through the following:

   a) Implement operational controls for dredging operations including modifications in the operation of the dredging equipment to minimize resuspension of dredged materials. The type of dredging equipment that will be used is unknown at this time. Example operational controls include the following:

      i) mechanical dredging-increase cycle time to reduce velocity of ascending loaded bucket, eliminate multiple bites to minimize sediment loss when bucket is reopened and eliminate bottom stockpiling to minimize the volume of sediment released into the water column;

      ii) hydraulic dredging-reduce cutterhead rotation speed to reduce potential for side casting, reduce swing speed to reduce the volume of resuspended sediment and eliminate process of bank undercutting;

      iii) hopper dredges and barge dredges-eliminate hopper overflow to reduce the volume of fine material flowing from the hopper, lower the hopper fill level to prevent material loss, use a recirculating system as water from the hopper overflow can be recirculated to the draghead and used to transport more material into the hopper

   b) Halt operations during periods of extreme tidal fluctuation when currents are at their strongest.

   c) Minimize the potential for effects to aquatic species and their habitat associated with sediment plumes from dredging. Designate a qualified professional to implement visual monitoring during active dredging to monitor the extent of sediment plumes and halt dredge operations if a sediment plume exceeds 500 m from the area to be dredged, in any direction.

7.5 EFH DETERMINATION

Based on the project design, the project location, the short-term impacts associated with dredging, and the proposed EFH Conservation Measures (including in-kind and in-proximity mitigation), EFH will not be adversely affected.

8.0 HABITAT MITIGATION

ODFW requires categorization of habitat types and identification of mitigation measures according to Oregon Administrative Rules (OAR) Division 415 Fish and Wildlife Habitat Mitigation Policy. The following habitat types will be directly impacted or lost along the North Spit due to the proposed dredging: 1) 5.55 acres of intertidal sand flat habitat; 2) 6.14 acres of intertidal sand/mudflat habitat; 3) 1.15 acres of intertidal eelgrass habitat; and, 4) 17.9 acres of unvegetated subtidal mud slope habitat adjacent to the existing dredged channel.

Previous studies (Akins and Jefferson 1973) reported that Coos Bay has 1,400 acres of lower intertidal and shallow subtidal tideflats covered by eelgrass meadows. ODFW (1979) conducted habitat mapping in Coos Bay and documented intertidal and subtidal aquatic beds. EPA is in the process of producing and field verifying Color Infrared photos documenting the current distribution of eelgrass in Coos Bay, however, this information is not yet available. As described earlier in this report eelgrass provides shelter for a variety of marine organisms and may lower predation, allowing more opportunity for foraging. The protective structure attribute of eelgrass is primarily for smaller organisms and juvenile life history stages of fishes. Orth et al. (1984) reported that shoot density, patchiness, leaf area, leaf morphology and the thickness, structure and proximity of the rhizome layer to the sediment surface are the primary characteristics that affect predation rates. Structural complexity is related to fish abundance and species richness (Phillips 1984). Fish diversity and eelgrass biomass were also significantly correlated in surveys conducted in Craig, Alaska (Murphy et al. 2000).

Eelgrass habitat may be considered a "Habitat Category 3", is essential or important, and limited. Mitigation of impacts and loss of up to 1.15 acres of eelgrass habitat will be accomplished through in-kind, in-proximity habitat mitigation to achieve no net loss of habitat quantity or quality. The Port has developed an eelgrass mitigation plan (David Evans & Associates 2007) which includes mitigation goals and standards, reporting requirements and scheduling for performance measures as required in OAR 635-415-0025. Eelgrass bed creation/restoration will occur at a minimum of a one to one ratio, and will occur within the lower bay subsystem.

Mudflats are sedimentary intertidal habitats created by deposition in low energy environments. Sand-mud bottoms are typically higher in organic content than sand bottoms and are firmer and more aerated than mud. The proposed dredging would impact 6.14 acres of sand/mudflat habitat that occurs between the subtidal channel and eelgrass beds, and sand flat habitat at the shoreline. Algal sand/mud flat habitat may be considered "Habitat Category 4", important for fish and wildlife species. Mudflats dissipate wave energy, reducing erosion of saltmarshes and shorelines, play an important role in nutrient chemistry of the estuary, and sequester contaminants. Mudflats are characterized by high biological productivity and abundance of organisms, but may have low diversity with species composition reflecting prevailing physical conditions. The surface of a mudflat is devoid of vegetation, but may have mats of benthic microalgae. Mudflats support species such as cockle, gaper, butter, littleneck and softshell clams and mud and ghost shrimp, and thus provide important forage areas for birds and fishes. An additional 5.55 acres of unconsolidated sand flat habitat along the shoreline of the North Spit would be impacted or lost as a result of the proposed dredging. The Port has developed an eelgrass mitigation plan (David Evans & Associates 2007) which includes out-of-kind (creation of low and high marsh salt habitat) mitigation for loss of sand and mudflat habitat, goals and standards, reporting requirements and scheduling for performance measures as required in OAR 635-415-0025. Mitigation will occur at a minimum of a one to one ratio.

Approximately 17.9 acres of unvegetated subtidal mud slope habitat adjacent to the existing dredged channel would also be modified through dredging. This habitat may be considered "Habitat Category 4", important for fish and wildlife species. This area slopes from 20 feet in depth out to the existing dredged channel at 40 feet in depth. Post-project, this area will be a deep-water channel (40 feet), used by LNG ships. This habitat type is not limited in Coos Bay. Jordon Cove energy will coordinate with ODFW on appropriate mitigation measures.

9.0 REFERENCES

Aagard, K., H.R. Sanborn and R.W. Sternberg. 1971. A fluvial and hydrographic survey of Coos Bay, Oregon. Submitted to Weyerhaeuser Co., North Bend, OR. 16 pp.

Adams, P.B., C.B. Grimes, J.E. Hightower, S.T. Lindely and M.L. Moser. 2002. Status review for North American Green Sturgeon, ***Acipenser medirostric***. National Marine Fisheries Service Southwest and Northwest Fisheries Science Centers and North Carolina Cooperative Fish and Wildlife Research Unit.

Akins, G. and C. Jefferson. 1973. Coastal wetlands of Oregon; a natural resource inventory report. Oregon Coastal Conservation Dev. Comm. Florence. 159 pp.

Anchor Environmental CA, L.P. 2003. Literature review of effects of resuspended sediments due to dredging operations. Prepared for Los Angeles Contaminated Sediments Task Force, Los Angeles, CA. Anchor Environmental CA, L.P. One Park Plaza Suite 600 Irvine, CA. June.

Arneson, R.J. 1975. Seasonal variation in tidal dynamics, water quality, and sediments in the Coos Bay estuary. M.S. thesis. Oregon State University, Corvallis. 250 pp.

Baker, C.A. 1978. A study of estuarine sedimentation in South Slough, Coos Bay, Oregon. M.S. thesis. Portland State University, Portland. 104 pp.

Baker, P. 1995. Review of ecology and fishery of the Olympia oyster, ***Ostrea lurida*** with annotated bibliography. ***J. Shellfish Res.*** 14(2):501-518

Baker, P., N.B. Terwilliger. 1999. Reestablishment of a native oyster: Implications for population distribution and structure. ***J. Shellfish Res.*** 19(1):687

Behnke, R.J. 1992. Native trout of western North America. Am. Fish. Soc,. Bethesda, 275p.Biological Review Team (BRT). 2003. Preliminary conclusions regarding the updated status of listed ESUs of West Coast salmon and steelhead. Draft Report. Northwest Fisheries Science Center, Seattle, Washington; Southwest Fisheries Science Center, Santa Cruz Laboratory, Santa Cruz, California. February 2003.

Bourke, R.H., B. Glenne and B.W. Adams. 1971. The nearshore physical oceanographic environment of the Pacific Northwest coast. Oregon State University Reference 71-45. Department of Oceanography, OSU, Corvallis.

Bourne, N. and D.W. Smith. 1972. The effect of temperature on the larval development of the horse clam, ***Tresus capax*** (Gould). ***Proc. Natl. Shellfish. Assoc.*** 62:35-37

Behnke, R.J. 1979. Monograph of the native trouts of the genus Salmo of western North America. 163 p. (Available Regional Forester, 11177 West 8th Avenue, PO Box 25127, Lakewood, CO 80225.).

Bisson, P.A., and R.E. Bilby. 1982. Avoidance of suspended sediment by juvenile coho salmon. North American Journal of Fisheries Management 2:371-374.

Bray, R.N., A.D. Bates and J.M. Land. 1997. Dredging-A handbook for engineers. Second Edition. Arnold, London.

Burger, C.V., R.L. Wilmot and D.B. Wangaard. 1985. Comparison of spawning areas and times for two runs of Chinook salmon (***Oncorhynchus kisutch***) in the Kenai River, Alaska. Can. J. Fish. Aquat. Sci. 42:693-700.

Burt, W.V. and W.B. McAllister. 1959. Recent studies in the hydrography of Oregon estuaries. Fish. Comm. Oreg. Res. Briefs 7(1): 14-27.

Busby, P.J., T.C. Wainwright, G.J. Bryant, L.J. Lierheimer, R.S. Waples and F.W. Waknitz. 1996. Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. Technical Memorandum NMFS-NWFSC-27. August 1996.

Carroll, J.C. and R.N. Winn. 1989. Species Profiles: Life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest): Brown Rock Crab, Red Rock Crab, and Yellow Crab

Chew, K.K. and A.P. Ma. 1987. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest)–common littleneck clam. U.S. Fish Wildl. Serv. Biol. Rep. 82(11). U.S. Army Corps of Engineers, TR EL-82-4. 22 pp.

Cleaver, F.C. 1951. Fisheries Statistics of Oregon. Contribution Number 16. Fish Commission of Oregon, Department of Research. Portland, Oregon.

Collins, M.A. 1995. Dredging induced near-filed resuspended sediment concentrations and source strengths. Miscellaneous Paper D-95-2, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Comyns, B.H.. 1997. Growth and mortality of fish larvae in the northcentral Gulf of Mexico and implications to recruitment. Ph.D. diss., Lousiana State Univ., Baton Rouge, LA. 199 p.

Connor, P.M. 1972. Acute toxicity of heavy metals to some marine larvae**.** Marine Pollution Bulletin, 3, pp.190-192.

Copeland, B.J. 1998. Salt Marsh Restoration: Coastal Habitat Enhancement. North Carolina Sea Grant College Program, Raleigh, NC. 32 pp.

Couch, D. and T.J. Hassler. 1989. Species Profiles: Life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest): Olympia Oyster.

Crowder, L.C., S.J. Lyman, W.F. Figuiera and J. Priddy. 2000. Source-sink dynamics and the problem of siting marine reserves. Bull. Mar. Sci. 66: 799-820.

Cummings, T.E. and E. Schwartz. 1971. Fish in Coos Bay, Oregon, with comments on distribution, temperature, and salinity of the estuary. Coastal Rivers Investigation Report 70-11. Fish Comm. Oregon. 22 pp.

David Evans and Associates, Inc (DEA). 2007. Oregon Gateway Marine Terminal, Estuarine Resource (Intertidal and Shallow Subtidal) Mitigation Plan. Prepared for Oregon International Port of Coos Bay.

DeWitt, J.W. 1954. A survey of the coastal cutthroat trough, ***Salmo clarki clarki Richardson***, in California, Calif. Fish Game 40:329-335.

Dicken, S.N., C.L. Johannessen and B. Hanneson. 1961. Some recent physical changes of the Oregon coast. Department of Geography, University of Oregon, Eugene. 151 pp.

Environmental Protection Information Center (EPIC). 2001. Petition to list the North American Green Sturgeon (***Acipenser medirostris***) as an endangered or threatened species under the Endangered Species Act. Petition To National Marine Fisheries Service by Environmental Protection Information Center, Center for Biological Diversity, and Waterkeepers Northern California, petitioners.

Essential Fish Habitat (EFH) Core Team for West Coast Groundfish. 1998. Appendix: Life History Descriptions for the West Coast Groundfish. National Marine Fisheries Service. Seattle, WA. June, 1998. Available: http://www.nwr.noaa.gov/1sustfsh/efhappendix/page1.html

Erickson, D.L., J.A. North, J.E. Hightower, J. Weber, and L. Lauck. 2002. Movement and habitat use of green sturgeon Acipenser medirostris in the Rogue River, Oregon, USA. Journal of Applied Ichthyology 18 (2002) 565-569.

Farr, R.A., M.L. Hughes, and T.A. Rien. 2001. Green Sturgeon Population Characteristics In Oregon. Annual Progress Report to U.S. Fish and Wildlife. Project Number: F-178-R.

Farr, R.A., M.L. Hughes, and T.A. Rien. 2003. Green Sturgeon Population Characteristics In Oregon. Annual Progress Report to U.S. Fish and Wildlife. Project Number: F-178-R

Farr, R.A. and J.C. Kern. 2004. Green Sturgeon Population Characteristics In Oregon. Annual Progress Report to U.S. Fish and Wildlife. Project Number: F-178-R.

Farr, R.A. and T.A. Rien. 2002. Green Sturgeon Population Characteristics In Oregon. Annual Progress Report to U.S. Fish and Wildlife. Project Number: F-178-R.

Fishman Environmental Services. 1999. Eastbank Riverfront (Phase I) Floating Walkway Fish Predation Study. Data Summary, Spring 1999 Sampling Season. Prepared for Portland Development Commission. FES Project 98102. 7pp.

Fleming, K. 1999. Northern Anchovy. ***In***: Orsi, James J., editor. Report on the 1980-1995 Fish, Shrimp, and Crab Sampling in the San Francisco Estuary, California. http://www.estuaryarchive.org/archive/orsi_1999

Florida Institute of Oceanography. 1996. Impacts and Direct Effects of Sand Dredging for Beach Renourishment on the Benthic Organisms and Geology of the West Florida Shelf. Report to Dept. of Interior MMS. September. Available at http://www.mms.gov/sandandgravel/PDF/flben.pdf

Foster, M.S. and D.R. Schiel. 1985. The ecology of giant kelp forests in California: a community profile. U.S. Fish and Wildlife Service Biological Rep. 85 (7.2). 152 pp.

Gaumer, T.F.,D. Demory and L. Osis. 1973. 1971 Coos Bay resource use study. Fish Comm. Oregon. 30 pp.

Gaumer, T.F., G.P. Robart and A. Geiger. 1978. Oregon bay clam distribution, abundance, planting sites and effects of harvest. Annual Report October 1, 1977 to September 30, 1978. Oregon Department of Fish and Wildlife. 65 pp.

Grant, J. and B. Thorpe. 1991. Effects of suspended sediment on growth, respiration, and excretion of the soft-shell clam (***Mya arenaria***). ***Can. J. Fish. Aquat. Sci.*** 48(7):1285-1292

Groot, C. and L. Margolis (eds). 1991. Pacific Salmon Life Histories. UBC Press, Vancouver. 543 pp.

Gross, M.R. 1987. Evolution of Diadromy in Fishes. Am. Fish. Soc. Symp. 1:14-25Healey, M.C. 1991. Life history of Chinook salmon (***Oncorhynchus tshawytscha***). Pp. 311-294 in C. Groot and L. Morgolis (eds.), Pacific Salmon Life Histories. UBC Press. Vancouver, B.C., Canada.

Guerra-Garcia, J.M.; J. Corzo; and Carlos Garcia-Gomez. 2003. Short-term benthic recolonization after dredging in the Harbour of Ceuta, North Africa. Marine Ecology, Vol. 24, Number 3, Sept. pp. 217-229(13).

Federal Register. 2001. Endangered and threatened wildlife and plants: 90-day finding for a petition to list green sturgeon as threatened under the Endangered Species Act. 14 December 2001, pages 64793-64794.

Hager, G. 2002. Risks of liquefied natural gas. USA Today. May 31.

Havis, R.N. 1988. Sediment resuspension by selected dredges. Environmental effects of dredging Technical Note EEDP-09-2. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Healey, M.C. 1982. The ecology of juvenile salmon in Georgia Strait, British Columbia, p. 203-229. In: W.J. McNeil and D.C. Himsworth (eds), Salmon Ecosystems of the North Pacific. Oregon State University Press, Corvallis, OR

Healey, M.C. 1991. Life history of Chinook salmon (***Oncorhynchus tshawytscha***). Pp. 311-294 in C. Groot and L. Morgolis (eds.), Pacific Salmon Life Histories. UBC Press. Vancouver, B.C., Canada.

Hightower M., L. Gritzo, A. Lukete-Hanlin, J. Covan, S. Tieszen, G. Wellman, M. Irwin, M. Kaneshige, B. Melof, C. Morrow and D. Ragland. 2004. Guidance on risk analysis and safety implications of a large liquified natural gas (LNG) spill over water. Sandia National Laboratories, Albuquerque, New Mexico 87185 and Livermore, California 94550.

Hjort, R.C., P.L. Hulett, L.D. LaBolle and H.W. Li. 1984. Fish and invertebrates of revetments and other habitats, the Willamette River, Oregon. Technical Report E-84-9 prepared for US Army Corps of Engineers under Intra-Army Order No. WESRF-82-106. 83 pp. + Appendices.

Hoffnagle, J. and R. Olson. 1974. The salt marshes of the Coos Bay Estuary. Port Coos Bay Comm. And Univ. Oreg. Oreg. Instit. Marine Biol., Charleston. 86 pp.

Hornig, S., A. Sterling and S.D. Smith. 1989. Species Profiles: Life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest): Ghost Shrimp and Blue Mud Shrimp.

Hostick, G. 1974. Numbers of fish captured in beach seine hauls in Coos River estuary, Oregon, June through September 1970. Fish Commission Oregon Coastal Rivers Investigation Information Report 74-11. 22 pp.

Houde, E.D. and J.A. Lovdal. 1984. Seasonality of occurrence, foods and food preferences of ichthyoplankton in Biscayne Bay, Florida. Estuar. Coast. Shelf Sci. 18:403-419.

Jefferts, C.A. 1977. The vertical distribution of infauna: a comparison of dredged and undredged areas in Coos Bay, Oregon. M.S. thesis. Oregon State University, Corvallis. 45 pp.

Johnston, J.M. 1982. Life histories of anadromous cutthroat with emphasis on migratory behavior. In E.L. Brannon and E.O. Salo (eds.), Proceedings of the salmon and trout migratory behavior symposium, p. 123-127. Univ. Washington, Seattle.

Johnson, O.W., T.A. Flagg, D.J. Maynard, G.B. Milner and F.W. Waknitz. 1991. Status review for Lower Columbia River Coho Salmon. NOAA F/NWC-202. June.

Johnson, O.W., R.S. Waples, T.C. Wainwright, K.G. Neely, F.W. Waknitz, and L.T. Parker. 1994. Status review of Oregon's Umpqua River sea-run cutthroat trout. NOAA Technical Memorandum NMFS-NWFSC-15.
Available: http://www.nwfsc.noaa.gov/pubs/tm/TM15/techmemo15.html

Johnson, O.W., W.S. Grant, R.G. Kope, K. Neely, F.W. Waknitz, and R.S. Naples. 1997. Status Review of Chum Salmon from Washington, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-32. December

Johnson, O.W., M.H. Ruckelshaus, W.S. Grant, F.W. Waknitz, A.M. Garrett, G.J. Bryant, K. Neely, and J.J. Hard. 1999. Status Review of Coastal Cutthroat Trout from Washington, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-37. January

Kennedy, V.S. and J.A. Mihursky. 1971. Upper temperature tolerances of some estuarine bivalves. ***Chesapeake Sci.*** 12(4):193-204

Kjelson, M.A., P.F. Raguel, and F.W. Fisher. 1982. Life history of fall run-Chinook salmon, Oncorhynchus tshawytscha, in the Sacramento-San Joaquin Estuary, California. In Estuarine Comparison, edited by V.S. Kennedy, pp.393-411. Academic Press, New York, New York.

Kraeg, B. 1979. Natural resources of Coquille estuary. Estuary inventory report Vol. 2, No. 7. ODFW, Corvallis. 48 pp.

LaSalle, M.W. 1990. Physical and chemical alterations associated with dredging. Proceedings, workshop on the effects of dredging on anadromous Pacific Coast fishes, Seattle, WA, September 8-9, 1988. C.A. Simenstad, ed., Washington Sea Grant Program, Seattle, WA, 1-12.

Lawson, P.W., E. Bjorkstedt, M. Chilcote, C. Huntington, J. Mills, K. Moore, T. Nickelson, G. Reeves, H. Stout and T.C. Wainwright. 2004. Identification of historical populations of coho salmon (Onchorhynchus kisutch) in the Oregon Coast Evolutionarily Significant Unit. Northwest Fisheries Science Center 2032 SE OSU Drive, Newport OR 97365.

Levy, D.A. and T.G. Northcote. 1982. Juvenile salmon residency in a marsh area of the Fraser River estuary. Can. J. Fish. Aquat. Sci. 39:270-276.

Li, H.W., C.B. Schreck and R.A. Tubb. 1984. Comparison of habitats near spur dikes, continuous revetments, and natural banks for larval, juvenile and adult fishes of the Willamette River. Water Resources Research Institute, WRRI-95. Oregon State University, Corvallis, Oregon. 15 pp.

Lister, D.B., C.E. Walker and M.A. Giles. 1971. Cowichan River Chinook salmon escapements and juvenile production 1965-1967. Can. Fish. Serv. 1971-3, 8 p.

Litle, K. and J.K. Parrish (eds). 2003. Where the River Meets the Sea: Case Studies of Pacific Northwest Estuaries. Pacific Northwest Coastal Ecosystems Regional Study, Seattle.

Lopez-Jamar, E.; J. Mejuto. 1988. Infaunal benthic recolonization after dredging operations in La Coruna Bay, NW Spain. Cahiers de Biologie Marine CBIMA5, Vol. 29, Number 1, pg. 37-49.

Macleod, J. 1970. Shad census study report-Coos-Millicoma rives. Oregon Game Commission, Portland.

Matthiessen, C.G. 1960. Observations on the ecology of the soft clam, ***Mya arenaria***, in a salt pond. ***Limn. Oceanogr.*** 5(3): 291-300

McCauley, J.E.; R.A. Parr and D.R. Hancock. 1977. Benthic infauna and maintenance dredging: a case study. Water Research, Vol. 11, Number 2, pg. 233-242.

Methot, R.D. 1981. Spatial covariation of daily growth rates of larval northern anchovy, ***Engraulis mordax***, and northern lampfish, ***Stenobrachius leucopsarus***. Rapp. P.-V. Reun. Cons. Int. Explor. Mer. 178: 424-431.

Miller, R.J. and E.L. Brannon. 1982. The origin and development of life history patterns in Pacific salmonids. In Brannon, E.L., and E.O. Salo (eds.), Proceedings of the Salmon and Trout Migratory Behavior Symposium, p. 296-309. School of Fisheries, Univ. Wash., Seattle.

Miller, J. A., and A. L. Shanks. 2004. Ocean-estuary coupling in the Oregon upwelling region: the abundance and transport of juvenile fish and larval invertebrates. . Marine Ecology Progress Series 271:267-279.

Minerals Management Service (MMS). 1996. East Florida Shelf Benthic Repopulation Study. Feb. Available at www.gomr.mms.gov.

Minerals Management Service (MMS). Beach Nourishment/Coastal Restoration Efforts Field Study for offshore of Alabama. Available at www.mms.gov/SandAndGravel/PDF/1999-052/Section8.pdf.

Misitano, D.A. 1977. Species composition and relative abundance of larval and post larval fishes in the Columbia River Estuary, 1973. U.S. Natl. Mar. Fish. Serv. Fish. Bull. 75(1): 218-222.

Mitsch, W.J. and J.G. Gosselink. 1993. ***Wetlands***. New York, Van Nostrand Reinhold.

Moffat & Nichol. 2006. Jordon Cove LNG Terminal Coos Bay, Oregon, Report on turbidity due to dredging. MNI Project No. 5797 Document No. 5797RP0009. Prepared for Black & Veatch and Jordon Cove Energy Project, L.P.

Moore, J.W., K.D. Martin and M.E. Gray. 2000. Coos Bay Salinity Intrusion Study-the effects of deepening the shipping channel on striped bass and other fish populations. ODFW Contract Number W66QKZ01017672.

Morgan, B. and K. Melcher. 2003. Sturgeon Tagging Project in Select Coastal Estuaries 2003. Oregon Department of Fish and Wildlife, Columbia River Management, Clackamas, OR.

Morris, R.H., D.P. Abbott and E.C. Haderlie. 1980. Intertidal Invertebrates of California. Stanford University Press, Stanford.

Moyle, P.B., P.J. Foley and R.M. Yoshiyama. 1992. Status of green sturgeon, ***Acipencer medirostris***, in California. Final Report submitted to National Marine Fisheries Service, Terminal Island, CA.

Musick, J.A. and M.M. Harbin. 2000. Marine, estuarine, and diadromous fish stocks at risk of extinction in North America (exclusive of Pacific salmonids). Fisheries 25(11): 6-30.

Myers, J.M., R.G. Kope, G.J. Bryant, D.Teel, L.J. Lierheimer, T.C. Wainwright, W. S. Grant, F.W. Waknitz, K. Neely, S.T. Lindley, and R.S. Waples. 1998. Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-35. February 1998

Narver, W.W. 1970. Diel vertical movements and feeding of underyearling sockeye salmon and the limnetic zooplankton in Babine Lake, British Columbia. J. Fish. Res. Board Can. 27:281-316.
National Marine Fisheries Service (NMFS). 1997. Fish Screening Criteria for Anadromous Salmonids. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Region.

Neave, F. 1961. Pacific salmon: Ocean stocks and fishery developments. Pac. Sci. Congr. Proc. 1957(10):59-62.

Newell, R.C., L.J. Seiderer and D.R. Hitchcock. 1998. The impact of dredging works in coastal waters: a review of the sensitivity to disturbance and subsequent recovery of biological resources on the sea bed. Oceanography and Marine Biology: An Annual Review, Vol. 36, pg. 127-178.

Newcombe, C.P. and D.D. MacDonald. 1991. Effects of suspended sediment and fisheries: A synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries Management 16: 693-727.

Newell, R.C., L.J. Seiderer and D.R. Hitchcock. 1998. The impact of dredging works in coastal waters: a review of the sensitivity to disturbance and subsequent recovery of biological resources on the sea bed. Oceanography and Marine Biology: an Annual Review 36: 127-178.

Oregon Department of Environmental Quality (DEQ). 1978. STORET retrieval data. Unpub. water quality data.

Oregon Department of Fish and Wildlife (ODFW). 1979. Natural resources of Coos Bay estuary. Prepared by ODFW Research and Development Section for Oregon Land Conservation and Development Commission. Vol. 2, No. 6.

Oregon Department of Fish and Wildlife (ODFW). 1979. Habitat classification and inventory methods for the management of Oregon estuaries. Prepared by Research and Development Section ODFW for Oregon Land Conservation and development Commission.

Oregon Department of Fish and Wildlife (ODFW). 1998. Coos Basin creel survey-1998. ODFW Charleston, Oregon. Unpublished reports on file ODFW Charleston, OR.

Oregon Department of Fish and Wildlife (ODFW). 1999. Coos Bay, Coos and Millicoma Rivers and Coquille River creel surveys-1999. ODFW Charleston, Oregon. Unpublished reports on file at ODFW Charleston, OR.

Oregon Department of Fish and Wildlife (ODFW). 2001. Oregon marine fisheries 2000 status report. Compiled by ODFW Marine Resources Program, Newport, Oregon. March.

Oregon Department of Fish and Wildlife (ODFW). 2002. Relationships Between Bank Treatment / Nearshore Development and Anadromous/ Resident Fish in the Lower Willamette River, Annual Progress Report, May 2000-June 2001.

Oregon Department of Fish and Wildlife (ODFW). 2003. Relationships Between Bank Treatment / Nearshore Development and Anadromous/ Resident Fish in the Lower Willamette River, Annual Progress Report, July 2001-June 2002.

Oregon Department of Fish and Wildlife (ODFW). 2005a. Oregon native fish status report 2005 public draft Volume I-species management unit summaries. ODFW, 3406 Cherry Avenue N.E., Salem Oregon 97303-4924.

Oregon Department of Fish and Wildlife (ODFW). 2005b. DRAFT Oregon's Nearshore Marine Resources Management Strategy. ODFW, Marine Resources Program, 2040 SE Marine Science Drive, Newport, Oregon 97365.

Oregon Department of Fish and Wildlife (ODFW). 2006. Comments submitted to Oregon Department of Energy on Resource Reports for the Jordon Cove Energy Project and for the Pacific Connector Gas Pipeline Project. September 8. Oregon Department of Energy, 625 Marion Street NE, Salem OR 97301-3737.

Oregon Department of Wildlife and Fisheries. 2006. Web site:
http://ftp.dfw.state.or.us/fish/commercial/landing_stats/2004/.

Oregon Estuary Plan Book. 1987. URL: www.inforain.org/mapsatwork/oregon estuary/.

Pacific Fishery Management Council (PFMC). 1998a. Final Environmental Assessment/Regulatory Review for Amendment 11 to the Pacific Coast Groundfish Fishery Management Plan. Pacific Fishery Management Council, Portland, Oregon, (October 1998).
http://www.pcouncil.org/groundfish/gffmp/gfall.html

Pacific Fishery Management Council (PFMC). 1998b. Appendix D - Description and Identification of EFH for the Coastal Pelagic Species FMP. Amendment 8 to the Coastal Pelagic Species FMP. December 1998. Pp. 26-38.

Pacific Fishery Management Council (PFMC). 1998c. Essential Fish Habitat - West Coast Groundfish. Modified from: Final EA/Regulatory Impact Review for Amendment 11 to the Pacific Coast Groundfish FMP. October 1998. Available: http://swr.ucsd.edu/hcd/grndfsh.pdf

Pacific Fishery Management Council (PFMC). 1999. Appendix A - Identification and Description of Essential Fish Habitat, Adverse Impacts, and Recommended Conservation Measures for Salmon. Amendment 14 to the Pacific Coast Salmon Plan. August 1999.
Available: http://www.pcouncil.org/Salmon/a14efh/efhindex.html

Pacific Fishery Management Council (PFMC). 2001. Second Draft - Fishery Management Plan and Environmental Impact Statement for U.S. West Coast-Based Fisheries for Highly Migratory Species. May 2001. Available: http://www.pcouncil.org/HMS/2draftfmp/2fmpindex.html

Pacific States Marine Fisheries Commission (PSMFC). 1996. White Sturgeon. Available:
http://www.psmfc.org/habitat/edu_wsturg_fact.html

Parfomak, P.W. 2003. Liquefied natural gas (LNG) infrastructure security: background and issues for Congress. Congressional Research Service, Library of Congress, Specialist in Science and Technology Resources, Science and Industry Division. September.

Parr, R.A. 1974. Harbor dredging and benthic fauna: a case study. M.S. thesis, Oregon State University, Corvallis, Oregon. 114 pp.

Pauly, G.B. Van Der Raay and D. Troutt. 1988. Species Profiles: Life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest): Pacific oyster.

Pauly, G.B., D.A. Armstrong, R. Van Citter and G.L. Thomas. 1989. Species Profiles: Life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest): Dungeness Crab.

Pearcy, W. G. 1962. Ecology of an estuarine population of winter flounder ***Pseudopleuronectes americanus*** (Walbaum). Bulletin of the Bingham Oceanographic Collection 18:1-78.
Pearcy, W., and S. Myers. 1974. Larval fishes of Yaquina Bay, Oregon: A nursery ground for marine fishes? Fishery Bulletin 72:201-213.

Peddicord, R.K., and V.A. McFarland. 1978. Effects of suspended dredged material on aquatic animals. Technical Report D-78-29. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS,USA.

Pennekamp, J.S., R.C. Eskamp, W.F. Rosenbrand, A. Mullie, G.L. Wessel, T. Arts and I.K. Decibel. 1996. Turbidity caused by dredging; viewed in perspective. Terra et Aqua, 64, pp.10-17.

Pennekamp, J.S. and M.P. Quaak. 1990. Impact on the environment of turbidity caused by dredging. Terra et Aqua, 42, pp.10-20.

Perdue, J.A., J.H. Beattie and L.K. Chew. 1981. Some relationships between gametogenic cycle and summer mortality phenomenon in the Pacific Oyster (***Crassostrea gigas***) in Washington State. ***J. Shellfish Res.*** 1(1):9-16.

Percy, K.L., D.A. Bella, C. Sutterlin and P.C. Klingeman. 1974. Description and information sources for Oregon estuaries. Sea Grant Coll. Prog., Oreg. State Univ., Corvallis. 294 pp.

Rheault, R.B. 2002. Eelgrass is great, but shellfish aquaculture is better. Available at http://www.ecsga.org/libraryitems/eelgrass.htm

Pitcher, T.J. 1986. Functions of shoaling in teleosts. In Fisher, T.J. (ed.), The behavior of teleost fishes, p. 294-337. Johns Hopkins Univ. Press, Baltimore, MD.

Recht, F. 1999. Yaquina and Alsea Bays are important salmon habitat. Pacific States Marine Commission, 205 SE Spokane Street, Suite 100, Portland, Oregon 97202

Reimers, P.E. and R.E. Loeffel. 1967. The length of residence of juvenile fall Chinook salmon in selected Columbia River tributaries. Fish Comm. Oreg. 13, 5-19 p.

Reimers, P.E. 1971. The movement of yearling coho salmon through Sixes River Estuary. Fish Comm. Oregon, Coastal Rivers Investigation Info. Rep. 71-2, 15 p. Oregon Department of Fish and Wildlife, P.O. Box 59, Portland, OR 97207.)

Rich, W.H. 1920. Early history and seaward migration of Chinook salmon in the Columbia and Sacramento Rivers. U.S. Bureau of Fisheries Bulletin 37:2-73.

Rich, A.A. 1997. Testimony of Alice A. Rich, Ph.D., regarding water rights applications for the Delta Wetlands Project, proposed by Delta Wetlands Properties for Water Storage on Webb Tract, Bacon Island, Bouldin Island, and Holland Tract in Contra Costa and San Joaquin Counties. July. Calif. Dept. of Fish and Game Exhibit DFG-7. Submitted to State Water Resources Control Board.

Richardson, S. 1973. Abundance and distribution of larval fishes in waters off Oregon, May-October 1969, with special emphasis on the northern anchovy, ***Engraulis mordax***. Fishery Bulletin 71:697-711.

Richardson, S., and W. Pearcy. 1977. Coastal and oceanic fish larvae in an area of upwelling off Yaquina Bay, Oregon. Fishery Bulletin 75:125-145.

Rien, T.A. and R.P. Beamesderfer. 1994. Accuracy and precision of white sturgeon age estimates from pectoral fin rays. Transactions of the American Fisheries Society 123:255-265, 1994.

Rien, T.A., R.P. Beamesderfer and C.A. Foster. 1994. Retention, recognition, and effects on survival of several tags and marks for white sturgeon. California Fish and Game 80:161-170.

Rien, T.A., L.C. Burner, R.A. Farr, M.D. Howell and J.A. North. 2001. Green Sturgeon Population Characteristics In Oregon. Oregon Department of Fish and Wildlife 17330 Southeast Evelyn Street Clackamas, OR 97015. Project Number: F-178-R.

Robinson, A.M. and W.P. Breese. 1982. The spawning season of four species of clams in Oregon. ***J. Shellfish Res***. 2(1):55-57

Rosenkeeter, J., K. Dugi and C. Ide. 1970. Coos Bay estuary report, Area A-1. Unpublished data, Oregon Institute of Marine Biology, University of Oregon, Charleston, Oregon.

Salo, E.O. 1991. Life history of chum salmon (***Oncorhynchus keta***) Pages 231-309 in Groot. C. and L. Margolis (eds.). 1991 Pacific salmon life histories. Vancouver, British Columbia.

Sandercock, F.K. 1991. Life history of coho salmon (Oncorhynchus kisutch). Pages 395-446 in Groot and Margolis (ed). Pacific Salmon Life Histories. UBC Press, Vancouver, Canada

Sanders, G. 1985. Summary of age, sex, run timing, and length-weight characteristics of Alaska steelhead, p. 29-49. In Alaska Dep. Fish Game, Alaska Steelhead Workshop 1985, unpubl. manuscr., 134 p. (Available from Environmental and Technical Services Division, National Marine Fisheries Service, 525 N.E. Oregon Street, Suite 500, Portland, OR 97232.)

Sayce, C.D. and D.F. Tufts. 1972. The effects of high water temperature on the razor clam, ***Siliqua patula*** (Dixon). ***Proc. Natl. Shellfish. Assoc.*** 62:31-34

Schlosser, S. and J. Bloeser. 2006. The collaborative study of juvenile rockfish, cabezon, and kelp greenling habitat associations between Morro Bay, California and Newport, Oregon. February. Final Report to: Pacific States Marine Fisheries Commission Summarizing data for 2003, 2004, and 2005.

Strathmann, M.F. 1987. Reproduction and Development of Marine Invertebrates of the Northern Pacific Coast. University of Washington Press, United States.

Schreck, C.B., H.W. Li, R.C. Hjort and C.S. Sharpe. 1986. Stock identification of Columbia River Chinook salmon and steelhead trout. Final Report to Bonneville Power Administration, Contract DE-A179-83BP13499, Project 83-451, 184 p. (Available from Bonneville Power Administration, P.O. Box 351, Portland, OR 97208).

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Bull. Fish. Res. Board Can. 966p.

Sedell, J.R. and K.J. Luchessa. 1982. Using the historical record as an aid to salmonid habitat enhancement. In Armantrout, N.B. (ed.), Acquisition and utilization of aquatic habitat inventory information, p. 210-222. American Fisheries Society, Western Division, Bethesda, MD.

Sedell, J.R. and J.L. Frogatt. 1984. Importance of streamside forests to large rivers – the isolation of the Willamette River, Oregon, USA, from its floodplain by snagging and streamside forest removal:

International Vereinigung fuer Theoretische und Angewandte Limnologie Verhandlugen, v. 22, P. 1828-1834.

Seymour, A.H. 1956. Effects of temperature upon young Chinook salmon. PhD dissertation, University of Washington, Seattle, Washington.

Shapovalov L. and A.C. Taft. 1954. The life histories of steelhead rainbow trout (***Salmo Gairdneri gairdneri***) and silver salmon (***Oncorhynchus kisutch***) with special reference to Waddel Creek, California, and recommendations regarding their management. Calif. Dep. Fish Game, Fish Bull. 98, 375 p.

SHN Consulting Engineers & Geologists, Inc. 2006a. Sediment sampling and analysis plan, Jordon Cove, Coos Bay, Oregon. SHN 365 N. 4th Street, Coos Bay, OR.

SHN Consulting Engineers & Geologists, Inc. 2006b. Botanical Resources Assessment Report, Jordan Cove Energy Project Coos County, Oregon. SHN 365 N. 4th Street, Coos bay, OR. March.

Simenstad, C.A., K.L. Fresh, and E.O. Salo. 1982. The role of Puget Sound and Washington coastal estuaries in the life history of Pacific salmon: An unappreciated function. Pp. 343-364 in V.S. Kennedy (ed.) Estuarine Comparisons. Academic Press, New York. 709 pp.

Slotta, L.S., C.K. Sollitt, D.A. Bella, D.H. Hancock, J.E. McCauley and R. Parr. 1973. Effects of hopper dredging and in-channel spoiling in Coos Bay, Oregon. Oregon State University, Corvallis. 147 pp.

Smith, P.E. 1985. Year class strength and survival of O-group clupeoids. ***In*** proceedings of the symposium on the biological characteristics of herring and their implications for management, pp 69-82. Ed. By J.R. Brett, Canadian Journal of Fisheries and Aquatic Sciences: 42(Suppl. I): 1-278.

Sorenson, D.L., M.M. McCarthy, E.J. Middlebrooks and D.B. Porcella. 1977. Suspended and dissolved solids effects on freshwater biota. EPA-600/3-77-042. U.S. Environmental Protection Agency, Corvallis, OR.

Steneck R.S., M.H. Graham, B.J. Bourque, D. Corbett, J.M. Erlandson, J.A. Estes and M.J. Tegner. 2002. Kelp forest ecosystems: biodiversity, stability, resilience and future. Environmental Conservation.

Stevens, Thompson and Runyan, Inc. (STR). 1974. Coos-Curry environmental protection program: Vol 1-water resources management plan; Vol 2-Technical appendix. Coos-Curry Council of Governments. Coos Bay.

Sulkin, S.D. and G. McKeen. 1994. Influence of temperature on larval development of four co-occurring species of the Brachyuran genus ***Cancer***. ***Mar. Bio.*** 118(4):593-600

Sumner, F.H. 1972. A contribution to the life history of the cutthroat trout in Oregon with emphasis on the coastal subspecies, ***Salmo clarki clarki Richardson***. Oregon State Game Comm., Corvallis, OR 142 p.

Seymour, A.H. 1956. Effects of temperature upon young Chinook salmon. PhD dissertation, University of Washington, Seattle, Washington.

Taylor, E.B. 1990a. Environmental correlates of life-history variation in juvenile Chinook salmon, Oncorhynchus tshawytscha (Walbaum). J. Fish Biol. 37:1-17.

Taylor, E.B. 1990b. Phenotypic correlates of life-history variation in juvenile Chinook salmon Oncorhynchus tshawytscha. J. Anim. Ecol. 59:455-468.

Thayer, G.W., W.J. Kenworthy and M.S. Fonseca. 1984. The ecology of seagrass meadows of the Atlantic Coast: A community profile. U. S. Fish and Wildlife Service, FWS/OBS-84/02. 147 pp.

Trotter, P.C. 1989. Coastal cutthroat trout: a life history compendium. Transactions of the American Fisheries Society 118: 463-473.

U.S. Army Corps of Engineers (USACE). 1975. Coos Bay, Oregon, deep draft navigation project: environmental impact statement, draft supplement. Portland District. Vol. I and II.

U.S. Army Corps of Engineers (USACE). 1998. Coos Bay sediment evaluation report. NR: NR.

U.S. Army Corps of Engineers (USACE). 1999. Coos Bay sediment evaluation report. NR: NR.

U.S. Army Corps of Engineers Engineer Research and Development Center (ERDC). 2000. Assessment of potential impacts of dredging operations due to sediment resuspension. USACE ERDC TN-DOER-E9. May.

U.S. Army Corps of Engineers (USACE). 2005. Coos Bay sediment quality evaluation report. NR: NR. https//www.nwp.usace.army.mil/ec/h/hr/Reports/Coos_Bay/CoosBat-2004.pdf.

U.S. Fish and Wildlife Service (USFWS). 2006. Letter to FERC regarding review of draft Resource Reports for the construction, operation, and maintenance of the Jordon Cove Energy Project (JCEP) liquefied natural gas (LNG) import terminal on the North Spit of Coos Bay, Oregon; (FERC Docket Nos. PF06-25-000 and PF06-26-000). FERC 888 First Street, N.E., Room 1A, Washington D.C. 20426.

Vronskiy, B.B. 1972. Reproductive biology of the Kamchatka River Chinook salmon (***Oncorhychus tshawytscha*** (Walbaum)). J. Ichthyol. 12:259-273.

Wagoner, L.J., K.K. Jones, R.E. Bender, J.A. Butler, D.E. Demory, T.F. Gaumer, J.A. Hurtado, W.G. Mullarky, P.E. Reimers, N.T. Richmond and T.J. Rumreich. 1990. Coos River Fish Management Plan. Oregon Department of Fish and Wildlife.

Ward, D.L. (ed.). 1992. Effects of waterway development on anadromous and resident fish in Portland Harbor. Final Research Report. Oregon Department of Fish and Wildlife. Funded by Port of Portland. 92 pp.

Ward, D.L., P.J. Connolly, R.A. Farr and A.A. Nigro. 1988. Feasibility of evaluating the impacts of waterway development on anadromous and resident fish in Portland Harbor. Annual Progress Report. Fish Research Project. Oregon Department of Fish and Wildlife, Portland, Oregon. 58 pp.

Ward, D.L. and R.A. Farr. 1989. Effects of waterway development on anadromous and resident fish in Portland Harbor. Annual Progress Report. Fish Research Project. Oregon Department of Fish and Wildlife, Portland, Oregon. 16 pp.

Ward, D.L. and R.A. Farr. 1990. Effects of waterway development on anadromous and resident fish in Portland Harbor. Annual Progress Report. Fish Research Project. Oregon Department of Fish and Wildlife, Portland, Oregon. 13 pp.

Ward, D.L. and R.A. Farr. 1991. Effects of waterway development on anadromous and resident fish in Portland Harbor. Annual Progress Report. Fish Research Project. Oregon Department of Fish and Wildlife, Portland, Oregon. 12 pp.

Ward, D.L. and A.A. Nigro. 1992. Differences in fish assemblages among habitats found in the lower Willamette River, Oregon: application of and problems with multivariate analysis. Fisheries Research. 13:119-132.

Ward, D.L., A.A. Nigro, R.A. Farr and C.J. Knutsen. 1994. Influence of waterway development on migrational characteristics of juvenile salmonids in the lower Willamette River, Oregon. North American Journal of Fisheries Management 14: 362-371.

Weitkamp, L.A., T.C. Wainwright, G.J. Bryant, G.B. Milner, D. J. Teel, R.G. Kope, and R.S. Waples. 1995. Status Review of Coho Salmon from Washington, Oregon, and California NOAA Technical Memorandum NMFS-NWFSC-24 September 1995. NOAA.

Wilsey and Ham. 1974. Estuarine resources of the Oregon Coast. A natural resource inventory report to the Oregon Coastal Conservation and Development Commission. 233 pp.

Withler, I. L. 1966. Variability in life history characteristics of steelhead trout (Salmo gairdneri) along the Pacific coast of North America. J. Fish. Res. Board Can. 23(3):365-393.

Wood , E.F., W.E. Odum, and J.C. Zieman. 1969. Influence of sea grasses on the productivity of coastal lagoons. pp. 495-502. ***In***, A. Ayala Castanares and F. B. Phleger, Eds. ***Coastal Lagoons***. Universidad Nacional Autonoma de Mexico, Ciudad Universitaria, Mexico, D. F.

Appendix A

Fish Captured in Coos Bay by ODFW, 1996 – 2000

Appendix A.

Fish species captured by ODFW in Coos Bay system during 1996-2000 seining surveys (ODFW).

Common Name	Scientific Name
American shad	***Alosa sapidissima***
Arrow goby	***Clevelandia ios***
Bay goby	***Lepidogobius lepidus***
Bay pipefish	***Syngnathus griseolineatus***
Black rockfish	***Sebastes melanops***
Bocaccio	***Sebastes paucispinis***
Brown rockfish	***Sebastes auriculatus***
Buffalo sculpin	***Enophrys bison***
Cabezon	***Scorpaenichthys marmoratus***
Chinook salmon	***Oncorhynchus tshawytscha***
Coast range sculpin	***Cottus aleuticus***
Coho salmon	***Oncorhynchus kisutch***
Copper rockfish	***Sebastes caurinus***
Crescent gunnel	***Pholis laeta***
Cutthroat trout	***Oncorhynchus clarki clarki***
English sole	***Parophrys vetulus***
Fluffy sculpin	***Oligocottus snyderi***
High cockscomb	***Anoplarchus purpurescens***
Jack smelt	***Atherinopsis californiensis***
Kelp greenling	***Hexagrammos decagrammus***
Largescale sucker	***Catostomus macrocheilus***
Lingcod	***Ophiodon elongatus***
Longnose dace	***Rhinichthys cataractae***
Northern anchovy	***Engraulis mordax***
Pacific herring	***Clupea harengus pallasi***
Pacific lamprey	***Entosphenus tridentatus***
Pacific sand lance	***Ammodytes hexapterus***
Pacific sardine	***Sardinops sagax***
Pacific staghorn sculpin	***Leptocottus armatus***
Pacific tomcod	***Microgadus proximus***
Pile perch	***Rhacochilus vacca***
Pinpoint gunnel	***Apodichthys flavidus***
Prickly sculpin	***Cottus asper***
Rainbow (steelhead) trout	***Oncorhynchus mykiss***
Red Irish Lord	***Hemilepidotus hemilepidotus***
Redside shiner	***Richardsonius balteatus***
Rex sole	Glyptocephalus zachirus
Rock greenling	Hexagrammos lagocephalus
Rockweed gunnel	***Xererpes fucorum***
Saddleback gunnel	***Pholis ornata***

Sand sole	***Psettichthys melanostictus***
Shiner perch	***Cymatogaster aggregata***
Silver surf perch	***Hyperprosopon allipticum***
Speckled dace	***Rhinichthys osculus***
Speckled sanddab	***Citharichthys stigmaeus***
Starry flounder	***Platichthys stellatus***
Striped bass	***Morone saxatilis***
Striped perch	***Embiotoca lateralis***
Surf smelt	***Hypomesus pretiosus***
Threespine stickleback	***Gasterosteus aculeatus***
Topsmelt	***Atherinops affinis***
Tube-snout	***Aulorhynchus flavidus***
Walleye perch	***Hyperprosopon argenteum***
White bait smelt	***Aliosmerus elongatus***
White perch	***Phanerodon furcatus***

Appendix B

Catch of Juvenile Chinook Salmon by ODFW, 1978 – 2000

Appendix B.

Catch of juvenile Chinook salmon during recruitment surveys in the Coos River system 1978-2000 (ODFW).

	Millicoma River			South Coos River			Combined		
Year	Seine hauls	Catch	C/E[b]	Seine hauls	Catch	C/E[b]	Seine hauls	Catch	**C/E[b]**
1978	10	157	15.7	15	182	12.1	15	339	13.6
1979	20	337	16.9	24	266	11.1	44	608	13.7
1980	25	685	27.4	27	563	20.9	52	1248	24.8
1981	20	212	10.5	24	106	4.4	44	318	7.2
1982	30	250	8.3	42	441	10.5	72	691	9.5
1983	30	655	21.8	42	879	20.9	72	1534	21.3
1984	29	473	16.3	42	492	11.7	71	965	13.6
1985	29	945	32.5	42	1,120	26.7	71	2065	29.1
1986	30	437	14.6	40	235	5.9	70	672	9.6
1987	30	426	14.2	41	596	14.5	71	1022	14.4
1988	20	974	48.7	28	1,916	68.4	48	2,390[c]	60.2
1989		No sampling effort in May or June							
1990		No sampling effort in May or June							
1991	30	1,454	48.5	42	1,057	25.2	72	2,511[c]	34.9
1992	30	774	25.8	42	702	16.7	72	1,476[c]	20.5
1993	27	726	26.9	42	1,371	32.6	69	2,097[c]	30.4
1994	30	909	30.3	39	654	16.8	69	1,563[d]	22.7
1995		No sampling effort in May or June							
1996	29	282	9.7	41	527	12.9	70	809[d]	11.6
1997	30	358	11.9	42	179	4.3	72	537[d]	7.5
1998	30	842	28.1	42	1,725	41.1	72	2,567[d]	35.7
1999	29	346	11.9	42	202	4.8	71	548[d]	7.7
2000	30	467	15.6	42	257	6.1	72	724	10.1
Mean C/E 1978-2000			17.7			13.3			15.2

[a] Includes all seine hauls made between May 1 and August 1.

[b] Catch-per-seine haul.

[c] Includes marked and unmarked hatchery fish. All hatchery fish were marked and excluded from catch prior to 1988. Only a small percentage of the hatchery fish were marked in 1988, 1991, 1992, and 1993.

[d] Estimated hatchery component removed from catch data.

Appendix C

Catch of Cuthroat by ODFW, 1978 – 2000

Appendix C.

Catch of Cutthroat Trout by ODFW, 1978-2000 (ODFW).										
Millicoma River					South Coos River				Combined	
Year	Seine hauls	catch 100-200 mm	catch >200 mm	C/E	Seine hauls	catch 100-200 mm	catch >200 mm	C/E	Seine hauls	catch 100-200 mm
1978	48	9	4	0.27	52	1	0	0.02	100	10
1979	36	11	9	0.56	40	7	4	0.28	76	18
1980	53	11	3	0.26	59	8	4	0.20	112	19
1981	40	5	2	0.18	52	2	1	0.06	92	7
1982	51	11	4	0.29	70	3	2	0.07	121	14
1983	55	9	10	0.35	84	8	3	0.13	139	17
1984	52	19	4	0.44	77	10	6	0.21	129	29
1985	54	8	3	0.20	84	6	6	0.14	138	14
1986	50	8	0	0.16	68	2	3	0.07	118	10
1987	50	6	6	0.24	67	1	1	0.03	117	7
1988	44	4	2	0.14	63	3	4	0.11	107	7
1989	36	8	4	0.33	57	1	0	0.02	93	9
1990	27	2	6	0.30	45	1	1	0.04	72	3
1991	54	14	11	0.46	90	10	1	0.12	144	24
1992	55	33	5	0.67	77	3	1	0.05	132	36
1993	49	37	28	1.33	78	9	4	0.17	129	46
1994	50	10	3	0.26	66	1	2	0.05	116	11
1995	Limited sampling effort									
1996	70	28	1	0.41	68	7	1	0.12	138	35
1997	70	12	4	0.23	70	3	0	0.04	140	15
1998	60	15	13	0.47	70	10	2	0.17	130	25
1999	55	6	2	0.15	70	9	4	0.19	125	15
2000	50	9	1	0.20	70	3	1	0.60	120	12
Mean C/E 1978-2000				0.37				0.11		

Appendix D

ODFW Estimated Recruitment of Striped Bass, 1978 – 2000

Appendix D.

Estimated recruitment of naturally produced young-of-the-year striped bass in the Coos River system and releases of hatchery young-of-the-year and yearling striped bass, 1978-2000 (hatchery releases were made in August or September for fingerlings and May or June for yearlings; ODFW).

Seine hauls	Catch
46	133
42	6
49	0
60	0
60	13
60	18
58	19
60	4
60	7
58	3
59	165 (2 wild)[c]
59	252 (5 wild)[c]
60	42 (9 wild)[c]
60	60 (0 wild)[c]
72	0
59	26 (3 wild)[c]
59	34 (4 wild)[c]
49	92 (17 wild)[c]
60	18 (6 wild)[c]
60	500 (13 wild)[c]
60	115 (10 wild)[c]
60	102 (2 wild)[c]
60	20 (2 wild)[c]

[a] Actual population estimates using Peterson mark-recapture method.
[b] An additional 200,000 unfed fry were released into Catching Slough with no apparent success.
[c] The 1988-97 and 1999-2000 catches were influenced by marked and/or unmarked hatchery fish. All hatchery fish were marked and excluded from the catch prior to 1988.
[d] Only 1 unmarked (wild) fish was sampled after the release of marked hatchery fish on August 15. Sample size was not large enough to compute a point estimate.
[e] Only 1 unmarked (wild) fish was sampled before the release of marked hatchery fish on August 17. Sample size was not large enough to compute a point estimate.

Appendix E

Catch of Juvenile American Schad by ODFW, 1978 – 2000

Appendix E.

Catch of juvenile American shad during recruitment surveys in the Coos River system 1978-2000 (ODFW).

	Millicoma River			South Coos River			Combined		
Year	Seine hauls	Catch	C/E	Seine hauls	Catch	C/E	Seine hauls	Catch	C/E
1978	23	1,713	74.48	23	3,169	137.78	46	4,882	106.00
1979	21	2,065	98.33	21	3,707	176.52	42	5,772	137.00
1980	23	1,907	82.91	26	7,519	289.19	49	9,426	192.00
1981	25	1,913	76.52	35	8,551	244.31	60	10,464	174.00
1982	25	784	31.36	35	2,297	65.63	60	3,081	51.40
1983	25	650	26.00	35	5,378	153.66	60	6,028	100.00
1984	23	1,950	84.78	35	9,270	264.86	58	11,220	193.00
1985	25	2,159	86.36	35	8,724	249.26	60	10,883	181.00
1986	25	1,858	74.32	35	8,132	232.34	60	9,990	167.00
1987	25	1,131	45.24	33	7,065	214.09	58	8,196	141.00
1988	24	3,445	144.00	35	8,504	242.97	59	11,949	203.00
1989	29	1,015	35.00	42	6,687	159.21	71	7,702	108.00
1990	25	4,995	200.00	35	10,463	298.94	60	15,458	258.00
1991	25	2,233	89.32	35	8,207	234.49	60	10,440	174.00
1992	30	1,314	43.8[b]	42	4,947	118[b]	72	6,261	87[b]
1993	25	1,073	42.92	34	6,419	188.79	59	7,492	126.98
1994	25	3,410	136.40	34	7,929	233.21	59	11,339	192.19
1995	20	1,475	73.75	29	8,298	286.14	49	9,773	199.45
1996	25	3,670	146.80	35	6,072	173.49	60	9,742	162.37
1997	25	3,214	128.60	35	4,291	122.60	60	7,505	125.08
1998	25	2,591	103.60	35	3,701	105.74	60	6,292	104.87
1999	25	1,592	63.68	35	6,556	187.31	60	8,148	135.80
2000	15	461	30.70	23	868	37.70	38	1329	35.00
Mean C/E 1978-2000									156.79

[a] Includes all seine hauls made between July 20 and October 1, except for 1992.

[b] Includes all seine hauls made between July 15 and October 1 because of exceptionally warm conditions in May and June, 1992.

Appendix F

Groundfish Managed by the PFMC

Appendix F.

Groundfish species managed by the Pacific Fishery Management Council.

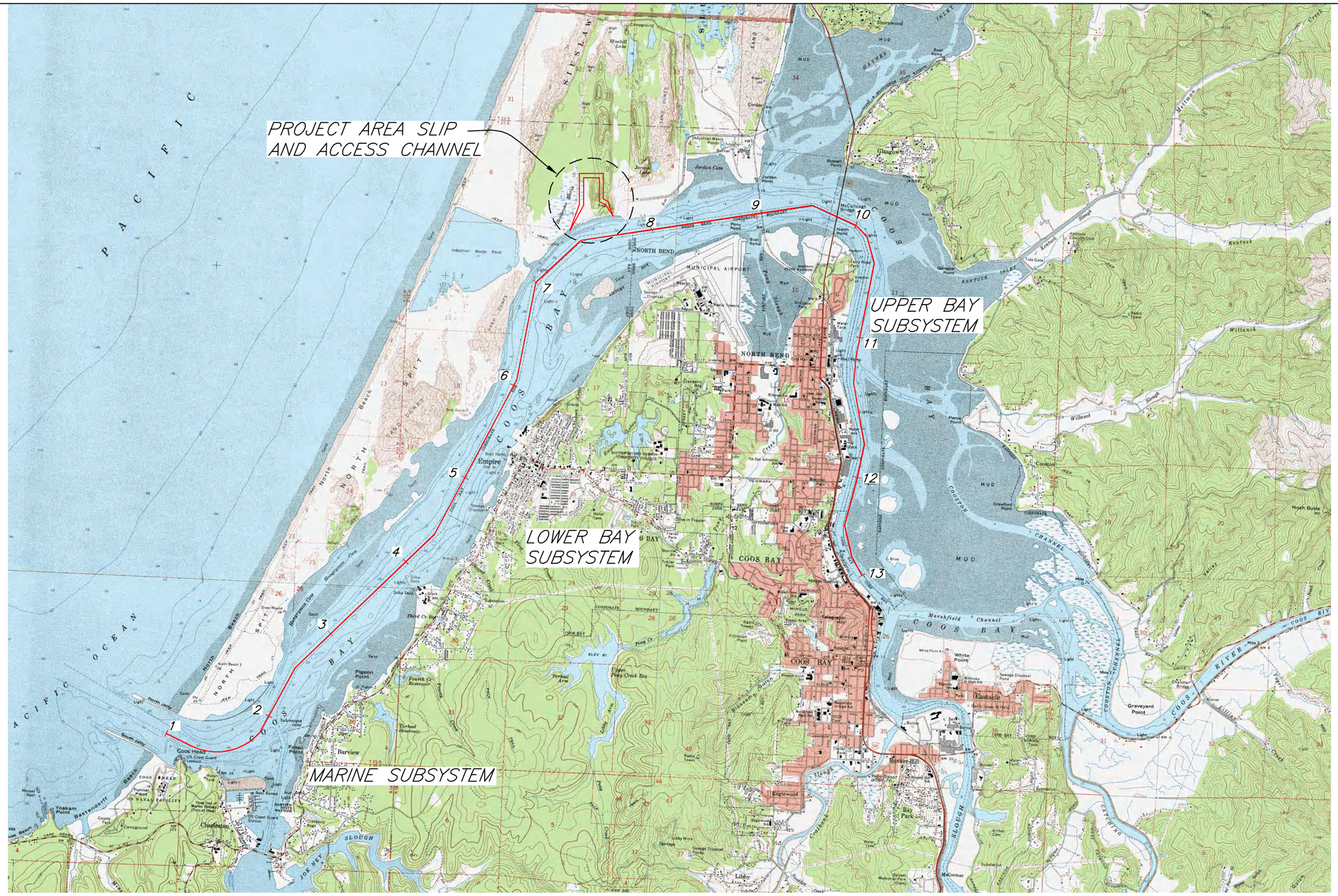
Butter sole (***Isopsetta isolepis)***
Flag rockfish (***Sebastes rubrivinctus)***
Curlfin sole (***Pleuronichthys decurrens)***
Gopher rockfish (***Sebastes carnatus)***
Dover sole (***Microstomus pacificus)***
Grass rockfish (***Sebastes rastrelliger)***
English sole (***Parophrys vetulus)***
Greenblotched rockfish (***Sebastes)***
Flathead sole (***Hippoglossoides elassodon)***
Greenspotted rockfish (***Sebastes chlorostictus)***
Pacific sanddab (***Citharichthys)***
Greenstriped rockfish (***Sebastes elongatus)***
Petrale sole (***Eopsetta jordani)***
Harlequin rockfish (***Sebastes variegatus)***
Rex sole (***Glyptocephalus zachirus)***
Honeycomb rockfish (***Sebastes umbrosus)***
Rock sole (***Lepidopsetta bilineata)***
Kelp rockfish (***Sebastes atrovirens)***
Sand sole (***Psettichthys melanostictus)***
Mexican rockfish (***Sebastes macdonaldi)***
Starry flounder (***Platichthys stellatus)***
Olive rockfish (***Sebastes)***
Arrowtooth flounder (***Atheresthes stomias)***
Pink rockfish (***Sebastes eos)***
Ratfish (***Hydrolagus colliei)***
Quillback rockfish ***(Sebastes maliger)***
Finescale codling (***Antimora microlepis)***
Redbanded rockfish (***Sebastes)***
Pacific rattail (***Coryphaenoides acrolepis)***
Redstripe rockfish (***Sebastes)***
Leopard shark (***Triakis semifasciata)***
Rosethorn rockfish (***Sebastes helvomaculatus)***
Soupfin shark (***Galeorhinus zyopterus)***
Rosy rockfish (***Sebastes rosaceus)***
Spiny dogfish (***Squalus acanthias)***
Rougheye rockfish (***Sebastes)***
Big skate (***Raja binoculata)***
Sharpchin rockfish ***(Sebastes)***
Longnose skate (***Raja rhina)***
California Skate (***Raja inornata)***
Shortraker rockfish (***Sebastes borealis)***
Pacific ocean perch (***Sebastes alutus)***

Silvergrey rockfish (***Sebastes)***
Shortbelly rockfish (***Sebastes jordani)***
Speckled rockfish (***Sebastes ovalis)***
Widow rockfish (***Sebastes entomelas)***
Groundfish species managed by the Pacific Fishery Management Council, continued.

Splitnose rockfish ***(Sebastes diploproa)***
Aurora rockfish (***Sebastes aurora)***
Squarespot rockfish ***(Sebastes hopkinsi)***
Bank rockfish ***(Sebastes rufus)***
Starry rockfish ***(Sebastes constellatus)***
Black rockfish (***Sebastes melanops)***
Stripetail rockfish (***Sebastes saxicola***
Black-and-yellow rockfish (***Sebastes chrysomelas)***
Tiger rockfish ***(Sebastes nigrocinctus)***
Blackgill rockfish (***Sebastes melanostomus)***
Treefish ***(Sebastes serriceps)***
Blue rockfish (***Sebastes mystinus)***
Vermilion rockfish (***Sebastes)***
Bocaccio (***Sebastes paucispinis)***
Yelloweye rockfish (***Sebastes ruberrimus)***
Bronzespotted rockfish (***Sebastes gilli)***
Yellowmouth rockfish (***Sebastes reedi)***
Brown rockfish (***Sebastes auriculatus)***
Yellowtail rockfish (***Sebastes flavidus)***
Calico rockfish (***Sebastes dallii)***
Longspine Thornyhead (***Sebastolobus altivelis)***
California rockfish (***Scorpena guttatta)***
Shortspine Thornyhead (***Sebastolobus alascanus)***
Canary rockfish (***Sebastes pinniger)***
Cabezon (***Scorpaenichthys marmoratus)***
Chilipepper (***Sebastes goodei)***
Kelp greenling ***(Hexagrammos decagrammus)***
China rockfish (***Sebastes nebulosus)***
Lingcod (***Ophiodon elongatus)***
Copper rockfish (***Sebastes caurinus)***
Pacific cod (***Gadus macrocephalus)***
Cowcod rockfish (***Sebastes levis)***
Pacific whiting (***Merluccius productus)***
Darkblotched rockfish (***Sebastes crameri)***
Sablefish (***Anoplopoma fimbria)***
Dusky rockfish (***Sebastes ciliatus***)

Appendix G

Figures 1-12


PROJECT AREA SLIP
AND ACCESS CHANNEL
UPPER BAY
SUBSYSTEM
LOWER BAY
SUBSYSTEM
MARINE SUBSYSTEM
1
2
3
4
5
6
7
8
9
10
11
12
13
PACIFIC OCEAN
COOS BAY
NORTH BEND
MUNICIPAL AIRPORT
Empire
Coos Head
Barview
Charleston
Yoakam Point
Bastendorff
Pigeon Point
Jordan Cove
Glasgow
Shorewood
Haynes Inlet
Kentuck Inlet
Pierce Point
Cooston
Graveyard Point
Eastside
Bunker Hill
Englewood
Bay Park
Libby
Empire Lakes
Jordan Pond
Pony Point
Russell Point
North Point
Gregorio Point
White Point
Crawford Point
Noah Butte
Coos River
Willanch Slough
Kentuck Slough
Marshfield Channel
Coos Bay Channel
Coquille River
Catching Slough
Joe Ney Slough
Haynes Slough
Isthmus Slough
Millicoma River
Glasgow Inlet
Kentuck Inlet
Kentuck Cemetery Cliff
Tide Gate
Coos Head US Coast Guard Lookout
Coos Bay Range Front Light
Coos Bay Range Rear Light
Coos Bay Entrance Range Front Light
Coos Bay Entrance Range Rear Light
Coos Bay Light
Coos Bay Jetty Light
North Jetty
South Jetty
Submerged Jetty
Spit
North Spit
North Beach
Sand Dunes
Mussel Reef
Cape Arago
Simpson Reef
Seven Devils Rocks
Hospital
Post Office
Library
Water Tank
Radio Towers
Sewage Disposal
Boat Ramp
Campground
Trailer Park
Golf Course
Cemetery
Substation
Fire Station
Coos Bay Public Library
Coos Bay Post Office
Coos Bay Water Tank
Coos Bay Radio Towers
Coos Bay Sewage Disposal
Coos Bay Boat Ramp
Coos Bay Trailer Park
Coos Bay Golf Course
Coos Bay Cemetery
Coos Bay Substation
Coos Bay Fire Station
Coos Bay Hospital
Coos Bay Post Office
Coos Bay Library

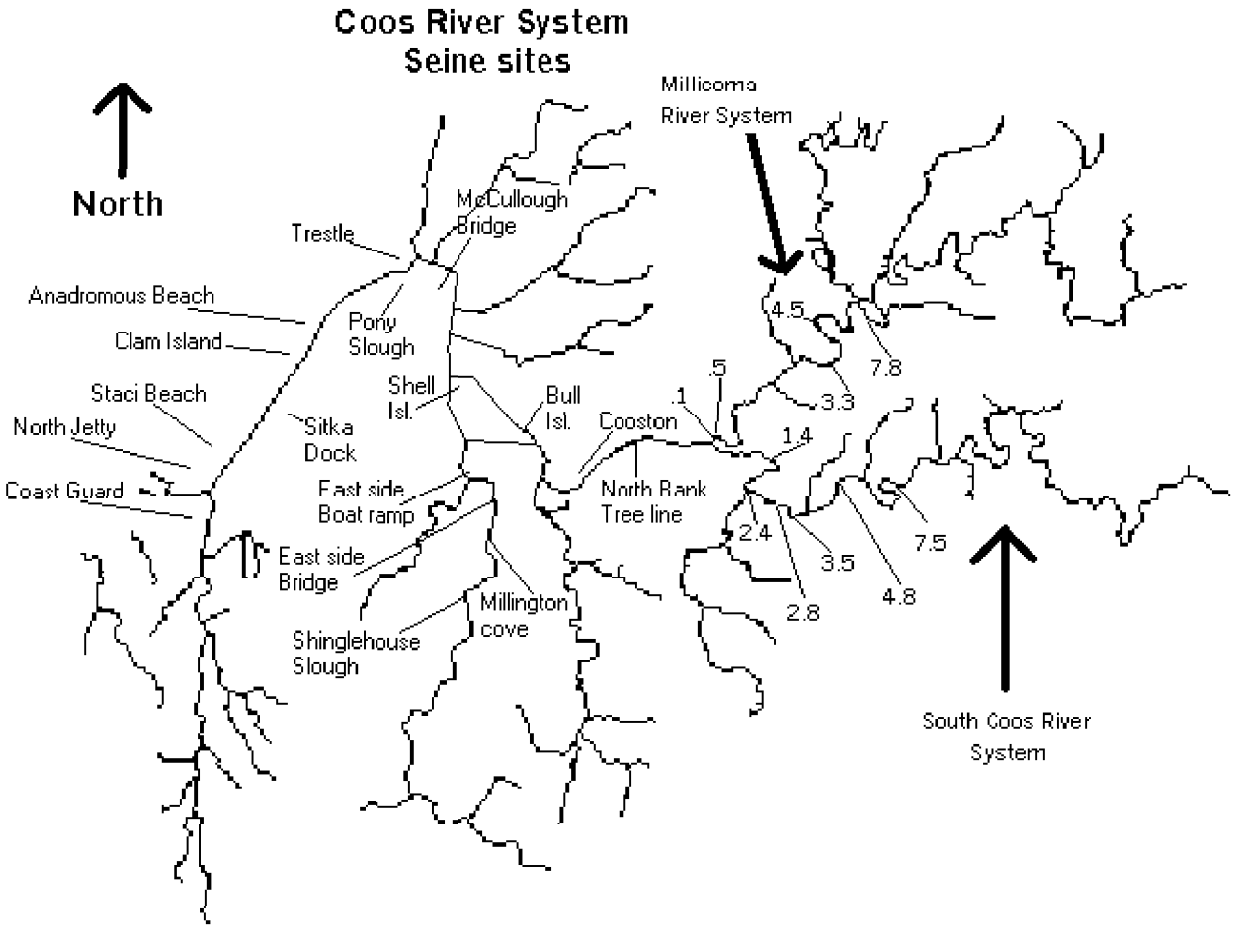
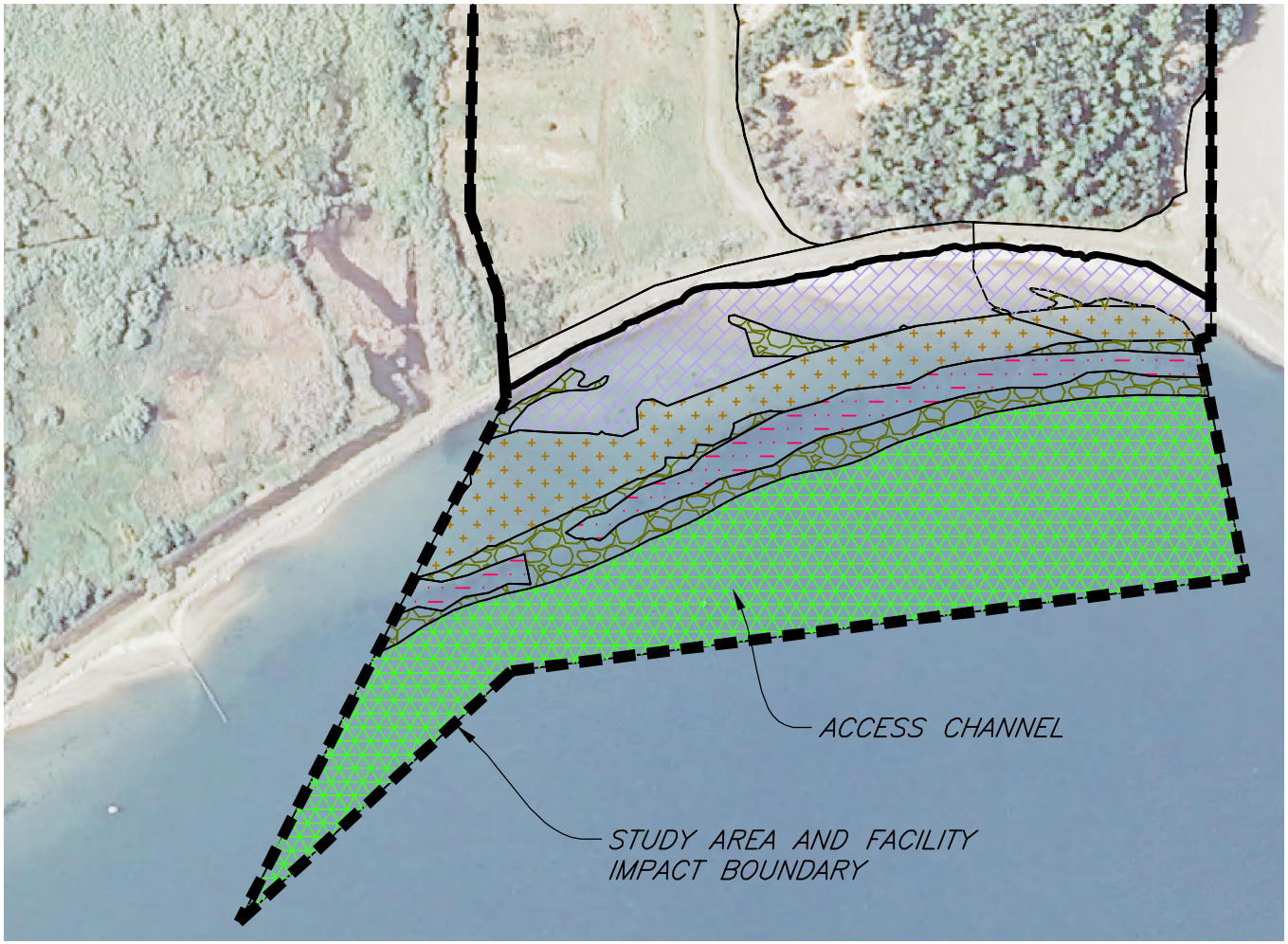


Figure 2. ODFW Seining Locations (ODFW 2005).



EXPLANATION

- INTERTIDAL UNVEGETATED SAND
- ALGAE/MUD/SAND
- EELGRASS
- SHALLOW SUBTIDAL
- DEEP SUBTIDAL

IMPACT ACREAGE	
HABITAT	ACRES
INTERTIDAL UNVEGETATED SAND	4.0
ALGAE/MUD/SAND	4.1
EELGRASS	2.5
SHALLOW SUBTIDAL	3.2
DEEP SUBTIDAL	15.4

IMAGE SOURCE: 2011 NATIONAL AGRICULTURAL IMAGERY PROGRAM
DATA SOURCE: DAVID EVANS AND ASSOCIATES, INC JCEP
ODFW HABITAT (11/20/2012)

NOTE:

THIS FIGURE HAS BEEN REVISED BASED ON THE 2012 JCEP LNG TERMINAL DESIGN AND HABITAT MAPPING OF THE SUBMERGED AQUATIC VEGETATION (SAV) AND ASSOCIATED ESTUARINE HABITAT IN THE SLIP AND ACCESS CHANNEL.

N

1"=400'

0 400

Consulting Engineers & Geologists, Inc.

Jordan Cove Energy Project
Fisheries Report
Coos County, Oregon

Habitat Types in the
Proposed LNG Terminal
SHN 611048.131

Revised January 2013 | 611048HABITAT | Figure 3

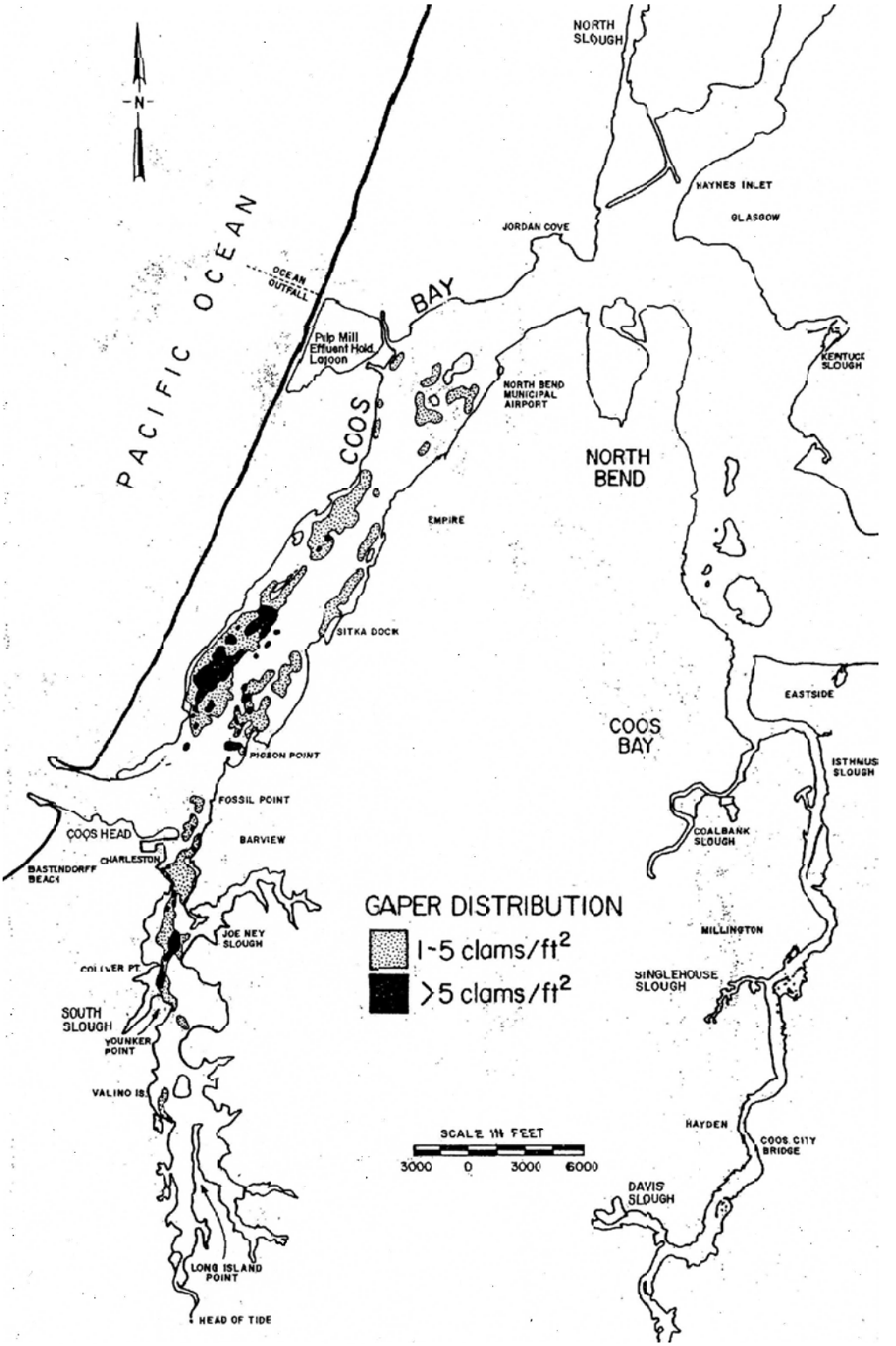


Figure 4. Gaper Distribution in Coos Bay (Gaumer et al. 1978).

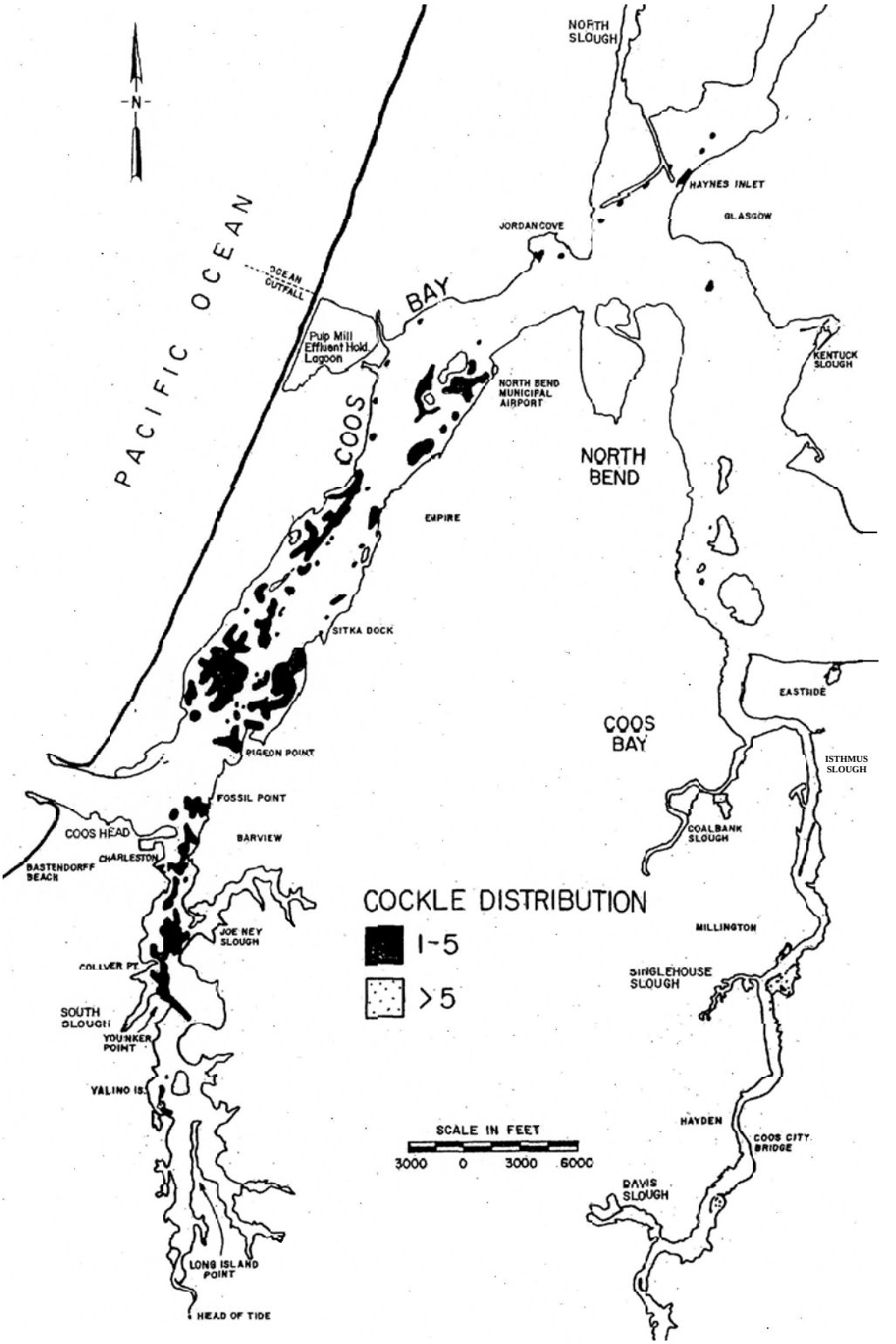


Figure 5. Cockle Distribution in Coos Bay (Gaumer et al. 1978).

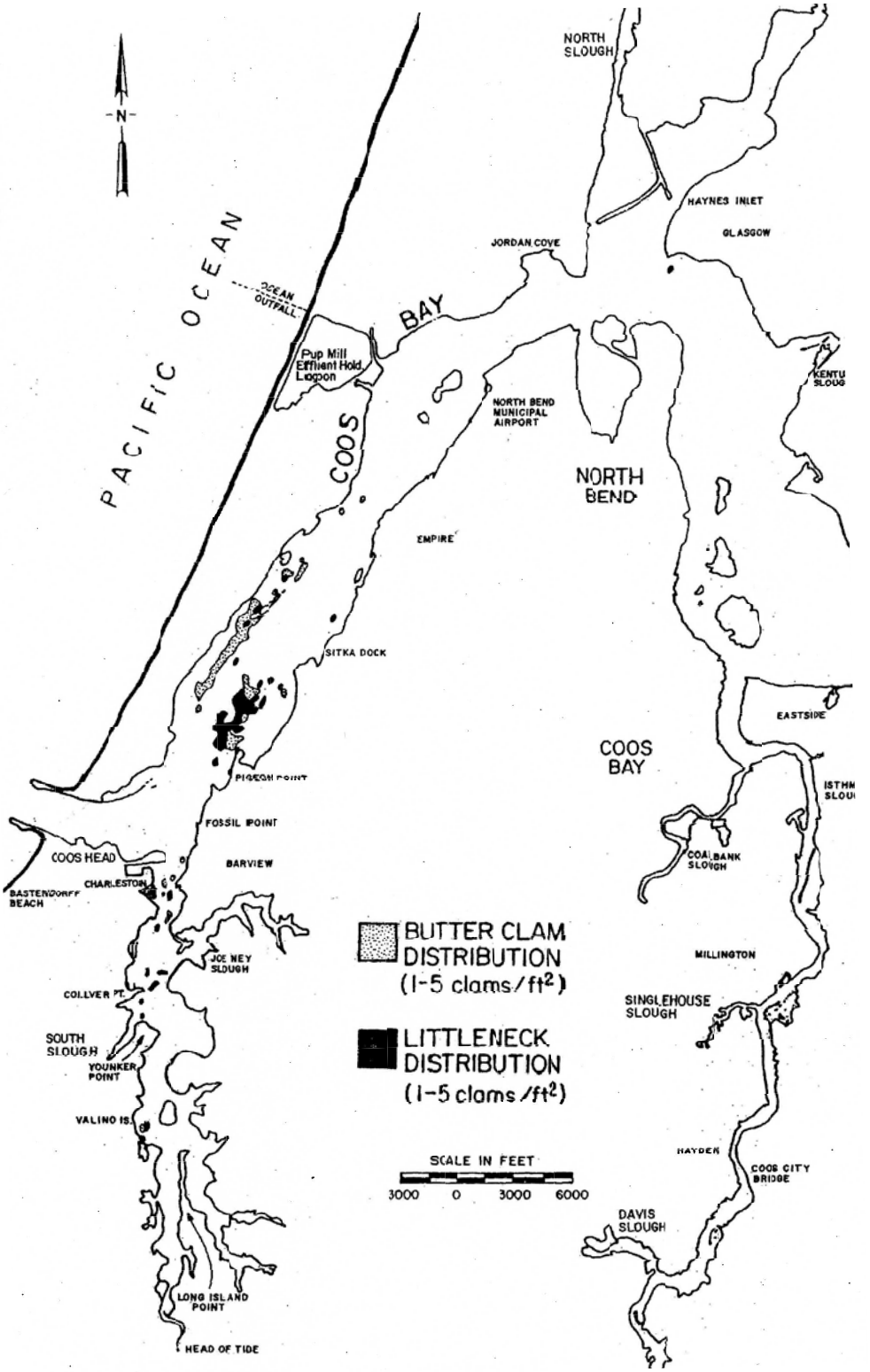


Figure 6. Butter and Littleneck Clam Distribution in Coos Bay (Gaumer et al. 1978).

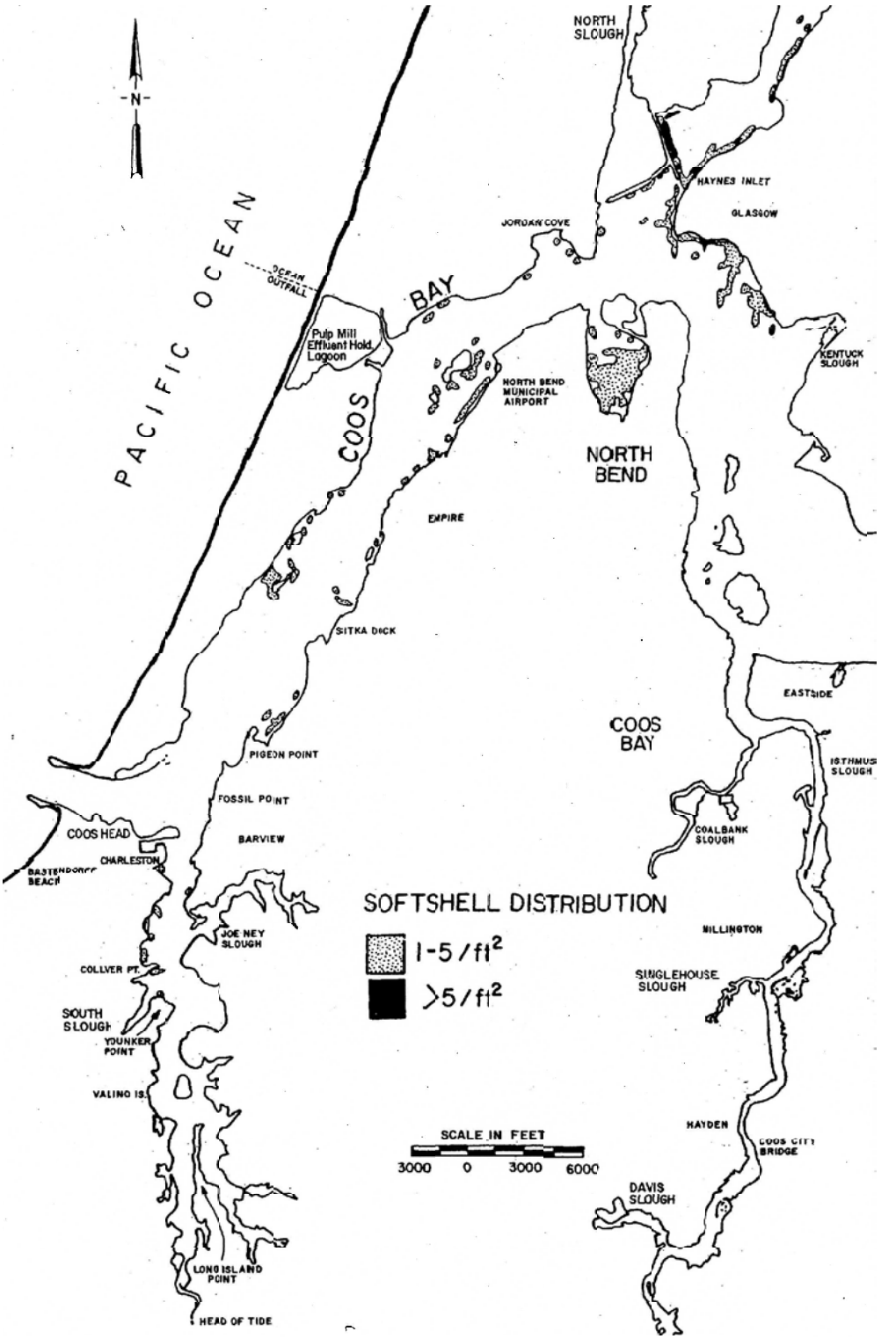


Figure 7. Softshell Clam Distribution in Coos Bay (Gaumer et al. 1978).

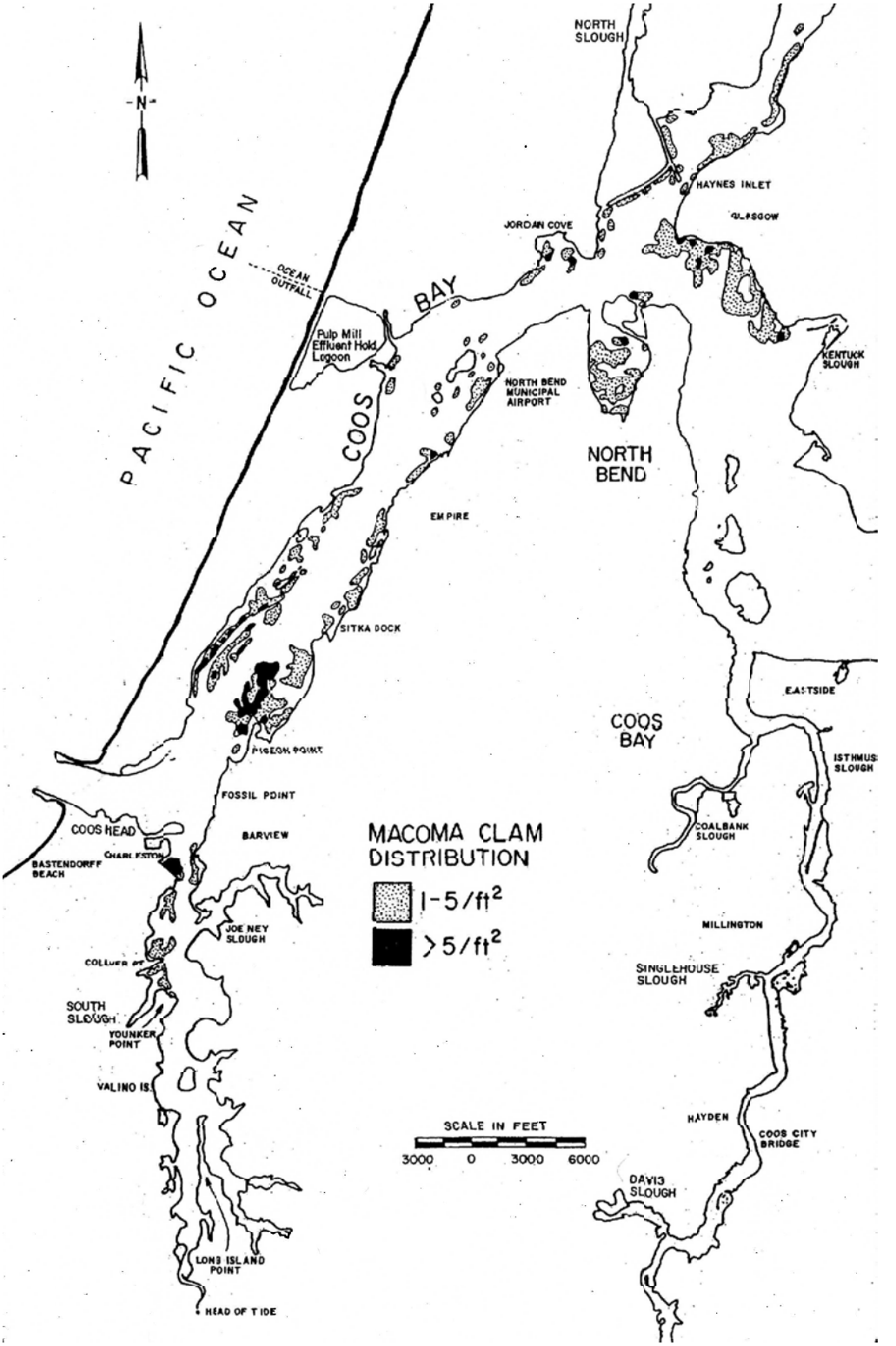


Figure 8. Macoma *(Macoma irus, M. nasuta and M. bathica)* Distribution in Coos Bay (Gaumer et al. 1978).

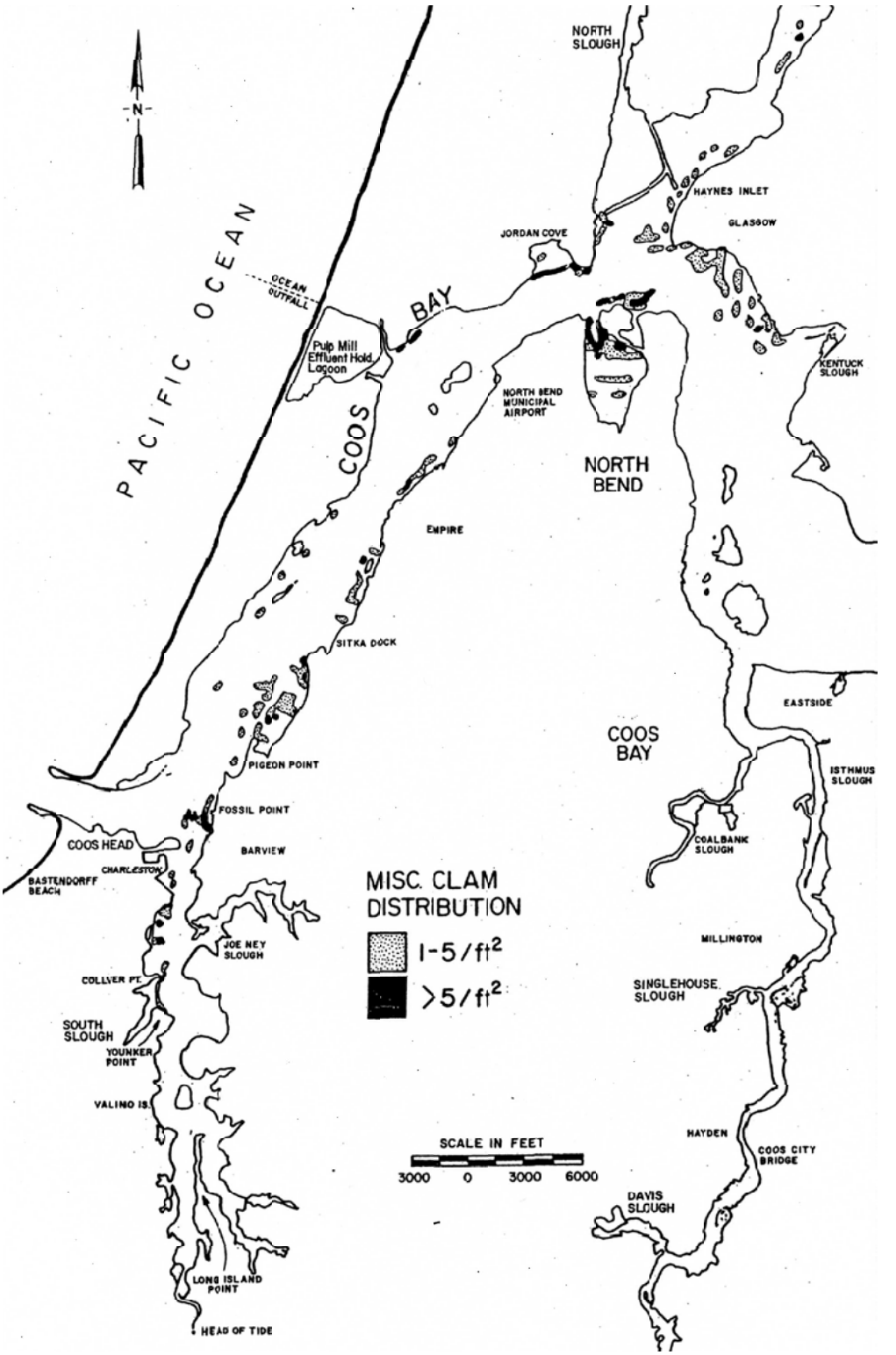


Figure 9. Miscellaneous Clam (California Softshell, Bodega, Paddock, Jackknife and Rock Clam) Distribution in Coos Bay (Gaumer et al. 1978).

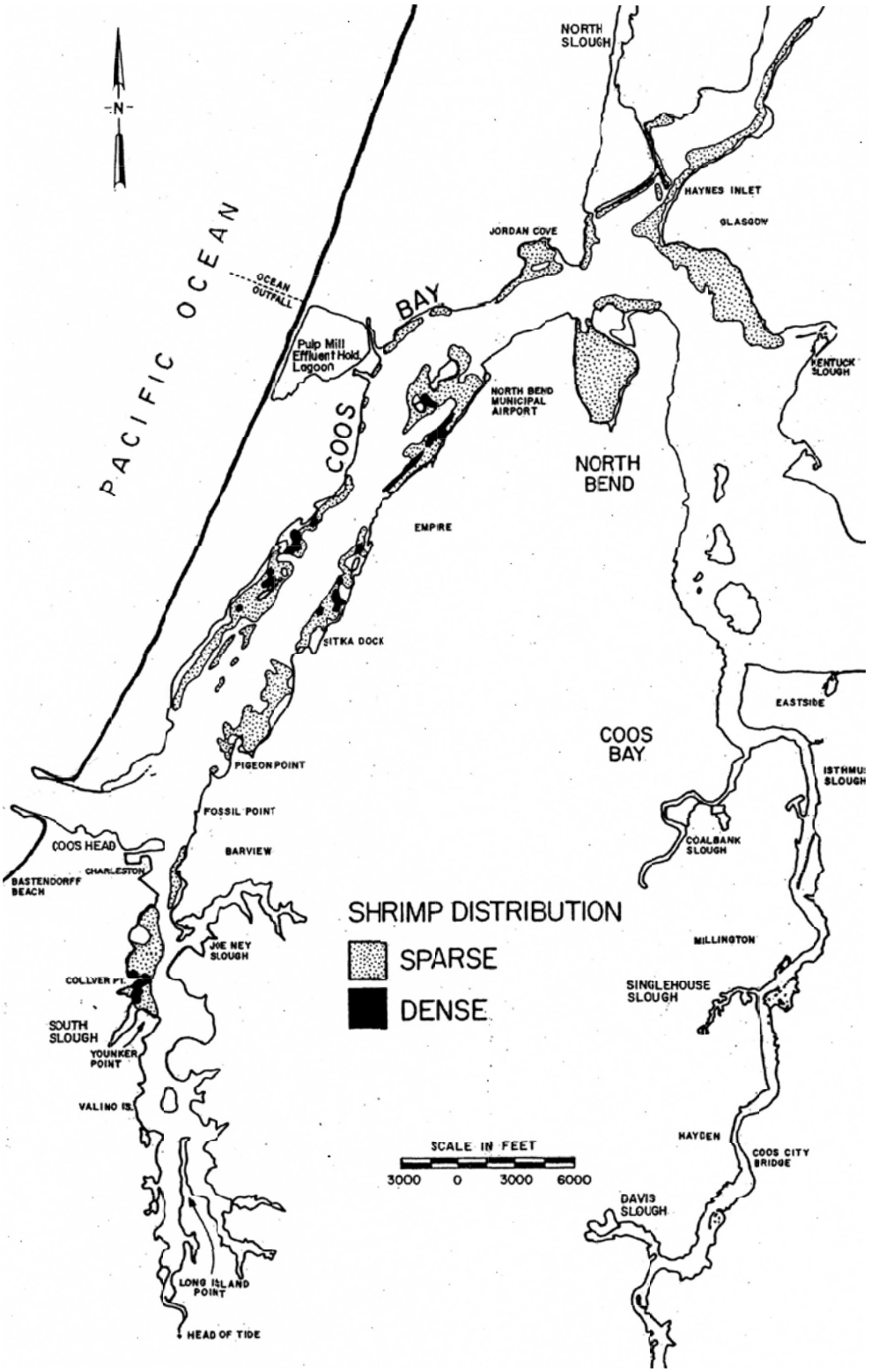


Figure 10. Shrimp Distribution in Coos Bay (Gaumer et al. 1978).

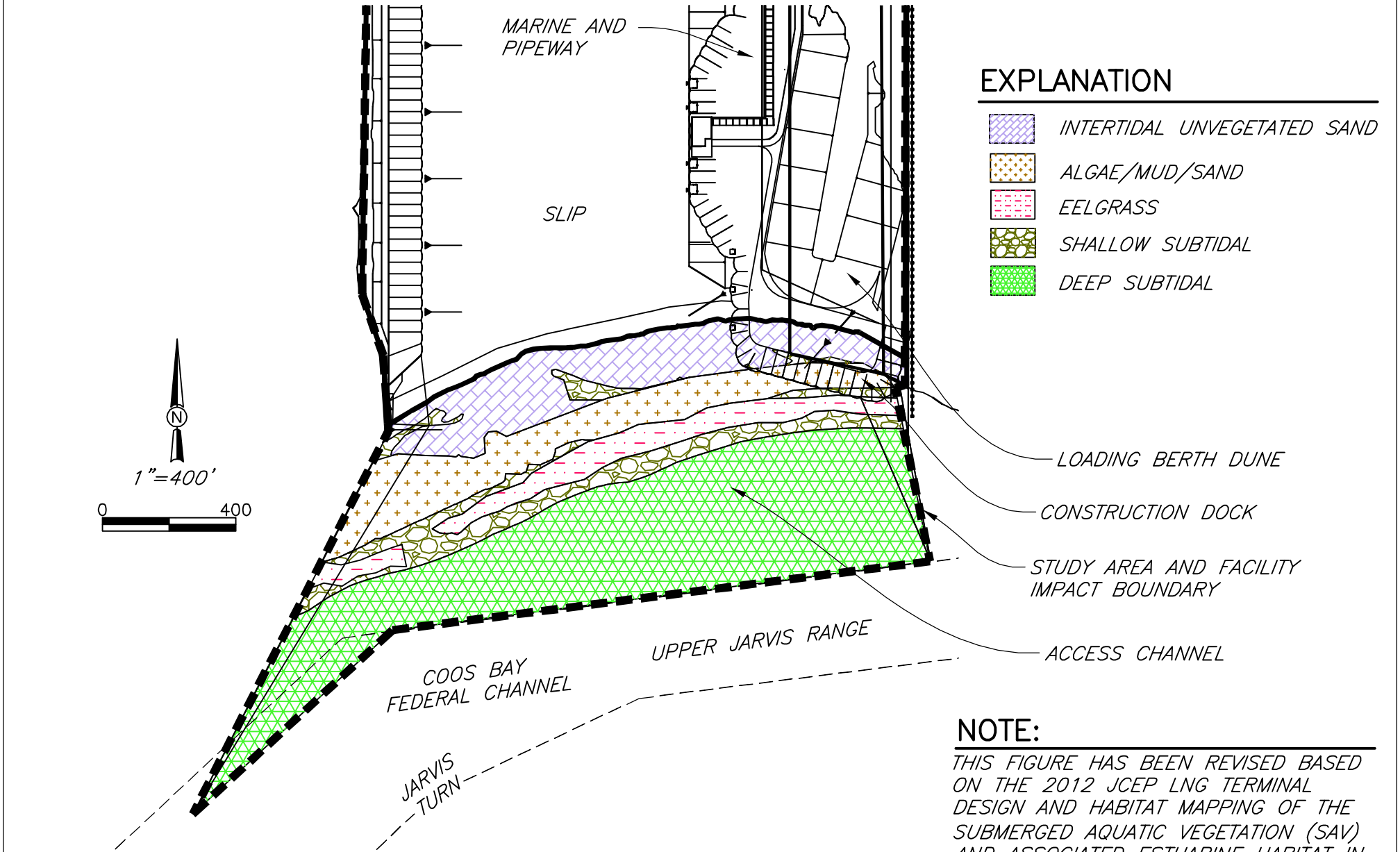
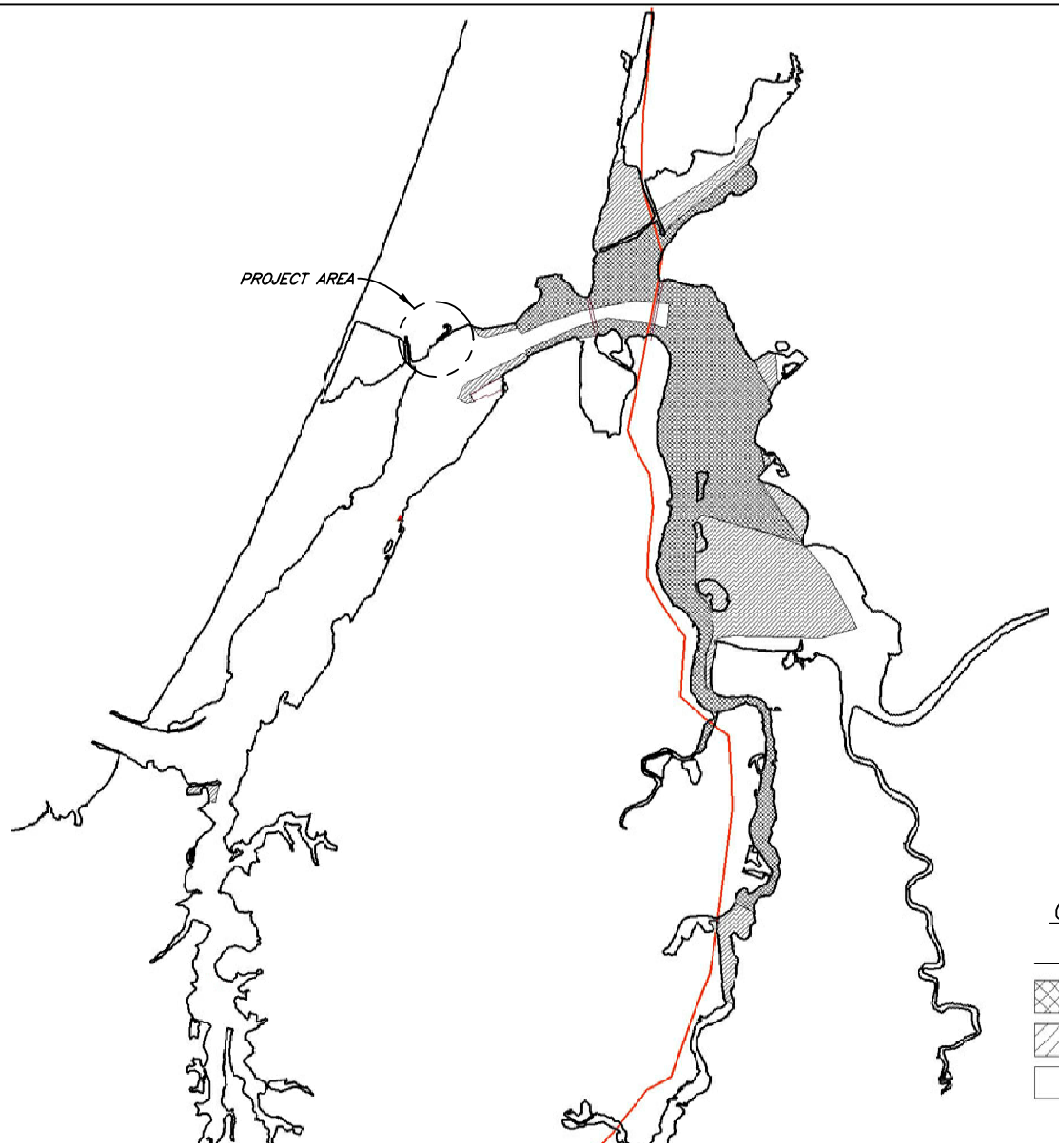


IMAGE SOURCE: 2011 NATIONAL AGRICULTURAL IMAGERY PROGRAM
DATA SOURCES: DAVID EVANS AND ASSOCIATES, INC JCEP ODFW HABITAT (11/2012)
BLACK AND VEATCH (2013)

NOTE:

THIS FIGURE HAS BEEN REVISED BASED ON THE 2012 JCEP LNG TERMINAL DESIGN AND HABITAT MAPPING OF THE SUBMERGED AQUATIC VEGETATION (SAV) AND ASSOCIATED ESTUARINE HABITAT IN THE SLIP AND ACCESS CHANNEL.

SHN Consulting Engineers & Geologists, Inc.	Jordan Cove Energy Project Fisheries Report Coos County, Oregon		Detailed View of Project Area to be Dredged and SAV Bed SHN 611048.131
	Revised January 2013	611048HABITAT	Figure 11



O. conchaphila HABITAT IN COOS BAY, 1997

PRIMARY HABITAT 1997

MARGINAL HABITAT 1997

NON-HABITAT 1997

N

SHN Consulting Engineers & Geologists, Inc.

JORDAN COVE ENERGY
COOS BAY, OREGON

Native Oyster Distribution In Coos Bay
After ODFW (1997)
SHN 005609

AUGUST 2006 | 005609-OYSTER-HAB.dwg | Figure 12

X:\2005\005609 Jordan Cove\dwg\Marine Estuary Habitat\005609-OYSTER-HAB-FIG12TEMP.dwg

APPENDIX P-6

DEA December 2014 Wildlife Habitat Mitigation Plan

Jordan Cove Energy Project

Wildlife Habitat Mitigation Plan in accordance with OAR 635-415-0000 through 0025

Prepared for:

125 Central Avenue, Suite 380

Coos Bay, OR 97420

Prepared by:

2100 SW River Parkway

Portland, OR 97201

December 2014

TABLE OF CONTENTS

1. INTRODUCTION 2
2. ALTERNATIVES 3
3. AVOIDANCE AND MININIMIZATION MEASURES 3
3.1 IMPACT AVOIDANCE 3
3.2 IMPACT MINIMIZATION 4
4. HABITAT IMPACTS 9
4.1 HABITAT IMPACT SUMMARY 9
4.2 EXISTING HABITAT FUNCTION 11
4.3 DIRECT IMPACTS AND HABITAT FUNCTION POST-CONSTRUCTION 13
4.4 INDIRECT IMPACTS 14
4.5 TEMPORAL LOSS 14
5. WILDLIFE SALVAGE 14
6. HABITAT MITIGATION SITE SELECTION 15
7. HABITAT MITIGATION SITE BASELINE CONDITIONS AND MITIGATION CONCEPTS 17
7.1 THE PANHANDLE SITE (PARCEL P) 18
7.2 THE LAGOON SITE (PARCEL W) 22
7.3 THE NORTH BANK SITE (PARCEL S) 24
8. HABITAT MITIGATION CALCULATIONS 25
9. COMPLEMENTARY MITIGATION 27
10. HABITAT MITIGATION MONITORING PLAN 28
10.1 AS-BUILT SURVEY (YEAR 1) 28
10.2 PHOTO DOCUMENTATION (YEARS 1 THROUGH 5) 28
10.3 PERFORMANCE STANDARDS 28
10.4 CONTINGENCY PLAN 29
11. LONG-TERM PROTECTION AND FINANCIAL SECURITY INSTRUMENTS 29
11.1 PROTECTION INSTRUMENT 29
11.2 LONG-TERM MAINTENANCE PLAN 29
12. PREPARERS AND CONTRIBUTORS 30
13. APPENDICES ..... ERROR! BOOKMARK NOT DEFINED.

Appendix A: Photographs
Appendix B: Figures
Appendix C: ODFW Wildlife Capture, Holding, Transport, and Relocation Guidance
Appendix D: Mitigation Specific to EFSC Jurisdiction

Tables

Table 1: Recommended Seed Mixtures for Sandy Soils on the North Spit of Coos Bay 7
Table 2: Overall JCEP and SDPP Impacts, in Acres 11
Table 3: Jordan Cove Energy Project Mitigation Opportunities/ Constraints by Parcel 16
Table 4: Mitigation Calculations for FERC-Jurisdictional Project Impacts, in Acres 26
Table 5: Mitigation Calculations for EFSC-Jurisdictional Project Impacts, in Acres 27

1. INTRODUCTION

The Jordan Cove Energy Project (JCEP) is comprised of three components that fall under the jurisdiction of the Federal Energy Regulatory Commission (FERC): the Jordan Cove Liquefied Natural Gas (LNG) Terminal Project, the Pacific Connector Gas Pipeline Project (PCGP), and the Slip and Access Channel Project. Jordan Cove Energy Project, L.P. (JCEP L.P.), the Oregon International Port of Coos Bay (Port), and Pacific Connector Gas Pipeline, L.P. (Pacific Connector) are seeking to construct, operate, and maintain these three project components. Figure 1, Project Vicinity, shows the primary elements of the JCEP discussed in this plan. The PCGP is not shown on Figure 1 because this plan does not cover the PCGP as mitigation for the PCGP will be addressed separately by Pacific Connector.

Natural gas will be delivered to the LNG terminal site (via the gas pipeline, which will connect the terminal with existing Pacific Gas and Electric Company intrastate pipeline and interstate natural gas pipeline systems), where it will be conditioned, cooled into a liquid, stored in two full-containment 160,000 m3 LNG storage tanks, and loaded on to LNG carriers for export at newly constructed marine facilities.

Such marine facilities include an access channel and a slip that the Port will seek authorization to construct, operate, and maintain. The Slip and Access Channel will connect the existing Coos Bay Navigation Channel and the Jordan Cove LNG Terminal Project site at approximately Coos Bay Navigation Channel Mile 7.3. Based on the estimated size of the LNG carriers expected to call upon the terminal, it is anticipated that approximately 90 ships per year will be required to transport the LNG from the terminal. The Project footprint is defined as the area that will be both temporarily and permanently impacted by the Jordan Cove LNG Terminal Project and the Slip and Access Channel Project.

Impacts resulting from the Jordan Cove LNG Terminal Project and the Slip and Access Channel Project have been minimized, to the greatest extent practicable, as discussed in the Federal Energy Regulatory Commission (FERC) Resource Reports available on line at the Jordan Cove Energy Project, L.P. FERC website. Please refer to the FERC Resource Reports for additional information on how the Project design was evaluated and selected as proposed.

A fourth component of the JCEP project, the South Dunes Power Plant (SDPP), falls under the jurisdiction of the Oregon Department of Energy's (ODOE) Energy Facility Siting Council (EFCS). Thus, habitat impacts specific to the SDPP are discussed separately in this document and are addressed in detail in Exhibits P and Q of the EFSC Application for Site Certificate (ASC). In order to clarify which portions of mitigation fall under which agency jurisdiction, mitigation for the FERC-related portions of the JCEP project is described first, followed by mitigation for impacts from the EFSC-related SDPP.

JCEP L.P. contracted with David Evans and Associates, Inc. (DEA) to develop a plan to mitigate unavoidable impacts to wildlife habitat. This mitigation plan is intended to thoroughly describe the manner in which the impacts of the project will be reduced or eliminated over time, avoided and/or minimized; and how the affected environment, including fish and wildlife habitat, will be

monitored, restored, rehabilitated, repaired and/or replaced, or otherwise compensated for in accordance with Oregon Administrative Rule (OAR) 635-415-0000 through 0025.

Meetings with three Oregon Department of Fish and Wildlife (ODFW) representatives and three JCEP team members took place in Coos Bay on July 23 and August 26, 2013. The purpose of these meetings was to discuss habitat mapping for the Jordan Cove LNG Terminal Project and the Slip and Access Channel Project components, and formulate an overall mitigation strategy that meets the ODFW Habitat Mitigation Policy. DEA presented a summary of existing conditions and unavoidable impacts to habitat resulting from proposed project development.

The group reviewed and edited the draft ODFW habitat categorization for the project, discussed potential strategies and locations for mitigating impacts, and visited potential mitigation sites to further refine these concepts. The results of these discussions are included in this document.

ODFW concurred with the habitat mapping within project elements described in the Final ODFW Habitat Categorization Technical Memo (dated September 10, 2013) on October 30, 2013. This mitigation plan was reviewed by ODFW and their input has been incorporated.

The acreage and location of mitigation areas for the overall JCEP project are provided in Table 3 and Figure 5 of Appendix B. The acreage and location of mitigation areas specific to EFSC jurisdiction of the SDPP are provided in Table 4 and the figures in Appendix D. Although the mitigation areas shown in Appendix D are specific to EFSC jurisdiction, they will be managed and maintained as a part of the overall JCEP mitigation portfolio, and subject to the performance criteria outlined in this document for the overall JCEP project.

2. ALTERNATIVES

The alternatives to the proposed development action are provided in detail in Resource Report10 (Docket No. CP13-483), which was produced by SHN Consulting Engineers & Geologists (SHN) in May 2013 and is available online. The SDPP was included in the project components that were assessed for alternatives as part of the overall JCEP project described in Resource Report 10.

3. AVOIDANCE AND MININIMIZATION MEASURES

3.1 IMPACT AVOIDANCE

Avoidance of wildlife habitat and species has been incorporated into the design of the project to the extent possible given the acreage requirements of the project. The majority of the SDPP Site (Figure 1) lies atop the former Weyerhaeuser Mill Site, which contains abandoned, previously developed areas and waste dumping areas as well as a currently permitted landfill. These highly degraded areas will be capped as part of the approved site cleanup process for the project.

Similarly, the North Point Workforce Housing Project has been sited atop level dredge spoils, much of which has been used as a log deck and for storage. Siting much of the project on dredge spoils and a disturbed former mill site and current landfill site has minimized habitat disturbance and avoided impacts to higher value, previously undisturbed habitat.

3.2 IMPACT MINIMIZATION

In addition to the minimization measures discussed in the following sections, JCEP proposes 1:1 mitigation for unavoidable short-term and long-term impacts to wildlife habitat. Implementation and monitoring of the habitat protection and enhancement proposed as mitigation for unavoidable impacts is described beginning in Section 6.

3.2.1 Best Management Practices (BMPs)

In addition to mitigating for all direct impacts to wildlife habitat, numerous BMPs will be used during construction, operation, and retirement of all components of the JCEP project, including the SDPP, to minimize impacts to wildlife and habitat both inside and outside the areas that will be directly impacted by the project. Additional BMPs will continue to be developed, however, examples of planned BMPs are found in the following documents:

- The EFSC ASC, specifically Exhibits J, P, Q, R, and X
- The JCEP Biological Assessment (BA) and appendices, specifically Appendices F and N
- FERC Resource Reports, primarily Resource Report 3

3.2.2 Environmental Monitoring

Environmental monitoring will be conducted in order to minimize impacts during construction and retirement of the project, including the SDPP. Environmental inspectors (EIs) will provide oversight for implementation of all BMPs. Their role is described in the latest version of the JCEP Biological Assessment, and is summarized in Exhibit P and below.

JCEP will employ a lead Environmental Inspector (EI) and multiple EIs as appropriate. The lead EI will be responsible for agency notifications and reporting requirements and will have oversight and ultimate authority over assistant EIs. The lead EI will also conduct routine meetings and maintain communications to uphold consistencies and compliance with the appropriate federal, state, and local regulations and permit requirements.

EIs will be on-site during active construction and will have peer status with all other activity inspectors. The EIs will have authority to stop activities that violate the measures set forth in the permits and authorizations and will have the authority to order corrective action. At a minimum, each EI will be responsible for:

- Ensuring compliance with the measures set forth in environmental permits and approvals;
- Identifying, documenting, and overseeing corrective actions, as necessary, to bring an activity back into compliance;
- Verifying that the limits of authorized construction work areas and locations of access roads are properly marked before clearing;
- Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;
- Identifying erosion/sediment control and stabilization needs in all areas;

- Determining the need for and ensuring that erosion controls are properly installed, as necessary, to prevent sediment flow into wetlands, waterbodies, sensitive areas, and onto roads. This would include evaluating controls prior to a predicted storm event whenever possible and installing additional measures as needed to control storm water and sediment;
- Inspecting and ensuring the maintenance of temporary erosion control measures at least daily in areas of active construction or equipment operation, on a weekly basis in areas with no construction or equipment operation and within 24 hours of each 0.5 inch or greater rainfall. Inspections will be recorded and records maintained for review upon request;
- Ensuring the repair of all ineffective temporary erosion control measures as soon as possible but not longer than 24 hours after identification;
- Keeping records of compliance with conditions of all environmental permits and approvals during active construction and restoration;
- Identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase.

During construction and restoration, JCEP would also utilize additional personnel as needed to support the EIs to ensure that the EIs' responsibilities are appropriately addressed. Support personnel may include, among others: biologists, wetland scientists, soil scientists, agronomists, foresters, reclamation specialists, visual resource specialists, or geologists, who have the appropriate, education, training, and expertise to effectively address the EI's responsibilities.

3.2.3 Noxious Weed Control

In addition to avoidance and minimization measures outlined in the documents listed in Section 3.2.1, noxious weed control activities will help minimize potential impacts by preventing the spread of noxious weeds during construction, operation, and retirement of the Facility.

The following specific strategies to reduce the spread of noxious weeds have been adapted from the JCEP Biological Assessment (April 2014), Appendix F, Erosion Control and Revegetation Plan (available online). Although these strategies were designed specifically for the pipeline portion of the project, they were developed in consultation with ODFW and are the most specific strategies currently documented, and were therefore used to represent strategies to be used for the overall JCEP project (including the SDPP). As outlined in the JCEP Biological Assessment, Environmental Inspectors (EIs) will provide oversight for implementation of all noxious weed control methods.

3.2.3.1 Pretreatment

Pretreatment will primarily be accomplished by mechanical operations by mowing to the ground level, if appropriate for the targeted weed species. Other appropriate mechanical methods may include disking, ripping, or chopping. Hand pulling methods may also be utilized if the area of infestation is small or where mechanical methods are not feasible. Infested areas will be cleared in a manner to minimize transport of weed seed, roots, and rhizomes or other vegetative materials and soil from the site.

Spot treatments with appropriate herbicides will also be conducted where applicable depending on the specific weed and site-specific conditions using integrated weed management principles. Spot herbicide treatment would only be utilized when it could be effective (i.e., plant phenology and effective herbicide treatment windows coincide) prior to construction. Any herbicide treatment would be conducted by a licensed applicator using herbicides labeled for the targeted species and registered for the use.

3.2.3.2 Equipment Inspection

Prior to transporting construction equipment to the construction right-of-way, all equipment will be inspected to ensure that it is clean and free of potential weed seed or sources (i.e., soil, roots or rhizomes) and power washed, if necessary, as determined by the EI. In addition, inspections of all project inspector vehicles and construction contractor vehicles will also be performed prior to being allowed on the construction right-of-way. This does not apply to local service vehicles that will stay on the existing roadway, traveling frequently in and out of the project area. The EI or JCEP's authorized representative will be responsible for performing inspections and registering or tagging the equipment prior to being transported or moved to the right-of-way.

3.2.3.3 Clearing and Grading

In areas where infestations have been identified, the contractor will stockpile cleared vegetation and salvage topsoil or graded material adjacent to the area from which they are stripped to eliminate the transport of soil-born noxious weed seeds, roots, or rhizomes. Where practical and feasible, grading activities will occur toward any known areas of infestation to minimize the potential spread of noxious weeds.

3.2.3.4 Weed-Free Materials

JCEP will use certified weed-free materials such as seed, mulch, and sediment barriers. The EI or JCEP's authorized representative will be responsible for ensuring that all materials will be certified weed-free following Oregon Department of Agriculture (ODA) standards, if available. If this certification process is not formalized at the time of construction, the certification process can be documentation from producers/vendors that materials were produced from certified weed-free fields, or materials can be inspected by the county extension agent or qualified conservation district personnel.

3.2.3.5 Weed Control

Where weed control is necessary, JCEP will employ hand and mechanical methods (pulling, mowing, disking, etc.) to prevent the spread of potential weed infestations. Decisions will be made based on whether other methods or combinations of methods are known to be effective on the species in similar habitats. The choice of herbicides will be based on the invasive species, how it reproduces, its seed viability, the size of its population, site conditions, known effectiveness under similar site conditions, and the ability to mitigate effects on non-target species.

In most cases, if an herbicide is used for control, it would be used in combination with other methods. For example, initial treatment of an invasive species may be done with an herbicide, but then manual or mechanical methods may be implemented as maintenance treatments over the

long-term. If herbicides are used to control noxious weed infestations, JCEP will employ a state or federally-licensed herbicide applicator to ensure that the appropriate herbicides are utilized for the targeted weed species during its proper phenological period and at the specified rate. The applicator will ensure that the herbicides are used according to the labeling restrictions and according to all applicable laws and restrictions.

The applicator will confirm that the herbicides are used under the proper seasonal and weather conditions to ensure effectiveness and to minimize drift to non-targeted areas. Herbicides will not be applied during precipitation events or when precipitation is expected within 24 hours or as specified on the label. Prior to herbicide application, JCEP and/or their contractor will obtain all required permits from the local jurisdictions/authorities and land managing agency.

3.2.3.6 Weed Control near Sensitive Areas and Habitats

Herbicides will not be used within 100 feet of a wetland or waterbody, unless allowed by the appropriate agency. If noxious weed infestations occur in the vicinity of sensitive sites, the proper treatment buffers will be applied to avoid potential adverse impacts to non-targeted species. In these areas site-specific control will be designed (e.g., application rate and method, timing, wind speed and direction, nozzle type and size, buffers, etc.) to mitigate the potential for adverse disturbance and/or contaminant exposure.

3.2.3.7 Revegetation and Seeding

As outlined in the JCEP BA, JCEP has consulted with various agencies regarding recommended seed mixtures for the project area. However, no seed mix specific to sandy areas on the North Spit was included. Therefore Steve Langenstein, the BLM Noxious Weed Coordinator for the area was consulted in October 2014, and has provided a native seed mix for use in sandy areas on the North Spit that conforms with Bureau of Land Management (BLM) policy and will provide a suitable native mix for non-BLM lands (Table 1). Disturbed areas will be seeded within six working days of final grading, weather and soil conditions permitting.

Table 1: Recommended Seed Mixtures for Sandy Soils on the North Spit of Coos Bay

Common Name	Scientific Name	Percent of Mix
California brome	*Bromus carinatus*	20%
Blue wildrye	*Elymus glaucus*	20%
Red fescue	*Festuca rubra*	20%
Tufted hairgrass	*Deschampsia caespitosa*	10%
Sterile wheat *	*Triticum aestivum*	30%

* The use of native seed mix is preferred; however, in sandy soils mixing sterile perennials such as sterile wheat will help ensure that erosion control is achieved quickly.

Seeding will be conducted using a mechanical broadcast seeder, hydroseeder, or seed drill, as appropriate. The seed application rates will be as specified for drilling rates and doubled if using broadcast seeding. Fertilizer, lime, or mulch will not be used in wetlands.

Broadcast seeding will be the preferred seeding method on steep slopes or other areas that cannot be accessed with other seeding equipment; areas that will be covered with erosion control fabric; and other areas determined appropriate for broadcast seeding by the EI. Seed will be broadcast with a mechanical seeder immediately after the seedbed has been prepared and the soil is loose. This will allow the seeds to be lightly covered as the soil settles. The seeding will be lightly dragged with chains or other appropriate harrows to lightly cover the seed in areas where it is possible, as determined by the EI. Broadcast seeding will occur immediately prior to installation of erosion control fabric or application of mulch (straw or wood).

Hydroseeding will be used in upland areas that can be safely accessed with hydroseeding equipment and other areas that are determined appropriate by the EI. Hydroseeding equipment shall be equipped with sufficient tanks, pumps, nozzles, and other devices required for mixing and hydraulically applying the seed, wood fiber mulch, and tackifier mix in slurry form onto the prepared ground. The hydroseeding equipment shall have built-in agitators which will keep the seed, mulch, tackifier, and water mixed homogeneously until pumped from the tank. Fertilizer may be included in the hydroseeder slurry for hydroseeded areas that are difficult to access for fertilizer application and incorporation, as determined by the EI. Hydroseeding and hydromulching will occur in one application unless the EI specifies that they occur as two separate applications.

Where hydroseeding and hydromulching occur as two applications, the hydroseeding slurry will contain tackifier at 25 percent of the manufacturer's recommended rate and 300 pounds of wood fiber mulch to mark the seeded locations and the evenness of the application. The hydromulching will occur immediately following hydroseeding on the same day, where feasible. Hydroseeding and hydromulching will be done from two directions (e.g., left and right or up and down), where possible, to ensure maximum coverage of the soil. Hydroseeding rates will be at the rates specified for broadcast seeding plus any adjustment the hydroseeding company recommends based on their equipment specifications.

3.2.3.8 Monitoring

During the first and second year post-construction JCEP will monitor for infestation of noxious weeds. Monitoring will occur in the areas where noxious weeds were identified prior to construction and were previously mapped to ensure that potential infestations do not reestablish and spread. JCEP's operational staff or their contractors will be responsible for these monitoring efforts. If infestations occur, JCEP would make an assessment of the source of the infestation, the potential of the infestation to spread to other adjacent areas, and develop a treatment plan to control the infestation. The treatment plan would be developed using integrated weed management principles, and if herbicides are used, all applicable approvals would be obtained prior to their use including landowner approvals. JCEP will consult with the Oregon Department of Agriculture Noxious Weed Control Program/ or local County Weed Program for additional support regarding noxious weed control issues that may occur during operation of the Facility.

JCEP will conduct follow-up inspections of all disturbed areas after the first and second growing seasons to determine the success of revegetation. Revegetation shall be considered successful in upland areas, if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands. If vegetative cover and density are not similar

or there are excessive weeds after two full growing seasons, a professional shall determine the need for additional restoration measures. JCEP will continue revegetation efforts until revegetation is successful, and when the site is stabilized, temporary erosion control measures will be removed. Once again, it should be noted that these BMPs to minimize impacts will be carried out in addition to the habitat mitigation and monitoring that is described in the following sections.

4. HABITAT IMPACTS

4.1 HABITAT IMPACTS SUMMARY FOR FERC-JURISDICTIONAL PROJECT COMPONENTS

The location, physical and operational characteristics, and duration of the proposed development action and wetland impacts are described in the permit applications submitted to the Oregon Department of State Lands (DSL) on March 20, 2014 and the US Army Corps of Engineers (USACE) on June 11, 2013 with recent updates sent on March 20, 2014. These documents are available on DSL's website:
http://www.statelandsonline.com/index.cfm?fuseaction=Comments.AppListLF&county=Coos

The DSL permit application (#54908-RF) was deemed complete by DSL on April 18, 2014. Since mitigation for wetland and estuarine resources is overseen by DSL and USACE, and is covered under the wetland mitigation plan for the project (available online). It is not covered in this document. The remainder of this document focuses on upland habitat mitigation.

The upland habitat types that may be affected by the proposed development action are shown in Figure 2 of Appendix B. They are described in the following sections and in detail in FERC Resource Report 3 (RR3), which is available online and is summarized below:

> The Project is not expected to have a long-term significant impact to vegetation resources, as the areas that will be graded and cleared for construction are relatively common and widespread throughout the North Spit and the Project vicinity. The Project footprint was selected on the basis of avoiding, to the extent practical, unique vegetation communities and higher value wetlands. Selection of temporary construction staging sites was primarily restricted to upland areas to avoid impacting wetlands. The fish and wildlife species which will be affected are described in detail in RR3, as summarized below:
>
> The Project site, comprised of the western LNG Terminal parcel, eastern SDPP parcel and utility corridor connecting the parcels, contains a number of habitats that support a variety of wildlife species as temporary or permanent residents. Approximately 178 tetrapod species (amphibians, reptiles, birds, and mammals) were recorded on or adjacent to the Project site during surveys conducted in October 2012 and during previous surveys from June to December 2005 and in early 2006. Terrestrial species include approximately 115 species. Approximately 151 seasonal or year-round resident bird species occur in the vicinity of the Project site, and a variety of habitats suitable for migratory birds exists within the Project site boundaries. Species types and densities are directly related to season of year, preferred habitats, food resources, and protective cover.

> The proposed Project site provides suitable habitat for a number of wildlife species associated with the coastal, mid-coastal, interior foothills, and mountain terrains that construction and operation of the proposed Project could affect. The majority of wildlife species detected on or adjacent to the Project site during the 2005/2006 and 2012 surveys were birds.

Although these species potentially occur, the Resource Report 3 goes on to say that, based on available knowledge, consultation with agencies, and focused surveys for particular species, no listed terrestrial species are known or expected to occur within the Project site boundary. Please refer to RR3 for greater detail.

The nature, extent, and duration of impacts expected to result from the proposed development actions are described in detail in RR3. These impacts have been incorporated into Figure 3, which shows post-construction habitat categories.

4.2 HABITAT IMPACT SUMMARY FOR THE EFSC-JURISDICTIONAL SDPP

Anticipated impacts to wildlife habitat within the EFSC SDPP site boundary are shown in Figure P-4 of Appendix D. To determine habitat impacts from development of the SDPP, state sensitive species that occur, or have the potential to occur within the site boundary and surrounding ½-mile analysis area were evaluated. Detailed analysis of impacts to state sensitive species is provided in Exhibit P of the EFSC ASC.

Impacts to threatened and endangered species, and associated habitat, were also evaluated and are described in detail in Exhibit Q of the EFSC ASC. Twenty three state-listed and 26 federally-listed threatened, endangered, and candidate species, as well as federal species of concern occur, or have the potential to occur, within the 5-mile radius analysis area used to evaluate threated and endangered species.

Habitats within the site boundary and the ½-mile analysis area include a variety of upland, wetland, and estuarine habitat types typical of the Coast Range ecoregion, as well as large areas of previously developed habitat within the site boundary. No irreplaceable habitat types were found during habitat surveys, which were conducted within the overall JCEP project footprint and the EFSC site boundary as part of the overall JCEP project

Table 2 outlines the number of acres expected to be impacted by the overall JCEP project. These acreages are subsequently broken out to highlight impacts associated with the EFSC-jurisdictional SDPP and those associated with FERC-jurisdictional components of the Project.

Table 2: Overall JCEP and SDPP Impacts, in Acres

Habitat Type and Category	Total JCEP Project Impacts	SDPP Impacts	Non-SDPP Impacts
Coastal Dune Forest (3)	102.9	10.0	92.9
Riparian Forest (3)	1.4	1.4	0.0
Shrub (4)	10.1	2.5	7.6
Herbaceous Shrub (4)	55.9	34.2	21.7
Herbaceous (4)	89.9	12.7	77.2
Unvegetated Sand (3)	3.5	3.5	0.0
Non-Jurisdictional Wetland (3)	1.0	1.0	0.0
Non-Jurisdictional Open Water (3)	1.0	0.8	0.2
TOTAL	**265.7**	**66.1**	**199.6**

4.3 EXISTING HABITAT FUNCTION

4.3.1 Category 2 and 3 Habitats

As indicated by their assigned number, Category 2 and 3 habitats currently function at a high level for wildlife. Category 2 habitats are limited to wetland and estuarine resources. Category 3 habitats include dune forest, un-vegetated sand, and riparian forest. The mitigation goal for Habitat Category 2 is: "if impacts are unavoidable, [mitigation] is no net loss of either habitat quantity **or** quality **and** to provide a net benefit of habitat quantity **or** quality". The mitigation goal for Habitat Category 3 is: "if impacts are unavoidable, [mitigation] is no net loss of either habitat quantity **or** quality" (OAR 635-415-0015).

4.3.2 Category 4 Habitats

Category 4 habitats, on the other hand, are not currently functioning at a high level for wildlife (compared to less-disturbed habitats in the vicinity). The vast majority of Category 4 habitats that would be impacted by the project lie on dredge spoils covered by very weedy herbaceous and shrub habitat (Photos 1-8, Appendix A). The mitigation goal for Habitat Category 4 is: "if impacts are unavoidable, [mitigation] is no net loss of either habitat quantity **or** quality" (OAR 635-415-0015). These habitats have been degraded extensively historically, and only provide habitat for generalist species such as deer, small mammals, and a limited suite of songbirds. No sensitive species are known to use these habitats, as discussed in RR3. In fact, at the Mill Site, much of the Category 4 habitat lies on top of historic development and waste dumping areas and on top of currently permitted landfills, all of which are required to be capped in the future as part of the Oregon Department of Environmental Quality (DEQ) approved site cleanup process.

Photos representing typical Category 4 habitat have been provided in Appendix A to inform the discussion. As shown, the herbaceous habitat type is found primarily on historically leveled areas (and to a lesser degree on recently colonized dunes) where pioneering species (mainly European beachgrass, [*Ammophila arenaria]*) have established themselves. Dominant species include European beachgrass, tall fescue (*Schedonorus arundinaceus*), sweet vernal grass (*Anthoxanthum odoratum*), Queen Ann's lace (*Daucus carota*), and hedgehog dogtail grass (*Cynosurus echinatus*).

Other species include velvet grass (*Holcus lanatus*), English plantain (*Plantago lanceolata*), tall orchardgrass (*Dactylis glomerata*), colonial bentgrass (*Agrostis capillaris*), hairy catsear (*Hypochaeris radicata*), small-head clover (*Trifolium microcephalum*), hop clover (*T. dubium*), and red and white clover (*T. pratense and repens*). Some of these areas were planted with pasture species. Native species are generally limited to yarrow (*Achillea millefolium*) and pearly everlasting (*Anaphalis margaritacea*), with American dunegrass (*Elymus mollis*) present in very limited areas. Himalayan blackberry (*Rubus armeniacus*) and scattered trees and shrubs (cultivated as well as native) are present in some places along the edges of the habitat near developed areas, and have been included in this habitat type due to their low cover overall. Some of these areas were planted with pasture species.

In Herbaceous/Shrub and Shrub habitat, several species of shrub, primarily Scotch broom (*Cytisus scoparius*), and Himalayan blackberry, as well as some native shrub species and trailing blackberry (*Rubus ursinus*) provided greater cover, but understory species were similar to Herbaceous habitat. In many places, Scotch broom has formed dense thickets, excluding most other species, as is the case in most of the Shrub habitat. Nearly all Category 4 habitats within the project footprint have been re-contoured historically.

The least-disturbed Category 4 habitats within the project footprint occur in the leveled area along the western edge of the project. This area is used by a variety of generalist species, and also by elk. Species such as peregrine falcon are known to forage over the habitat, and human disturbance is generally limited to occasional foot traffic and vehicles. The habitat at the western portion of the North Point Workforce Housing Project site is similarly little-disturbed (the eastern portion has been used as a log deck), but similarly dominated by non-native species, and less accessible to species such as elk due to its geographic isolation.

The remaining Category 4 areas are more frequently disturbed, occurring at the edge of Roseburg forest industrial property, and at the Mill Site interspersed with paved and gravel lots. As mentioned, active (but covered) landfill occupies the western edge of the Mill Site (west of the two ponds near the center of the site). In addition, the Mill Site contains large quantities of buried hazardous materials left over from mill activities, which don't directly affect existing wildlife function, but limit potential for restoration activities. Vehicular and foot traffic from property management activities is present at times, but the areas retain some function for wildlife due to their position adjacent to Jordan Cove. These habitats would be converted to herbaceous habitat post-construction, and would be mitigated for at a 1:1 ratio.

No Category 5 habitats were present within the study area. Category 6 habitats require avoidance and minimization, but no mitigation, and were not included in mitigation calculations.

4.4 DIRECT IMPACTS AND HABITAT FUNCTION POST-CONSTRUCTION

Project impacts include both long-term and short-term impacts. Although these terms do not correspond exactly with permanent and temporary disturbance, they are used interchangeably in this document in order to remain consistent with the other EFSC documents created for the project (specifically Exhibit C). Long-term impacts include portions of the landscape that are converted to structures, pavement, or gravel, result in steep slopes, or are surrounded by active industrial project components, rendering the habitat essentially useless to wildlife. Short-term impacts include activities such as grading and re-vegetation of dune habitats, which would occur for several weeks or months in duration, but would then be returned to pre-project or better condition. These impacts are shown in Figure 3, with long-term impacts in orange and short-term impacts in yellow. Areas that were mapped as Category 6 (pink cross-hatch) prior to project impacts were not included in mitigation calculations.

Only areas that were mapped in orange and yellow (with no pink cross-hatch) in Figure 3 were included in mitigation calculations. For instance, placement of underground water lines along the Trans Pacific Parkway was not mapped, and was not included in impact calculations for several reasons. First, the existing habitat although classified as Category 4, is extremely degraded by weeds and disturbance due to its location between the Trans Pacific Parkway and the railroad. Second, impacts would be extremely short-term (require approximately one week in duration, with impacts occurring along each portion of the water line for only several hours at a time). Finally, since the waterline area would be re-vegetated with native species following installation, condition of impacted areas would be improved over existing condition, resulting in in-situ mitigation for impacts. Similarly, since wetland impacts are dealt with in the joint permit application and wetland mitigation process, they were not included in impact calculations for this plan, since that would mean that mitigation would occur twice for the same impact.

During the July 23, 2013 meeting, ODFW indicated that OAR 615-415-000 through 0025 does not differentiate between short-term and long-term impacts. Instead, ODFW considers the magnitude, duration, and geographic size of proposed mitigation in context with the magnitude, duration, and geographic size of the proposed impacts and with the specific mitigation goals defined for each Habitat Category. The project specific short-term impact areas, (which would be graded and re-vegetated) may retain minimal function for a few species of wildlife and would therefore typically be considered Category 4. However, these areas would lose nearly all of their function for wildlife due to re-contouring of ground surfaces and disturbance from proximity to project elements (compared to existing conditions). Therefore, for simplicity, JCEP has assumed conservatively that all habitats that are impacted, whether short-term or long-term (post-construction Habitat Category 4 or Category 6) would be considered to have no function post-construction (zero percent function), and would be mitigated for at a 1:1 ratio.

Since all habitats shown to be impacted in Figure 3 would be considered to have no function post-construction, and since JCEP will provide 1:1 mitigation for all these impacted areas, it is assumed that no additional future mitigation would be required for subsequent project activities within habitats shown to be impacted in Figure 3.

As mentioned previously, wetland impacts and mitigation are overseen by DSL and USACE, and are not addressed in this document. However, as shown in Figure 3, impacts to non-jurisdictional

wetlands would occur (shown in purple), which are not included in the wetland mitigation plan. Therefore, mitigation for 2.0 acres of non-jurisdictional wetland impacts will be provided under this plan, as discussed in Section 7.

4.5 INDIRECT IMPACTS

Regarding indirect impacts, the July 2013 meeting attendees agreed that JCEP would not initially attempt to quantify mitigation for indirect impacts, and that ODFW would discuss the issue internally and comment on indirect impacts as the permitting process evolves. However, it should be assumed that some form of additional mitigation may be required for indirect impacts outside the project footprint, especially for indirect impacts to less-disturbed wildlife areas near the project. To that end, JCEP has acquired additional acreage within the parcels identified for mitigation.

4.6 TEMPORAL LOSS

It is assumed that preservation and at least the first phases of ecological uplift at the mitigation sites would occur prior to or concurrent with construction, which would result in no temporal loss of function for wildlife habitat. If this were to become impossible due to timing of financing or implementation, additional mitigation would be required to offset temporal loss of function.

5. WILDLIFE SALVAGE

As mentioned, in order to minimize impacts to wildlife from construction, ODFW has provided wildlife capture, holding, transport, and relocation (e.g., wildlife salvage) guidance, which is provided in Appendix C. These salvage actions are in the process of being coordinated with ODFW, and they and other stakeholders are invited to comment and provide additional on-site guidance as the project nears initiation.

As prescribed in that guidance:

> "In order to avoid or minimize disturbance, injury and mortality to individual wildlife species, the ODFW has developed a technical guidance series with recommended Best Management Practices (BMPs). Incorporation and implementation of BMPs into various project activities is expected to prevent or minimize negative impacts to wildlife, as well as help project proponents comply with wildlife protection laws.
>
> It is ODFW's intent that BMPs be considered during the planning, design and budgeting phases of project development. Selected BMPs are then to be implemented during project construction and maintenance phases to achieve the goal of preventing and minimizing negative impacts to wildlife and their habitats.
>
> Wildlife capture and relocation is described as the following:
>
> > *"The capture of live wildlife from a site and relocation of those wildlife to nearby suitable habitat to ameliorate negative impacts, such as disturbance, injury and/or mortality, that otherwise would be expected to result from project activities if the wildlife were not removed from the site."*

Under this definition, the goal is to relocate captured wildlife to the nearest suitable habitat within the same watershed (HUC6) and preferably on the same property. If suitable habitat within the same watershed is unavailable or is deemed fully occupied, or if relocation is determined by ODFW to not be in the best interest of the wildlife for whatever reason, ODFW will determine final disposition (e.g., release at an alternative relocation site, transfer to temporary holding facility, etc..)".

"The process of wildlife capture and relocation involves a number of components including the following:

1) Applying for and obtaining a Wildlife Capture, Holding, Transport, Relocation Permit / Letter of Authorization from ODFW prior to project implementation.
2) Determining what species are likely to be encountered where based on habitat types present, known occurrence information (if any), species ecology, and time of year.
3) Educating project staff in identification of wildlife species.
4) Establishing a communication plan for project staff to report wildlife observed / encountered.
5) Procedures to be followed for capture and relocation of wildlife, including identification of relocation sites and preparation of needed equipment.
6) Contingency planning for non-native invasive species, injured or diseased wildlife.
7) Employment of a professional wildlife biologist or other trained personnel to implement the wildlife capture and relocation protocol, including final reporting to ODFW."

Capture, holding, transport, and relocation techniques differ according to wildlife species or grouping of wildlife species. At this time, ODFW has developed protocols for turtles and amphibians. Protocols for other species groups are currently being developed, and will be incorporated as they become available.

6. HABITAT MITIGATION SITE SELECTION

In order to meet the fish and wildlife habitat mitigation goals for the project, DEA worked with ODFW to identify essential wildlife habitat to be protected from future disturbance and development, and to be enhanced to provide improved wildlife habitat function. Figure 4 provides an overview of parcels investigated, which are discussed in detail below and shown in Figure 5. Table 3 provides a summary of opportunities and constraints for all parcels that were investigated.

Table 3: Jordan Cove Energy Project Mitigation Opportunities/ Constraints by Parcel

Map ID	Taxlot	Owner/ Site Name	Site Acres	Comments
A-D	Various-see Figure 4	Sand Hills Gun Club, Inc.	>100	Good opportunites, but owner not interested.
E-H	Various-see Figure 4	McKeown, Joseph, et al.	>100	Good opportunites, but owner not interested..
I	24S13W28TL0030000	U.S.A	39	Federal parcel surrounded by private lands. Unlikely opportunity for mitigation due to ownership.
J	24S13W03TL0030000	Coos County	84	Split by USFS-designated main OHV route North-South which limits suitability.
K	23S13W14TL0020000	Coos County	58	A designated main OHV route runs through the center of parcel, but western portions may provide protection for unique wildlife habitats. ODFW verified suitability.
L	23S13W22TL0010000	Coos County	22	Contains unique wildlife habitats along Tenmile Creek. ODFW verified suitability of habitat for mitigation.
M	24S13W02BBTL009000	Coos County	28	Good opportunity for protection from development which is occurring north and south of parcel. Potential wildlife corridor to east from ODNRA.
N	24S13W02TL0040000	Coos County	86	Portions of the parcel could provide opportunities for protection and enhancement.
O	24S13W11TL0040000	Coos County	17	Good potential conservation opportunity. Potential wildlife corridor to east from ODNRA.
P	24S13W32TL0020000	Panhandle Site	105	Parcel connects public trailhead to ODNRA lands and and contains high quality wetland and upland habitats. Good opportunity.
Q	24S13W16TL00100, 200	Adamek Property	68	Parcel is primarily suitable only for out-of-kind mitigation and therefore not as desirable for the project.
R	21121700400, 21121700700	Roseburg North and South	150	Dune forest logged 5-15 yrs ago, located north of the Umpqua River. Confirmed suitable by ODFW, but sold before it could be acquired.

Map ID	Taxlot	Owner/ Site Name	Site Acres	Comments
S	26S14W09T L0010000	North Bank Site	161	Dune forest located on the north bank of the Coquille River, adjacent to the Bandon Marsh National Wildlife Refuge, with opportunities for complementary mitigation.
W	25S13W06T L0010100, 25S13W07T L0010100	Weyerhauser Lagoon Site	315	Located on the North Spit between Coos Bay and the ocean. Heavily used by wildlife and recreationists, and therefore a good mitigation opportunity, though primarily out-of-kind.

DEA investigated numerous potential mitigation strategies, beginning in 2007. The first effort identified possible habitat enhancement projects on Bureau of Land Management (BLM) land on the North Spit. These ideas were developed for several months, but abandoned due to lack of support from BLM management. The next strategy was to provide funding for protection of U.S. Forest Service (USFS) lands threatened by off-highway vehicle (OHV) use within the Oregon Dunes National Recreation Area (ODNRA). However, this plan was not possible due to USFS administrative restrictions.

In 2010 and 2011, DEA investigated the opportunities and constraints involved in mitigation on private lands adjacent to the ODNRA. Research was based on aerial photography interpretation, and site visits and conversations with Stuart Love, ODFW Wildlife Biologist, and Chris Claire, ODFW Fish Biologist. Numerous sites were investigated, but with no success because no private landowners within suitable parcels were willing to sell their property (Table 2, Parcels A-H). Several suitable Coos County parcels were found (Parcels L-O), but it was uncertain whether the County would commit to selling the parcels. JCEP was able to obtain two large parcels suitable for some portions of the mitigation plan (Parcels P and W), but sufficient acreage for in-kind mitigation for forested habitats was still lacking.

In 2013 and 2014, investigation of private and Coos County parcels was renewed, and coordination with ODFW continued, but neither Coos County nor private landowners in the vicinity were willing to sell, and the search was widened to include areas further north and south of the project. Parcel R, located 22 miles north of the project, was deemed suitable but was sold before it could be acquired. In April, 2014, a parcel containing forested dune habitat located on the north bank of the Coquille River adjacent to the Bandon Marsh National Wildlife Refuge was found (Parcel S). Upon review by ODFW, it was deemed suitable for in-kind mitigation for forested habitats. JCEP has taken steps to acquire Parcel S, which combined with Parcel P and W, will provide more than the required mitigation acreage for the project.

7. HABITAT MITIGATION SITE BASELINE CONDITIONS AND MITIGATION CONCEPTS

This section provides a detailed description of mitigation site conditions and mitigation concepts for parcels P, S, and W. The parcels that were selected were chosen based on their suitability for

mitigation, availability, and composition of habitats that could meet the in-kind and out-of-kind mitigation needs of the project. Habitat types and categories in each of these parcels were mapped using the same methodology used for other project elements, as shown in Figure 5.

In addition to permanent preservation of each mitigation parcel through implementation of a conservation easement, an ecological enhancement (uplift) is required, but no specific uplift type or ratio is prescribed by statute. In order to document uplift (thereby making the parcels eligible as mitigation under OAR 635-415-0000 through 0025), some combination of uplift alternatives that results in measurable functional uplift at each proposed mitigation parcel would be required. Several ecological uplift concepts (covering all the proposed sites) were discussed with ODFW during numerous meetings and site visits to discuss project mitigation. The uplift concepts discussed for each site have been vetted by ODFW as acceptable forms of uplift for the project. Performance standards related to these actions are provided in Section 8.

JCEP L.P. has entered negotiations with the Coos Watershed Association (CWA), a local non-profit organization established in 1993 meeting the requirements of ORS 271.715(3)(b), to provide long-term management and maintenance of all mitigation sites associated with the JCEP (including estuarine and freshwater wetland mitigation). JCEP L.P. would endow CWA to provide these services through the life of the Project (estimated approximately 30 years post construction). In doing so, JCEP LP, via CWA, can steer the mitigation sites toward substantial compliance with permit conditions and provide the required ecological uplift. In addition, a long-term maintenance plan, which would be in place prior to JCEP L.P. issuing Notice to Proceed for construction of the Jordan Cove Energy Project, is being written to provide guidance for the land manager.

If negotiations with CWA fail, JCEP L.P. would create and endow another land manager meeting the requirements of ORS 271.715(3)(b) to provide management and maintenance services for the mitigation projects for the life of the Project.

7.1 THE PANHANDLE SITE (PARCEL P)

The Panhandle Site (Figure 5, Sheet 1) lies north of the Trans Pacific Parkway and is part of a larger natural area that extends north into the ODNRA. The area has exceptional ecological features that are difficult to replace. For this reason, it was purchased in 2012 to be used for mitigation. The site is used by hikers from the Weyerhaeuser North Spit Overlook trailhead west of the site, and such use, which is supported by ODFW, would be allowed to continue.

7.1.1 Existing Conditions

The site is approximately 133 acres in size and contains several upland vegetation communities, as shown in Figure 5 and described below.

7.1.1.1 Coastal Dune Forest Habitat

Coastal dune forest habitat consists of forest areas established on fully stabilized sand dunes in the region. It is found throughout the study area in various successional stages. Dominant species include Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), shore pine (*Pinus contorta spp. contorta*), and Port Orford cedar (*Chamaecyparis lawsoniana*), with

scattered Sitka spruce (*Picea sitchensis*). In some places, patchy canopy promotes vigorous shrub growth and cover, ranging from dense to nearly impenetrable.

Dominant shrubs are evergreen huckleberry (*Vaccinium ovatum*), salal (*Gaultheria shallon*), bearberry (*Arctostaphylos uva-ursi*), and Pacific rhododendron (*Rhododendron macrophyllum)* with scattered California wax myrtle (*Myrica californica*) and hairy Manzanita (*Arctostaphylos columbiana*). The understory is generally lacking herbaceous species due to dense canopy cover, although portions of the forest are less dense than others.

Project specific coastal dune forest habitat parcels would be considered Category 3, due to the essential function they provide (based on ODFW policy definition). Species such as American marten, bats, and some songbirds depend upon it for species survival, and loss of the habitat could result in depletion of some of these species on a local scale. However, the habitat is not limited since similar habitats are found north and east of the project and provide alternate functional habitat for these relatively mobile species.

7.1.1.2 Herbaceous Habitat

The herbaceous habitat type is found on recently colonized dunes where pioneering species have established themselves. Dominant species include European beachgrass and colonial bentgrass, tall fescue, sweet vernal grass, and other non-native species, with some cover by native species such as seashore lupine (*Lupinus littoralis*), small-head clover, and beach strawberry (*Trifolium microcephalum*). Scotch broom is present in places, but is fairly limited.

This habitat type would not be considered essential (based on ODFW policy definition) because no species are known to depend upon it exclusively for their survival, and loss of the habitat would not likely result in depletion of any species. The habitat is not limited since similar habitats are found in the vicinity. Therefore the habitat is classified as Category 4 because it is not essential, or limited, but is important to wildlife.

7.1.1.3 Shrub Habitat

This habitat type is located on more stabilized dunes and has been colonized by shrubs and young trees, primarily Scotch broom and young shore pine. Overall shrub cover is 25% or more in this habitat type. The herbaceous species include mainly the non-native species described above such as European beachgrass, sweet vernal grass, and colonial bentgrass. The habitat is classified as Category 4 because it is not essential, or limited, but is important to wildlife.

7.1.1.4 Un-vegetated Sand Habitat

This habitat type includes areas of moving sand that have not been colonized by vegetation, except for very scattered herbaceous pioneer species such as European beachgrass. Although the habitat formed by these dunes is generally devoid of vegetation, it provides important habitat for a variety of wildlife, including songbirds that forage on seeds blown into this habitat, and raptors and small mammals that use the edges for foraging. ODFW considers the habitat to be limited on a local scale, since it is present only on a small strip of land between Highway 101 and the ocean. By ODFW definition, it is non-essential, but important to wildlife and limited, and would therefore be classified as Category 3.

7.1.1.5 Forested Wetland

The forested wetland habitat type consists of wetlands that have remained undisturbed long enough to develop a consistent tree canopy. It is dominated primarily by shore pine with some areas of tree-sized Hooker willow (*Salix hookeriana*). Mature red alder (*Alnus rubra*) and Sitka spruce also occurs in places, typically at the wetland boundary or on upland hummocks within the wetlands. The shrub layer is dominated by common coastal wetland species such as Pacific crabapple (*Malus fusca*), Hooker willow, Douglas' spirea (*Spirea douglasii)* and twinberry (*Lonicera involucrata*) in places. The herbaceous layer is typically dominated by slough sedge (*Carex obnupta*). The habitat is classified as Category 2 because it is essential for wildlife, and limited, but can be replaced through mitigation.

7.1.1.6 Scrub-Shrub Wetland

This habitat type is commonly dominated by Hooker willow, with salmonberry and other common coastal wetland species such as slough sedge and skunk cabbage (*Lysichiton americanus*). Pacific crabapple was also a dominant shrub species in some areas. The habitat is classified as Category 2 because it is essential for wildlife, and limited, but can be replaced through mitigation.

7.1.1.7 Emergent Wetland

This habitat type is typically dominated by slough sedge. In places, other typical species include spreading rush (*Juncus patens*), water parsley (*Oenanthe sarmentosa*), Pacific silverweed (*Potentilla anserina*), and salt grass (*Distichlis spicata*), among others. Wetter portions of this habitat type consisted of aquatic floating and emergent plants in relatively shallow seasonally or perennially inundated areas, including pond lily (*Nuphar polysephalum*), water parsley, cattail (*Typha latifolia*), and small-fruited bulrush (*Scirpus microcarpus*). The emergent wetland habitat is classified as Category 2 because it is essential for wildlife, and limited, but can be replaced through mitigation.

7.1.1.8 Open Water

Open water habitat is present in steep-sided interdunal areas and within deeper portions of wetland areas, where no vegetation was present. This habitat is classified as Category 2 because it is essential to wildlife and limited.

7.1.1.9 Unique Habitats Present

The Panhandle site contains unique qualities determined to be of significant importance to the State of Oregon, in the Coast Range Ecosystem. Information regarding the presence of these qualities has been gathered from resources found in the Oregon Conservation Strategy (ODFW, 2006) and from information provided by the Oregon Biodiversity Information Center (ORBIC) website. Important qualities observed at the mitigation site include the following:

1. Significant populations of rare plants or animals;
2. Rare wetland type;
3. Native, mature forest wetland and;
4. Preserves a wetland type disproportionally lost

1. Significant populations of the rare amphibian Northern red-legged frog (*Rana aurora*) have been observed in multiple locations throughout and adjacent to the site. Northern red-legged frogs are listed by the ODFW as "Sensitive – Vulnerable," federally as a "Species of Concern" and listed by ORBIC as "List 4."

2. Two rare wetland types based on rare plant associations have been observed at the site. Rare plant associations are listed on the Oregon Wetlands Explorer National Resources Digital Library (http://oregonexplorer.info/wetlands/AtriskWetlandPlantAssociations).

The first plant association at the site includes *Salix hookeriana* - (*Malus fusca*) / *Carex obnupta* - *Lysichiton americanus* (coast willow - (crabapple) / slough sedge - skunk cabbage shrub swamp). This plant association has a state rank of S2, defined as imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (extirpation), typically with 6-20 occurrences. This wetland type was observed in patchy distribution throughout the area defined in the 2013 DEA wetland delineation as scrub-shrub wetland. This includes approximately 6.4 acres wetlands.

The second at-risk plant association observed at the site is shore pine / slough sedge. This plant association has a state rank of S1, defined as critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation, typically with 5 or fewer occurrences. This wetland type was observed in the majority of forested portions of the site defined in the wetland delineation as forested wetland. This includes approximately 3.2 acres of wetlands.

3. A mature forested wetland is defined as a wetland in which mean diameter of trees (d.b.h., FACW and FAC species only) exceeds 18 inches, and/or the average age of trees exceeds 80 years, or there are >5 trees/acre with diameter >32 inches. Although no data has been collected, the site appears to meet this criterion.

4. Historical evidence suggests that this site is a remaining portion of a much larger complex of interdunal wetlands that once occurred on the North Spit. Interdunal wetlands are considered by the state to be an area of "special areas of concern". An interdunal wetland is defined as a seasonally inundated wetland, usually without a naturally-occurring inlet or outlet, located between sand dunes where wind has scoured the sand down to the water table (deflation plain), and often with significant cover of native species.

7.1.2 Mitigation Concept

Approximately 55 and 80 acres of habitat at the Panhandle Site will be used for in-kind and out of kind mitigation, respectively (mitigation calculations are provided in Section 8 and Table 3). Since the parcel is accessed by sand trail leading from the Weyerhaeuser parking lot trailhead across USFS land, uplift actions at the Panhandle Site would most likely need to be accomplished by hand rather than with mechanical means. Therefore the proposed uplift would include the following:

- Removing Scotch broom from selected portions of the parcel.
- Continuing to allow the public to cross the parcel and access USFS lands to the north.
- Providing stewardship of the entire parcel for the life of the project.

As shown in Figure 5, Sheet 2, two proposed uplift areas (A and B) have been outlined in red. Scotch broom is currently present in patches in these areas (Photo 9). Given the proximity to the Weyerhaeuser parking lot trailhead (which lies to the southwest of the parcel across USFS lands) the land manager would likely focus on Area A first, followed by Area B as time and budget allows. Minimum uplift requirements for each site are provided in Section 8.

In addition to weed removal, native species could be seeded or transplanted into weed removal areas. However, given that manual (backpack) watering would be required as a result of access limitations; this may not be the best use of resources. In any case, if native plantings are deemed feasible, the approach would be to use best available science to conduct restoration in small areas, followed by monitoring and adaptive management. Although native plantings may occur, they are not included as performance criteria.

Techniques for disposal of removed Scotch broom may include the following or similar techniques. The Scotch broom could be:

- Removed from the site and disposed of (labor intensive).
- Piled and left to dry, then burned in open sand areas during the appropriate season.
- Deposited on the eastern face of the steep forested area east of the uplift site.

7.2 THE LAGOON SITE (PARCEL W)

7.2.1 Existing Conditions

Parcel W lies on the North Spit just west of the Trans Pacific Parkway near the project area. It is an approximately 319-acre parcel composed primarily of Category 2 wetland habitats, with Category 4 upland habitats up slope of the wetlands (Figure 5, Sheet 4). Otherwise known as the Weyerhaeuser lagoons, the site is used heavily by songbirds and water birds, as well as by recreationists and birdwatchers, who access the lagoons and the beach by gated gravel roads on the north side of the parcel. Similar to the Panhandle, JCEP intends to allow for public use and enjoyment of the site, while enhancing portions of the site for wildlife. The North Spit sand road runs along the southern edge of the parcel and provides additional recreational and education opportunities.

7.2.2 Mitigation Concept

Approximately 40 and 30 acres of habitat at the Lagoon Site will be used for in-kind and out of kind mitigation, respectively. Two separate activities are proposed for the Lagoon Site: the required uplift associated with the approximately 70 acres of mitigation, and additional, in-kind mitigation for impacts to 1.9 acres of Un-vegetated Sand (US) habitat. This section addresses the uplift action, while the following section addresses US mitigation.

7.2.2.1 Lagoon Site Uplift Action

The proposed uplift area at the Lagoon Site is shown in red on Figure 5, Sheet 5. The proposed uplift is to maintain the area free from Scotch broom and Himalayan blackberry (Photo 12). This area was chosen because it would improve wildlife habitat between the wetlands and the access road, which would improve wildlife habitat as well as provide a better visitor experience for birdwatchers and other recreationists. In addition, the area in red is separated from larger

populations of weeds by the wetland areas, which may make it more feasible to reduce weed cover in the area over the long term.

An additional uplift action is to build an educational kiosk at the location of the asterisk (or elsewhere as deemed appropriate) to invite the public to enjoy the site and to provide some educational information.

Therefore the proposed uplift would include the following:

- Removing Scotch broom and Himalayan blackberry from the area marked in red.
- Continuing to allow the public to use the parcel for recreation, and constructing an education kiosk to guide the experience.
- Providing stewardship of the entire parcel for the life of the project.

7.2.2.2 Lagoon Site Mitigation Action

As mentioned previously, in-kind mitigation for impacts to 3.5 acres of Un-vegetated Sand (US) is required by ODFW policy. Preservation of 1.6 acres of US is to be provided at the Panhandle Site, but since mechanical access at the Panhandle is limited, it was deemed unfeasible to create an additional 1.9 acres of US at the Panhandle. Since no opportunities are apparent at the North Bank site, US mitigation is proposed at the Lagoon Site.

The proposed 1.9 acres of mitigation is shown in green on Figure 5, sheet 5. The mitigation concept is to create an open sand area (which is limited on the North Spit due to invasion of European beachgrass) by burying areas of primarily European beachgrass-dominated herbaceous habitat with sand. The sand would likely consist of material sourced from the JCEP project site, and would be brought in by truck and compacted in lifts to a depth of 5 or 6 feet. A 10-foot buffer would be maintained between the compacted sand and the wetland boundary to the east in order to reduce movement of sand into the wetland, and existing signs and trails would be avoided or replaced. Since the mitigation area lies on the leeward side of the steep foredune, excessive wind erosion is not anticipated following placement of sand. Performance criteria would state that the sand would be monitored and would contain at least 95% bare sand during the 5-year monitoring period.

Dave Lauten, Research Assistant with the Oregon Biodiversity Information Center (ORBIC) has worked on European beachgrass control for western snowy plover restoration on the North Spit for more than a decade. Per ODFW suggestion, he was consulted in June 2014 to determine appropriate removal methods and discuss potential conflicts with plover from creation of US at the Lagoon Site. He has not seen plover using areas as far north as the mitigation site, and in his opinion, there is only a fraction of a percent chance that the plover might use the mitigation site, for the following reasons:

- Narrow width of the mitigation area, combined with the adjacent steep-sided dune and shrub wetland areas make the habitat unattractive to plover because they are more susceptible to predators.
- Lack of direct, open sand access to the shore, and distance from the existing plover areas combined with site fidelity of plover in those established areas, make it unlikely they would visit the site, and less likely that they would remain within it.

Mr. Lauten recommended avoiding using sand material with shell hash in it, since shell hash is attractive to the plover. He also acknowledged the difficulty of controlling beachgrass over the long term, but felt that for a smaller site the mitigation concept could work. He felt the biggest threat to keeping sand areas from invading beachgrass was vegetative creep from the edges of the mitigation area, especially the steep upslope side, where the grass (and seeds) would tend to invade from.

The following discussion of European beachgrass biology would inform the mitigation action. It was excerpted from the California Invasive Plant Council Invasive Plants of California's Wildland website, with sources (present in online article) removed for brevity (http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=5&surveynumber=182.php):

> European beachgrass has changed beach topography, creating steep foredunes where none were present prior to its introduction. European beachgrass forms a dense cover that appears to exclude many native taxa. Dunes dominated by European beachgrass also have lower arthropod species diversity, and fewer rare arthropod species than dunes dominated by native species. European beachgrass is able to withstand up to 3.3 feet a year of sand burial.
>
> **Mechanical control methods:** Some attempts have been made at Oregon Dunes National Recreation Area to remove European beachgrass with heavy machinery. In the most ambitious attempt, European beachgrass was removed to a depth of approximately one meter (3.3 feet). The removed material was buried and capped with up to one meter of sand.
>
> **Chemical control methods:** In experimental trials conducted in northern California from 1991 to 1994, using a variety of herbicides, the only foliar treatment that consistently reduced live European beachgrass cover by 90 percent or more was glyphosate (as RoundupÂ®), applied at concentrations of 4 percent or 10 percent and mixed with 0.5 percent added surfactant (CitowettÂ® or Silwet L-77Â® were used) applied at 200 gallons per acre.

Given the prodigious growth rates of the species, JCEP proposes to apply herbicide to the European beachgrass as described above prior to depositing sand. Dave Lauten felt that this approach was as effective as any other method that has been used on the North Spit. Native plant species present within the fill area would be salvaged and replanted in nearby areas to the extent practicable prior to application of herbicide, and herbicide would be applied as required by law to avoid effects to the adjacent wetland areas.

7.3 THE NORTH BANK SITE (PARCEL S)

7.3.1 Existing Conditions

Parcel S (approximately161 acres) lies on the north bank of the Coquille River adjacent to the Bandon Marsh National Wildlife Refuge (NWR- Figure 5, Sheet 7). It is currently owned by Roseburg Forest Products, and contains primarily conifer forest atop stabilized sand dunes (Category 3) that was harvested between 14 and 58 years ago, and is scheduled to be harvested at 40-50 year rotations. Scrub-shrub wetlands (Category 2) lie along the eastern edge of the parcel, and a small drainage mapped as scrub-shrub wetland runs through the center of the parcel.

Timber roads that have been reclaimed by vegetation run throughout the parcel, and in places contain populations of noxious weeds.

7.3.2 Mitigation Concept

The forested areas surrounding the North Bank Site consist primarily of industrially logged forest, which provides little habitat diversity. The proposed uplift area at the North Bank Site is to provide diversity in the landscape by conducting forestry activities that would put the uplift area on a trajectory toward creating mature forest. To that end, JCEP is developing a forestry plan to guide management of the parcel.

The North Bank Site is large and almost entirely forested. As shown in Figure 5, sheet 8, the proposed uplift area would occur on 71.2 acres, and stewardship would occur for the life of the project. During forestry activities, removal of weeds, including Scotch broom, gorse, and blackberry (Photo 11) would occur to the extent practicable. Of the 71.2 acres preserved and enhanced at the North Bank, 1.4 acres of riparian forest habitat would be included as in-kind mitigation for impacts to riparian forest.

In addition to these actions, the proximity of the parcel to Bandon Marsh NWR provides opportunities for complementary uses between the two areas. Bandon Marsh consists primarily of wetlands and contains relatively little upland, forested habitat. Enhancement of Parcel S for wildlife could increase use of the parcel by wildlife. If suitable, educational opportunities for human visitors could be coordinated as well. Coordination between JCEP and Bandon Marsh NWR would be considered voluntary, and is not included in the performance criteria.

Therefore the proposed uplift would include the following:

- Documentation of forestry activities that put the uplift area on a trajectory toward creating mature forest
- Allowing the public to cross the parcel if deemed compatible with wildlife habitat uplift activities.
- Providing stewardship of the entire parcel for the life of the project

8. HABITAT MITIGATION CALCULATIONS

8.1 HABITAT MITIGATION CALCULATIONS FOR FERC-JURISDICTIONAL PROJECT COMPONENTS

The number of acres required for mitigation for each habitat type within the FERC project boundary and the number of acres to be used for 1:1 mitigation are shown in Table 4 below. As described in the ODFW habitat mitigation policy, in-kind, in-proximity mitigation is required for Category 2 and 3 habitats. Therefore, impacted Category 2 and 3 habitats are mitigated by protecting and enhancing the same kind of habitat that was impacted. Other habitats may be mitigated by preserving habitats other than those that were impacted.

Acreage requirements for the project as a whole were determined by comparing existing habitat mapping (Figure 2) with the post-construction mapping provided in Figures 3 and 4. Since all areas to be either temporarily or permanently impacted by the project would be considered to

retain zero function post-construction, this resulted in a requirement of 263.7 acres of mitigation for upland impacts.

In addition to the 263.7 acres of upland habitat, 1.8 acres of impacts to non-jurisdictional wetland at the Mill Site and 0.2 acres of impacts to non-jurisdictional wetland at the North Point Workforce Housing Project will be offset with 1.8 acres of in-kind mitigation at the Panhandle Site and 0.2 acres at the Lagoon Site. Thus, a total of 265.7 acres of habitat will be mitigated as a result of development impacts from the JCEP project. As mentioned previously, wetland impacts and mitigation are overseen by DSL and USACE, and are not covered in this document.

In-kind mitigation would occur at all three mitigation sites. Out-of-kind mitigation would also occur at the Panhandle and Lagoon sites (Parcels P and W), preserving and enhancing wetlands as mitigation for impacts to Category 4 herbaceous and shrub habitats. Wetland types used for out-of-kind mitigation include Category 2 freshwater wetlands and open water.

In order to mitigate in-kind for a total of 3.5 acres of impacts to un-vegetated sand, at least 1.9 acres of herbaceous habitat covered by European beachgrass at the Lagoon Site (Parcel W) would be returned to un-vegetated sand (dune) condition, in addition to the 1.6 acres of existing sand being used for in-kind mitigation at the Panhandle Site (Parcel P).

Table 4 outlines the number of acres required to mitigate for impacts to FERC-jurisdictional project components, which total 215.2 acres.

Table 4: Mitigation Calculations for FERC-Jurisdictional Project Impacts, in Acres

FERC Impacted Habitat Type	Total JCEP Mitigation Required	In-Kind Mitigation			Out-of Kind Mitigation*			FERC Mitigation Provided
		Parcel P	Parcel W	Parcel S	Parcel P	Parcel W	Parcel S	
Coastal Dune Forest	102.9	23.1		69.8				92.9
Riparian Forest	1.4							0.0
Shrub	10.1	3.8	5.1		1.2			10.1
Herbaceous Shrub	55.9	0.4			21.7			22.1
Herbaceous	89.9	14.1	9.9		44.0	21.9		89.9
Un-Vegetated Sand	3.5							0.0
Emergent Wetland	1.0							0.0
Open Water	1.0					0.2		0.2
Total	**265.7**	**41.4**	**15.0**	**69.8**	**66.9**	**22.1**	**0.0**	**215.2**

8.2 HABITAT MITIGATION CALCULATIONS FOR EFCS-JURISDICTIONAL PROJECT COMPONENTS

The number of acres required for mitigation for each habitat type within the EFSC project boundary and the number of acres to be used for 1:1 mitigation are shown in Table 5 below and illustrated in the figures in Appendix D. Although the mitigation areas in Appendix D are specific to the SDPP, both the EFSC- and FERC-jurisdictional portions of the Project will be managed and maintained together as a part of an overall JCEP mitigation portfolio and subject to the performance criteria outlined in this document for the entire JCEP project.

Table 5: Mitigation Calculations for EFSC-Jurisdictional Project Impacts, in Acres

EFSC Impacted Habitat Type	Total JCEP Mitigation Required	In-Kind Mitigation			Out-of Kind Mitigation*			EFSC Mitigation Provided
		Parcel P	Parcel W	Parcel S	Parcel P	Parcel W	Parcel S	
Coastal Dune Forest	102.9	10.0						10.0
Riparian Forest*	1.4			1.4				1.4
Shrub	10.1							0.0
Herbaceous Shrub	55.9		22.9		10.9			33.8
Herbaceous	89.9							0.0
Un-Vegetated Sand	3.5	1.6	1.9					3.5
Emergent Wetland	1.0	1.0						1.0
Open Water	1.0	0.8						0.8
Total	**265.7**	**13.4**	**24.8**	**1.4**	**10.9**	**0.0**	**0.0**	**50.5**

9. COMPLEMENTARY MITIGATION

As required by the OARs, all these actions complement and do not diminish mitigation provided for previous development actions. This is especially true at the Panhandle Site, where previous wetland mitigation on adjacent Weyerhaeuser property will be augmented by upland habitat mitigation, and at the North Bank Site, where complementary mitigation could occur in coordination with Bandon Marsh. Mitigation at the Panhandle Site would also expand existing protection of the adjacent ODNRA lands.

10. HABITAT MITIGATION MONITORING PLAN

Per OARs, monitoring efforts shall continue for the duration and at a frequency needed to ensure that the goals and standards in OAR 635-415-0025 are met, unless the Department determines that no significant benefit would result from such monitoring. Monitoring efforts should include protocols and methods, and a reporting schedule for monitoring the effectiveness of mitigation measures. This plan proposes a monitoring period of no more than five years. Monitoring Year 1 shall begin upon substantial completion of mitigation construction/implementation.

10.1 AS-BUILT SURVEY (YEAR 1)

An as-built survey will be conducted to document appropriate contours have been attained (where grading may be proposed) and plantings were installed as designed. An as-built report will be prepared including the as-built survey, photos, and a brief synopsis of work completed including any design changes.

10.2 PHOTO DOCUMENTATION (YEARS 1 THROUGH 5)

Photo locations will be established as appropriate within the mitigation sites to document conditions within the first five years. Supplemental photos will be taken as appropriate to document enhancement and any problem areas.

10.3 PERFORMANCE STANDARDS

As previously mentioned, mitigation for impacts from EFSC- and FERC-jurisdictional development actions will be managed and maintained as a part of the overall JCEP mitigation portfolio and subject to the performance criteria outlined in this document for the overall JCEP project. Objectives and performance standards common to all mitigation sites are as follows:

Objective 1: Permanent preservation of parcel.

- **Performance Standard 1.1:** A legal protection instrument is in place in the form of a conservation easement.

Objective 2: The portion of the parcel preserved for mitigation purposes is demonstrably managed for conservation for the life of the project.

- **Performance Standard 2.1:** A land manager will be endowed to monitor and maintain the parcels, demonstrate that an ecological uplift has been provided at each site, provide monitoring reports for the first five years after implementation of proposed mitigation measures, and maintain the sites throughout the life of the Project.

- **Performance Standard 2.2:** A long-term maintenance plan will be developed in coordination with the appropriate agencies to guide long-term stewardship for each mitigation site.

Objective 3: An ecological uplift has been provided at each mitigation site.

The specific performance standards by site are as follows:

Panhandle Site (Parcel P)

- **Performance Standard 3.1**: Ecological uplift (in the form of Scotch broom removal over a minimum of 5.8 acres) has been completed and is reflected in monitoring reports for five years.

North Bank Site (Parcel S)

- **Performance Standard 3.2:** Ecological uplift (forestry activities designed to encourage succession to mature forest within a minimum of 71.2 acres) has been completed for five years based on annual monitoring reports.

Lagoon Site (Parcel W)

- **Performance Standard 3.3:** Ecological uplift (in the form of Scotch broom and Himalayan blackberry removal within a minimum of 10.2 acres, and construction of an educational kiosk) has been completed and maintained for five years based on annual monitoring reports.

- **Performance Standard 3.4:** Placement and compaction of sand to an approximate depth of 6 feet has been completed and maintained over an area of at least 1.9 acres to provide at least 95% open sand cover for five years based on annual monitoring reports.

10.4 CONTINGENCY PLAN

Contingency plans will be developed by the endowed conservation entity and coordinated with ODFW should the performance standards not be met. The nature of the contingency plan will depend on the problems that arise and would likely be related to weed control and potential vandalism or effects from natural disasters.

11. LONG-TERM PROTECTION AND FINANCIAL SECURITY INSTRUMENTS

11.1 PROTECTION INSTRUMENT

JCEP L.P. will prepare a conservation easement to provide long term protection for the mitigation sites for the life of the project. The conservation easement will be reviewed by the project stakeholders, and will be in place prior to JCEP L.P.'s issuing Notice to Proceed for construction of the Jordan Cove Energy Project.

11.2 LONG-TERM MAINTENANCE PLAN

11.2.1 Anticipated Ownership

The mitigation sites will be owned by Fort Chicago LNG II U.S. L.P. (a wholly owned and controlled subsidiary of JCEP L.P.'s parent company Veresen, Inc.).

11.2.2 Anticipated Long-term Maintenance Actions

Long-term maintenance will include the activities described for each site above. Other activities may include garbage/debris removal and installation of protective signage and/or other deterrents

if vandalism or inappropriate activities are found to occur. In addition, a long-term maintenance plan will be in place prior to JCEP L.P.'s issuing Notice to Proceed.

11.2.3 Entity Responsible for Maintenance

JCEP L.P. will be responsible for maintenance of the mitigation sites, and some or all of the long-term maintenance will be performed by the land manager endowed by JCEP L.P.

11.2.4 Anticipated Funding Source

JCEP L.P. will create an endowment to fund long term maintenance of the mitigation sites by the land manager.

12. PREPARERS AND CONTRIBUTORS

Phil Rickus, DEA Ecologist, authored this report. Ethan Rosenthal, Ecologist, and Art Martin, Energy Coordinator, Wildlife Division, Oregon Department of Fish and Wildlife, and Sean Sullivan, DEA Project Manager, provided the quality reviews. Dawn Afman, DEA Project Assistant, prepared the report drafts, and Sara Gilbert, DEA GIS Project Manager, provided graphics.

13. APPENDICES

APPENDIX A: Photographs



Photo 1: Looking south along the eastern edge of the Mill Site at weedy herbaceous shrub habitat.



Photo 2: Looking north along the eastern edge of the Mill Site at weedy herbaceous habitat.



Photo 3: Looking west from the south-central portion of the Mill Site at weedy herbaceous habitat.



Photo 4: Weedy herbaceous habitat atop the landfill at the Mill Site.



Photo 5: Weedy shrub habitat on the north side of the Mill Site.



Photo 6: Looking south at weedy herbaceous habitat west of Ingram Yard.



Photo 7: Looking northwest from the west side of the North Point Workforce Housing Project property at weedy herbaceous and shrub habitat.



Photo 8: Typical upland conditions on top of fill pad in the eastern portion of the North Point Workforce Housing Project. Photo from center of site looking north.



Photo 9: Panhandle Site. Looking east at the eastern edge of Uplift Area A at Scotch broom that that can be removed to provide uplift.



Photo 10: Looking north at habitats to be preserved in the northern portion of the Panhandle Site.

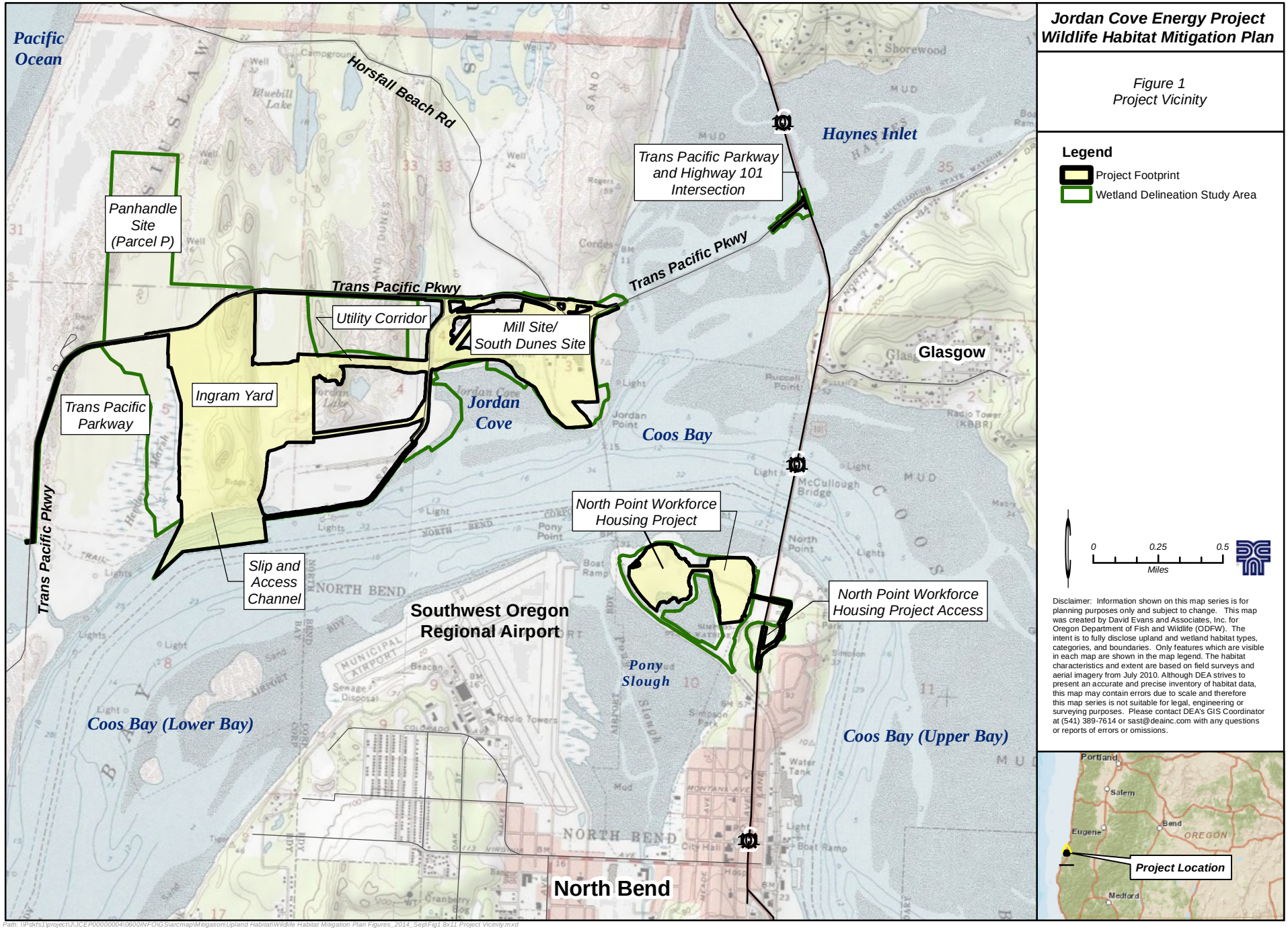


Photo 11: North Bank Site. Looking northwest from North Bank Lane at habitat that will be put on a trajectory toward mature forest to provide uplift, as well as patches of gorse that can be removed during forestry activities.



Photo 12: Lagoon Site. Looking west toward the ocean from the south side of the access road at Scotch broom that can be removed to provide uplift. Photo taken near area where an educational kiosk is to be constructed.

APPENDIX B: Figures



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Figure 1
Project Vicinity

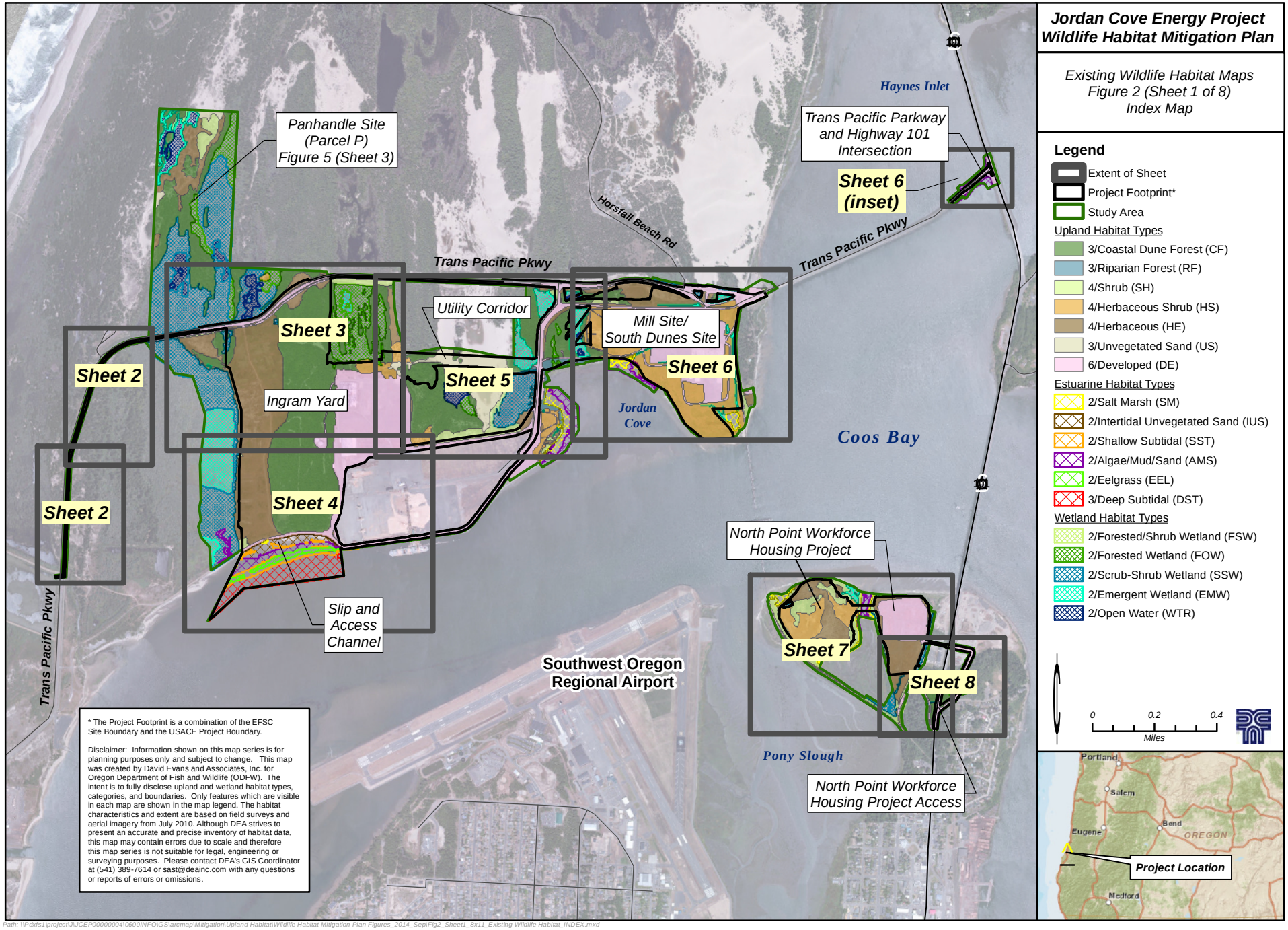
Legend

- Project Footprint
- Wetland Delineation Study Area

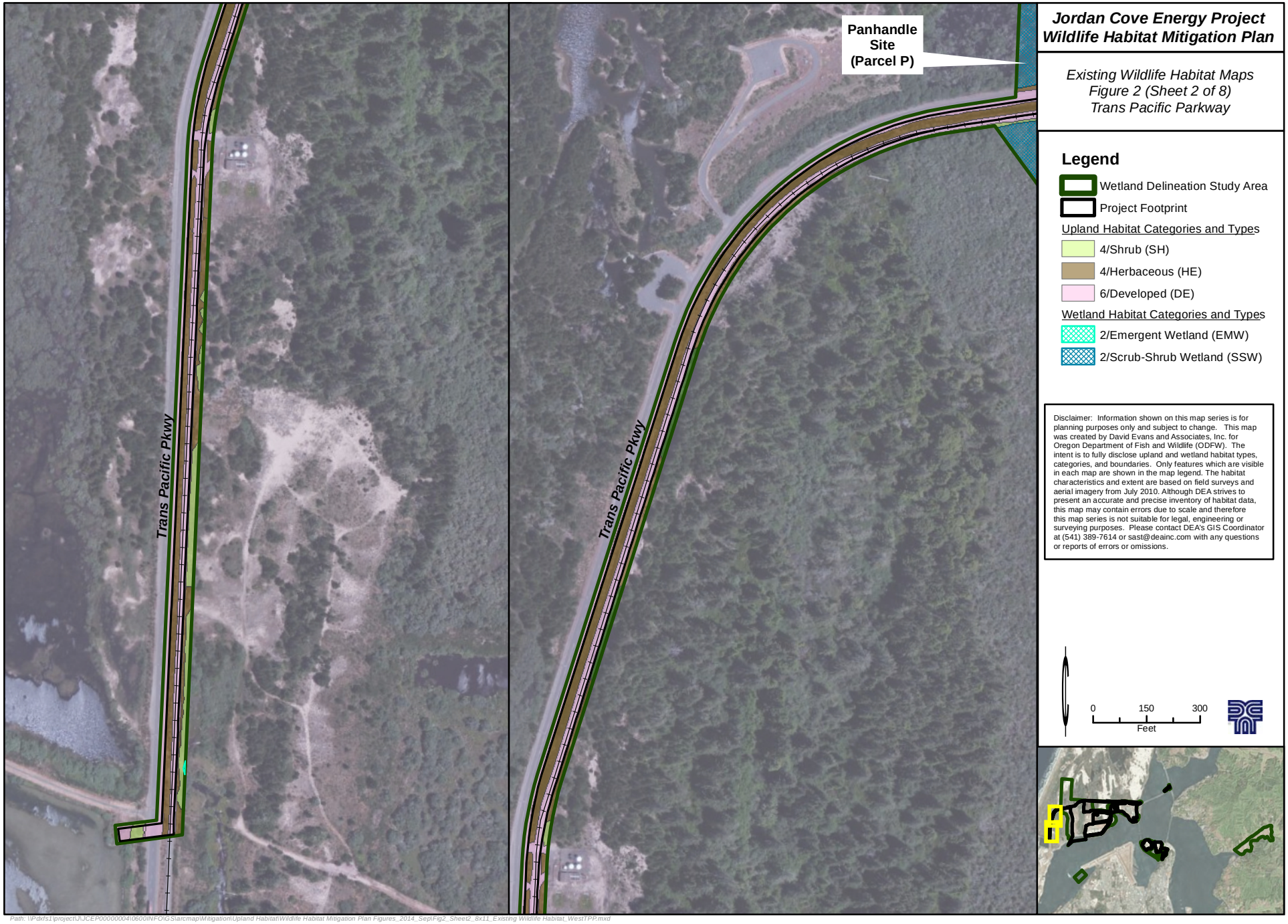
0 0.25 0.5
Miles

Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Path: \\Pdxfs1\project\J\JCEP00000004\0600INFO\GIS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sept\Fig1 8x11 Project Vicinity.mxd
Date: 10/22/2014 Time: 9:25:52 AM User: sast



Path: \\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig2_Sheet1_8x11_Existing Wildlife Habitat_INDEX.mxd
Date: 10/20/2014 Time: 4:50:05 PM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Existing Wildlife Habitat Maps
Figure 2 (Sheet 2 of 8)
Trans Pacific Parkway

Legend

- Wetland Delineation Study Area
- Project Footprint

Upland Habitat Categories and Types

- 4/Shrub (SH)
- 4/Herbaceous (HE)
- 6/Developed (DE)

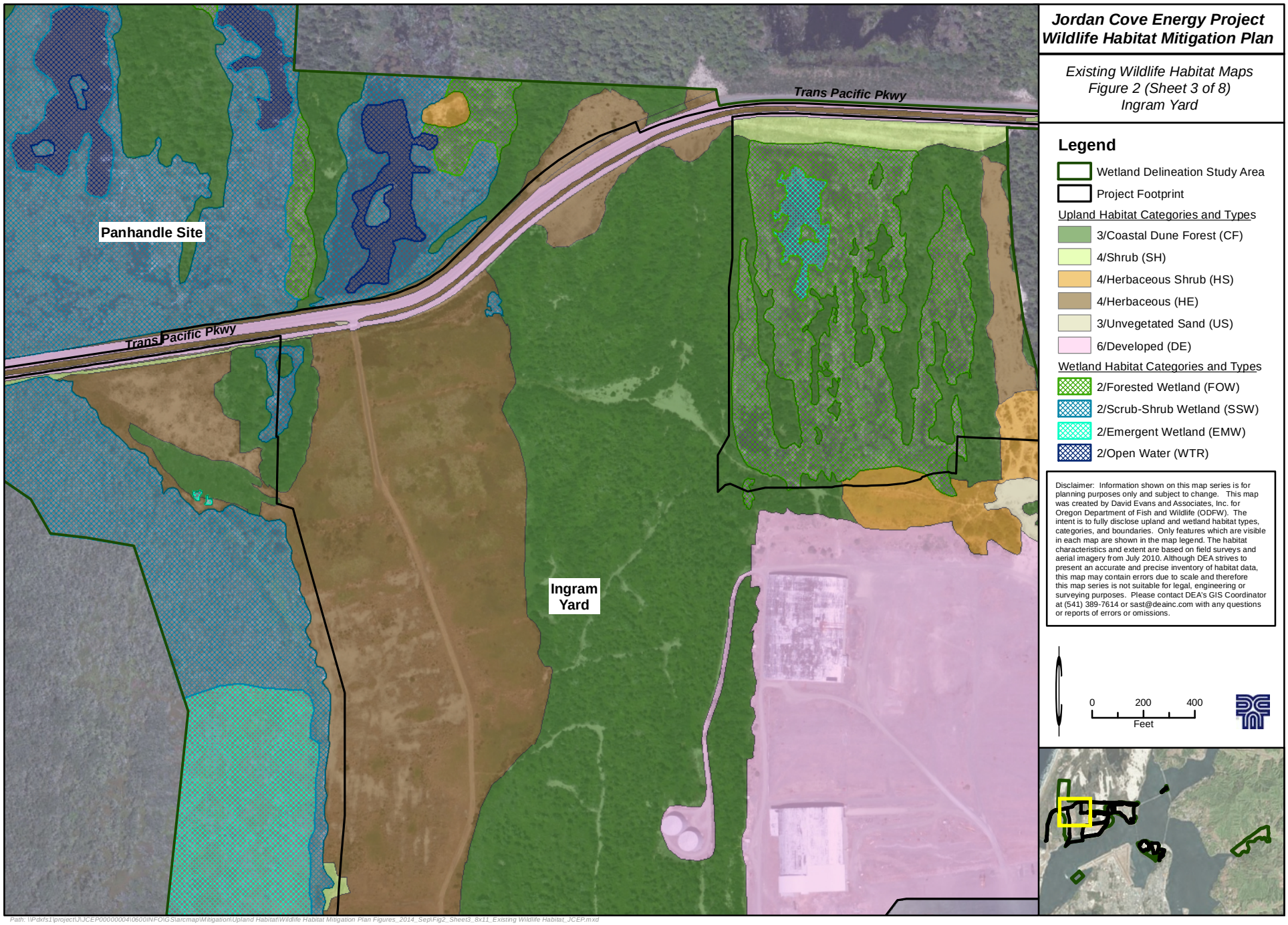
Wetland Habitat Categories and Types

- 2/Emergent Wetland (EMW)
- 2/Scrub-Shrub Wetland (SSW)

Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

0 150 300
Feet

Path: \\Pdxfs1\project\J\JCEP0000004\0600\INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig2_Sheet2_8x11_Existing Wildlife Habitat_WestTPP.mxd
Date: 10/22/2014 Time: 11:51:54 AM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Existing Wildlife Habitat Maps
Figure 2 (Sheet 3 of 8)
Ingram Yard

Legend

- Wetland Delineation Study Area
- Project Footprint

Upland Habitat Categories and Types

- 3/Coastal Dune Forest (CF)
- 4/Shrub (SH)
- 4/Herbaceous Shrub (HS)
- 4/Herbaceous (HE)
- 3/Unvegetated Sand (US)
- 6/Developed (DE)

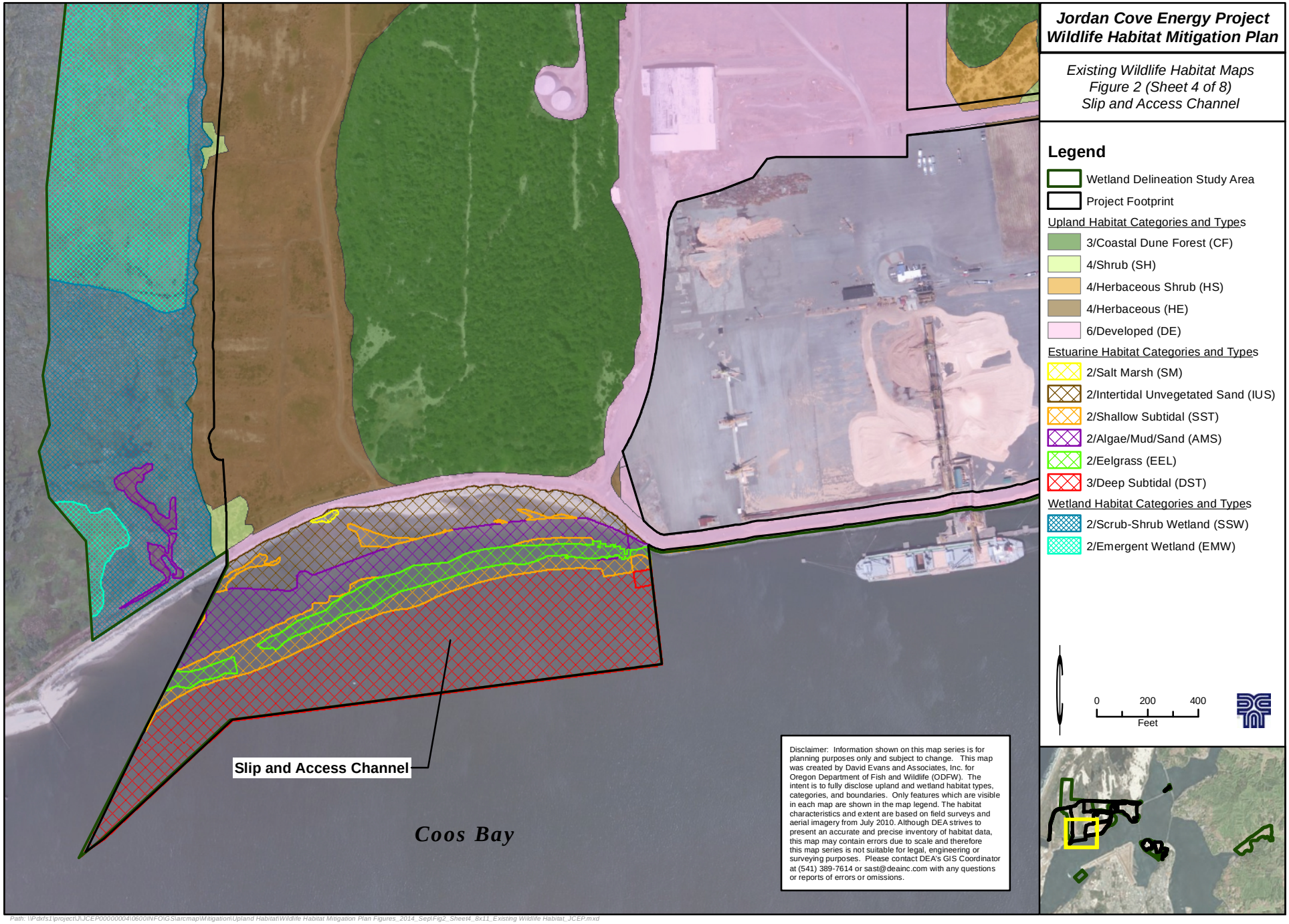
Wetland Habitat Categories and Types

- 2/Forested Wetland (FOW)
- 2/Scrub-Shrub Wetland (SSW)
- 2/Emergent Wetland (EMW)
- 2/Open Water (WTR)

Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

0 200 400
Feet

Path: \\Pdxfs1\project\J\JCEP0000004\0600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig2_Sheet3_8x11_Existing Wildlife Habitat_JCEP.mxd
Date: 10/22/2014 Time: 11:53:15 AM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Existing Wildlife Habitat Maps
Figure 2 (Sheet 4 of 8)
Slip and Access Channel

Legend

- Wetland Delineation Study Area
- Project Footprint

Upland Habitat Categories and Types
- 3/Coastal Dune Forest (CF)
- 4/Shrub (SH)
- 4/Herbaceous Shrub (HS)
- 4/Herbaceous (HE)
- 6/Developed (DE)

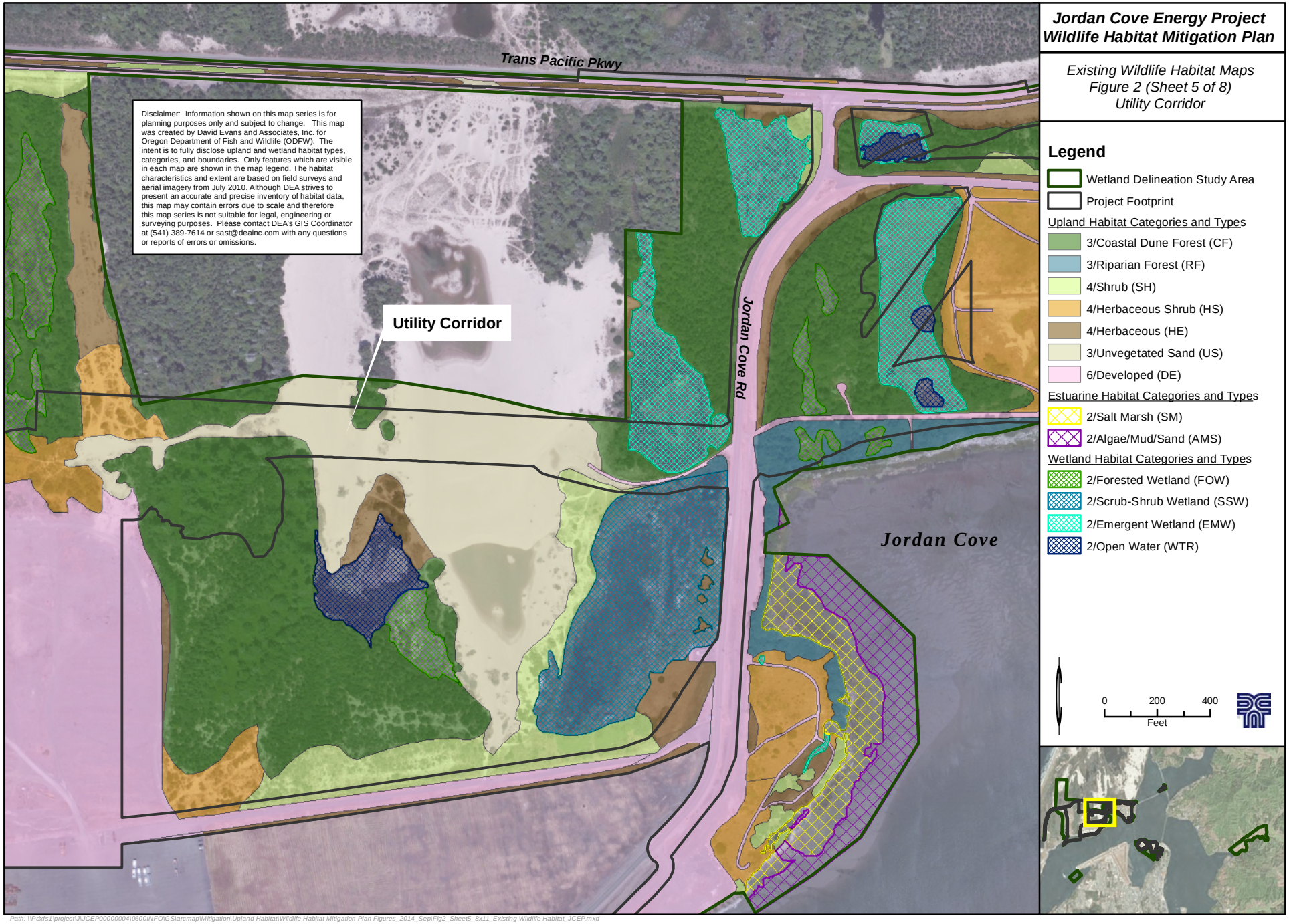
Estuarine Habitat Categories and Types
- 2/Salt Marsh (SM)
- 2/Intertidal Unvegetated Sand (IUS)
- 2/Shallow Subtidal (SST)
- 2/Algae/Mud/Sand (AMS)
- 2/Eelgrass (EEL)
- 3/Deep Subtidal (DST)

Wetland Habitat Categories and Types
- 2/Scrub-Shrub Wetland (SSW)
- 2/Emergent Wetland (EMW)

0 200 400
Feet

Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

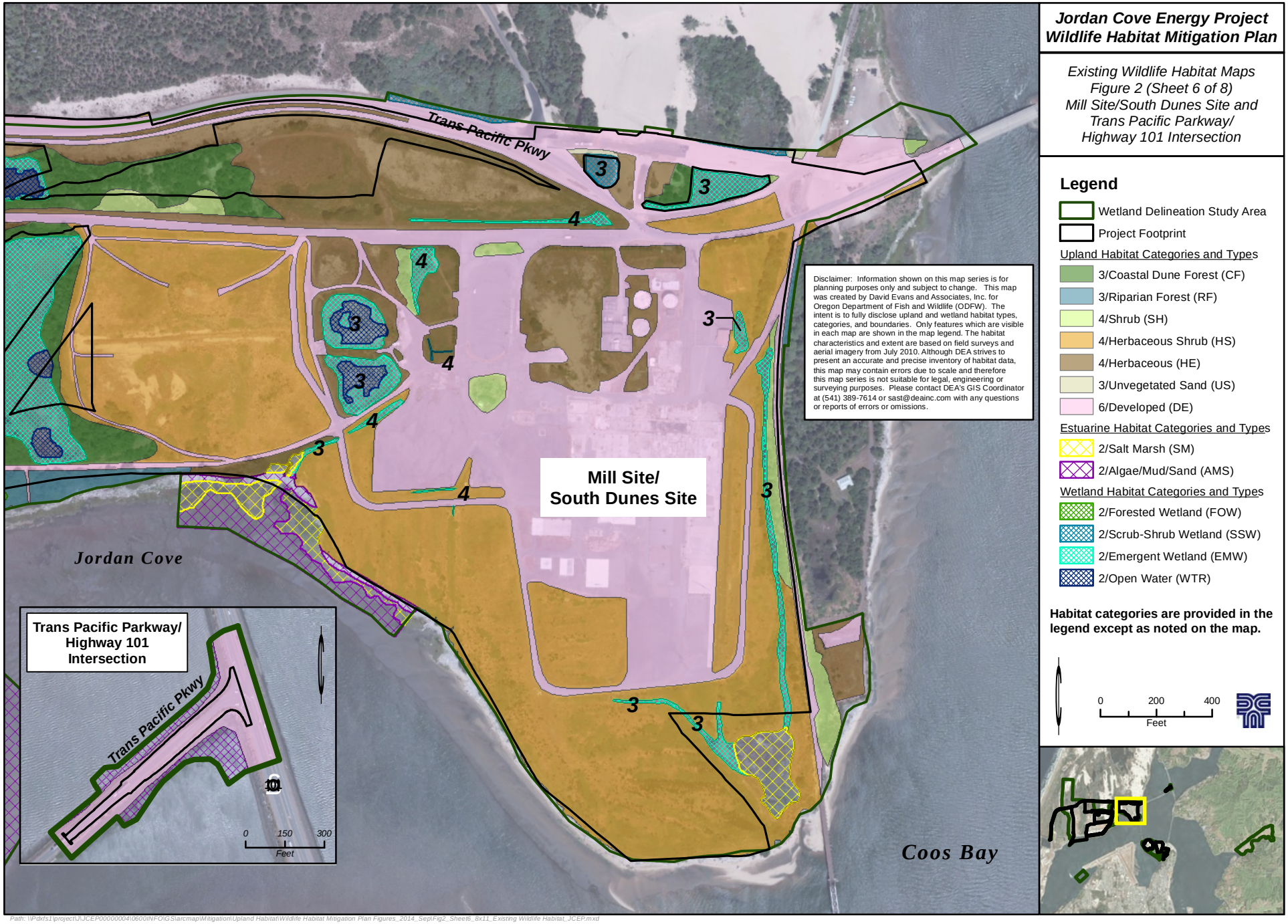
Path: \\Pdxfs1\project\J\JCEP000000004\0600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig2_Sheet4_8x11_Existing Wildlife Habitat_JCEP.mxd
Date: 10/22/2014 Time: 12:05:14 PM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Existing Wildlife Habitat Maps
Figure 2 (Sheet 5 of 8)
Utility Corridor

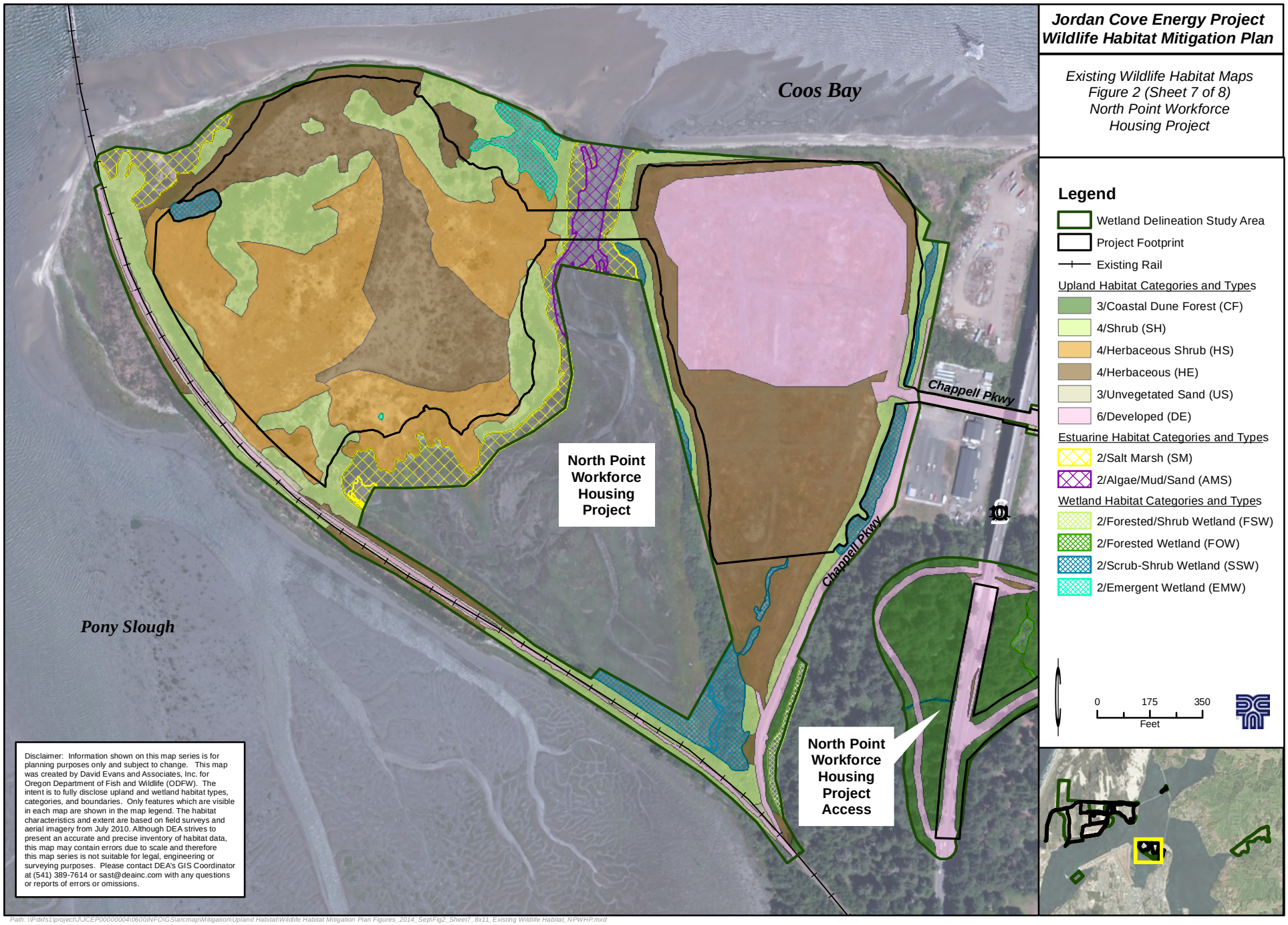
Path: \\Pdxfs1\project\J\JCEP0000004\0600INFO\GIS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig2_Sheet5_8x11_Existing Wildlife Habitat_JCEP.mxd
Date: 10/22/2014 Time: 11:58:19 AM User: sast



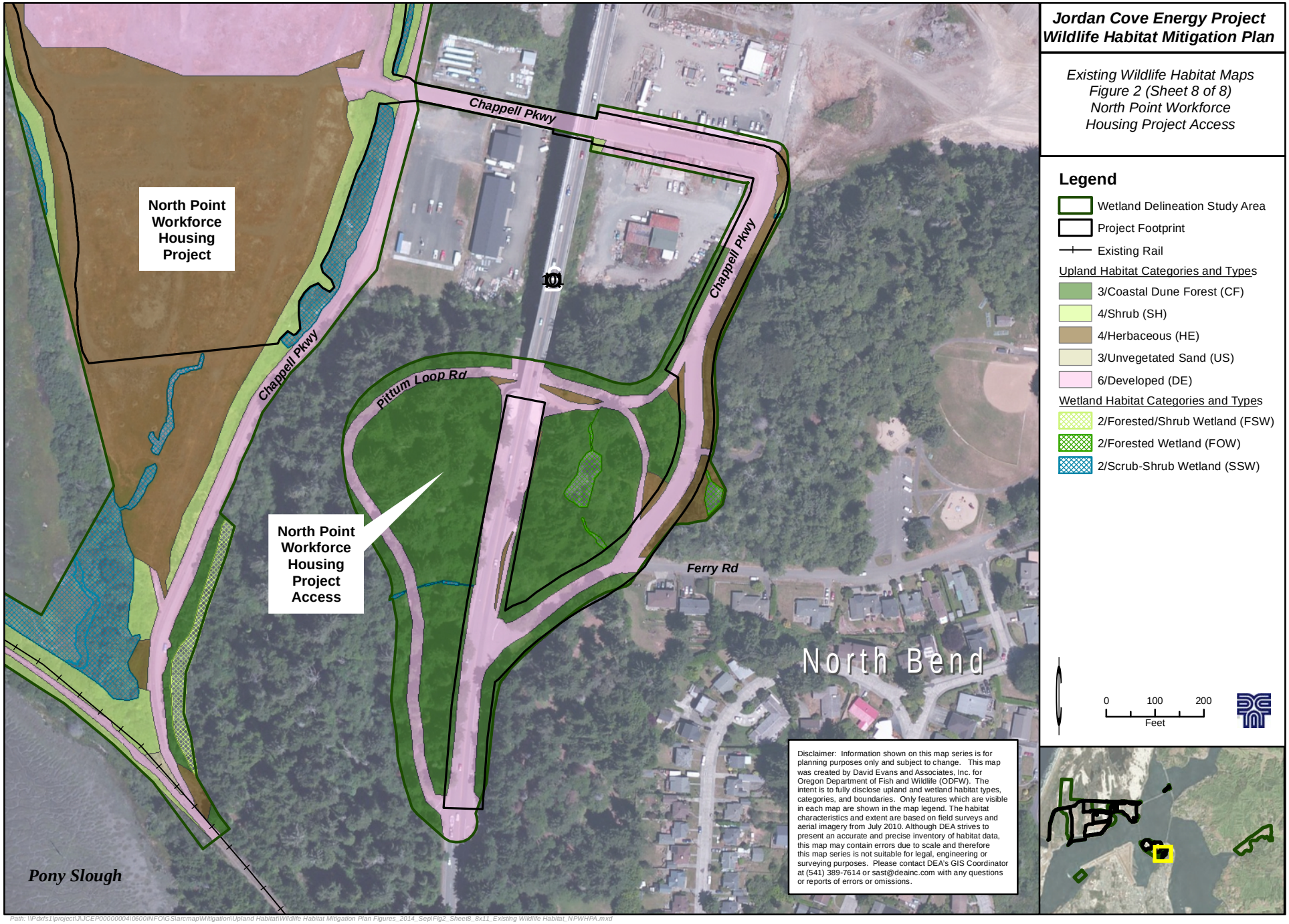
Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Existing Wildlife Habitat Maps
Figure 2 (Sheet 6 of 8)
Mill Site/South Dunes Site and
Trans Pacific Parkway/
Highway 101 Intersection

Path: \\Pdxfs1\project\J\JCEP0000004\0600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig2_Sheet6_8x11_Existing Wildlife Habitat_JCEP.mxd
Date: 10/22/2014 Time: 12:07:32 PM User: sast



Path: \\Pdxfs1\project\J\JCEP0000004\0600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig2_Sheet7_8x11_Existing Wildlife Habitat_NPWHP.mxd
Date: 10/22/2014 Time: 12:00:46 PM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Existing Wildlife Habitat Maps
Figure 2 (Sheet 8 of 8)
North Point Workforce Housing Project Access

Legend

- Wetland Delineation Study Area
- Project Footprint
- Existing Rail

Upland Habitat Categories and Types

- 3/Coastal Dune Forest (CF)
- 4/Shrub (SH)
- 4/Herbaceous (HE)
- 3/Unvegetated Sand (US)
- 6/Developed (DE)

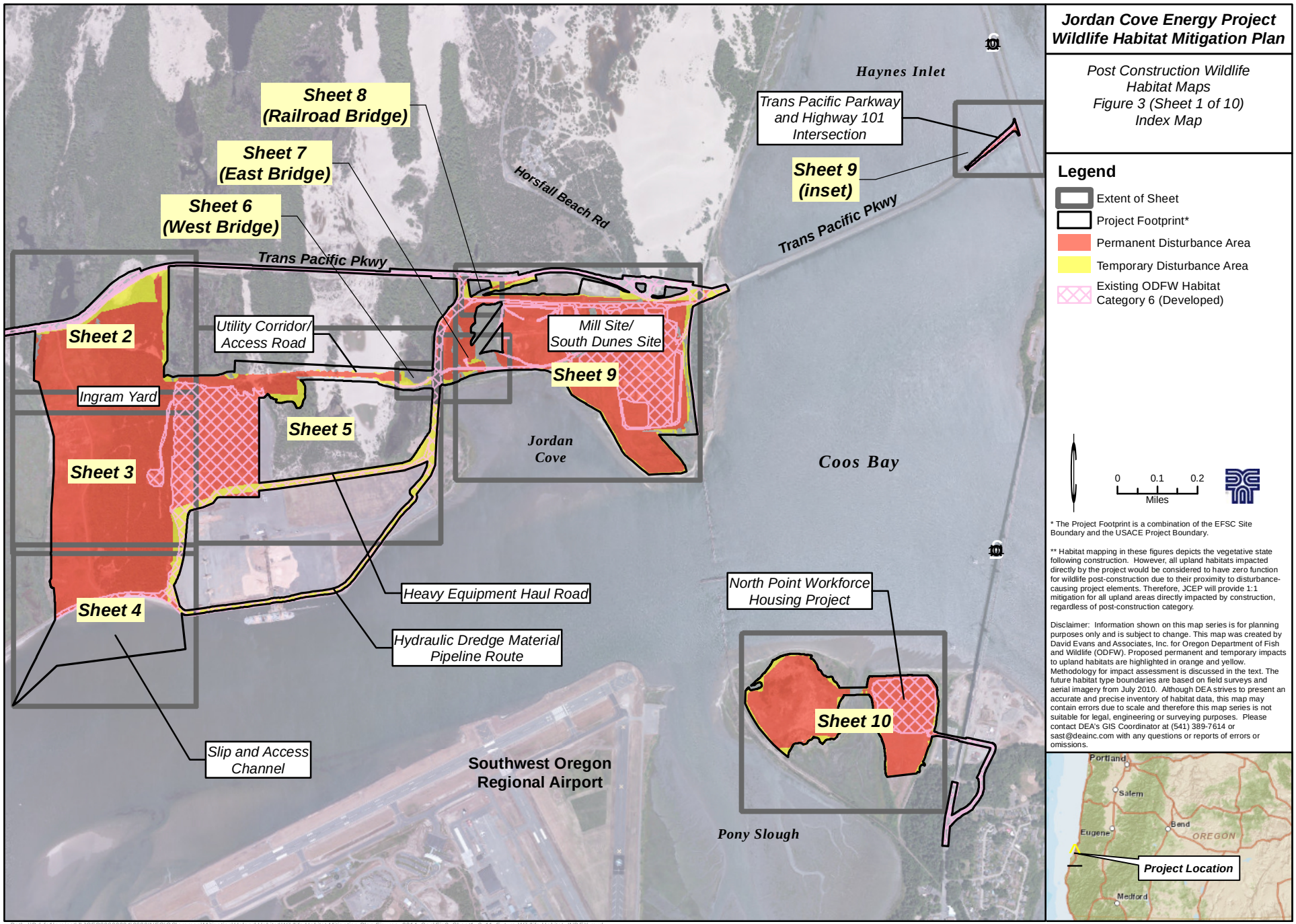
Wetland Habitat Categories and Types

- 2/Forested/Shrub Wetland (FSW)
- 2/Forested Wetland (FOW)
- 2/Scrub-Shrub Wetland (SSW)

0 100 200
Feet

Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Path: \\Pdxfs1\project\J\JCEP0000004\0600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig2_Sheet8_8x11_Existing Wildlife Habitat_NPWHPA.mxd
Date: 10/22/2014 Time: 12:02:57 PM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Post Construction Wildlife Habitat Maps
Figure 3 (Sheet 1 of 10)
Index Map

Legend

- Extent of Sheet
- Project Footprint*
- Permanent Disturbance Area
- Temporary Disturbance Area
- Existing ODFW Habitat Category 6 (Developed)

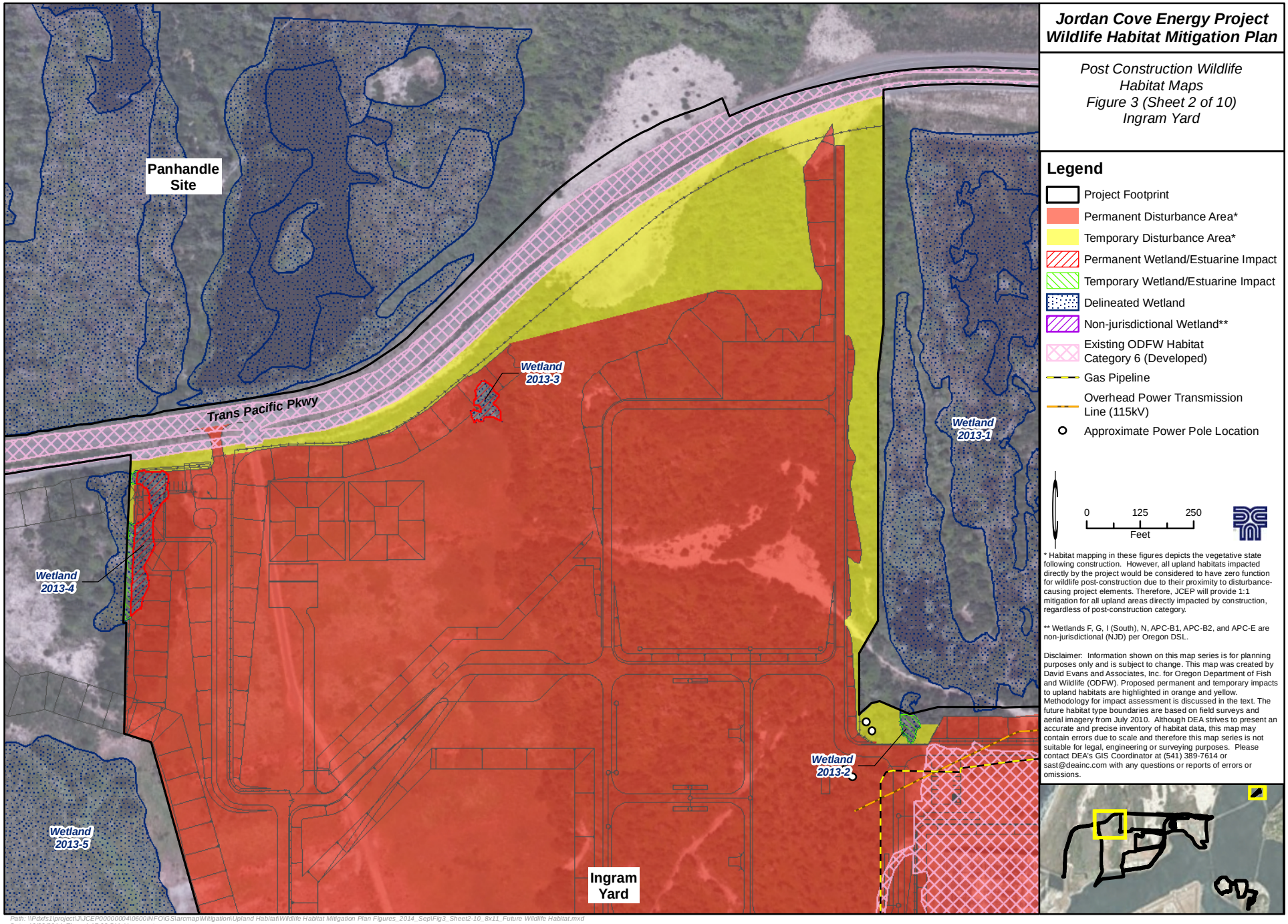
0 0.1 0.2
Miles

* The Project Footprint is a combination of the EFSC Site Boundary and the USACE Project Boundary.

** Habitat mapping in these figures depicts the vegetative state following construction. However, all upland habitats impacted directly by the project would be considered to have zero function for wildlife post-construction due to their proximity to disturbance-causing project elements. Therefore, JCEP will provide 1:1 mitigation for all upland areas directly impacted by construction, regardless of post-construction category.

Disclaimer: Information shown on this map series is for planning purposes only and is subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). Proposed permanent and temporary impacts to upland habitats are highlighted in orange and yellow. Methodology for impact assessment is discussed in the text. The future habitat type boundaries are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Path: \\Pdxfs1\project\J\JCEP00000004\0600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig3_Sheet1_8x11_Future Wildlife Habitat_INDEX.mxd
Date: 10/22/2014 Time: 1:12:39 PM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Post Construction Wildlife Habitat Maps
Figure 3 (Sheet 2 of 10)
Ingram Yard

Legend

- Project Footprint
- Permanent Disturbance Area*
- Temporary Disturbance Area*
- Permanent Wetland/Estuarine Impact
- Temporary Wetland/Estuarine Impact
- Delineated Wetland
- Non-jurisdictional Wetland**
- Existing ODFW Habitat Category 6 (Developed)
- Gas Pipeline
- Overhead Power Transmission Line (115kV)
- Approximate Power Pole Location

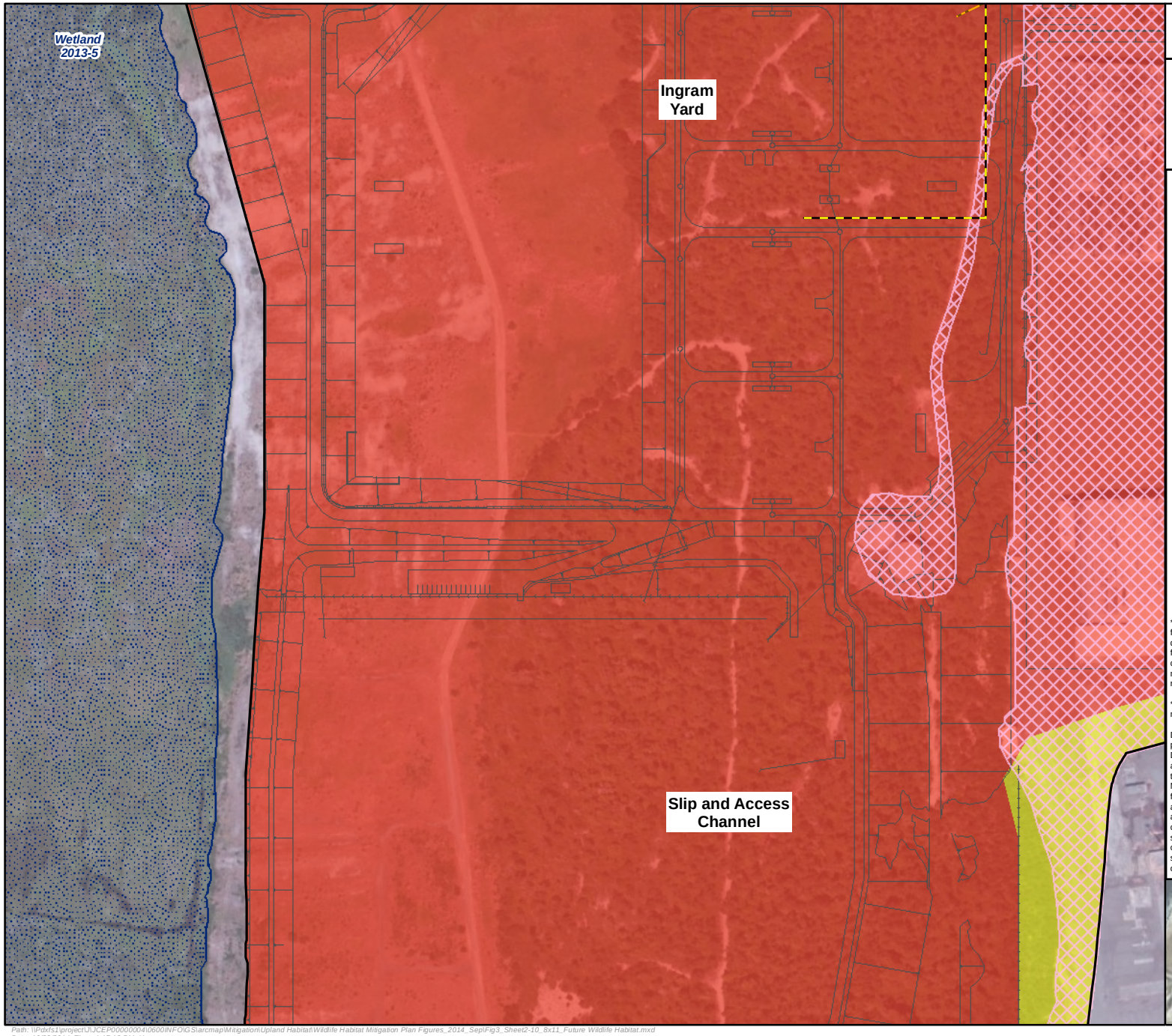
0 125 250
Feet

* Habitat mapping in these figures depicts the vegetative state following construction. However, all upland habitats impacted directly by the project would be considered to have zero function for wildlife post-construction due to their proximity to disturbance-causing project elements. Therefore, JCEP will provide 1:1 mitigation for all upland areas directly impacted by construction, regardless of post-construction category.

** Wetlands F, G, I (South), N, APC-B1, APC-B2, and APC-E are non-jurisdictional (NJD) per Oregon DSL.

Disclaimer: Information shown on this map series is for planning purposes only and is subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). Proposed permanent and temporary impacts to upland habitats are highlighted in orange and yellow. Methodology for impact assessment is discussed in the text. The future habitat type boundaries are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Path: \\Pdxfs1\project\J\JCEP0000000410600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig3_Sheet2-10_8x11_Future Wildlife Habitat.mxd
Date: 10/22/2014 Time: 1:17:08 PM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Post Construction Wildlife Habitat Maps
Figure 3 (Sheet 3 of 10)
South Ingram Yard/Slip

Legend

- Project Footprint
- Permanent Disturbance Area*
- Temporary Disturbance Area*
- Permanent Wetland/Estuarine Impact
- Temporary Wetland/Estuarine Impact
- Delineated Wetland
- Non-jurisdictional Wetland**
- Existing ODFW Habitat Category 6 (Developed)
- Gas Pipeline
- Overhead Power Transmission Line (115kV)

0 125 250
Feet

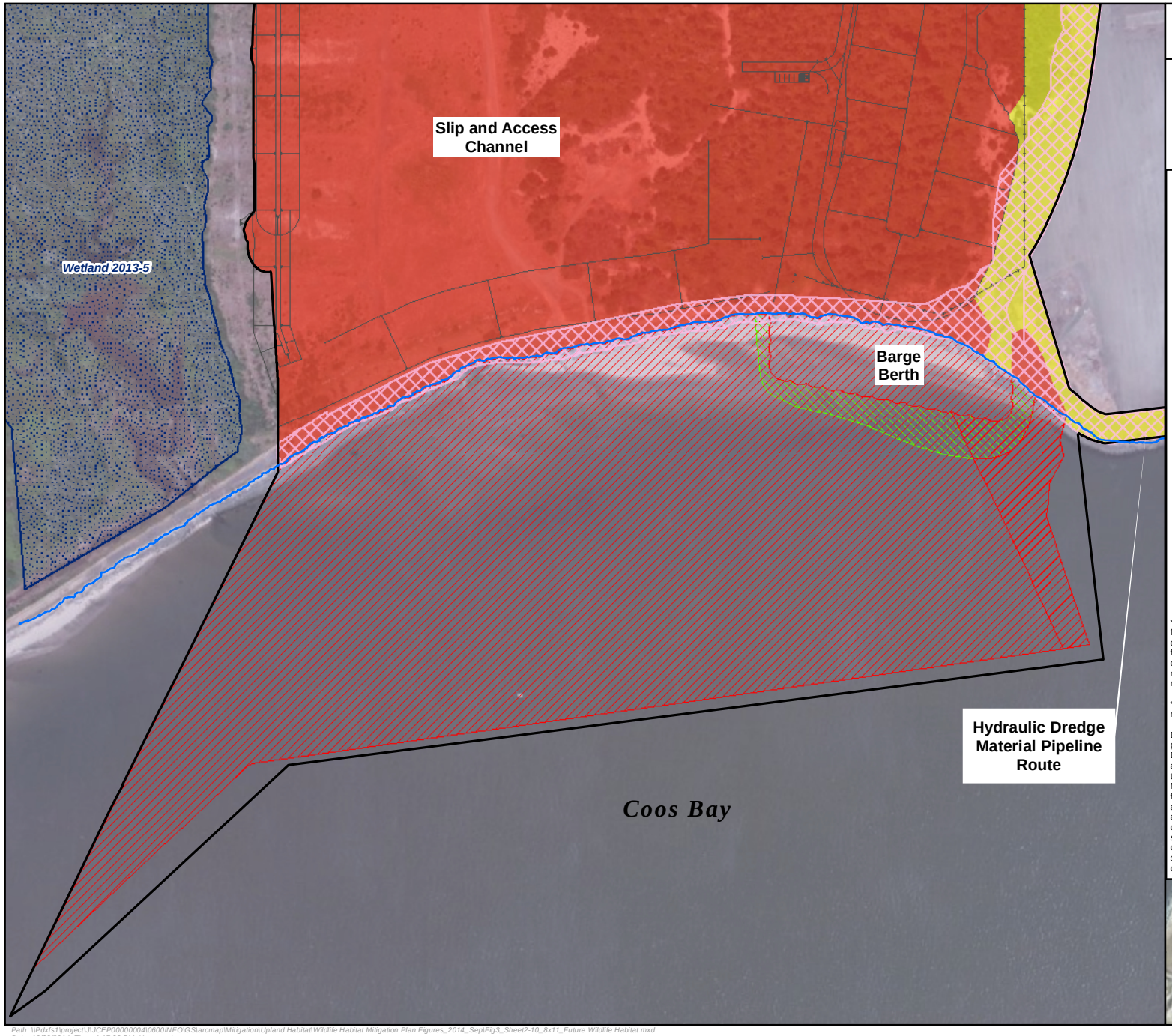
* Habitat mapping in these figures depicts the vegetative state following construction. However, all upland habitats impacted directly by the project would be considered to have zero function for wildlife post-construction due to their proximity to disturbance-causing project elements. Therefore, JCEP will provide 1:1 mitigation for all upland areas directly impacted by construction, regardless of post-construction category.

** Wetlands F, G, I (South), N, APC-B1, APC-B2, and APC-E are non-jurisdictional (NJD) per Oregon DSL.

Disclaimer: Information shown on this map series is for planning purposes only and is subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). Proposed permanent and temporary impacts to upland habitats are highlighted in orange and yellow. Methodology for impact assessment is discussed in the text. The future habitat type boundaries are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.



Path: \\Pdxfs1\project\J\JCEP0000000410600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig3_Sheet2-10_8x11_Future Wildlife Habitat.mxd
Date: 10/22/2014 Time: 1:17:18 PM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Post Construction Wildlife Habitat Maps
Figure 3 (Sheet 4 of 10)
Slip and Access Channel

Legend

- Project Footprint
- Permanent Disturbance Area*
- Temporary Disturbance Area*
- Permanent Wetland/Estuarine Impact
- Temporary Wetland/Estuarine Impact
- Delineated Wetland
- Non-jurisdictional Wetland**
- Existing ODFW Habitat Category 6 (Developed)
- Highest Measured Tide (HMT) (10.26 ft NAVD88)

0 125 250
Feet

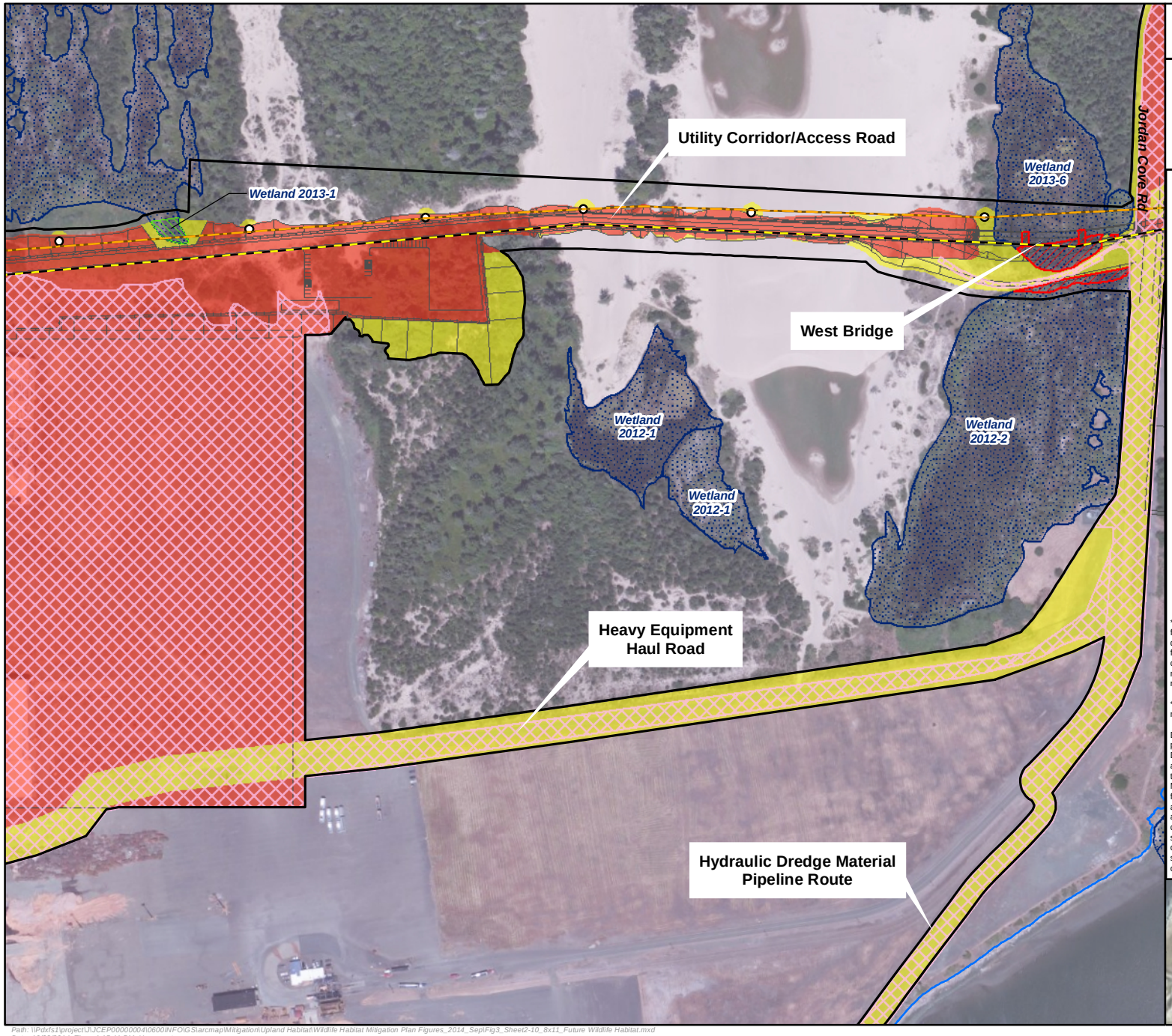
* Habitat mapping in these figures depicts the vegetative state following construction. However, all upland habitats impacted directly by the project would be considered to have zero function for wildlife post-construction due to their proximity to disturbance-causing project elements. Therefore, JCEP will provide 1:1 mitigation for all upland areas directly impacted by construction, regardless of post-construction category.

** Wetlands F, G, I (South), N, APC-B1, APC-B2, and APC-E are non-jurisdictional (NJD) per Oregon DSL.

Disclaimer: Information shown on this map series is for planning purposes only and is subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). Proposed permanent and temporary impacts to upland habitats are highlighted in orange and yellow. Methodology for impact assessment is discussed in the text. The future habitat type boundaries are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.



Path: \\Pdxfs1\project\J\JCEP0000000410600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig3_Sheet2-10_8x11_Future Wildlife Habitat.mxd
Date: 10/22/2014 Time: 1:17:28 PM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Post Construction Wildlife Habitat Maps
Figure 3 (Sheet 5 of 10)
Utility Corridor

Legend

- Project Footprint
- Permanent Disturbance Area*
- Temporary Disturbance Area*
- Permanent Wetland/Estuarine Impact
- Temporary Wetland/Estuarine Impact
- Delineated Wetland
- Non-jurisdictional Wetland**
- Existing ODFW Habitat Category 6 (Developed)
- Highest Measured Tide (HMT) (10.26 ft NAVD88)
- Gas Pipeline
- Overhead Power Transmission Line (115kV)
- Approximate Power Pole Location

0 175 350
Feet

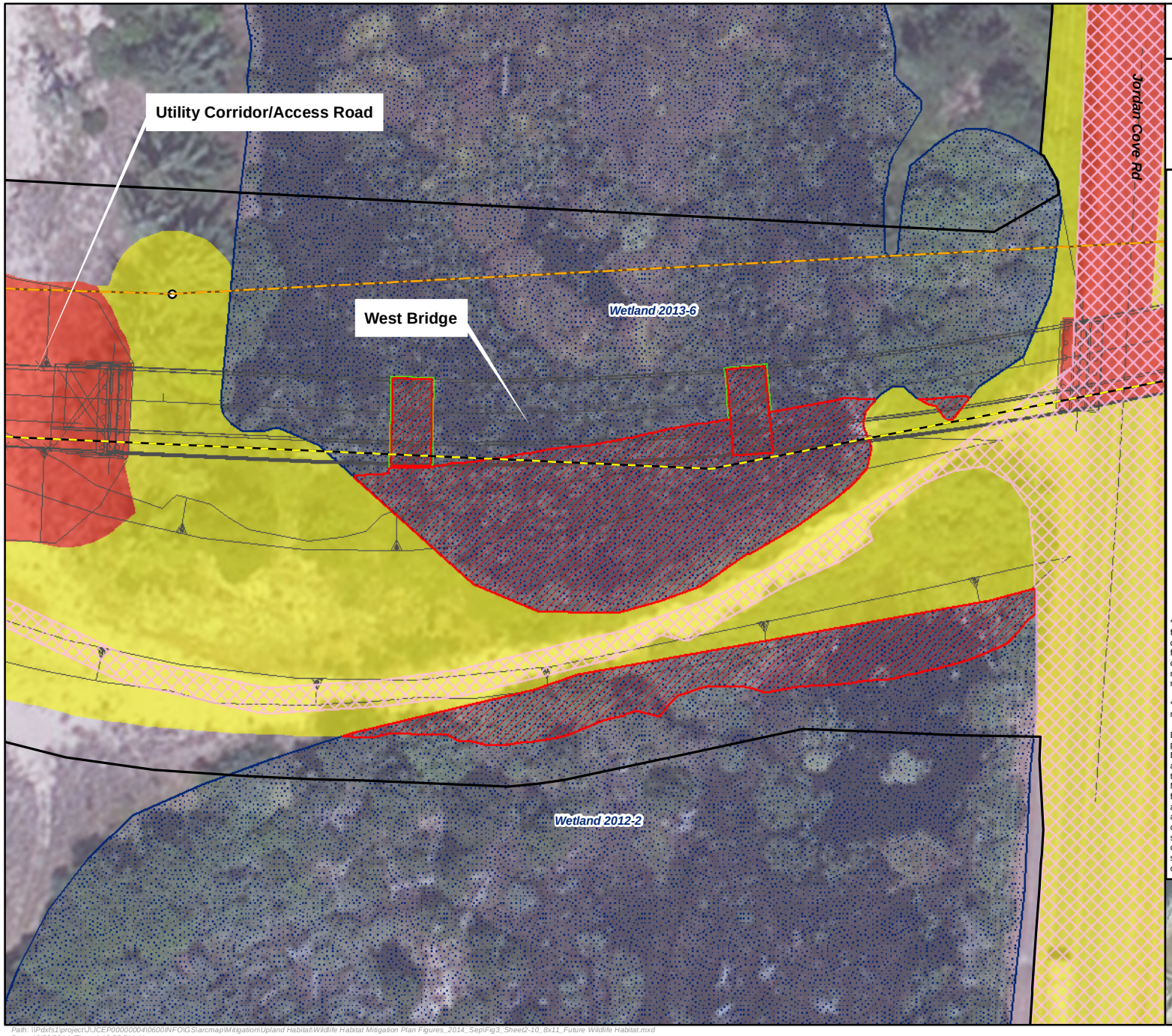
* Habitat mapping in these figures depicts the vegetative state following construction. However, all upland habitats impacted directly by the project would be considered to have zero function for wildlife post-construction due to their proximity to disturbance-causing project elements. Therefore, JCEP will provide 1:1 mitigation for all upland areas directly impacted by construction, regardless of post-construction category.

** Wetlands F, G, I (South), N, APC-B1, APC-B2, and APC-E are non-jurisdictional (NJD) per Oregon DSL.

Disclaimer: Information shown on this map series is for planning purposes only and is subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). Proposed permanent and temporary impacts to upland habitats are highlighted in orange and yellow. Methodology for impact assessment is discussed in the text. The future habitat type boundaries are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.



Path: \\Pdxfs1\project\J\JCEP0000000410600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig3_Sheet2-10_8x11_Future Wildlife Habitat.mxd
Date: 10/22/2014 Time: 1:15:41 PM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Post Construction Wildlife Habitat Maps
Figure 3 (Sheet 6 of 10)
West Utility Corridor Bridge

Legend

- Project Footprint
- Permanent Disturbance Area*
- Temporary Disturbance Area*
- Permanent Wetland/Estuarine Impact
- Temporary Wetland/Estuarine Impact
- Delineated Wetland
- Non-jurisdictional Wetland**
- Existing ODFW Habitat Category 6 (Developed)
- Gas Pipeline
- Overhead Power Transmission Line (115kV)
- Approximate Power Pole Location

0 30 60
Feet

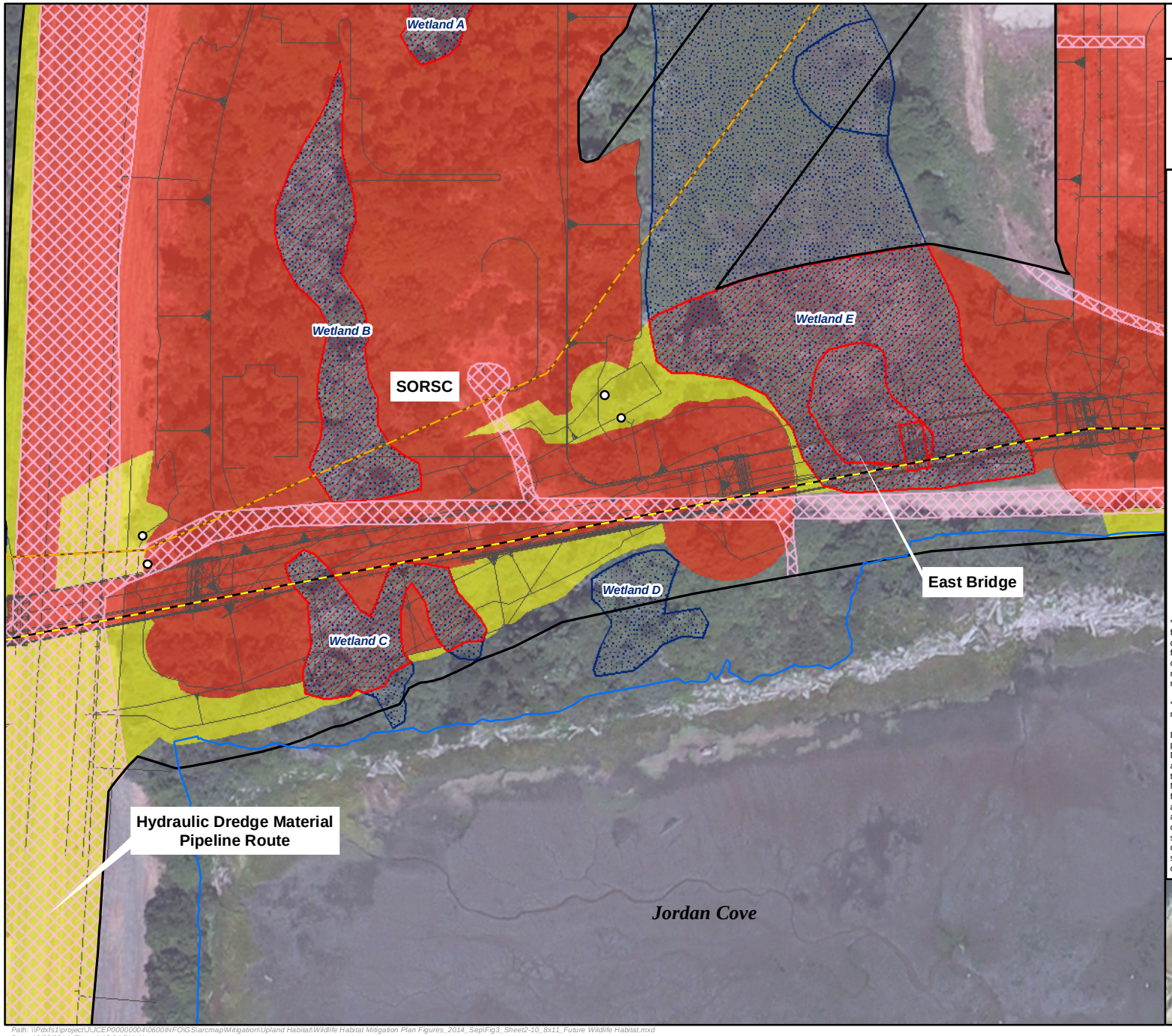
* Habitat mapping in these figures depicts the vegetative state following construction. However, all upland habitats impacted directly by the project would be considered to have zero function for wildlife post-construction due to their proximity to disturbance-causing project elements. Therefore, JCEP will provide 1:1 mitigation for all upland areas directly impacted by construction, regardless of post-construction category.

** Wetlands F, G, I (South), N, APC-B1, APC-B2, and APC-E are non-jurisdictional (NJD) per Oregon DSL.

Disclaimer: Information shown on this map series is for planning purposes only and is subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). Proposed permanent and temporary impacts to upland habitats are highlighted in orange and yellow. Methodology for impact assessment is discussed in the text. The future habitat type boundaries are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.



Path: \\Pdxfs1\project\J\JCEP0000000410600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig3_Sheet2-10_8x11_Future Wildlife Habitat.mxd
Date: 10/22/2014 Time: 1:13:35 PM User: sast



Jordan Cove Energy Project Wildlife Habitat Mitigation Plan

Post Construction Wildlife Habitat Maps
Figure 3 (Sheet 7 of 10)
East Utility Corridor Bridge

Legend

- Project Footprint
- Permanent Disturbance Area*
- Temporary Disturbance Area*
- Permanent Wetland/Estuarine Impact
- Temporary Wetland/Estuarine Impact
- Delineated Wetland
- Non-jurisdictional Wetland**
- Existing ODFW Habitat Category 6 (Developed)
- Highest Measured Tide (HMT) (10.26 ft NAVD88)
- Gas Pipeline
- Overhead Power Transmission Line (115kV)
- Approximate Power Pole Location

0 50 100
Feet

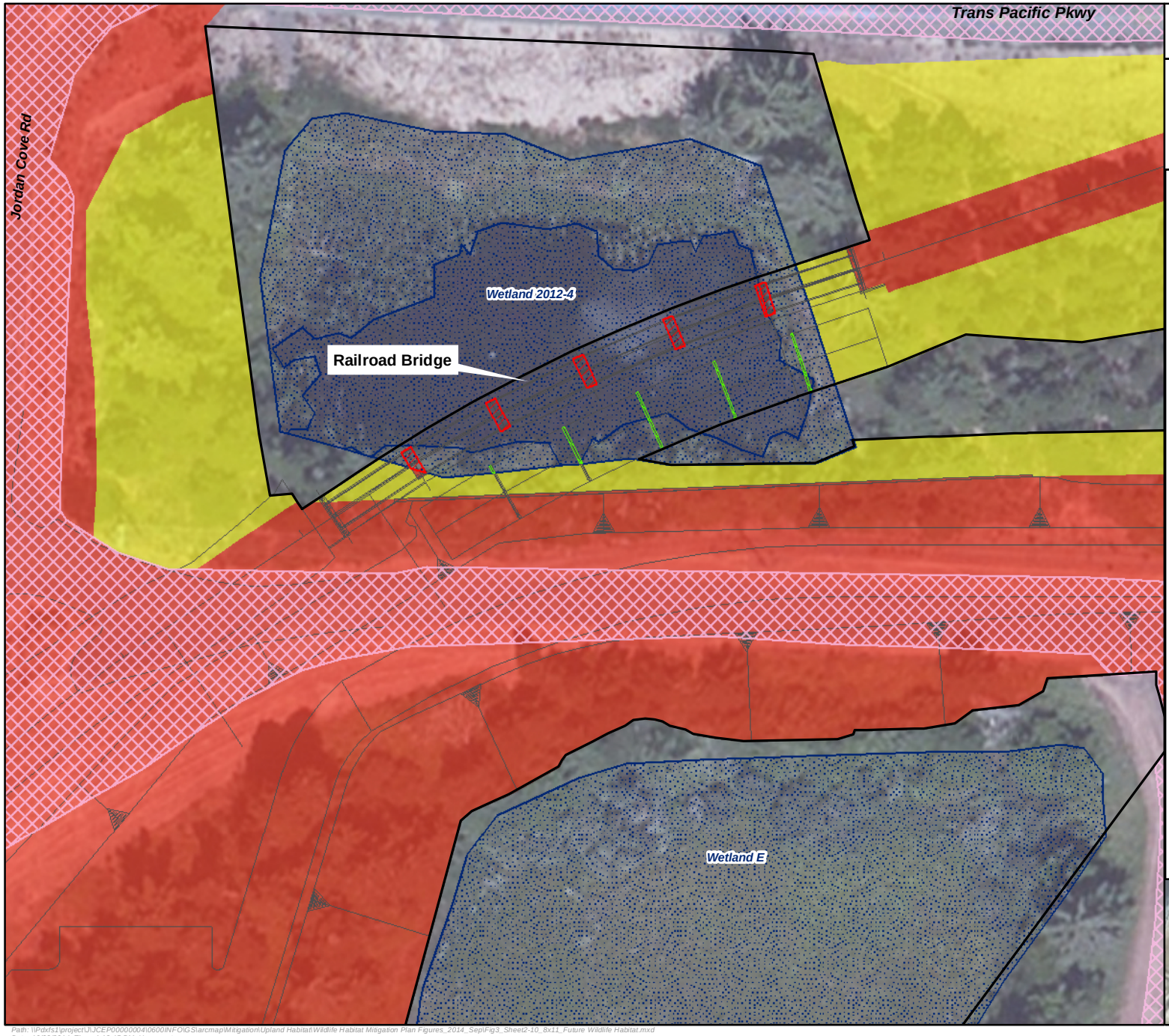
* Habitat mapping in these figures depicts the vegetative state following construction. However, all upland habitats impacted directly by the project would be considered to have zero function for wildlife post-construction due to their proximity to disturbance-causing project elements. Therefore, JCEP will provide 1:1 mitigation for all upland areas directly impacted by construction, regardless of post-construction category.

** Wetlands F, G, I (South), N, APC-B1, APC-B2, and APC-E are non-jurisdictional (NJD) per Oregon DSL.

Disclaimer: Information shown on this map series is for planning purposes only and is subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). Proposed permanent and temporary impacts to upland habitats are highlighted in orange and yellow. Methodology for impact assessment is discussed in the text. The future habitat type boundaries are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.



Path: \\Pdxfs1\project\JJCEP00000004\0600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig3_Sheet2-10_8x11_Future Wildlife Habitat.mxd
Date: 10/22/2014 Time: 1:12:24 PM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Post Construction Wildlife Habitat Maps
Figure 3 (Sheet 8 of 10)
Railroad Bridge

Legend

- Project Footprint
- Permanent Disturbance Area*
- Temporary Disturbance Area*
- Permanent Wetland/Estuarine Impact
- Temporary Wetland/Estuarine Impact
- Delineated Wetland
- Non-jurisdictional Wetland**
- Existing ODFW Habitat Category 6 (Developed)
- Overhead Power Transmission Line (115kV)

0 30 60
Feet

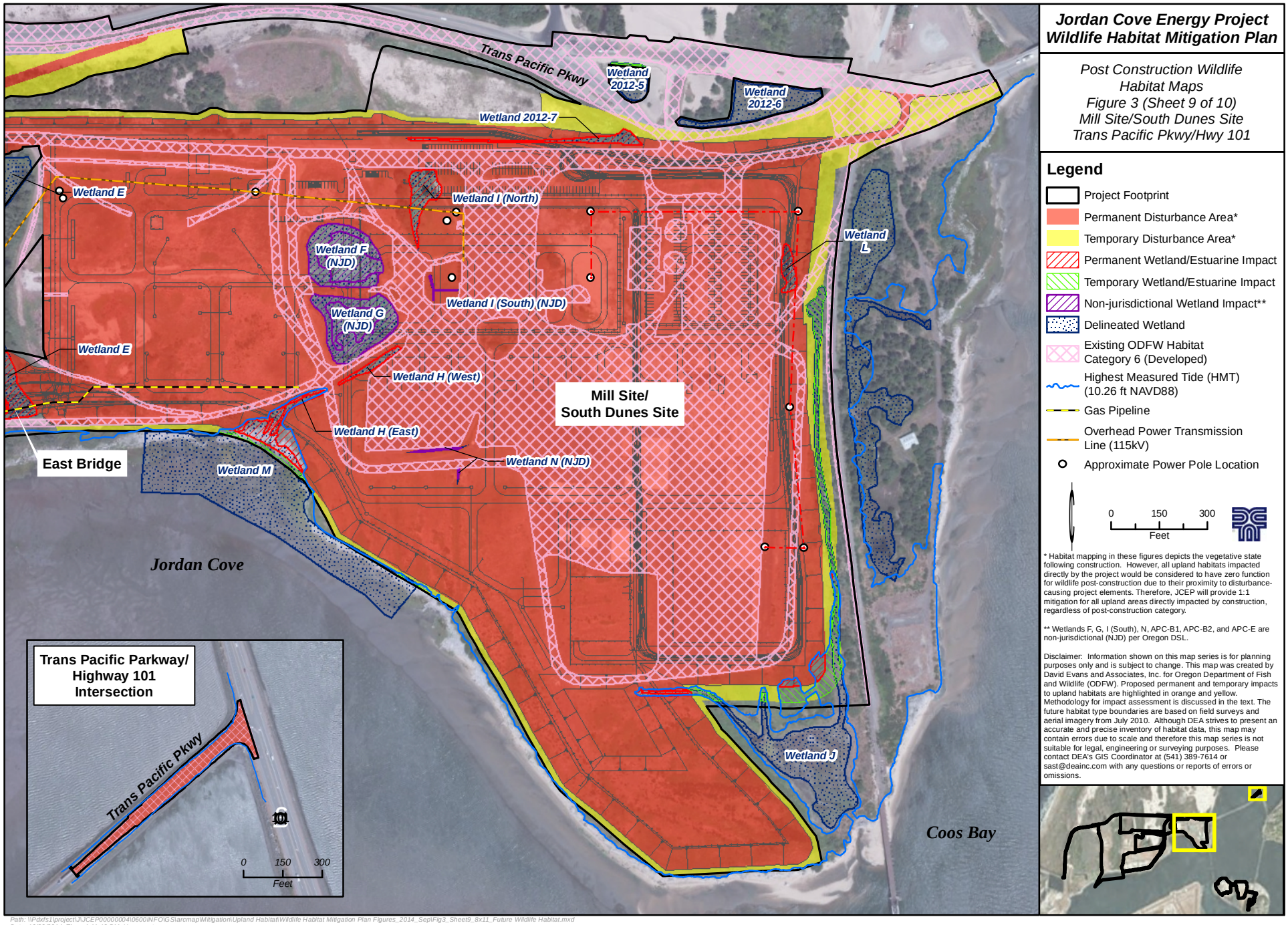
* Habitat mapping in these figures depicts the vegetative state following construction. However, all upland habitats impacted directly by the project would be considered to have zero function for wildlife post-construction due to their proximity to disturbance-causing project elements. Therefore, JCEP will provide 1:1 mitigation for all upland areas directly impacted by construction, regardless of post-construction category.

** Wetlands F, G, I (South), N, APC-B1, APC-B2, and APC-E are non-jurisdictional (NJD) per Oregon DSL.

Disclaimer: Information shown on this map series is for planning purposes only and is subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). Proposed permanent and temporary impacts to upland habitats are highlighted in orange and yellow. Methodology for impact assessment is discussed in the text. The future habitat type boundaries are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.



Path: \\Pdxfs1\project\J\JCEP0000000410600INFO\GIS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig3_Sheet2-10_8x11_Future Wildlife Habitat.mxd
Date: 10/22/2014 Time: 1:13:45 PM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Post Construction Wildlife Habitat Maps
Figure 3 (Sheet 9 of 10)
Mill Site/South Dunes Site
Trans Pacific Pkwy/Hwy 101

Legend

- Project Footprint
- Permanent Disturbance Area*
- Temporary Disturbance Area*
- Permanent Wetland/Estuarine Impact
- Temporary Wetland/Estuarine Impact
- Non-jurisdictional Wetland Impact**
- Delineated Wetland
- Existing ODFW Habitat Category 6 (Developed)
- Highest Measured Tide (HMT) (10.26 ft NAVD88)
- Gas Pipeline
- Overhead Power Transmission Line (115kV)
- Approximate Power Pole Location

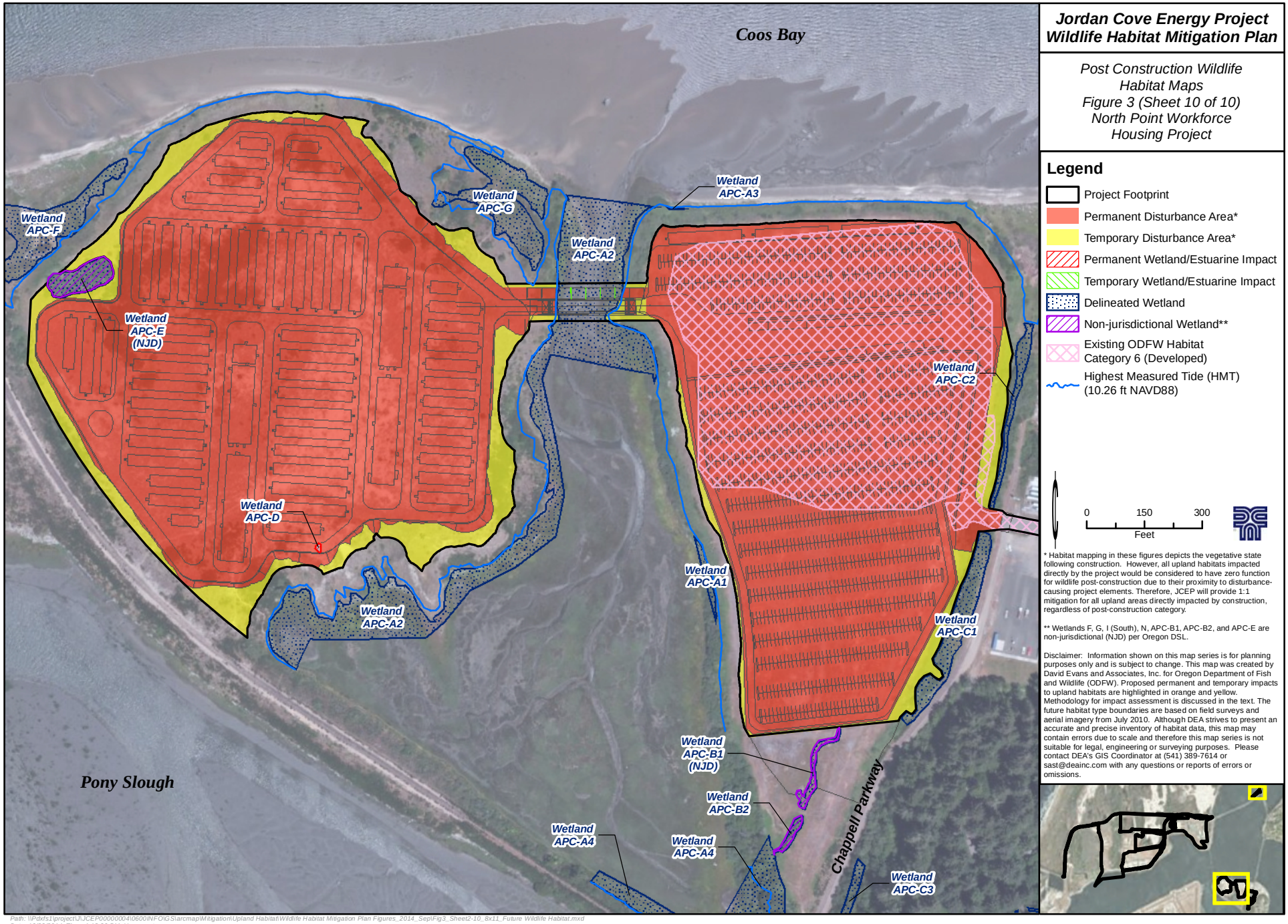
0 150 300
Feet

* Habitat mapping in these figures depicts the vegetative state following construction. However, all upland habitats impacted directly by the project would be considered to have zero function for wildlife post-construction due to their proximity to disturbance-causing project elements. Therefore, JCEP will provide 1:1 mitigation for all upland areas directly impacted by construction, regardless of post-construction category.

** Wetlands F, G, I (South), N, APC-B1, APC-B2, and APC-E are non-jurisdictional (NJD) per Oregon DSL.

Disclaimer: Information shown on this map series is for planning purposes only and is subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). Proposed permanent and temporary impacts to upland habitats are highlighted in orange and yellow. Methodology for impact assessment is discussed in the text. The future habitat type boundaries are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Path: \\Pdxfs1\project\J\JCEP0000000410600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig3_Sheet9_8x11_Future Wildlife Habitat.mxd
Date: 10/22/2014 Time: 1:11:42 PM User: sast



Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan

Post Construction Wildlife Habitat Maps
Figure 3 (Sheet 10 of 10)
North Point Workforce Housing Project

Legend

- Project Footprint
- Permanent Disturbance Area*
- Temporary Disturbance Area*
- Permanent Wetland/Estuarine Impact
- Temporary Wetland/Estuarine Impact
- Delineated Wetland
- Non-jurisdictional Wetland**
- Existing ODFW Habitat Category 6 (Developed)
- Highest Measured Tide (HMT) (10.26 ft NAVD88)

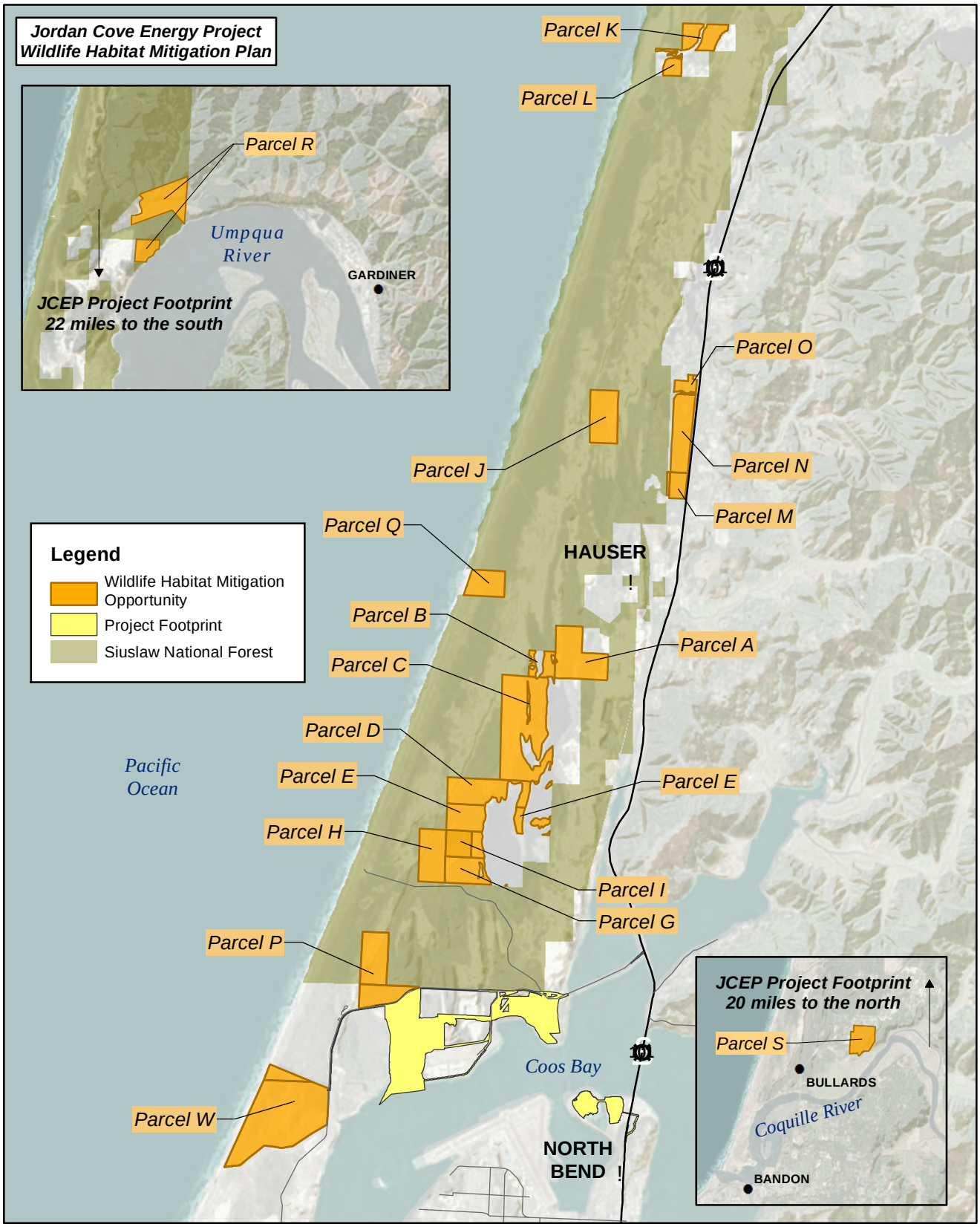
0 150 300
Feet

* Habitat mapping in these figures depicts the vegetative state following construction. However, all upland habitats impacted directly by the project would be considered to have zero function for wildlife post-construction due to their proximity to disturbance-causing project elements. Therefore, JCEP will provide 1:1 mitigation for all upland areas directly impacted by construction, regardless of post-construction category.

** Wetlands F, G, I (South), N, APC-B1, APC-B2, and APC-E are non-jurisdictional (NJD) per Oregon DSL.

Disclaimer: Information shown on this map series is for planning purposes only and is subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). Proposed permanent and temporary impacts to upland habitats are highlighted in orange and yellow. Methodology for impact assessment is discussed in the text. The future habitat type boundaries are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Path: \\Pdxfs1\project\J\JCEP0000000410600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig3_Sheet2-10_8x11_Future Wildlife Habitat.mxd
Date: 10/22/2014 Time: 1:18:30 PM User: sast



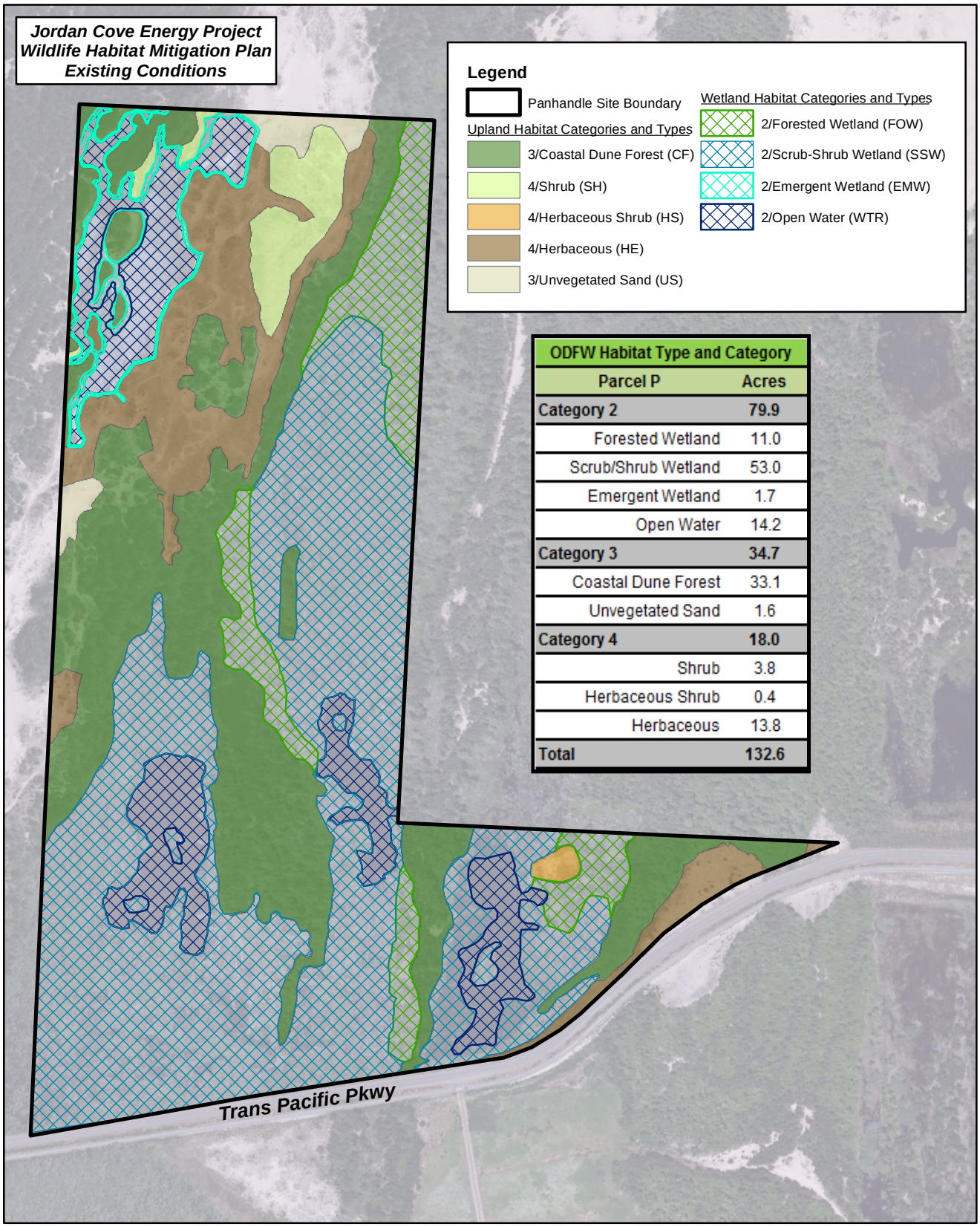
Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Wildlife Habitat Mitigation Site Maps
Figure 4
Wildlife Habitat Parcels Investigated

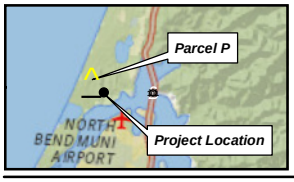
0 0.5 1
Mile

File: \\Pdxfs1\project\JJCEP0000004\0600\INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig4_8x11_Wildlife Habitat Parcels Investigated.mxd
10/22/2014 9:31:07 AM

Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan
Existing Conditions



ODFW Habitat Type and Category	
Parcel P	Acres
Category 2	**79.9**
Forested Wetland	11.0
Scrub/Shrub Wetland	53.0
Emergent Wetland	1.7
Open Water	14.2
Category 3	**34.7**
Coastal Dune Forest	33.1
Unvegetated Sand	1.6
Category 4	**18.0**
Shrub	3.8
Herbaceous Shrub	0.4
Herbaceous	13.8
Total	**132.6**

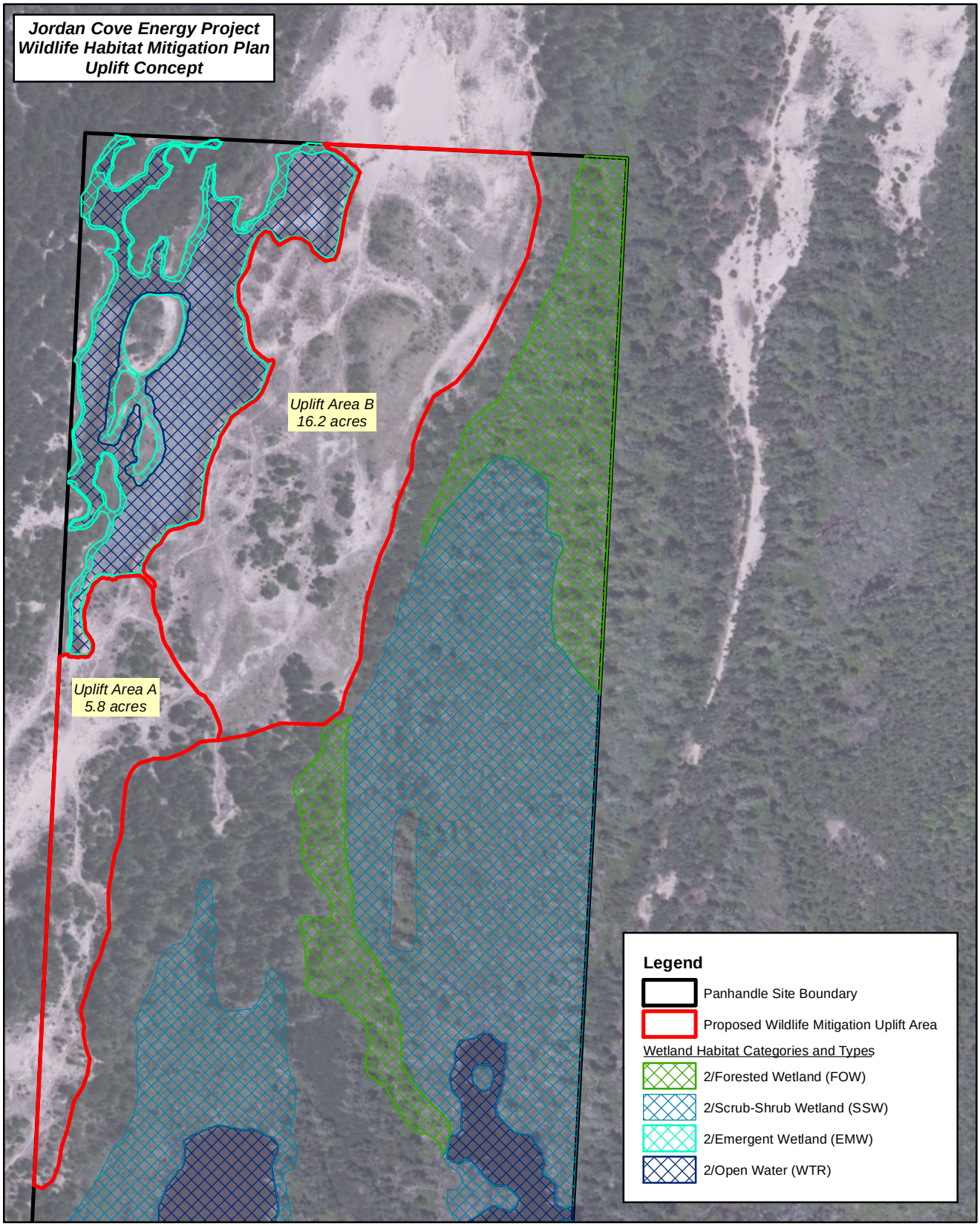


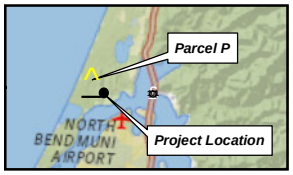
Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Wildlife Habitat Mitigation Site Maps
Figure 5 (Sheet 1 of 9)
Panhandle Site (Parcel P)

0 250 500
Feet

File: \\Pdxfs1\project\JJCEP0000004\0600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig5_Sheet1_8x11_ParcelP_Habitat.mxd
10/22/2014 8:37:46 AM



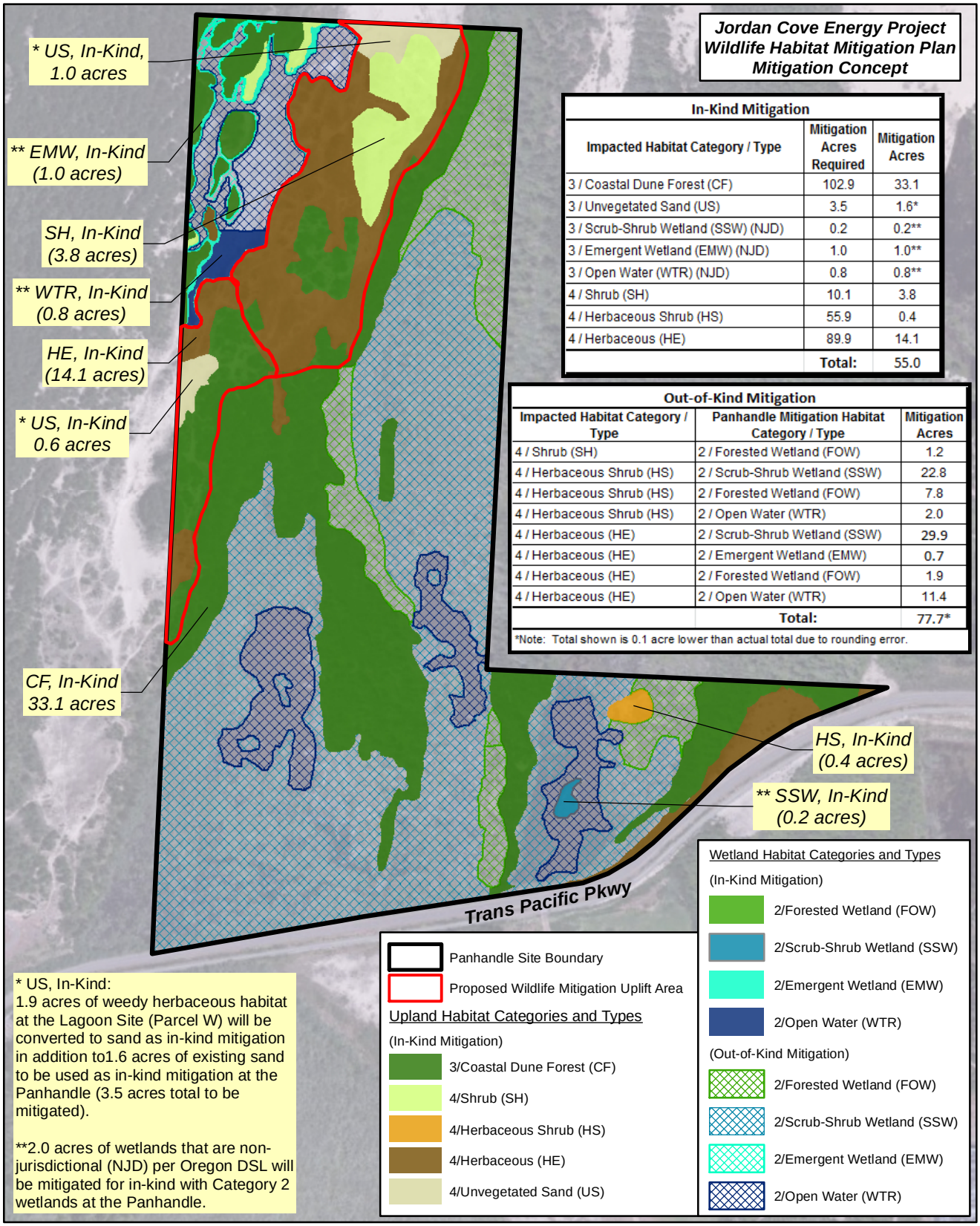


Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Wildlife Habitat Mitigation Site Maps
Figure 5 (Sheet 2 of 9)
Panhandle Site (Parcel P)

0 150 300
Feet

Jordan Cove Energy Project
Wildlife Habitat Mitigation Plan
Mitigation Concept



In-Kind Mitigation

Impacted Habitat Category / Type	Mitigation Acres Required	Mitigation Acres
3 / Coastal Dune Forest (CF)	102.9	33.1
3 / Unvegetated Sand (US)	3.5	1.6*
3 / Scrub-Shrub Wetland (SSW) (NJD)	0.2	0.2**
3 / Emergent Wetland (EMW) (NJD)	1.0	1.0**
3 / Open Water (WTR) (NJD)	0.8	0.8**
4 / Shrub (SH)	10.1	3.8
4 / Herbaceous Shrub (HS)	55.9	0.4
4 / Herbaceous (HE)	89.9	14.1
	Total:	55.0

Out-of-Kind Mitigation

Impacted Habitat Category / Type	Panhandle Mitigation Habitat Category / Type	Mitigation Acres
4 / Shrub (SH)	2 / Forested Wetland (FOW)	1.2
4 / Herbaceous Shrub (HS)	2 / Scrub-Shrub Wetland (SSW)	22.8
4 / Herbaceous Shrub (HS)	2 / Forested Wetland (FOW)	7.8
4 / Herbaceous Shrub (HS)	2 / Open Water (WTR)	2.0
4 / Herbaceous (HE)	2 / Scrub-Shrub Wetland (SSW)	29.9
4 / Herbaceous (HE)	2 / Emergent Wetland (EMW)	0.7
4 / Herbaceous (HE)	2 / Forested Wetland (FOW)	1.9
4 / Herbaceous (HE)	2 / Open Water (WTR)	11.4
	Total:	77.7*

*Note: Total shown is 0.1 acre lower than actual total due to rounding error.

* US, In-Kind:
1.9 acres of weedy herbaceous habitat at the Lagoon Site (Parcel W) will be converted to sand as in-kind mitigation in addition to1.6 acres of existing sand to be used as in-kind mitigation at the Panhandle (3.5 acres total to be mitigated).

**2.0 acres of wetlands that are non-jurisdictional (NJD) per Oregon DSL will be mitigated for in-kind with Category 2 wetlands at the Panhandle.

Panhandle Site Boundary

Proposed Wildlife Mitigation Uplift Area

Upland Habitat Categories and Types

(In-Kind Mitigation)

- 3/Coastal Dune Forest (CF)
- 4/Shrub (SH)
- 4/Herbaceous Shrub (HS)
- 4/Herbaceous (HE)
- 4/Unvegetated Sand (US)

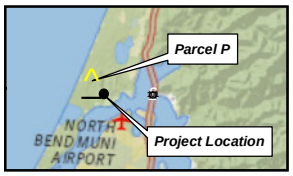
Wetland Habitat Categories and Types

(In-Kind Mitigation)

- 2/Forested Wetland (FOW)
- 2/Scrub-Shrub Wetland (SSW)
- 2/Emergent Wetland (EMW)
- 2/Open Water (WTR)

(Out-of-Kind Mitigation)

- 2/Forested Wetland (FOW)
- 2/Scrub-Shrub Wetland (SSW)
- 2/Emergent Wetland (EMW)
- 2/Open Water (WTR)

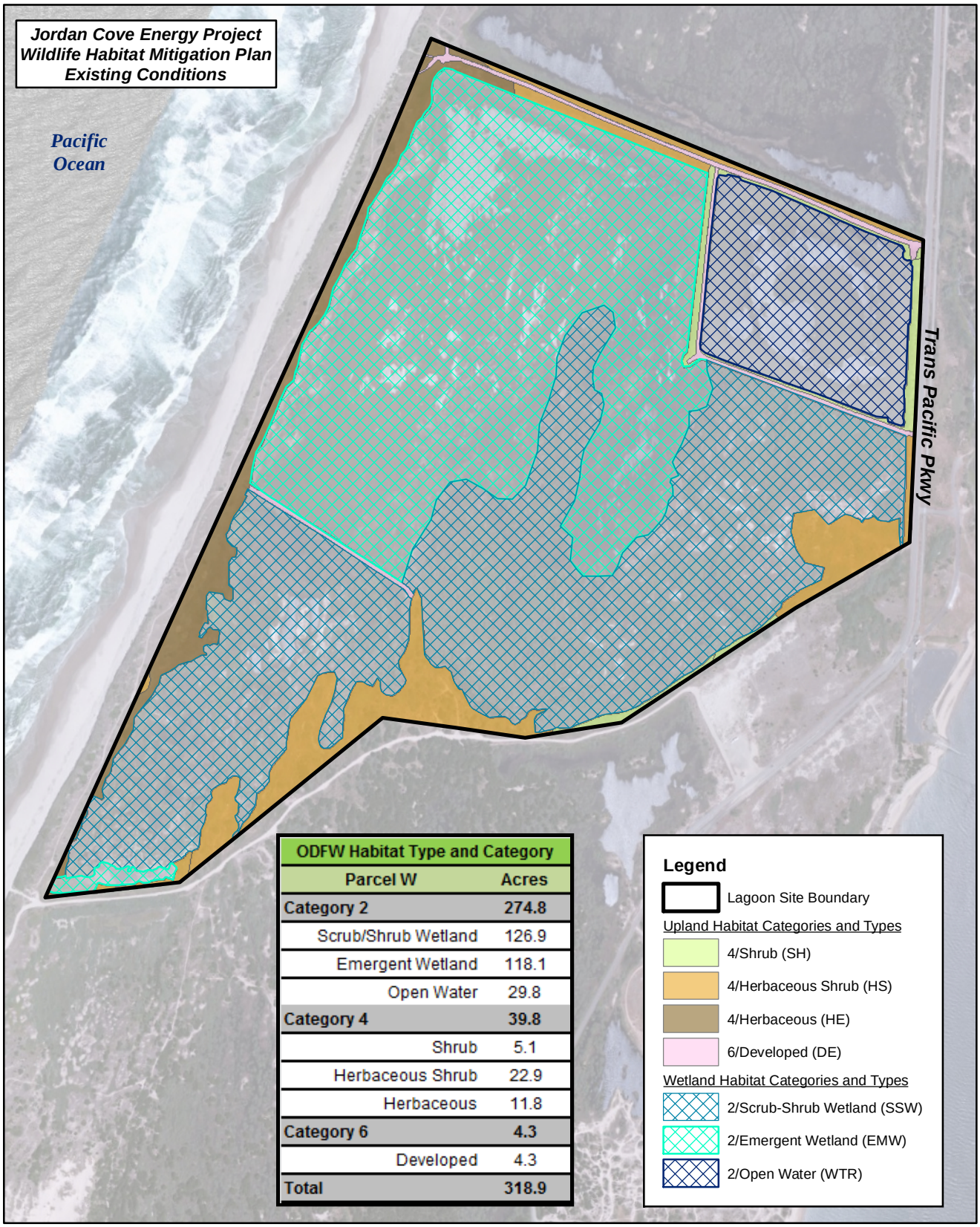


Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Wildlife Habitat Mitigation Site Maps
Figure 5 (Sheet 3 of 9)
Panhandle Site (Parcel P)

0 250 500
Feet

File: \\Pdxfs1\project\JJCEP00000004\060\INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig5_Sheet3_8x11_ParcelP_Wildlife Mitigation Acreages.mxd
10/22/2014 9:08:38 AM



ODFW Habitat Type and Category	
Parcel W	Acres
Category 2	274.8
Scrub/Shrub Wetland	126.9
Emergent Wetland	118.1
Open Water	29.8
Category 4	39.8
Shrub	5.1
Herbaceous Shrub	22.9
Herbaceous	11.8
Category 6	4.3
Developed	4.3
Total	318.9

Legend

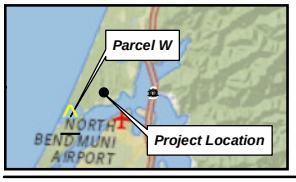
- Lagoon Site Boundary

Upland Habitat Categories and Types

- 4/Shrub (SH)
- 4/Herbaceous Shrub (HS)
- 4/Herbaceous (HE)
- 6/Developed (DE)

Wetland Habitat Categories and Types

- 2/Scrub-Shrub Wetland (SSW)
- 2/Emergent Wetland (EMW)
- 2/Open Water (WTR)

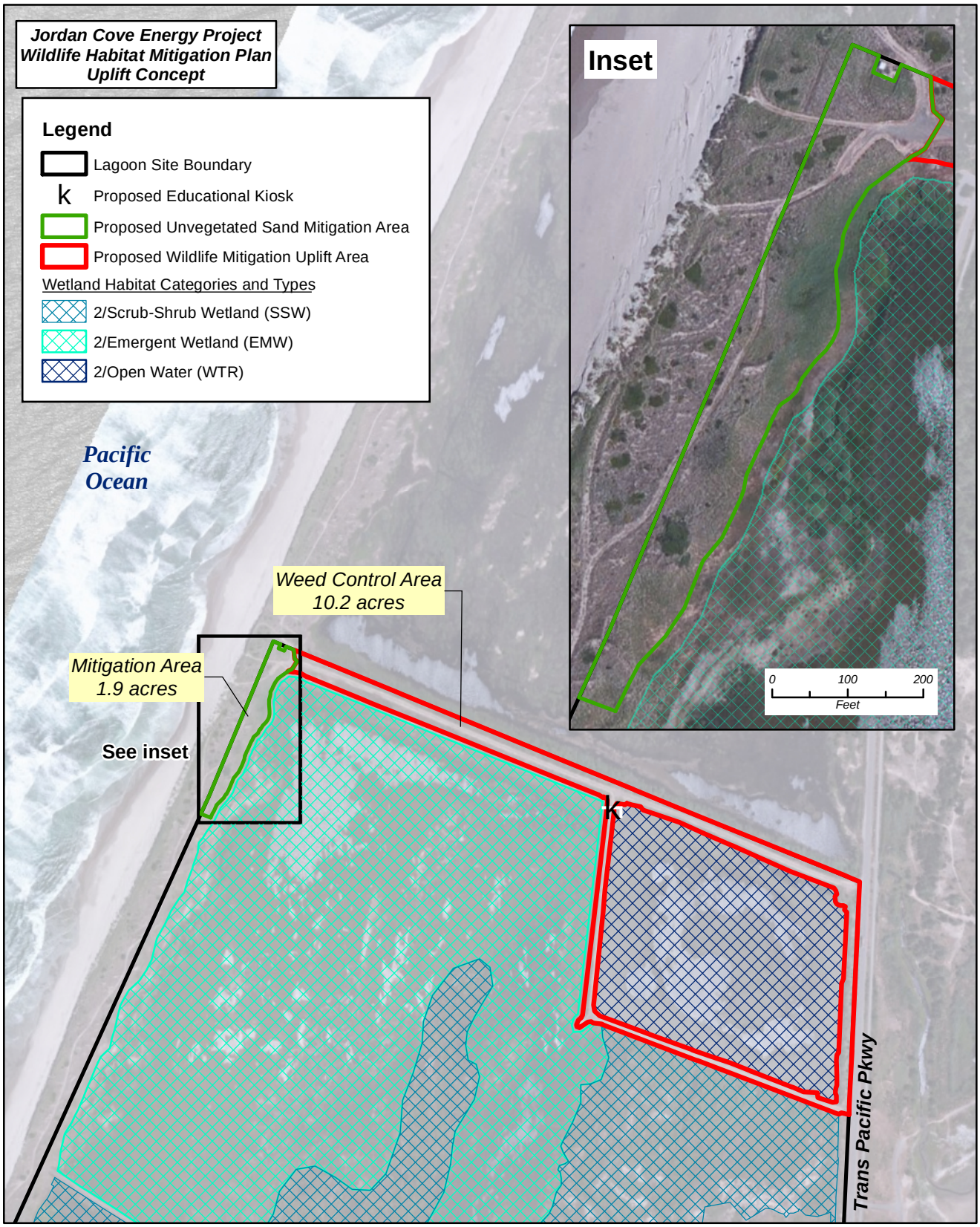


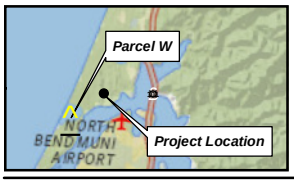
Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Wildlife Habitat Mitigation Site Maps
Figure 5 (Sheet 4 of 9)
Lagoon Site (Parcel W)

0 500 1,000
Feet

File: \\Pdxfs1\project\JJCEP0000004\0600\INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig5_Sheet4_8x11_ParcelW_Habitat.mxd
10/22/2014 8:41:22 AM



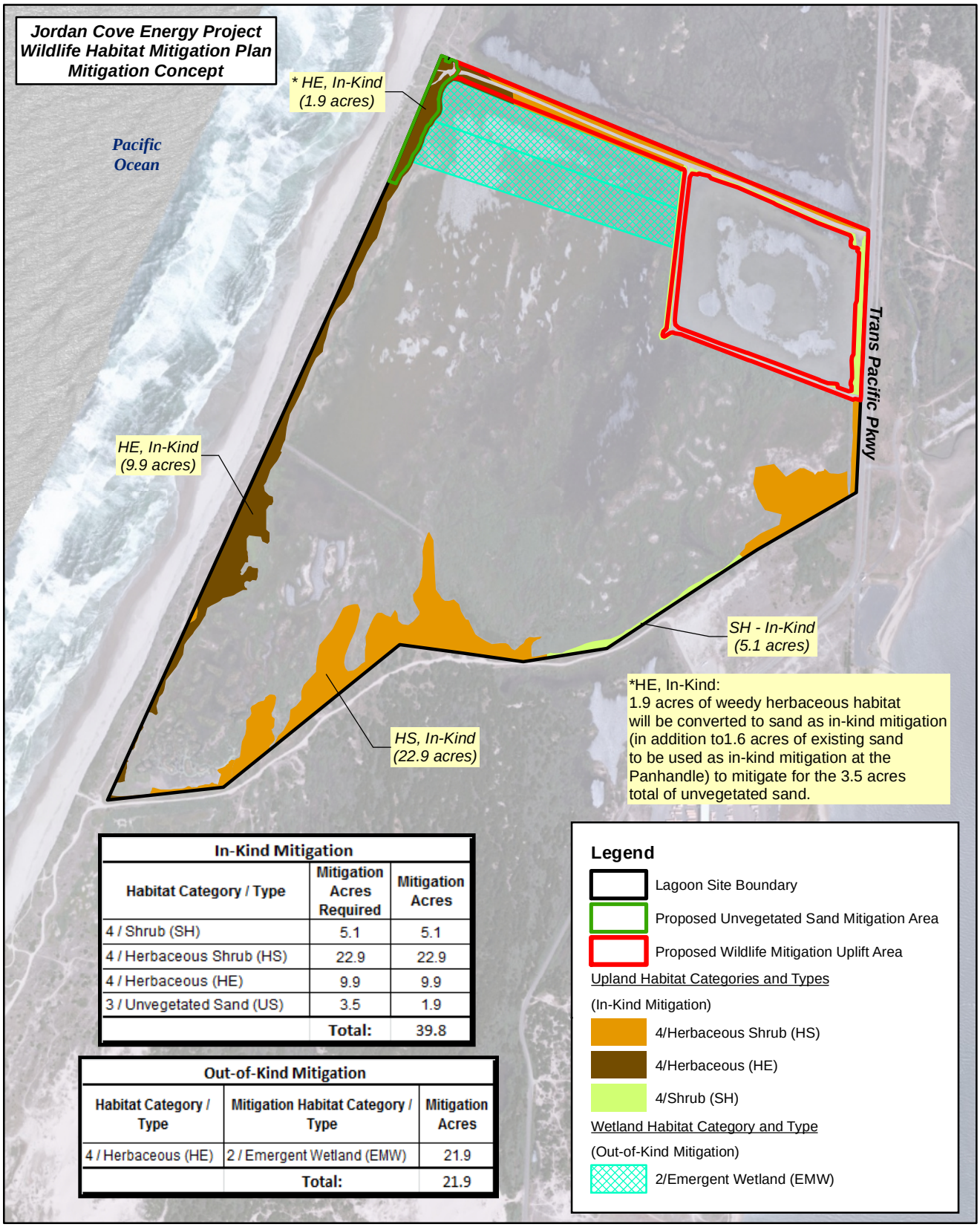


Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Wildlife Habitat Mitigation Site Maps
Figure 5 (Sheet 5 of 9)
Lagoon Site (Parcel W)

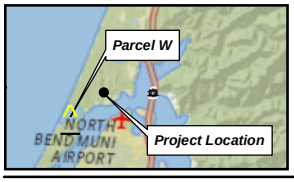
0 350 700
Feet

File: \\Pdxfs1\project\JJCEP0000004\0600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig5_Sheet5_8x11_ParcelW_Wildlife Mitigation Uplift Area.mxd
10/22/2014 8:59:54 AM



In-Kind Mitigation		
Habitat Category / Type	Mitigation Acres Required	Mitigation Acres
4 / Shrub (SH)	5.1	5.1
4 / Herbaceous Shrub (HS)	22.9	22.9
4 / Herbaceous (HE)	9.9	9.9
3 / Unvegetated Sand (US)	3.5	1.9
	Total:	39.8

Out-of-Kind Mitigation		
Habitat Category / Type	Mitigation Habitat Category / Type	Mitigation Acres
4 / Herbaceous (HE)	2 / Emergent Wetland (EMW)	21.9
	Total:	21.9

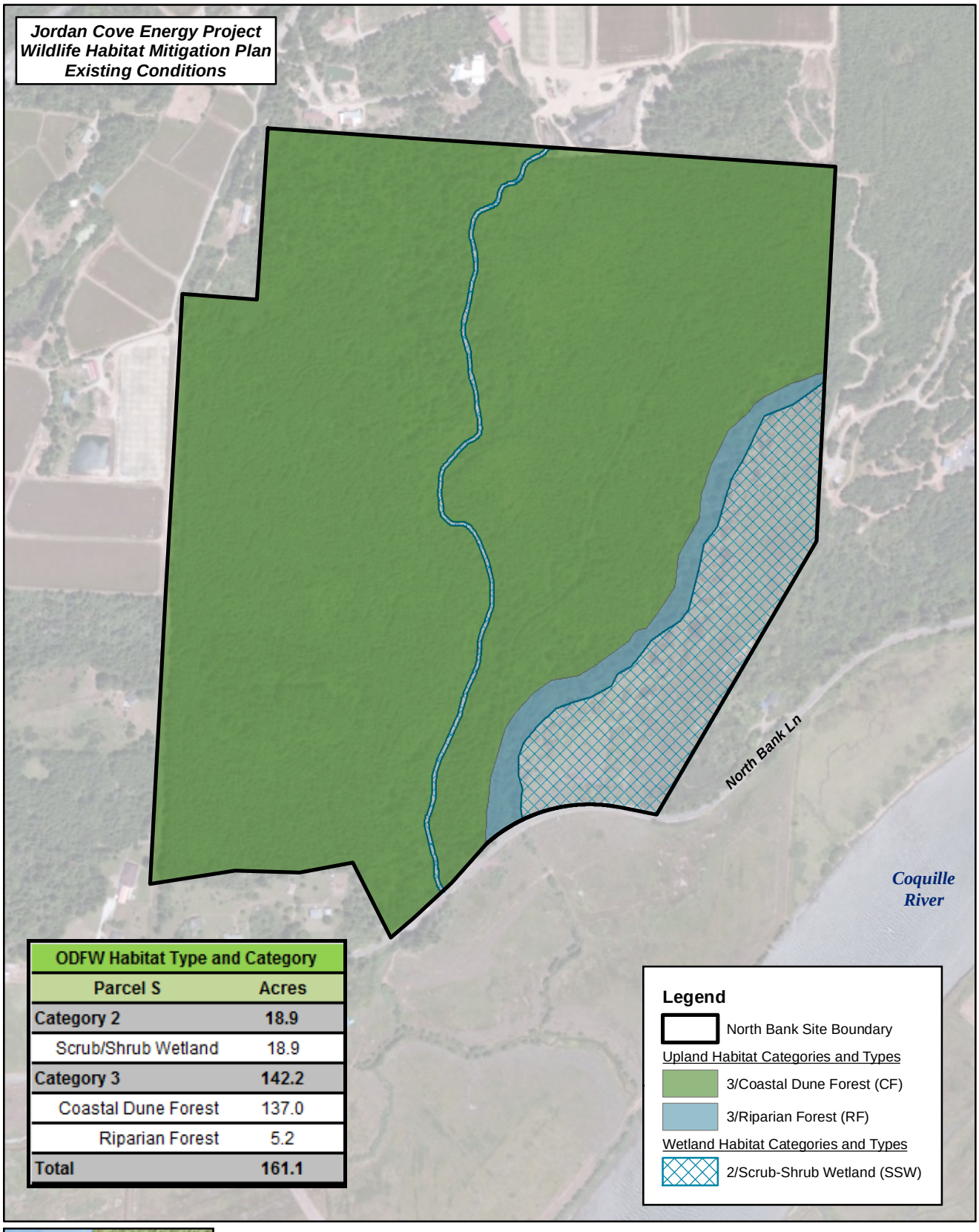


Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

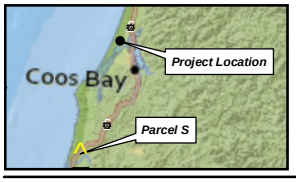
Wildlife Habitat Mitigation Site Maps
Figure 5 (Sheet 6 of 9)
Lagoon Site (Parcel W)

0 500 1,000
Feet

File: \\Pdxfs1\project\JJCEP0000004\0600\INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig5_Sheet6_8x11_ParcelW_Wildlife Mitigation Acreages.mxd
10/22/2014 9:04:54 AM



ODFW Habitat Type and Category	
Parcel S	Acres
Category 2	18.9
Scrub/Shrub Wetland	18.9
Category 3	142.2
Coastal Dune Forest	137.0
Riparian Forest	5.2
Total	161.1

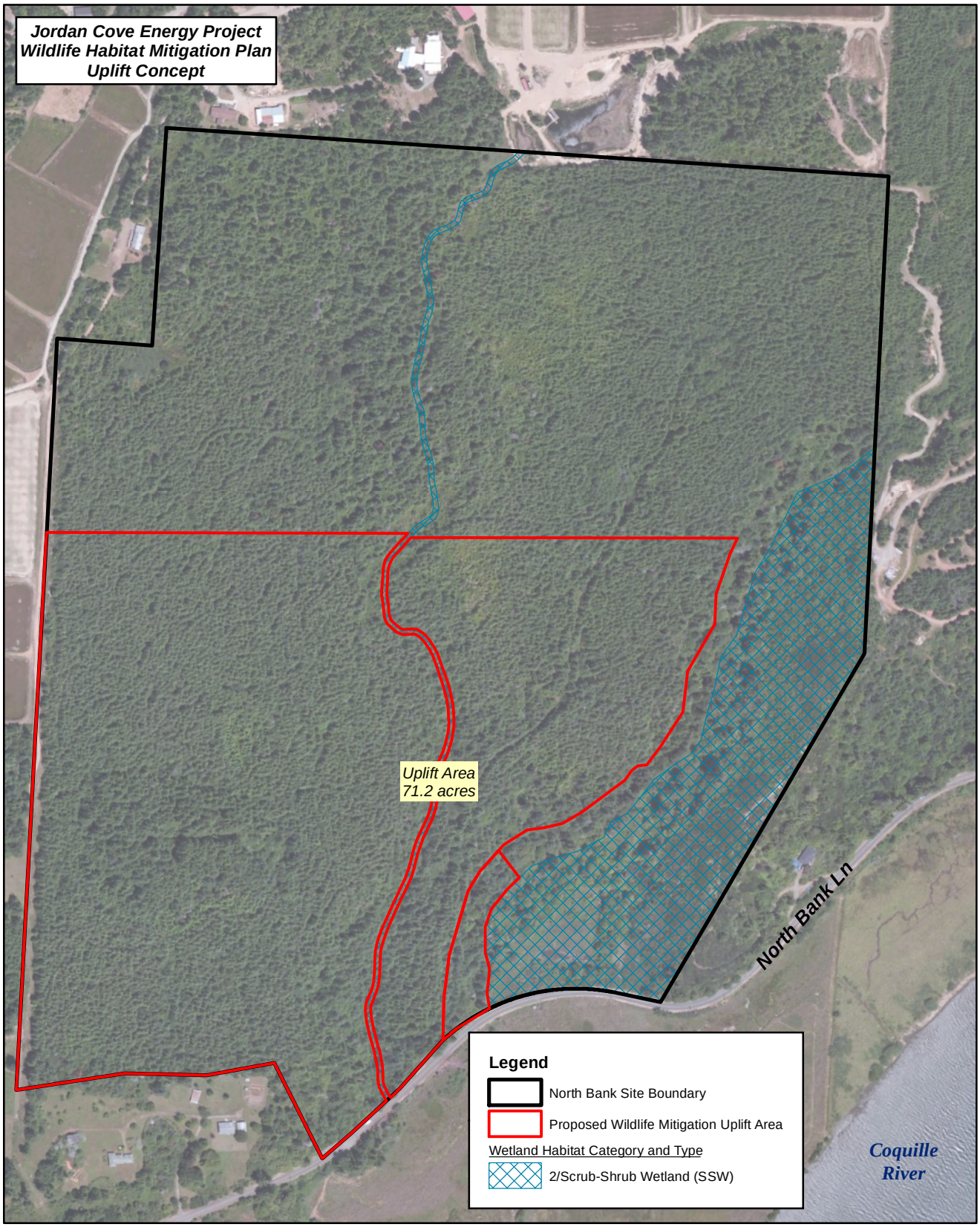


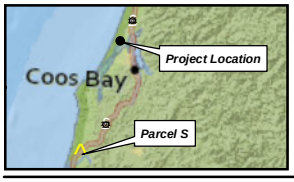
Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Wildlife Habitat Mitigation Site Maps
Figure 5 (Sheet 7 of 9)
North Bank Site (Parcel S)

0 250 500
Feet

File: \\Pdxfs1\project\JJCEP0000004\0600\INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig5_Sheet7_8x11_ParcelS_Habitat.mxd
10/22/2014 8:42:54 AM



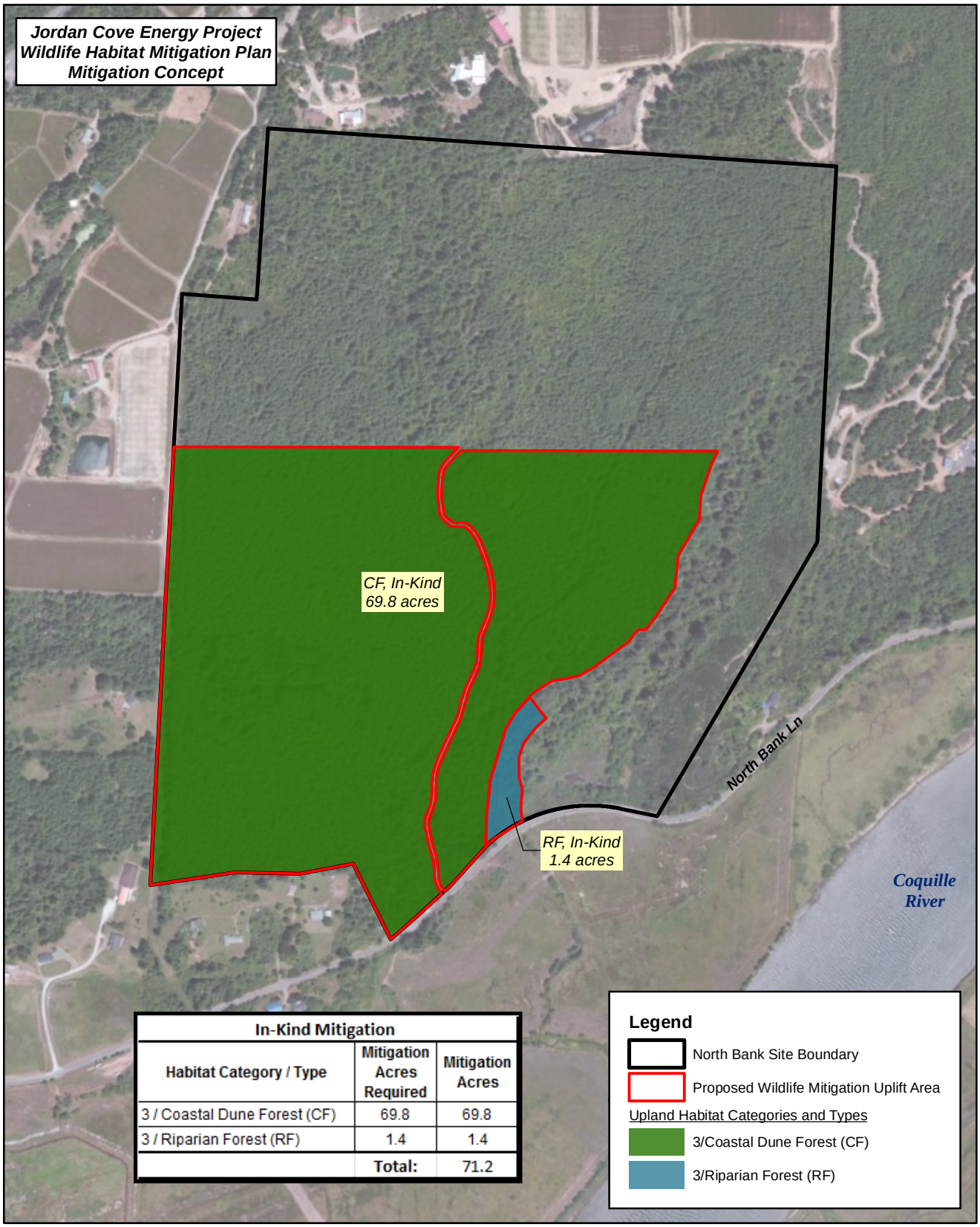


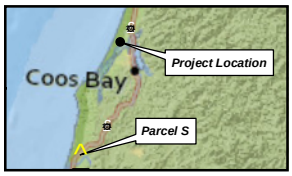
Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Wildlife Habitat Mitigation Site Maps
Figure 5 (Sheet 8 of 9)
North Bank Site (Parcel S)

0 250 500
Feet

File: \\Pdxfs1\project\JJCEP0000004\0600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig5_Sheet8_8x11_ParcelS_ Wildlife Mitigation Uplift Area.mxd
10/22/2014 9:00:53 AM





Disclaimer: Information shown on this map series is for planning purposes only and subject to change. This map was created by David Evans and Associates, Inc. for Oregon Department of Fish and Wildlife (ODFW). The intent is to fully disclose upland and wetland habitat types, categories, and boundaries. Only features which are visible in each map are shown in the map legend. The habitat characteristics and extent are based on field surveys and aerial imagery from July 2010. Although DEA strives to present an accurate and precise inventory of habitat data, this map may contain errors due to scale and therefore this map series is not suitable for legal, engineering or surveying purposes. Please contact DEA's GIS Coordinator at (541) 389-7614 or sast@deainc.com with any questions or reports of errors or omissions.

Wildlife Habitat Mitigation Site Maps
Figure 5 (Sheet 9 of 9)
North Bank Site (Parcel S)

0 250 500
Feet

File: \\Pdxfs1\project\JJCEP0000004\0600INFO\GS\arcmap\Mitigation\Upland Habitat\Wildlife Habitat Mitigation Plan Figures_2014_Sep\Fig5_Sheet9_8x11_ParcelS_ Wildlife Mitigation Acreages.mxd
10/22/2014 9:03:17 AM

APPENDIX C: ODFW Wildlife Capture, Holding, Transport, and Relocation Guidance

OREGON DEPARTMENT OF FISH AND WILDLIFE

TECHNICAL GUIDANCE FACT SHEET: WILDLIFE CAPTURE, HOLDING, TRANSPORT & RELOCATION

BACKGROUND

Many activities occurring throughout Oregon, even projects designed to restore and enhance native habitats for fish and wildlife and improve water quality of streams and wetlands, can inadvertently have negative impacts to wildlife and their habitats. Wildlife monitoring and capture / relocation are increasingly becoming an important and integral parts of environmental quality assurance for construction and development projects. Many projects involve the removal of vegetation, disturbance of leaf litter and soil, and impact water bodies. There is a need to consider the effects of project activities on individual animals and their populations as a whole.

Examples of activities that may negatively impact wildlife and wildlife habitat include, but are not limited to:

- Stream enhancement, including placement of large wood
- Invasive species (plant and animal) removal
- Re-vegetation efforts
- Recreation trail construction
- Culvert replacement / maintenance projects
- Water quality improvement projects
- Stormwater management projects
- Fencing projects
- Water level (hydrology) management
- Dredging operations
- Road and bridge construction / improvement projects
- Herbicide application
- On-going vegetation management such as mowing
- Wildlife research activities
- Recreational activities (e.g., angling, kayaking, wildlife viewing)
- Tree trimming and pruning
- Communication tower construction and maintenance
- Any construction project involving vegetation removal, grading, and other ground disturbance with changes in background levels of noise, light, and human presence

In order to avoid or minimize disturbance, injury and mortality to individual wildlife species, the Oregon Department of Fish and Wildlife (ODFW) has developed a technical

guidance series with recommended Best Management Practices (BMPs). Incorporation and implementation of BMPs into various project activities is expected to prevent or minimize negative impacts to wildlife, as well as help project proponents comply with wildlife protection laws.

It is ODFW's intent that BMPs be considered during the planning, design and budgeting phases of project development. Selected BMPs are then to be implemented during project construction and maintenance phases to achieve the goal of preventing and minimizing negative impacts to wildlife and their habitats.

BEST MANAGEMENT PRACTICE: WILDLIFE CAPTURE AND RELOCATION

Wildlife capture and relocation is an ODFW recommended Best Management Practice in certain circumstances as it can prevent and minimize negative impacts to wildlife resulting from a specific project action, wildlife capture and relocation is described as the following:

> ***"The capture of live wildlife from a site and relocation of those wildlife to nearby suitable habitat to ameliorate negative impacts , such as disturbance, injury and/or mortality, that otherwise would be expected to result from project activities if the wildlife were not removed from the site."***

Under this definition, the goal is to relocate captured wildlife to the nearest suitable habitat within the same watershed (HUC6) and preferably on the same property. If suitable habitat within the same watershed is unavailable or is deemed fully occupied, or if relocation is determined by ODFW to not be in the best interest of the wildlife for whatever reason, ODFW will determine final disposition (e.g., release at an alternative relocation site, transfer to temporary holding facility, etc..).

A permit from ODFW is needed for the following reasons:

- Authorization from ODFW is needed to capture and be in possession of most wildlife species, including those categorized as Nongame Wildlife Protected.

- It is unlawful for any person to hunt, trap, pursue, kill, take, catch, angle for, or have in possession, either dead or alive, whole or in part any Nongame Wildlife Protected *(OAR 635-044-0130)*.

- Transport and relocation of wildlife must be authorized and approved by ODFW *(ORS 497.308)*.

- Wildlife relocation release sites must by designated and approved by ODFW.

- Non-native wildlife may be encountered. Release of domestically raised or imported wildlife without a permit from ODFW is prohibited *(ORS 498.052)*.

- Nonnative Prohibited Wildlife may not be possessed live or relocated to other sites except for the purpose of humane euthanasia *(OAR 635-056)*.

The process of wildlife capture and relocation involves a number of components including the following:

1) Applying for and obtaining a Wildlife Capture, Holding, Transport, Relocation Permit / Letter of Authorization from ODFW prior to project implementation.

2) Determining what species are likely to be encountered where based on habitat types present, known occurrence information (if any), species ecology, and time of year.

3) Educating project staff in identification of wildlife species.

4) Establishing a communication plan for project staff to report wildlife observed / encountered.

5) Procedures to be followed for capture and relocation of wildlife, including identification of relocation sites and preparation of needed equipment.

6) Contingency planning for non-native invasive species, injured or diseased wildlife.

7) Employment of a professional wildlife biologist or other trained personnel to implement the wildlife capture and relocation protocol, including final reporting to ODFW.

PROTOCOLS BY WILDLIFE SPECIES

Capture, holding, transport and relocation techniques differ according to wildlife species or grouping of wildlife species. ODFW's recommended protocols by species or species group are as follows:

Attachment 1. Turtles, Amphibians

Note: Protocols for other species are currently being developed

ATTACHMENT 1. WILDLIFE CAPTURE, HOLDING, TRANSPORT AND RELOCATION PROTOCOL

SPECIES GROUP: AMPHIBIANS

There are 31 native amphibian species (newts, salamanders, frogs and toads) in Oregon. One (1) introduced non-native species, the American bullfrog, also occurs in parts of the state and is considered invasive. Many of Oregon's native amphibians are listed as State Sensitive Species as either "Sensitive-Critical" or "Sensitive-Vulnerable" in all or a portion of their range. These species are all classified as "Nongame Wildlife Protected" (OAR 635-044-0130). It is unlawful to hunt, trap, pursue, kill, take, catch, angle for, or have in possession, either dead or alive, whole or in part, any species classified as Nongame Wildlife Protected except as otherwise authorized by ODFW permit.

The American bullfrog is classified as a "Nonnative Controlled Species" (OAR 635-056-0070) due to their known negative impact on Oregon's native fish and wildlife. OAR states that no person may import, purchase, sell, barter or exchange, or offer to import, purchase, sell barter or exchange live bullfrogs (viable eggs, hatchlings, tadpoles, juveniles and adults). Individual bullfrogs may be collected from the wild and held indoors in an escape proof aquarium as per OAR 635-044-0035. Release back in to the wild is prohibited unless the person first obtains a permit from ODFW. Bullfrogs may be legally harvested year-round. There is no bag limit and no angling license is required. See ODFW's guidance document on bullfrog capture for more information.

Oregon's amphibians are grouped into the following categories based on their habitat requirements and life histories:

Amphibians Inhabiting Slow-Moving Waterbodies
Northwestern salamander, Long-toed salamander, Tiger salamander, Rough-skinned newt, Great Basin spadefoot, Western toad, Woodhouse's toad, Pacific treefrog, Red-legged frog, Cascades frog, Columbia spotted frog, Oregon spotted frog, Northern leopard frog, American bullfrog.

Amphibians Inhabiting Medium to Fast-Flowing Streams
Coastal giant salamander, Cope's giant salamander Cascade torrent salamander, Columbia torrent salamander, Southern torrent salamander, Coastal tailed frog, Rocky Mountain tailed frog, Foothill yellow-legged frog

Terrestrial Salamanders
Clouded salamander, Black salamander, Oregon slender salamander, California slender salamander, Ensatina, Dunn's salamander, Larch Mountain salamander, Western red-backed salamander, Del Norte salamander, Siskiyou Mountains salamander

Identification of Suitable Amphibians Habitat

Suitable amphibian habitat includes both aquatic and terrestrial habitats. Most amphibians spend a part of their life on land. Many amphibians forage and over-winter on land, hiding under leaf litter, amongst vegetation, and under downed wood/logs. Except for those salamander species that are fully terrestrial (i.e., lay eggs on land) all amphibian species require water for breeding and egg laying. Areas where amphibians are most likely to be encountered should be identified and delineated on a project map and/or on the ground. Defer to an ODFW wildlife biologist or other qualified biologist on areas where amphibians may be encountered within the project area, especially breeding sites. Special consideration should be given to special status species (e.g., State Sensitive Species) are known or suspected to be present.

Amphibian Identification

A qualified wildlife biologist or other person proficient in amphibian identification (native and non-native) and identification of amphibians eggs and larvae should be present on-site and available during project implementation. Amphibian identification materials (see **Section A**) should be provided to all project staff with the potential to encounter amphibians.

Project Timing

When amphibians (native or non-native) are known or suspected to be present or when suitable amphibian habitat (aquatic or terrestrial) has been identified at or near a project site, ODFW's Amphibian Capture, Holding, Transport and Relocation Protocol (this document) should be incorporated into the project to prevent or minimize negative impacts to amphibians from the project. The Amphibian Capture, Holding, Transport and Relocation Protocol should be in effect during the entire project period and in any season, as amphibians may be encountered at any time of the year in Oregon.

The general annual activity cycle of native amphibians is as follows:

Winter / Early Spring – Beginning in early winter, some species (long-toed salamanders, red-legged frogs) begin emerging from over-wintering sites, gathering at breeding sites, and laying eggs. The first Northwestern salamanders lay their eggs and Pacific treefrogs begin chorusing. Some Cascades frogs and Oregon and Spotted frogs lay their eggs. Amphibians may bask on logs, rocks, banks or floating vegetation, especially on sunny spring days and when water temperatures are cool. Some very early eggs hatch.

Mid Spring / Late Spring– Fully terrestrial salamanders are active and lay their eggs. Most terrestrial salamander females guard their eggs. Many Northwestern salamanders and the first rough-skinned newts move to breeding pond and lay their eggs. Early eggs hatch. The giant salamanders, which have been active throughout winter in stream, begin breeding in mid-spring. Most tiger salamanders, Pacific treefrogs, and western toads lay their eggs and eggs hatch. Western toad eggs hatch quickly. Most red-legged frog and Cascades frog eggs and the early Oregon and spotted frog eggs hatch. Most spotted frogs breed in mid-spring. Great Basin spadefoots and Woodhouse's toads emerge from over-wintering sites and lay their eggs which hatch in a few days. Tadpoles are growing and early salamander larvae

metamorphose. Foothill yellow-legged frogs breed as stream flows lessen. Torrent salamanders begin breeding. American bullfrogs become active as water temperatures warm.

Early Summer / Late Summer
All salamander larvae are active and growing. Aquatic salamander larvae metamorphose. Many rough-skinned newts, treefrogs and American bullfrog are laying their eggs. Most frogs and toads have metamorphoses; froglets and toadlets are commonly encountered as they disperse from breeding areas. Some adult frogs and toads move to permanent streams or moist uplands sites. The last American bullfrogs lay their eggs which hatch in a few days. Tailed frogs tadpoles that are several years old metamorphose.

Early Fall / Late Fall – Many rough-skinned newts, tiger salamanders and late Northwestern salamanders metamorphose. Cope's and coastal giant salamanders probably breed at this time. Late tadpoles of many frog species metamorphose. Many tailed frogs probably mate at this time. All salamanders are active on the surface in response to fall rains. As temperatures drop to near freezing, salamanders overwinter in the ground. Larvae that have not yet metamorphosed overwinter in mud or water of permanent ponds. Many fully terrestrial salamanders mate at this time. Some red-legged frogs, Cascades frogs, long-toed salamanders and spotted frogs move to breeding ponds.

Note: Timing of emergence, courtship, egg-laying and metamorphosis can be influenced by weather conditions, hydrologic conditions, and elevation.

See **Section B** for additional information for each amphibian species.

Techniques for Locating and Capturing Amphibians

Since amphibians use both aquatic and terrestrial habitats, they may be found on land and in the water. The following methods are most useful in locating and capturing amphibians:

Visual Searches / Encounter Surveys
Presence of amphibians and their eggs can be verified using visual searches / encounter survey methods (i.e., naked eye). Reasonable efforts should be made to capture all amphibians encountered that are perceived to be in jeopardy of being harmed by the project activities. Amphibians may be observed basking in the sun on logs, rocks or other surfaces; or they sometimes can be seen swimming close to the water's surface. Larvae tend to gather in the warmest available water. Egg masses can be detected when walking the shorelines and shallow sections of suitable breeding habitats. Amphibians, especially adult frogs and toads, are often found on land near eggs or near the edges of aquatic breeding habitats. When a threat is perceived, some amphibians remain still while others quickly move away from the threat, often escaping into nearby water, hiding in vegetation, or burying themselves in the bottom substrate of a pond or other waterbody. Amphibians on land include adult amphibians (males or female) making over-land dispersal movements in search of suitable breeding habitat, hiding

cover or for foraging. Juvenile amphibians also can be found on land and will often move together in groups in search of food and hiding cover.

Surveys for amphibians conducted at various times of day are the most effective method for locating and capturing amphibians. Amphibians are generally most active in the spring and in the fall so these are the best times to encounter them. Searches/surveys should begin about 2-3 weeks prior to construction (depending on the size of the impact area). Visual surveys and capture should occur over a period of about a week, or more, to increase chances of finding all amphibians present in the impact area. The time of day and the weather at the time of the search and on preceding days will influence the surveyor's ability to detect amphibians. Visual searches should not be conducted during heavy wind, high winds or overcast conditions. Surveys generally should not be conducted during periods of cold weather or at night. Visual surveys can be conducted by boat, float tube, or snorkeling.

In some cases, ponds or other waterbodies may need to be drained before or during construction. In this situation, the waterbody should be subjected to a final Visual Search / Encounter Survey immediately after it is drained in order to find and capture remaining amphibians.

Thorough ground searches should be conducted to locate amphibians on land. Conduct a walk-through of the areas identified as potential amphibian habitat, looking for amphibians on land. Look below you and around you. Walk slowly. Do not take pets or young children with you as it is important to be quiet and focused on the task at hand. Try to walk in a somewhat fixed direction or pattern along a route parallel to the water's edge or other land feature, covering all suitable habitats. A qualified biologist or other person trained to locate and identify amphibian breeding sites should search for suitable breeding habitat within the project impact area.

All mobile life stages of amphibians should be captured with a dip net that is deep enough (about 12 inches deep) so that captured amphibians cannot climb or jump out. Adult and juvenile life forms may also be hand-captured if necessary. Amphibian eggs/egg masses should be collected gently by hand or by long-handled spoons to avoid disintegration of the eggs/egg masses. See Amphibian Handling section below for more procedural information.

<u>Auditory Surveys</u>

Breeding males of some frog and toads species can be identified and located by their calls. However, most breeding frogs and toads in Oregon do not have audible vocalizations. Breeding males tend to be most vocal at night; therefore auditory surveys should be conducted during his timeframe. Auditory surveys should be used to complement other types of amphibian survey methods.

Night Surveys

Salamanders, frogs and toads tend to be more active at night. Night-time surveys for these species can be conducted with the aid of a flashlight and are usually done in conjunction with other survey methods.

Drift Fencing and Pit Fall Traps

Sites where high densities of amphibians are known or predicted (based on habitat suitability) or sites with poor survey conditions, should be encircled by drift fences to the extent feasible. Contact ODFW for more information on this procedure. The most common type of drift fence is a 3-foot high fabric fence with pre-attached stakes, the type commonly used at construction sites to prevent siltation into nearby waterbodies. The fence should be stretched between the impact and no-impact zones with the bottom 2-3 inches of the fence laying flat on the ground and inward toward the project construction area. This flap should then be covered by a layer of soil to prevent amphibians from squeezing underneath. Generally, use of pitfall traps should be restricted to research studies because they can result in high mortality of both target species and non-target species if not properly used. Pitfall traps can be set on the inside of the drift fence and/or at the open ends of the fence if the fence is not able to completely enclose the work area. Contact ODFW for more information on use of pitfall traps.

Aquatic Funnel Traps

Generally, use of aquatic funnel traps should be restricted to research studies because they can result in high mortality of both target species and non-target species if not properly used. Small aquatic funnel traps (e.g., minnow traps, “pop-bottle” traps) can be baited (note: bait is not necessary for some species) and deployed in areas with standing water to capture amphibians. Larvae tend to be more likely to enter funnel traps compared to adult amphibian life forms, with a few exceptions (e.g., rough-skinned newt). Funnel traps can be used in conjunction with drift fences set in the waterbody to help direct amphibians to the trap entrance. Use of aquatic funnel traps (and any other trap type) should be coordinated closely with ODFW to minimize potential harm to both targeted and non-targeted species. Contact ODFW for more information on use of aquatic funnel traps.

Electroshocking

Electroshocking is commonly used during stream surveys for fishes, but it can also be used to detect amphibians in slow-moving or standing waterbodies. Electroshocking should not be used as a method to directly sample amphibians, but if already planned in a project area for sampling and capturing of fish, it may be useful for incidental sampling and capture of amphibians that are also present. Amphibians not buried in the substrate will be stunned and can then be scooped up with a dip net.

Altering Water Levels & Searching Excavated Material

If working in an aquatic system where water levels can be manipulated, lowering of the water (pool area) can help facilitate capture of amphibians. For projects involving excavation and removal of material from the bottom of an existing pond or other waterbodies, a search for amphibians buried (hiding) in excavated material should be made during the excavation process and any amphibian found gently removed from

excavated debris excavated materials should be carefully deposited in an un-impacted area near the project and spread thin to facilitate location and capture of amphibians.

Amphibian Eggs and Larvae

During aquatic searches for amphibians, egg masses and larvae (e.g., tadpoles) may be found / observed. During ground searches or earth-moving activities terrestrial salamander eggs (usually with a guarding female nearby) may be encountered. If possible, amphibian eggs/egg masses should be allowed to hatch and larvae should be allowed to metamorphose to juvenile life form. Eggs/egg masses located during the visual survey should be marked and avoided. Brightly colored flagging is an ideal method of marking amphibian eggs/egg masses. If amphibian eggs/egg masses and/or larvae (native species only) are encountered and cannot be avoided and are determined to be at risk from the project, they should be collected and the project manager should contact ODFW immediately for instruction. ODFW will likely instruct the project manager to relocate the eggs and/or larvae to the nearest known area of suitable breeding habitat outside the project area.

It is acceptable to interrupt any non-native amphibian (e.g., American bullfrog) found breeding or laying eggs. Non-native amphibians should be captured if possible and egg masses collected. See ODFW's guidance document for more information on bullfrogs including options for captured bullfrogs.

Amphibian Handling

Amphibians on land should generally be approached slowly, although swiftness is also necessary to capture many species of amphibians, especially frogs, whether it is by dip net or hand capture method. If capturing by hand and if time allows, put on a clean, unused pair of latex or rubber gloves and gently grab the amphibian around the body or scoop up with cupped hands. Un-gloved hands should be clean and free from any obvious chemicals or other potentially harmful substance such as sun screen, insect repellent, or hand lotion. Amphibians have fragile and absorptive skin that needs to stay clean and moist.

Handling of eggs/egg masses and larvae should be done by hand or using a long-handled spoon to minimize disintegration caused by netting. Most egg masses will be attached to some type of vegetation, for example, emergent aquatic vegetation or the slender stem of an over-hanging riparian shrub. To collect attached egg masses, use scissors or small pruning shears to clip the vegetation below the egg mass (and above if necessary) to free it, allowing it to be collected by hand. When collecting eggs/egg masses by hand, hands should be free from obvious chemicals or other potentially harmful substances.

Amphibian Holding & Transport

Captured amphibians are to be placed carefully in a clean, escape-proof plastic container suitable for the size and number of amphibians collected. Recommended container dimensions are 16" deep x 16" wide x 24" long. A medium sized cooler can serve as a holding/transport container. A deep container is the best way to prevent escape, and with frogs and toads a container with a tight fitting lid is necessary to prevent escape. Air holes can be made in the lid, although this is not deemed necessary for temporary holding as there is plenty of air in the container itself. Multiple amphibians may be placed in a single container since, but different species should be housed in separate containers. For aquatic amphibians, a small amount of water (about ½ to 1-inch, depending on the species and the

size of the amphibian(s) should be put in the container to provide moisture and prevent dehydration. Water should be from the aquatic waterbody from which the amphibian originated. Terrestrial amphibians (e.g., salamanders) and eggs (usually found with guarding female nearby) should be housed in a container filled with a portion of substrate (soil, leaf litter) in which the salamander / nest was found.

Egg masses and aquatic larvae should be housed in a container similar to that used to hold aquatic amphibian adults and juveniles. Ample water from the point of origin should be provided.

During holding and transport, captured amphibians and egg/egg masses should be kept at ambient air temperature and out of the direct sunlight. Amphibians and eggs/egg masses should not be handled, moved, or transported more than necessary. Amphibians and egg/egg masses should be held in holding/transportation containers ideally for no more than 30 minutes to minimize stress.

Final Disposition of Captured Amphibians and Collected Egg Masses

Final disposition (e.g., relocation/release) of captured amphibians and collected eggs/egg masses is informed by whether the amphibian is a native or non-native species.

Release of Native Amphibians - All native amphibians and their eggs/egg masses are to be released at the location(s) designated by ODFW in the Wildlife Capture, Handling, Transport and Relocation Permit unless otherwise directed by ODFW. For amphibians and egg masses to be released into aquatic habitat, water temperatures at the release location ideally should be no more than 9 to 10° F different from the water temperature at point of capture. Upon release, amphibians should be observed for a couple of minutes to confirm recovery from capture, holding and transport.

Collected egg masses should be gently placed in suitable aquatic habitat at the release site designated by ODFW. Suitable habitat is characterized by standing or very slow-moving shallow water (approximately 6 inches to 18 inches deep), a partially sunny exposure, and cool water. Egg masses should be placed in the water in an area where it can receive some solar radiation to aid in metamorphosis; this often in along the northern or eastern edge of an aquatic area.

Any native amphibian and amphibian eggs/egg masses captured/collected may be temporarily held for the purpose of gathering biological data (e.g., species, life stage, gender, weight, length, number, etc…), but is to be immediately transported and released thereafter, unharmed and at a location designated by ODFW in the Wildlife Capture, Handling, Transport and Relocation Permit. Collection of biological data is not required unless specifically included as a condition of the Wildlife Capture, Handling, Transport and Relocation Permit. Final disposition is to be determined by ODFW and according to conditions outlined in the Wildlife Capture, Handling, Transport and Relocation Permit.

Non-Native Amphibians - All non-native amphibians (e.g., American bullfrog) and their eggs/egg masses collected are to be placed in an escape-proof container and

transferred to ODFW within 24 hours of collection unless otherwise authorized in the Wildlife Capture, Holding, Transport and Relocation Permit. Options for bullfrogs are described in ODFW's guidance document.

Required Reporting

All amphibians captured, eggs collected, and incidental mortalities (if any) are to be recorded on a form provided by ODFW. Information to be recorded includes: capture date and time, species captured, life stage (i.e., adult, juvenile, larvae, egg/egg mass), capture location, release site location, and any mortalities. Biological data on amphibians captured is considered optional unless required by a specific Wildlife Capture, Holding, Transport and Relocation Permit condition. Relevant field observations can be reported also. Digital photographs can be submitted with the report. The report is to be submitted to ODFW within 30 days of the Wildlife Capture, Handling, Transport and Relocation Permit expiration date.

Procedures to Avoid Transmission of Diseases or Parasites

Transmission and disease and /or parasites are a real threat facing Oregon's native amphibians and amphibians around the world. To minimize the risk and transmission of disease and parasites implementation of the following measures is recommended:

At all times, handle an amphibian (native or non-native) as if it has a contagious disease or hosts parasites. Native amphibians and non-native amphibians should not be placed in the same container. During handling, hands should be clean and /or wear a new pair of disposable latex or rubber gloves. If a glove is torn while handling an amphibian put on a new glove over the old one. Place used gloves and disposable supplies (e.g., surveyors tape or flagging, etc.) in a plastic trash bag and dispose of offsite. All tools that contact amphibians should be disinfected prior to and after used in accordance with procedures described below.

Disinfection of Capture and Holding Equipment and Containers - All tools and equipment (e.g., dip net) coming into contact with amphibians and their eggs/egg masses from different waterbodies (i.e., not hydrologically connected) ruler) should be disinfected. Recommended disinfecting solution is 0.175-percent sodium hypochlorite (bleach). 0.175-percent sodium hypochlorite bleach is a 1:10 dilution of 5 percent household bleach to water. Before disinfecting, first remove any organic debris (e.g., dirt, feces, etc.) by rinsing the area with water or brushing off the area with paper towels or a scrub brush. Saturate the equipment and work surface with the solution and allow to air dry. When measuring amphibians, use only metal or plastic rulers; never use a wooden ruler, which is too porous and cannot be properly disinfected.

Clothing Disinfection Procedures - Do not allow an amphibian or their eggs/egg masses to contact clothing. If it does, change clothes before handling another amphibian or egg/ egg mass. Contaminated clothes should be washed before worn again while handling amphibians. Keep a change of clothes on-hand and change clothes, including shoes, before leaving the site. As an alternative, wear disposable jumpsuits or gowns and disposable paper or plastic shoe covers.

Vehicles / Heavy Equipment – If vehicles/equipment use will occur in more than one area of suitable amphibian habitat ensure that all equipment is clean and dry or disinfected before it moves to another location. Known presence/absence of disease in an area should be used to inform and modify as deemed necessary procedures to prevent/minimize risk of disease transmission.

For More Information:

Protocol for Avoiding and Minimizing Impacts to the Columbia Spotted Frog (*Rana luteiventris*) During Construction. Appendix B of Final Environmental Assessment and Finding of No Significant Impact for Victory Ranch River Restoration Project Wasatch and Summit Counties, Utah. U.S. Bureau of Reclamation. PRO-EA-03-011. April 2004 http://www.usbr.gov/uc/envdocs/ea/victory_ranch/vr_FEA_apdxB.pdf

Final Recovery Plan for the Chiricahua Leopard Frog. Appendix I. Recommended Conservation Measures for Projects Affecting Frogs. USFWS. April 2007. http://www.usbr.gov/lc/phoenix/biology/azfish/pdf/CLFRecoveryPlan.pdf

RAMSEY CANYON LEOPARD FROG CONSERVATION AGREEMENT AND CONSERVATION ASSESSMENT AND STRATEGY. Nongame Branch, Wildlife Management Division Arizona Game and Fish Department, Phoenix, Arizona. Ramsey Canyon Leopard Frog Conservation Team. August 2007. http://www.fws.gov/southwest/es/arizona/Documents/SpeciesDocs/Ramsey_Frog/20070827_RASU%20ConAg%20and%20CAS_Final.pdf

Informal Consultation for the Proposed Lagunitas Bridge Replacement Project, Caltrans District 04, Marin County, California, Bridge Number: 27c0071, 04-Mar-0-Ross, BRLS-5176 (003). Letter dated November 19, 2009 from the USFWS to California Department of Transportation. http://www.townofross.org/pdf/lagunitas-road-bridge/usfws-concurrence-letter.pdf

British Columbia, Ministry of Environment. Best Management Practices for Amphibians and Reptiles in Urban and Rural Environments in British Columbia. November 2004. http://www.env.gov.bc.ca/wld/documents/bmp/HerptileBMP_complete.pdf

SECTION A. SPECIES IDENTIFICATION TOOLS

ODFW recommends the following amphibian field guides and web link to aid in species identification:

Corkran, C. and C. Thom. 2006. Amphibians of Oregon, Washington and British Columbia. Lone Pine Publishing. 176 pp.

ODFW. Frogs are Cool! Facts for Kids. http://www.dfw.state.or.us/species/docs/FrogsFlyer.pdf

ODFW. Oregon Wildlife Species – Salamanders and Newts
http://www.dfw.state.or.us/species/amphibians/index.asp#Salamanders|

ODFW. Oregon Wildlife Species – Frogs
http://www.dfw.state.or.us/species/amphibians/index.asp#frogs

SECTION B. ADDITIONAL SPECIES INFORMATION

SPECIES	OVIPOSITION SITES & AQUATIC HABITATS	TERRESTRIAL HABITATS & HABITS
Northwestern Salamander	Wetlands, ponds, lakes, and slow-moving parts of streams.	Forests, riparian. Subterranean when not breeding. Nocturnal.
Long-toed Salamander	Seasonal and permanent wetlands, ponds, ditches and slow-moving parts of streams.	Grasslands, shrub-steppe, forest. Subterranean when not breeding. Nocturnal.
Tiger Salamander	Lakes, ponds and ditches.	Shrub-steppe, grasslands forest. Subterranean when not breeding. Nocturnal.
Cope's Giant Salamander	Streams with rock or gravel substrate.	Moist riparian forests. Occasionally found in ponds, high elevation lakes, deep water. Nocturnal.
Coastal Giant Salamander	Streams with rock or gravel substrate.	Moist riparian forests. Occasionally found in ponds, high elevation lakes, deep water. Nocturnal.
Rough-skinned Newt	Ponds, lakes, wetlands and slow-moving parts of streams.	Primarily forests, also grasslands.
Columbia Torrent Salamander	Cold, fast-flowing, clear, headwater streams, seeps, and waterfall splash zones in forested areas.	Moist forests and talus slopes near streams.
Southern Torrent Salamander	Cold, fast-flowing, clear, headwater streams, seeps, and waterfall splash zones in forested areas.	Moist forests and talus slopes near streams.
Cascade Torrent Salamander	Cold, fast-flowing, clear, headwater streams, seeps, and waterfall splash zones in forested areas.	Moist forests and talus slopes near streams.
Coastal Tailed Frog	Fast, cold streams with cobble or gravel substrate.	Forests. Occasionally found in high elevation ponds and lakes. Nocturnal.
Rocky Mountain Tailed Frog	Fast, cold streams with cobble or gravel substrate.	Forests. Occasionally found in high elevation ponds and lakes. Nocturnal.
Great Basin Spadefoot	Seasonal and permanent ponds, wetlands, ditches and slow-moving parts of streams.	Shrub-steppe and grasslands. Nocturnal.
Western Toad	Wetlands, lakes, springs, ponds, stock ponds, and slow-moving parts of streams.	Forests, grasslands and along streams.
Woodhouse's Toad	Permanent and seasonal waters, lakes, ponds, and slow-moving parts of streams.	Shrub-steppe and grasslands. Adults nocturnal and crepuscular; juveniles diurnal.
Pacific Treefrog	Permanent and seasonal wetlands, ponds, ditches, slow-moving parts of streams, and backyard water features.	Forests, woodlands, grasslands, shrub-steppe, and some residential and agricultural areas.
Red-legged Frog	Permanent and seasonal wetlands, ponds, lakes, slow-moving parts of streams, and some backyard water features.	Forests, riparian areas, and along streams. Have been found up to 2 miles from water.
Foothill Yellow-legged Frog	Streams and rivers.	Forests and woodlands; usually near water.

Cascades Frog	Permanent and seasonal ponds, lakes, potholes, wet meadows, bogs, and fens. Above 2,400 feet elevation.	Streams; usually near water.
Columbia Spotted Frog	Permanent and seasonal wetlands, lakes, ponds, stream overflow pools, sloughs, and beaver ponds.	Streams; usually near water.
Oregon Spotted Frog	Permanent and seasonal emergent wetlands and springs associated with lakes, and/or streams.	Streams; usually near water.
Northern Leopard Frog	Permanent and seasonal ponds, lakes, stream overflow pools, sloughs.	Streams, riparian areas, meadows.
American Bullfrog (introduced)	Permanent waters, ponds, lakes, wetlands, and slow-moving parts of streams.	Usually near water.
Clouded Salamander	Forests with decaying logs, rock crevices.	Fully terrestrial. Female guard eggs.
Black Salamander	Forests, woodlands, moist talus, and streamside areas with decaying downed logs, rock crevices.	Fully terrestrial. Female guards eggs.
Ensatina	Moist forests, woodlands, and some residential agricultural areas with decaying logs, piles of firewood, or scrap man-made materials.	Fully terrestrial. Female guards eggs.
Oregon Slender Salamander	Forests (usually mature) with decaying logs; moist talus and lava fields.	Fully terrestrial. Female guards eggs.
California Slender Salamander	Humid coastal forests with decaying logs, rocks.	Fully terrestrial.
Dunn's Salamander	Rocky edges of forested streams, moist to wet talus, rocky seeps.	Fully terrestrial. Female guards eggs.
Larch Mountain Salamander	Talus slopes in or near mature forest with decaying logs; rocky areas.	Fully terrestrial. Little known about nesting.
Western Red-backed Salamander	Forests, woodlands, moist talus; springs near streams.	Fully terrestrial. Female guards eggs.
Del Norte Salamander	Forests, woodlands, and moist talus with decaying logs, rocks.	Fully terrestrial. Female guards eggs.
Siskiyou Mountains Salamander	Deep talus and rock outcrops in or near forests; decaying logs near talus.	Fully terrestrial. Little known about nesting.

Sources:

Olson, D.H., W.P. Leonard, R. B. Bury. 1997. Sampling Amphibians in Lentic Habitats: Methods and Approaches for the Pacific Northwest. Northwest Fauna 4, Society for Northwestern Vertebrate Biology, Olympia, WA.

Corkran, C. and C. Thom. 2006. Amphibians of Oregon, Washington and British Columbia. Lone Pine Publishing. 176 pp.

ATTACHMENT 1. WILDLIFE CAPTURE, HOLDING, TRANSPORT AND RELOCATION PROTOCOLS

SPECIES GROUP: TURTLES

Oregon has two species of native turtles, the western pond turtle and the western painted turtle. Both turtle species are listed as State Sensitive Species as "Sensitive-Critical" and are classified as "Nongame Wildlife Protected" (OAR 635-044-0130). It is unlawful to hunt, trap, pursue, kill, take, catch, angle for, or have in possession, either dead or alive, whole or in part, any species classified as Nongame Wildlife Protected except as otherwise authorized by ODFW permit.

Two non-native turtle species are known to occur and reproduce successfully in the wild in Oregon – the red-eared slider turtle and the snapping turtle. Both are considered invasive species and have been categorized as "Prohibited Nonnative Wildlife" (OAR 635-056-0050) as they have negative impacts on our native fish and wildlife and habitats. It is unlawful to be in possession of or release into the wild any live Prohibited Nonnative Wildlife species except as authorized by ODFW permit.

Identification of Suitable Turtle Habitat

Suitable turtle habitat includes both aquatic and terrestrial habitats. Defer to an ODFW wildlife biologist or other qualified biologist on areas where turtles may be encountered within the project area, including nesting sites. Areas where turtles are most likely to be encountered should be identified and delineated on a project map and / or on the ground.

Turtle Identification

A qualified wildlife biologist or other person proficient in turtle identification (native and non-native) and identification of turtle nests and turtle eggs should be present on-site and available during project implementation. Turtle identification materials (see **Section A**) should be provided to all project staff with the potential to encounter turtles.

Project Timing

When turtles (native or non-native) are known or suspected to be present or when suitable turtle habitat (aquatic or terrestrial) has been identified at or near a project site, ODFW's Turtle Capture, Holding, Transport and Relocation (CHTR) Protocol (this document) should be incorporated into the project to prevent or minimize negative impacts to turtles from the project. The Turtle CHTR Protocol should be in effect during the entire project period and in any season, as turtles may be encountered at any time of the year in Oregon.

The general annual activity cycle of western pond and western painted turtles is as follows:

> Spring - In the early spring (typically March), turtles emerge from hibernation sites and move to wetlands to forage for food. Turtles begin basking on logs, rocks, banks or floating vegetation, especially on sunny spring days and when water temperatures are cool. Courtship and mating activities occur from March into June.

Summer - Throughout June and July, most sexually mature female turtles leave the water to nest. Nesting occurs in dry upland areas having sparse vegetation and that receive plenty of sun. Most nesting activity occurs between dusk and dawn hours when light levels are low. Females excavate the nest chamber with their hind legs and eggs are deposited into the cavity. When egg-laying is complete, the female turtle covers the eggs with dirt and conceals the nest from potential predators. The female turtle then vacates the nesting habitat and in most cases returns to the water. The eggs are incubated by the summer sun. During mid to late summer (after nesting), turtles may have a period of reduced foraging and basking activity or dormancy called aestivation that occurs in wetlands and forests, and other upland habitats near the wetland habitat utilized earlier that year. During periods of very warm summer weather, turtles do not spend much time basking.

Fall - Eggs hatch in September and October (in about 75 days) in warm sunny weather, or as much as 125 days in cooler weather or shadier conditions. If the eggs don't get enough warmth they may not hatch at all. The fully formed hatchling turtles survive on the yolk sac which they slowly absorb as they grow. Some hatchlings emerge from their nests in the fall, although most over-winter in their natal nests and emerge in the spring. After emergence, hatchlings typically make short movements near the nest just below the surface of the ground for nearly a year. Some move to aquatic habitats and seek cover. Courtship and mating can occur in the fall. Turtles move to hibernation habitats in mid-fall.

Winter - Turtles are generally inactive during the winter months as they hibernate. Western painted turtles prefer to over-winter at the bottom of muddy ponds and off-channel sloughs. Most western pond turtles over-winter on land under the top layer of soil and leaf litter or under other thick ground vegetation.

See **Section B** for additional pertinent information for each turtle species.

Methods for Locating and Capturing Turtles

Since turtles use both aquatic and terrestrial habitats, they may be found on land and in the water. Presence of turtles in water can be verified using visual survey methods (i.e., naked eye, binoculars, spotting scope). Turtles may be observed basking in the sun on logs, rocks or other surfaces; or they sometimes can be seen swimming close to the water's surface. When a threat is perceived, basking turtles often slip quietly into the water.

Turtles on land include adult turtles (males or female) making over-land dispersal movements, gravid females in search of suitable nesting habitat, and hatchling turtles that have left the nest chamber. Hatchling turtles may spend up to a year at or near the nest site, and may be encountered on the surface of the ground or near the surface under leaf litter and other vegetation. Hatchling turtles are very difficult to find, even to the trained eye.

Ground Search Methods - Thorough ground searches should be conducted to locate turtles on land. Conduct a walk-through of the areas identified as potential turtle habitat, looking for turtles on land. Peer ahead to areas of suitable habitat with both naked eye and binoculars. Look below you and around you. Walk slowly. Do not take pets or young children with you as it is important to be quiet and focused on

the task at hand. Try to walk in a somewhat fixed direction or pattern along a route parallel to the water's edge or other land feature, covering all suitable habitats. A qualified biologist or other person trained to locate and identify turtle nests should search for turtle nests in areas of suitable habitats within the project impact area.

Reasonable efforts should be made to capture all turtles encountered that are perceived to be in jeopardy of being harmed by the project activities. Turtles can be caught by hand while they are in the water or on the land. A net or other tool may be used to capture turtles on land if hand capture is undesirable. Turtles in water can also be caught with dip nets or seine nets. If working in an aquatic system where water levels can be manipulated, lowering of the water (pool area) can help facilitate capture of turtles. Live traps (e.g., basking trap, hoop trap) can be deployed to capture turtles in aquatic habitats. Live trapping should be coordinated closely with ODFW to minimize potential harm to turtles and minimize capture of non-target animals. For projects involving excavation and removal of material from the bottom of an existing pond, a search for turtles buried (hiding) in excavated material should be made during the excavation process and any turtles found removed from excavated debris.

Turtle Nests and Hatchlings

During ground searches, female turtles in the act of nesting / laying eggs may be encountered or completed turtle nests may be found. If possible, native turtle species found nesting should be allowed to complete the nesting process undisturbed. The nest should then be marked and avoided. Brightly colored flagging is an ideal method of marking turtle nests, although a pile of rocks or upright stick can suffice. If nesting turtles (native species only) or completed nests cannot be avoided and are deemed at risk by the project, the project manager should contact ODFW for instruction.

Turtle nests and hatchlings are very cryptic and are often difficult to see, making them even more vulnerable to disturbance. Ground-disturbing activities may uncover and reveal turtle nests with eggs or hatchlings. If turtle eggs or hatchlings are encountered and are determined to be in harm's way, they should be collected and the project manager should contact ODFW immediately for instruction. ODFW may instruct the project manager to transfer the eggs / hatchlings to an ODFW-licensed wildlife rehabilitation facility specializing in turtle care. Alternatively, a new nest chamber may be dug in a safe area and eggs placed inside (by ODFW staff or other trained person), or hatchlings may be relocated to suitable habitat nearby.

It is acceptable to interrupt any non-native turtles found nesting. The non-native turtle should be captured and the nest excavated to collect all eggs laid. All non-native turtle hatchlings should also be captured. All non-native turtles and eggs are to be transferred to ODFW.

Turtle Handling

Turtles on land should generally be approached slowly. If time allows, put on a clean, unused pair of latex or rubber gloves and grasp the turtle at its bridge (connection between the carapace [top shell] and plastron [bottom shell]) with both hands, holding it firmly with its plastron parallel to, and facing the ground.

** Important Safety Note: *All turtles have powerful jaws and sharp beak-like mouths that can inflict a painful bite in self defense. Extreme caution should be used when handling snapping turtles as they have very long necks that can extend to both sides and above. When handling a snapping turtle, place your hands toward the rear of the turtle near the hind legs and out of reach from the turtle's head.*

Turtle Holding & Transport

Captured turtles are to be placed carefully in a clean, escape-proof plastic container. Recommended minimum container dimensions are 16" deep x 16" wide x 24" long. A deep container is the best way to prevent escape. A container with a locking lid can also prevent escape. Air holes can be made in the lid, although this is not deemed necessary for temporary holding as there is plenty of air in the container itself. Multiple turtles (2-3, depending on size of turtles and container) may be placed in a single container since they are social creatures.

When temporarily holding multiple turtles in a single container, turtles should be approximately the same size; turtles of the same size generally will get along. If a turtle is particularly aggressive toward another turtle (e.g., biting), put the aggressive turtle in a separate container. Do not offer or put any food in the container. It is normal behavior for turtles to crawl on top of each other. A turtle may flip over, but usually it can right itself without assistance. If you notice that a turtle is unable to right itself, assist. Turtles should be kept at ambient air temperature and out of the direct sunlight. A small amount of water (about ½ to 1-inch, or enough to reach the turtle's bottom shell) should be put in the container. Use water from the waterbody from which the turtle originated; regular tap water is also fine. Very small turtles should be kept moist at all times as they can dehydrate more quickly. Turtle eggs should be put in a container (e.g., a five gallon bucket) and covered with a few inches of nesting substrate to keep them moist. Turtles and eggs should not be handled more than necessary.

Final Disposition of Captured Turtles and Collected Eggs

Final disposition of captured turtles and collected eggs is informed by whether the turtle is a native or non-native species.

Native Turtles - Any western pond turtle or western painted turtle captured may be temporarily held for the purpose of collecting biological data (e.g., gender, length, weight), but is to be released immediately thereafter, unharmed and at the location(s) designated by ODFW in the Wildlife CHTR Permit. Collection of biological data is not required unless specifically included as a condition of the permit. Disposition of any native turtle nest, egg(s) or hatchling found is to be determined by ODFW and according to conditions outlined in the Wildlife CHTR Permit.

Non-Native Turtles - All non-native turtles (e.g., red-eared slider, snapping turtle) are to be placed in an escape-proof container(s) and all non-native turtle eggs found are to be collected and placed in a zip-lock bag or other suitable container. All non-native turtles and eggs are to be transferred to ODFW within 24 hours of collection unless otherwise authorized in the Wildlife CHTR Permit.

Required Reporting

All turtles captured, eggs collected, and incidental mortalities (if any) are to be recorded on a form provided by ODFW. Information to be recorded includes: capture date and time, species captured, life stage (i.e., adult, sub-adult, juvenile, hatchling, egg), capture location, release site location, and any mortalities. Biological data on turtles captured is considered optional unless required by a specific Wildlife CHTR Permit condition. Relevant field observations can be reported also. Digital photographs can be submitted with the report. The report is to be submitted to ODFW within 30 days of the Wildlife CHTR Permit expiration date.

Other Considerations

Additional considerations applicable to the Turtle CHTR Protocol are as follows:

Procedures to Avoid Transmission of Diseases or Parasites - At all times, handle a turtle (native or non-native) as if it has a contagious disease or parasites. Native turtles and non-native turtles should not be placed in the same container. During handling, wear a new pair of disposable latex or rubber gloves (i.e., one pair of gloves, per turtle, per encounter). If a glove is torn while handling a turtle, which is likely when its toenail scrapes the glove, put on a new glove over the old one. Used gloves and disposable supplies (e.g., surveyors tape or flagging, etc.) must be placed in a plastic trash bag and disposed of offsite. All tools that contact turtles should be disinfected in accordance with procedures described below.

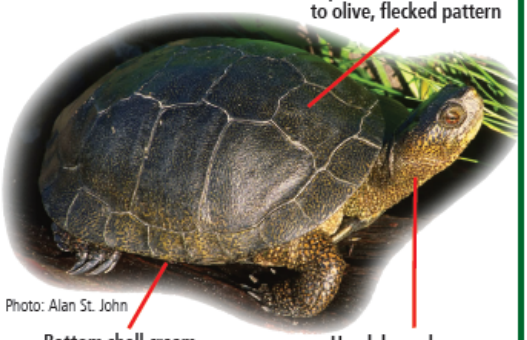
- **Clothing Disinfection Procedures** - Do not allow a turtle to contact clothing. If it does, change clothes before handling another turtle. Contaminated clothes should be washed before worn again while handling turtles. Keep a change of clothes on-hand and change clothes, including shoes, before leaving the site. As an alternative, wear disposable jumpsuits or gowns and disposable paper or plastic shoe covers.

- **Disinfecting Tools and Equipment** - All equipment and work surfaces after contact with each turtle, any equipment (e.g., ruler) that comes in contact with a turtle should be disinfected. Recommended disinfecting solution is 0.175-percent sodium hypochlorite (bleach). A 0.175-percent sodium hypochlorite bleach is a 1:10 dilution of 5 percent household bleach to water. Before disinfecting, first remove any organic debris (e.g., dirt, feces, etc.) by rinsing the area with water or brushing off the area with paper towels or a scrub brush. Saturate the equipment and work surface with the solution and allow to air dry. When measuring turtles, use only metal or plastic rulers; never use a wooden ruler, which is too porous and cannot be properly disinfected.

SECTION A. SPECIES IDENTIFICATION TOOLS

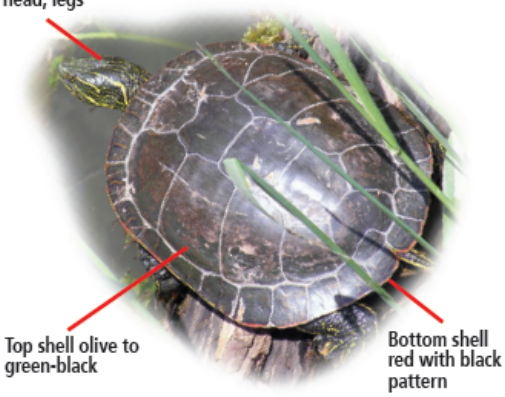
Oregon Native Turtles

Western Pond



- Found in ponds, lakes, rivers
- Digs nests in sunny dry soil, sparse vegetation
- Rests and over-winters in upland forest

Western Painted



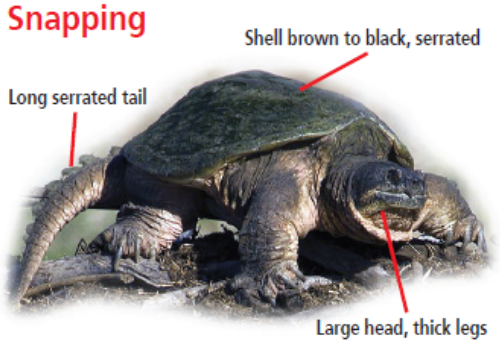
- Prefers slow moving water, ponds, sloughs
- Digs nests in sunny dry soil, sparse vegetation
- Over-winters in mud in pond bottoms

It is illegal to remove them from the wild, possess, transport or sell them.

the OREGON CONSERVATION STRATEGY

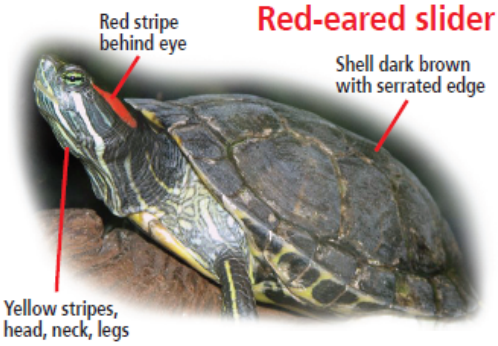
Oregon Non-Native Turtles

Snapping



- Native to eastern U.S.
- Can grow to 20 in. length
- Eats a variety of native fish and wildlife

Red-eared slider



- Native to eastern U.S.
- Competes with native turtles for food, basking and nest sites

It is illegal in Oregon to buy, sell, possess or release these invasive, non-native species.

Please report turtle sightings: www.oregonturtles.com

Oregon Department of Fish and Wildlife, Oregon Zoo, Native Turtles of Oregon

SECTION B. ADDITIONAL SPECIES INFORMATION

SPECIES: WESTERN POND TURTLE (*Actinemys marmorata*)

Management Status: USDI Fish and Wildlife Service Species of Concern. USDA Forest Service, Region 6 (Oregon and Washington) and USDI OR/WA Bureau of Land Management, Sensitive Species. Oregon Department of Fish and Wildlife: Conservation Strategy - Strategy Species and Oregon Sensitive-Critical Species. Washington: Endangered Species; Conservation Strategy – Species of Greatest Conservation Need. California: Species of Special Concern; Wildlife Action Plan – included in Wildlife Species Matrix as priority species. Natural Heritage Global Rank: G3G4 (not immediately imperiled); State Rank: California S3 (rare, uncommon or threatened), Oregon S2 (imperiled), Washington S1 (critically imperiled).

Range: The western pond turtle's range extends from northwestern Baja California, Mexico, north to Puget Sound in Washington. It is restricted to areas west of the Sierra Nevada and Cascade Mountains with a few exceptions. In Oregon, the western pond turtle occupies regions primarily west of the Cascades with suitable habitat, at elevations below approximately 1800 m or 6,000 feet (Nussbaum et al. 1983, ORNHIC database 2008). The largest populations in Oregon are found in the Willamette, Umpqua, Rogue, and Klamath River drainages.

Specific Habitat: The western pond turtle requires both aquatic and terrestrial habitats. It uses permanent and seasonal aquatic habitats including rivers, sloughs, lakes, reservoirs, ponds, and irrigation canals. The species moves onto land for nesting, over-wintering, dispersal, and basking. Over-winter sites typically include terrestrial refugia, burial in the substrate of aquatic habitats, or in undercut banks along streams. Nesting typically occurs within 200 m of aquatic habitat in areas with compact soil, sparse vegetation, and good solar exposure.

Threats: Major factors cited as limiting western pond turtle populations include loss of aquatic habitats, elevated nest and hatchling predation, reduced availability of nest habitat, and road mortality. Predation of nests may be above historical levels in human-altered landscapes due to greater abundance of medium-sized predators. Predation of hatchlings by introduced bullfrogs (*Rana catesbeiana*), smallmouth bass (*Micropterus dolomieui*), and largemouth bass (*Micropterus salmoides*) is thought to be significant although evidence for this is lacking. Road mortality is an important threat particularly in urban and recreational areas. Release of pet turtles to natural areas is a growing threat and may result in increased competition and disease transmission. In addition, removal of western pond turtles by the public for pets may cause local declines. Connectivity between aquatic and upland habitats increasingly becomes a concern as urban and agricultural development continues to fragment landscapes. Agricultural and vegetation management activities can result in nest destruction and mortality to adult females. Recreational activities within or adjacent to aquatic and nest habitats are an important concern in some parts of the species' range. Accidental catch of turtles while fishing also occurs. Illegal shooting of western pond turtles may occur in some areas. Research and survey work can affect western pond turtles by disrupting behavior, increasing the risk of disease transmission, and potentially influencing predator behavior.

Management Considerations: Western pond turtles occur on lands managed by public agencies at many jurisdictional levels including City, County, State, and Federal levels. Western pond turtles occur predominately on lands in private ownership in the Willamette Valley Ecoregion. Management approaches and actions will need to take into account the diversity of land allocation patterns. Because of the broad distribution of western pond turtles on private lands, management will need to focus on non-federal lands in some regions by engaging private landowners and watershed councils. Because both aquatic and upland habitats are required by western pond turtles, management by more than one public agency or landowner is likely to affect a given population or even an individual turtle. Despite these challenges, management actions that can contribute to the conservation of western pond turtles are numerous. Conservation actions to improve conditions for western pond turtles in Oregon include improving aquatic and terrestrial habitats, reducing road mortality, managing recreation near turtle-use areas, controlling non-native turtles, eliminating future releases of pet turtles, and in some areas may include reducing nest and hatchling predation.

SPECIES: WESTERN PAINTED TURTLE (*Chrysemys picta bellii*)

Management Status: U.S.D.I. Fish and Wildlife Service Species of Concern, U.S.D.A. Forest Service, Region 6 and U.S.D.I. Bureau of Land Management in Oregon-- Sensitive Species. Oregon Conservation Strategy - Strategy Species and Oregon Sensitive-Critical species. Washington - no special status. Natural Heritage Global Rank: G5 (Demonstrably widespread); State Rank in Oregon: S2 (imperiled); State Rank in Washington: S5 (Demonstrably widespread).

Range: The painted turtle is the most widespread native turtle species in North America, occurring from the Atlantic to the Pacific coasts. Its range includes most of the eastern and central United States. The subspecies *C. picta bellii*, the western painted turtle, occupies the largest portion of the species range, from western Ontario to British Columbia and south into the central United States. In Oregon, native western painted turtles are narrowly distributed along the northern portion of the state. They are found in north-central and north-eastern Oregon, primarily in the Columbia River Basin, and in the northern portion of the Willamette River Basin, primarily north of Salem. Painted and pond turtles co-occur in aquatic habitats in the northwest portion of Oregon, especially in the Willamette River basin north of Salem.

Specific Habitat: Aquatic and terrestrial habitats are required for western painted turtles. Their aquatic habitat is typically slow-moving and shallow water, including streams, canals, sloughs, small lakes, and ponds. They appear to select water bodies with surface or emergent vegetation and a muddy substrate. Terrestrial habitat is used primarily for nesting, but occasionally for over-wintering and overland movements among aquatic habitats. Nest habitat is composed of sparsely vegetated areas with southern exposure near aquatic habitat, usually within 50 m. A broad array of substrates is used for nesting, including recent fill. Over-wintering is often in shallow aquatic environments but also occurs in terrestrial habitats. Little is known of habitat use by hatchlings, but evidence suggests they tend to use shallower aquatic habitats. In Oregon, western painted and western pond turtles use similar habitat. The primary difference appears to be the painted turtle's greater dependence on aquatic habitat for over-wintering and selection of slower, more stagnant aquatic habitats.

Threats: Threats to western painted turtles in Oregon are very similar to western pond turtles and are often landscape-specific. Factors most often cited as limiting western painted turtle populations include loss of wetland and upland habitat, and elevated nest and hatchling predation. Elevated hatchling predation has been purported to be from introduced fish and bullfrogs, but evidence is lacking to support this hypothesis. Predation on nests is believed to be elevated in urban environments due to greater abundance of mid-sized predators that have adapted to human disturbance such as raccoons, skunks and coyotes, but there has been little quantification of these threats. Reduced nest site availability is a concern as well, particularly in urban environments. Because a large portion of the western painted turtle population in Oregon is in or near urban areas, threats are tied to factors associated with large human populations. This includes road mortality and limited connectivity between nesting, over-wintering, aquatic, and dispersal habitat, competition from introduced turtle species, human disturbance from increased recreational use of aquatic systems, and indirect effects of pesticide use. Indirect effects of research activities in some populations are a concern. Although wetland systems are often protected, the adjacent upland areas that are crucial for reproduction are frequently not protected. An important and increasing threat is the loss of genetic uniqueness because of release of pet painted turtles. Most of these threats are associated with the reduction in habitat and increased human access in the western portion of the painted turtle's range in Oregon.

Management Considerations: Conservation actions to improve conditions for western painted turtles in Oregon include improving aquatic and terrestrial habitats especially in managed waterways such as the Columbia Slough, increasing connectivity among populations, and reducing loss of adults by decreasing road mortality and reducing illegal removal by the public. Improving or creating nest habitat, hatchling habitat, and basking structures in some aquatic habitats, and managing recreation near turtle-use areas are feasible management actions.

Populations of introduced and invasive species, especially the red-eared slider and more recently the common snapping turtle, need to be managed. Furthermore, eliminating the release of pet painted turtles is vital to maintain genetic integrity of the populations in Oregon. Education on introductions and translocations is critical to reduce or eliminate the frequency of these often well-intended activities by the public. Further, if the threat of the capture and removal of western painted turtles from their native habitats in the Portland metropolitan areas is as high as local natural resource professionals fear, instituting a volunteer citizen "watch" may be very useful. Because of long-term survey and research efforts that have been occurring at some vulnerable populations, we recommend the development of a larger-scale research and survey strategy, designed to avoid or minimize possible impacts on turtle populations from all of the survey and research activities.

Development of a conservation plan for painted turtles in the Portland metropolitan region would facilitate the coordination of effective conservation actions across numerous jurisdictions. Because western painted turtles occur largely on private lands and designated open spaces managed by public agencies, management will need to focus on non-federal lands, and engage private landowners and local municipalities.

SPECIES: RED-EARED SLIDER (*Trachemys scripta elegans)*

Origin: Eastern United States

Ecology: Found in ponds, lakes and slow moving or still backwaters of rivers. Diet consists of plants, insects, snails, tadpoles, crayfish, worms and fish.

Status: Prohibited in Oregon. Large populations are found throughout the Willamette Valley and in other areas of the state. Most are illegally released pets.

Impact: Competes with native turtles for food and nesting, basking and cover habitat. Red-eared sliders can transmit parasites and diseases to which our native turtles have no immunity.

SPECIES: SNAPPING TURTLE (*Chelydra serpentina)*

Origin: Eastern United States

Ecology: Found in ponds, lakes, sloughs or slow moving rivers, preferring water bodies with muddy bottoms. Diet is comprised of aquatic vegetation, amphibians, crayfish, worms, birds, small mammals, carrion and other turtles. Snapping turtles will eat about anything that will fit between their jaws.

Status: Prohibited in Oregon. Populations found throughout the Willamette Valley and in other areas of the state.

Impact: In Oregon, snapping turtles compete with native turtles for food, nesting and cover habitat. Snapping turtles can transmit parasites and diseases to which our native turtles are not immune.

Oregon Department of Fish and Wildlife
Wildlife Division – Wildlife Permits
4034 Fairview Industrial Drive SE
Salem, OR 97302
Phone: (503) 947-6000

FOR OFFICIAL USE ONLY
Permit No. _____
Date _____
Annual Report _____

Wildlife Capture, Holding, Transport and Relocation Permit Application

SECTION I – PROJECT INFORMATION

Project Name:		
Township:	Range:	Section(s):
Latitude and Longitude:		
County:	Nearest City:	
Watershed Name:		

Applicant:	Contact:
Phone:	Email:
Address:	
Mailing Address (if different):	

Project Description: Describe the planned project including purpose of the project, project scope and stages, project methods, and schedule. Describe existing habitat conditions and anticipated impacts to wildlife habitat. Attach project map(s) that shows project work boundary, habitat types, streams, wetlands, project staging areas, proposed relocation site(s), etc… Photos of the site are helpful. _____

_____

_____

_____

_____

_____

Project Start Date:	Project End Date:

Wildlife Species Confirmed On-Site: (based on visual and auditory observations, tracks, scat, and other sign) _____

_____

_____

Wildlife Species Suspected On-Site: (based on presence of suitable habitat, species known to occur in the vicinity of project site, etc.): _____

_____

_____

SECTION II – WILDLIFE CAPTURE, HOLDING, TRANSPORT, AND RELOCATION INFORMATION

Wildlife Species for which Authorization is Requested:

Species Name (individual species or species group)	**Capture Method** (e.g., hand, dip net, live trap)	**Duration of Temporary Holding** (e.g., # minutes, hours, days)	**Proposed Relocation Site** (i.e., site name, habitat type)

Wildlife Capture, Holding, Transport, Relocation Methods: Describe the proposed methods to capture the above listed wildlife species. Describe wildlife handling procedures and equipment and protocols to keep wildlife healthy and to prevent escape. Address species disease transmission prevention and non-native invasive species. _____

_____

_____

_____

_____

_____

SECTION III – SUB-PERMITTEES

Name	Affiliation	Contact Information

SECTION IV – PERMIT STIPULATIONS & GUIDELINES

The intent of the Wildlife Capture, Holding, Transport and Relocation Permit is to provide a mechanism for capturing and relocating native wildlife that otherwise would be harmed or killed by a planned project action (see ODFW's *Technical Guidance Fact Sheet: Wildlife Capture, Holding, Transport, and Relocation* for more background information). The intent of the permit is primarily to protect those species classified by Oregon Administrative Rule (OAR) as "Nongame Wildlife Protected" (OAR 635-044-0130). It is unlawful for any person to hunt, trap, pursue, kill, take, catch, angle for, or have in possession, either dead or alive, whole or in part any Nongame Wildlife Protected. In addition, this permit provides a mechanism to relocate any wildlife classified as "Nongame Wildlife Nonprotected" that otherwise be harmed or killed during a specified project action. While these species are not offered the same level of protection by ODFW at this time, ODFW supports and recommends efforts to minimize and avoid harm to and mortality of all native wildlife. ODFW authorization is required to transport and relocate any wildlife regardless of its classification (ORS 497.308) and release locations must be approved by ODFW. Additionally, non-native wildlife may be encountered. Release of domestically raised or imported wildlife without a permit from ODFW is prohibited (ORS 498.052) and Nonnative Prohibited Wildlife may not be possessed live or relocated to other sites except for the purpose of humane euthanasia (OAR 635-056). The ODFW Capture, Holding, Transport and Relocation permit is the authorization mechanism for native and non-native wildlife that may be encountered during a specific project action.

This Permit:

1) Is not transferable unless authorized.

2) Must be carried on person(s) when conducting wildlife capture, holding, transport and relocation.

3) Cannot be used in lieu of a hunting or trapping license or a Wildlife Scientific Take Permit.

4) Does not authorize trespass on private property.

5) Is not valid to capture, hold, transport or relocate any state or federally listed threatened or endangered species.

6) Is not valid in any refuge, park, city, wildlife area or area posted closed to capturing wildlife without written approval of the manager or administrator of such area.

7) Unless otherwise determined by ODFW and federal native fish conservation partners, will not be issued until the applicable state and/or federal permits have been obtained when the proposed methods to capture wildlife may incidentally affect a state or federally protected fish species. For example, electro-shocking to capture amphibians in a stream with Coho salmon.

8) Will not be issued until federal permits required for capture of any migratory bird or marine mammals have been obtained, if applicable.

9) Expires on December 31 of the year of issuance. An annual report is to be submitted to ODFW at the completion of the project or within 30 days of permit expiration. The annual report shall list capture date, species captured, number of specimens captured, location of capture with UTM coordinate or legal description, and final disposition / relocation site. A report is required even if no capture/relocation occurred.

Failure to comply with the conditions stipulated in the Permit is cause for ODFW to cancel the permit and obtain control of any wildlife captured still in possession of the Permittee.

_____ _____

Applicant Signature Date

ODFW WILDLIFE CAPTURE, HOLDING, TRANSPORT AND RELOCATION REPORT FORM

PERMIT NO.: _____

Name of Permittee: _____ **Date: _____**

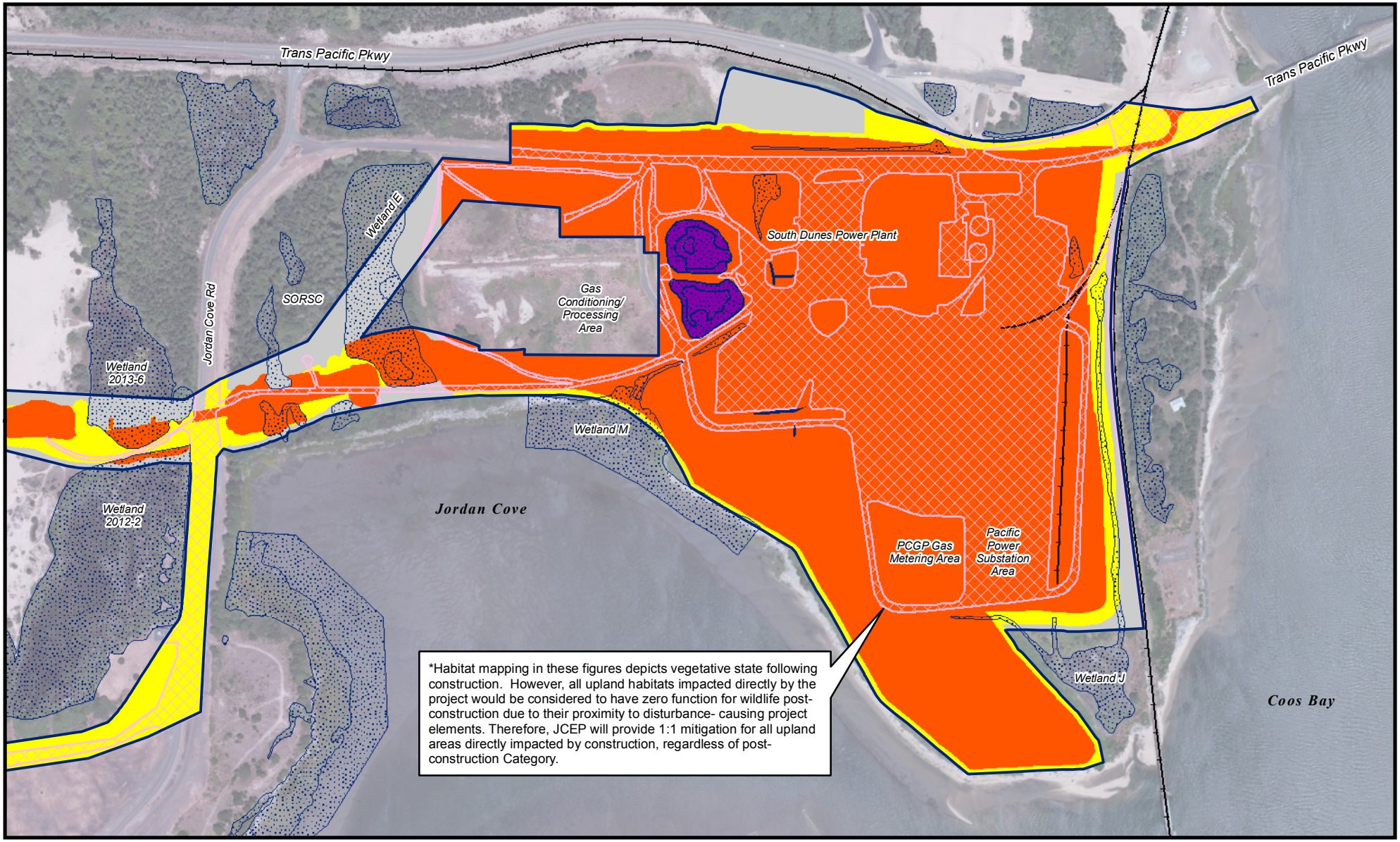
Capture Date	Species	Life Stage [1]	Capture Site [2]	Date of Release & Release Site [2]	Number Released Alive	Number of Mortalities / Transfers	Disposition of Mortalities / Transfers [3]	Biological Data Collected [4]	Pertinent Field Notes [5]

1 Life Stage – indicate whether an adult, sub-adult, juvenile, egg, egg mass, tadpole or larvae
2 Capture Site & Release Site – provide specific location information including UTM coordinate if available
3 Disposition of Mortalities / Transfers – indicate if buried on site, transferred to ODFW, or transferred to wildlife rehabilitation facility
4 Biological Data Collected – provide information on gender, length, weight, and general body condition. Include units of measurements.
5 Pertinent Field Notes – include any other relevant field observations or information related to the wildlife capture/relocation effort

Version 1.4 created on 9/25/13

Send report to:
ODFW
Attn: Wildlife Permits Coordinator
4034 Fairview Industrial Drive SE
Salem, OR 97302

APPENDIX D: Mitigation Specific to EFSC Jurisdiction



N

0 250 500 Feet

1 inch = 500 feet

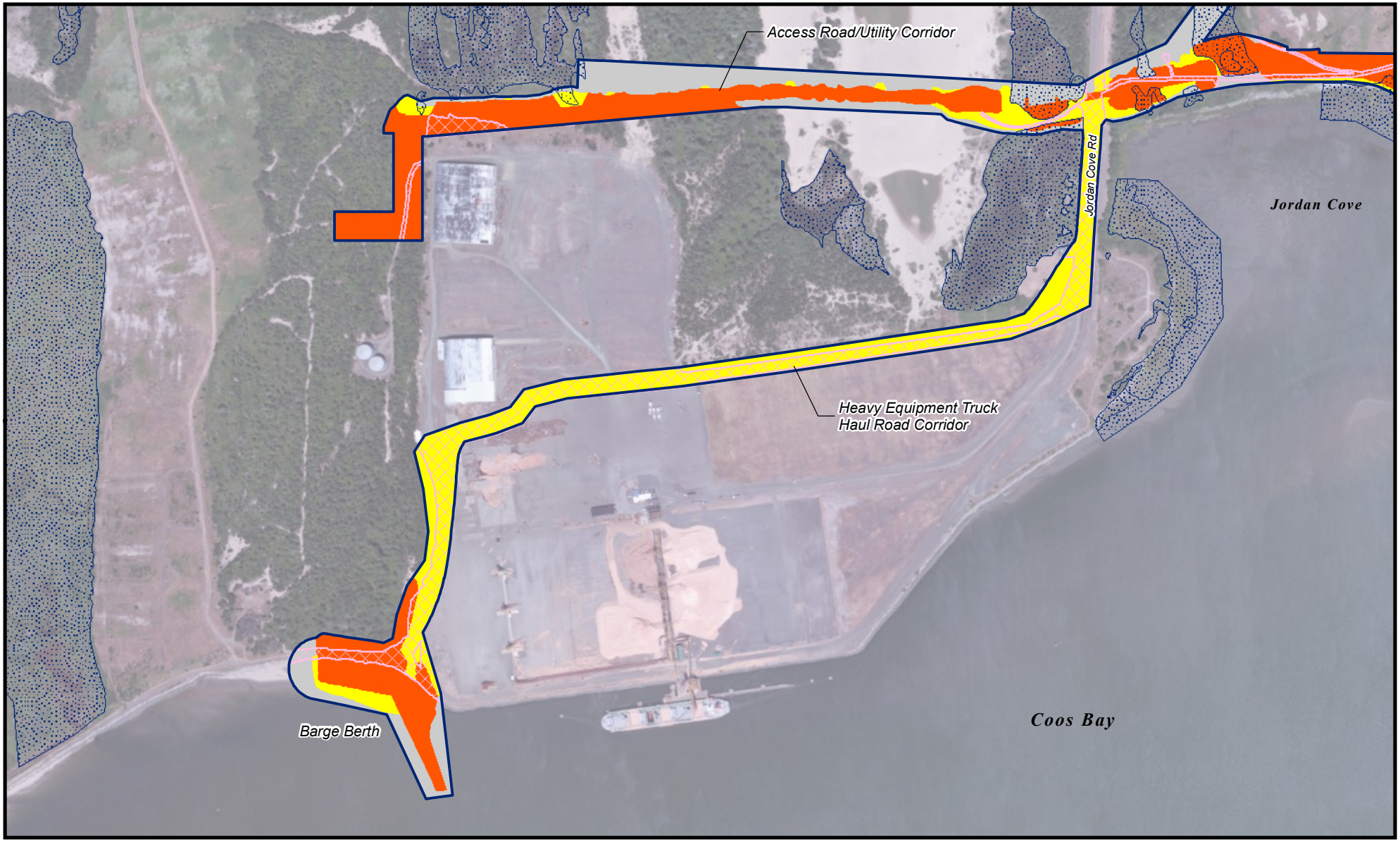
EFSC Site Boundary
Existing Rail
Delineated Wetland
Previously Disturbed Habitat
Permanent Disturbance Area
Temporary Disturbance Area
Undisturbed Area
Non-Jurisdictional Wetland Permanent Disturbance Area

South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-4, Sheet 1 of 2
ODFW Wildlife Habitat Impact Areas

Date: 9/26/2014
Reviewed By PR
Designed By SAST



N

0 350 700 Feet

1 inch = 700 feet

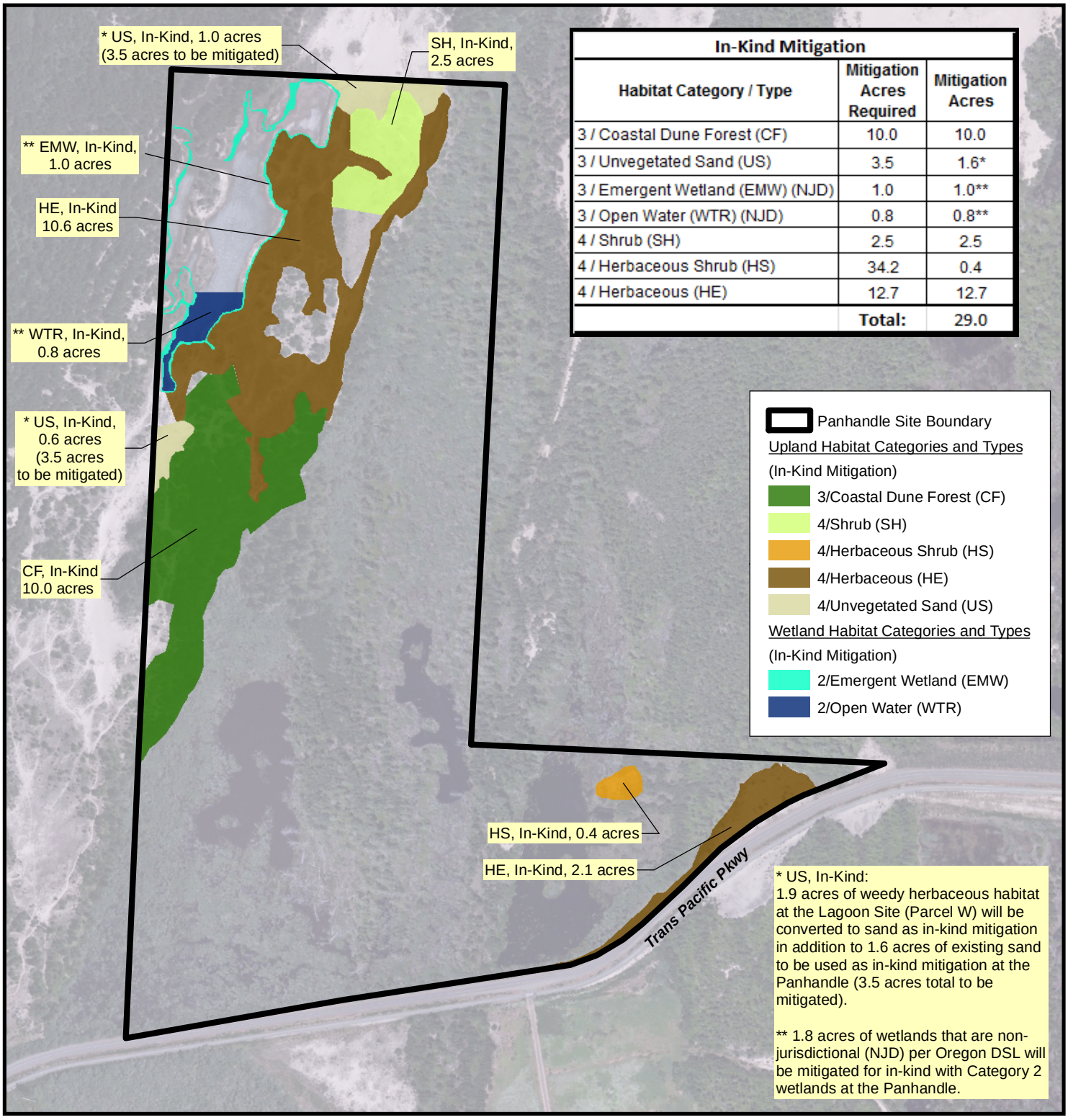
EFSC Site Boundary
Existing Rail
Delineated Wetland
Previously Disturbed Habitat
Permanent Disturbance Area
Temporary Disturbance Area
Undisturbed Area

South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-4, Sheet 2 of 2
ODFW Wildlife Habitat Impact Areas

Date: 9/26/2014
Reviewed By PR
Designed By SAST



In-Kind Mitigation

Habitat Category / Type	Mitigation Acres Required	Mitigation Acres
3 / Coastal Dune Forest (CF)	10.0	10.0
3 / Unvegetated Sand (US)	3.5	1.6*
3 / Emergent Wetland (EMW) (NJD)	1.0	1.0**
3 / Open Water (WTR) (NJD)	0.8	0.8**
4 / Shrub (SH)	2.5	2.5
4 / Herbaceous Shrub (HS)	34.2	0.4
4 / Herbaceous (HE)	12.7	12.7
	Total:	29.0

* US, In-Kind:
1.9 acres of weedy herbaceous habitat at the Lagoon Site (Parcel W) will be converted to sand as in-kind mitigation in addition to 1.6 acres of existing sand to be used as in-kind mitigation at the Panhandle (3.5 acres total to be mitigated).

** 1.8 acres of wetlands that are non-jurisdictional (NJD) per Oregon DSL will be mitigated for in-kind with Category 2 wetlands at the Panhandle.

0 275 550 Feet

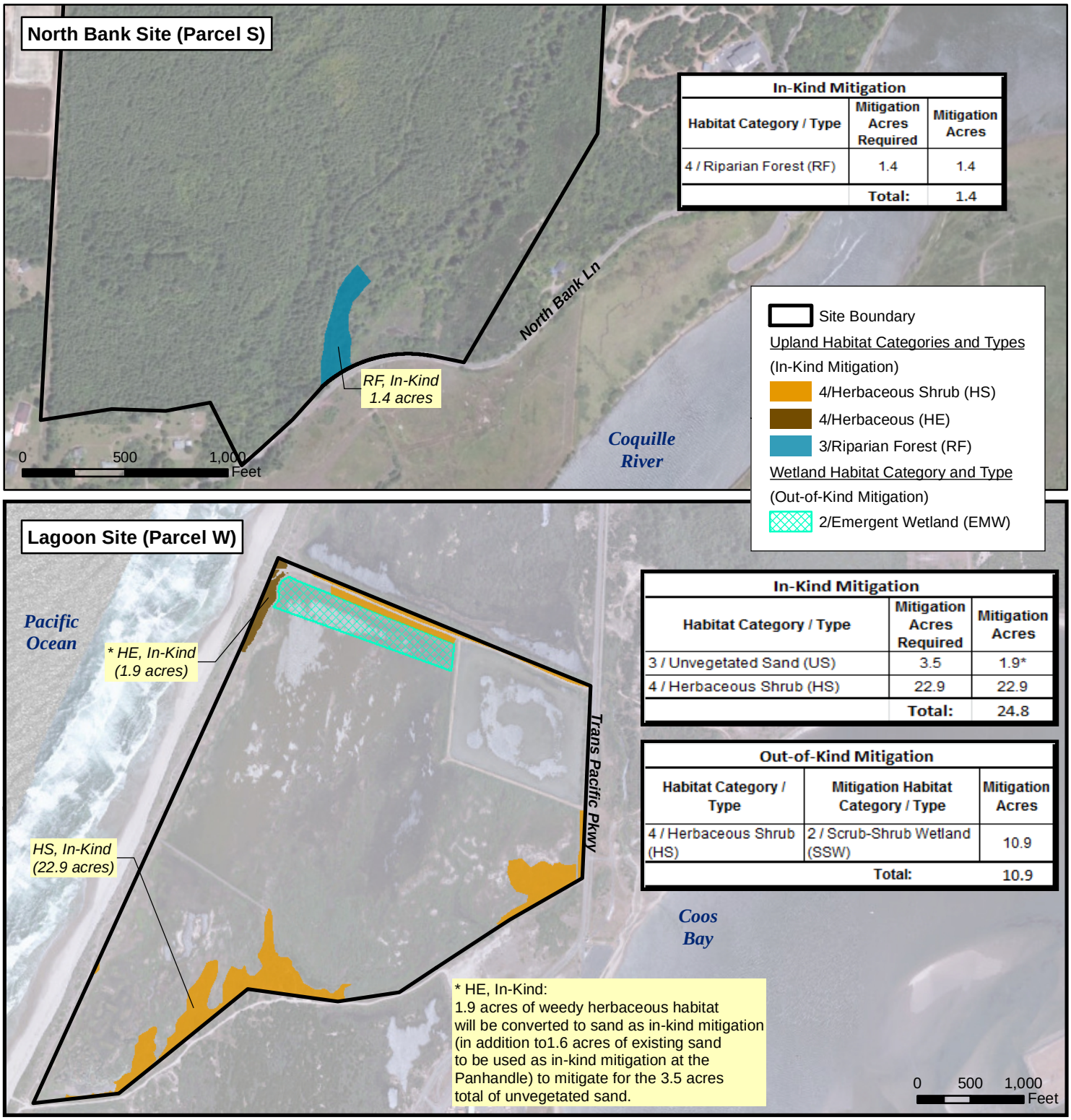
1 inch = 550 feet

South Dunes Power Plant Project

EFSC Application

EXHIBIT P
Figure P-7 (Sheet 1 of 2)
EFSC Wildlife Habitat Mitigation Acreage Provided at the Panhandle Mitigation Site

Date: 10/21/2014
Reviewed By PR
Designed By SAST



South Dunes Power Plant Project

EFSC Application

EXHIBIT P Figure P-7 (Sheet 2 of 2)
EFSC Wildlife Habitat Mitigation Acreage Provided at North Bank (Parcel S) and Lagoon (Parcel W) Mitigation Sites

Date: 10/22/2014
Reviewed By PR
Designed By SAST

APPENDIX P-7

ODFW Wildlife Division 2008 Sensitive Species List

OREGON DEPARTMENT OF FISH AND WILDLIFE
SENSITIVE SPECIES:
Frequently Asked Questions and Sensitive Species List

organized by category

It is Oregon's policy "to prevent the serious depletion of any indigenous species" (ORS 496.012). The Oregon administrative rules for threatened and endangered species (OAR 635-100-0100 to 0130) are intended to help implement this policy. In accordance with these rules, species can be classified as "threatened" (any native species likely to become endangered within the foreseeable future throughout any significant part of its range within the state) or "endangered" (any native species determined to be in danger of extinction). However, recovering species when their populations are severely depleted can be difficult and expensive. In addition, designation of such species can be socially and economically divisive.

To provide a positive, proactive approach to species conservation, a "sensitive" species classification was created under Oregon's Sensitive Species Rule (OAR 635-100-040). The Sensitive Species List focuses fish and wildlife management and research activities on species that need conservation attention. Although the intent of the Sensitive Species List is to prevent species from declining to the point of qualifying as threatened or endangered, this list is not used as a "candidate" list for species to be considered for listing under the Oregon Threatened and Endangered Species rules.

What is a Sensitive Species?
"Sensitive" refers to naturally-reproducing fish and wildlife species, subspecies, or populations which are facing one or more threats to their populations and/or habitats. Implementation of appropriate conservation measures to address the threats may prevent them from declining to the point of qualifying for threatened or endangered status.

What is the purpose of ODFW's Sensitive Species List?
The Sensitive Species List serves as an early warning system for biologists, land managers, policy makers, and the public. It helps ensure that conservation actions are prioritized, cost-efficient, and effective.

How is the Sensitive Species List used?
ODFW uses the sensitive species designations primarily to encourage voluntary actions that will improve species status. Once threats to species are identified, conservation opportunities and strategies can be developed. These actions may include:

- partnering with land management agencies to maintain, improve or restore habitat;
- providing technical expertise, incentives and recognition to landowners who wish to provide wildlife habitat;
- creating cooperative agreements with assurances for private landowners who provide habitat;
- cooperatively incorporating species' needs into activities that could negatively affect species;
- conducting further research to identify threats and methods to address the threats;
- bringing together land managers, researchers, and other people to share information;
- monitoring populations to detect either positive or negative changes in populations; and
- educating people about what these species need to persist and what actions people can take to assist in species' conservation.

Although the Sensitive Species List is primarily a non-regulatory tool, it is referenced in ODFW's Chemical Process Mining Consolidated Application and Permit Review Standards (OAR 635 Division 420) and In-Water Blasting Permits (OAR 635 Division 425).

How does the Sensitive Species List relate to the Oregon Conservation Strategy and other species priority lists?
The Oregon Conservation Strategy (http://www.dfw.state.or.us/conservationstrategy/) offers a blueprint for the long-term conservation of Oregon's native fish and wildlife and their habitats through a proactive, non-regulatory and statewide approach to conservation. The Conservation Strategy identifies priority issues, landscapes, habitats and species based on conservation needs and opportunities. The Sensitive Species List is, for the most part, an updated subset of species highlighted in the Conservation Strategy. The Sensitive Species List is focused on the species at greatest risk of further decline and/or becoming threatened or endangered if action is not taken. ODFW intends to merge the Sensitive Species List with the Conservation Strategy when the Conservation Strategy is updated.

Other agencies, the Oregon Natural Heritage Information Center and non-profit organizations also maintain priority species lists. Because each list has different goals and methods, the priorities can be different between lists. The Sensitive Species List reflects Oregon Department of Fish and Wildlife priorities for conserving the species most at-risk.

What factors are considered in designating a species as "Sensitive"?
The factors considered for designating a species sensitive include: imminent or active deterioration of primary habitat; limited population numbers or survival due to parasites, disease, predation, contaminants, disturbance, or other natural or human-caused factors; over-utilization; and inadequate existing state or federal programs for management or conservation of species and/or primary habitats. These factors may also include impacts from invasive non-native species that threaten native species through hybridization, disease introductions, predation, competition, or habitat alteration.

How do species get added or removed from the Sensitive Species List?
The Sensitive Species List is reviewed and updated every two years. Each taxonomic group of animals is reviewed by ODFW biologists and scientific experts from other agencies, universities and private organizations. The scientists are asked to consider new and historic information on species distribution, population trends, and biological needs; changes in threats; gaps in knowledge and data; recent conservation actions; and state and federal programs or regulations. The scientists may propose to remove, add, or re-classify species based on this information. The draft list is then peer-reviewed by state, federal, university, and consulting biologists. The Sensitive Species List is an administrative list and is not formally adopted through a rule-making process.

In addition, any person may request that a species be added to or removed from the Sensitive Species List through a written request that briefly outlines the status of the species and how its condition meets the criteria cited in OAR 635-100-0040(2).

What do the sub-categories "critical" and "vulnerable" mean?
Sensitive Species are assigned to two subcategories. **"Critical"** sensitive species are imperiled with extirpation from a specific geographic area of the state because of small population sizes, habitat loss or degradation, and/or immediate threats. Critical species may decline to point of qualifying for threatened or endangered status if conservation actions are not taken. **"Vulnerable"** sensitive species are facing one or more threats to their populations and/or habitats. Vulnerable species are not currently imperiled with extirpation from a specific geographic area or the state but could become so with continued or increased threats to populations and/or habitats.

Previous versions of the Sensitive Species List had two additional categories, "Unknown" and "Peripheral or Naturally Rare." These two categories were eliminated during the 2008 update to focus the Sensitive Species List on the species most at risk and to increase its utility as a conservation, monitoring and research tool.

What if there is not enough information to determine whether a species should be sensitive?

The status of some species cannot be determined because there isn't basic information on distribution, habitat associations and abundance. This basic information is needed before population status or threats can be evaluated. The Conservation Strategy notes such species ("data gaps") for fish and wildlife. In addition, the ODFW website provides a list of fish species with information needs.

What about species which just migrate through the state, barely reach Oregon, or are recent arrivals?
With the exception of species at risk throughout their range, only species that reproduce in Oregon are considered. Breeding populations of migratory birds are considered separately from migrant or wintering populations. As a result, only breeding populations are designated for some birds that also occur as common migrants or winter residents. The Sensitive Species List does not include bird species that only winter in Oregon or migrate through the state.

Peripheral species which barely reach the state are not considered for inclusion on the Sensitive Species List unless they are considered threatened, endangered, sensitive, or of special concern in an adjoining state(s). Similarly, species that are naturally rare are not included unless there are known threats to their populations and/or habitats.

Priority is given to species which were known to occur historically in Oregon. Some species are expanding their range into Oregon but do not have long-term historical status as breeding species. If they establish permanent breeding populations, they may be considered for inclusion in the future. Non-native species, those that were accidentally or intentionally released into the state, are not included.

What is the difference between "sensitive species" and "sensitive bird nesting, roosting and watering sites"?
"Sensitive species" is a designation applied to species which are declining in numbers and are facing one or more threats to their populations and/or habitats. "Sensitive bird nesting, roosting, and watering sites" is a designation applied to sites. It is used by the Oregon Department of Forestry, ODFW and local jurisdictions to protect key sites that are used by wildlife and are prone to disturbances from human activity and habitat alterations.

Why are subspecies and "Species Management Units" designated as "Sensitive Species?" Also, why are some species designated by geographic units like ecoregions or watersheds?
For the purpose of the Sensitive Species List, "species" means any group or population of wildlife that interbreeds and is substantially reproductively isolated. This interpretation of the term "species" may include subspecies. Because factors affecting species survival or reproduction may differ across Oregon, species' status may be designated statewide or by geographic area; i.e., fish by Species Management Unit and terrestrial wildlife species by ecoregion.

Species that are otherwise doing well within most parts of their range within the state are not considered for designation on a smaller geographic area basis unless (1) there is historical evidence that they were present in significant numbers in that geographic area and (2) they are or potentially could be at risk of extirpation from that geographic area. Although designating species within an ecoregion may be based on local surveys, the basis is often a qualitative evaluation of populations and threats based on local expertise.

Terrestrial wildlife (amphibians, birds, mammals and reptiles) are considered by ecoregion (Figure 1). Ecoregions are portions of the state with similar climate and vegetation. The Oregon Department of Fish and Wildlife uses the Environmental Protection Agency's Level III Ecoregion map (http://www.epa.gov/wed/pages/ecoregions/or_eco.htm), but combines the Snake River Plain with the Northern Basin and Range. This ecoregional map is used by several other state agencies, including the Oregon Natural Heritage Information Center. If an ecoregion is not included for a species, the species is considered sensitive throughout its range in Oregon.

Where possible, fish species were designated by Species Management Unit (SMU). Native fish in Oregon are managed by SMU as directed by the Native Fish Conservation Policy (OAR 635-007-0502 to OAR 635-007-

0509). Species Management Units represent a collection of populations from a common geographic region that share similar genetic and ecological characteristics. During the development of the 2005 Native Fish Status Report, SMUs were identified for many species. Hydrologic units were used to define general distribution for both SMUs and species (Figure 2).

Why are species that are "threatened" or "endangered" under the federal Endangered Species Act included on the Sensitive Species List?

The State of Oregon and the federal government maintain separate lists of Threatened and Endangered species under different laws. Some species are listed as threatened or endangered under federal law but not under state law and may be included as state "Sensitive Species."

What taxonomic standards are used to define species?

As scientists learn more about certain animals, they may change species classification and/or names. ODFW uses these widely-accepted taxonomic standards and also consulted the Integrated Taxonomic Information System (ITIS; http://www.itis.gov). Taxonomic information is current as of May 2008.

- *Fish, species*: Nelson, J. S., E. J. Crossman, H. Espinosa-Perez, L. T. Findley, C. R. Gilbert, R. N. Lea, and J. D. Williams. 2004. Common and scientific names of fishes from the United States, Canada, and Mexico. American Fisheries Society, Special Publication 29, Bethesda, Maryland.
- *Fish, subspecies:*
    - Behnke, Robert J. 2002. Trout and Salmon of North America. The Free Press. New York.
    - Integrated Taxonomic Information System. http://www.itis.gov. Updated 27 February 2008.
    - Moyle, P. B. 2002. Inland Fishes of California. Revised and expanded. University of California Press. Berkeley, California.
- *Amphibians and Reptiles*: Crother, B. I., editor. 2008. Scientific and standard English names of amphibians and reptiles of North America north of Mexico, with comments regarding confidence in our understanding. 6th Edition. Society for the Study of Amphibians and Reptiles, Herpetological Circular No. 37, 84 pages.
- *Birds:* Banks, R. C. et al. 2007. Forty-eighth supplement to the American Ornithologists' Union Checklist of North American Birds. The Auk 124(3):1109–1115.
- *Mammals:* Wilson, D. E., and D. M. Reeder, editors. 2005. Mammal Species of the World. A Taxonomic and Geographic Reference. 3rd Edition. Johns Hopkins University Press. 2,142 pages.

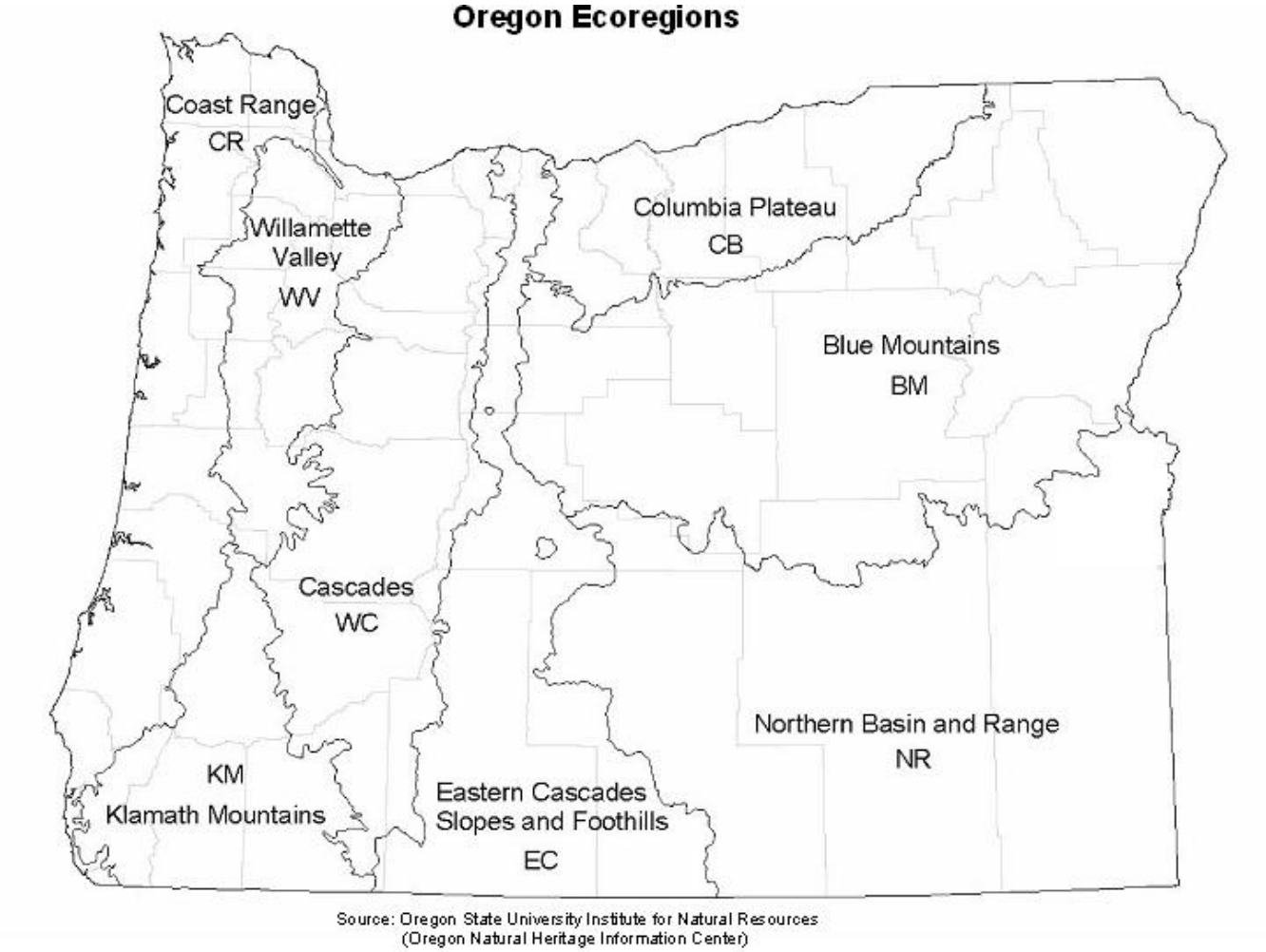


Figure 1. Ecoregions used for determining status of terrestrial wildlife (amphibians, reptiles, birds, and mammals).



Data Source: Oregon BLM and US Forest Service HUC4 boundary Layer (1:24,000).

Subbasin Number, Name

16040201, Upper Quinn
16040205, Thousand- Virgin
17050103, Middle Snake-Succor
17050105, South Fork Owyhee
17050106, East Little Owyhee
17050107, Middle Owyhee
17050108, Jordan
17050109, Crooked-Rattlesnake
17050110, Lower Owyhee
17050115, Middle Snake-Payette
17050116, Upper Malheur
17050117, Lower Malheur
17050118, Bully
17050119, Willow
17050201, Brownlee Reservoir
17050202, Burnt River
17050203, Powder River
17060101, Hells Canyon
17060102, Imnaha River
17060103, Lower Snake-Asotin
17060104, Upper Grande Ronde River
17060105, Wallowa River
17060106, Lower Grande Ronde
17070101, Middle Columbia-Lake Wallula
17070102, Walla Walla
17070103, Umatilla
17070104, Willow
17070105, Middle Columbia-Hood
17070201, Upper John Day
17070202, North Fork John Day
17070203, Middle Fork John Day
17070204, Lower John Day
17070301, Upper Deschutes
17070302, Little Deschutes
17070303, South Fork Crooked
17070304, Upper Crooked
17070305, Lower Crooked
17070306, Lower Deschutes
17070307, Trout
17080001, Lower Columbia-Sandy
17080003, Lower Columbia-Clatskanie
17080006, Lower Columbia
17090001, Middle Fork Willamette
17090002, Coast Fork Willamette
17090003, Upper Willamette
17090004, Mckenzie
17090005, North Santiam
17090006, South Santiam
17090007, Middle Willamette
17090008, Yamhill
17090009, Molalla-Pudding
17090010, Tualatin
17090011, Clackamas
17090012, Lower Willamette
17100201, Necanicum
17100202, Nehalem
17100203, Wilson-Trask-Nestucca
17100204, Siletz-Yaquina
17100205, Alsea
17100206, Siuslaw
17100207, Siltcoos
17100301, North Umpqua
17100302, South Umpqua
17100303, Umpqua
17100304, Coos
17100305, Coquille
17100306, Sixes
17100307, Upper Rogue
17100308, Middle Rogue
17100309, Applegate
17100310, Lower Rogue
17100311, Illinois
17100312, Chetco
17120001, Harney-Malheur Lakes
17120002, Silvies
17120003, Donner Und Blitzen
17120004, Silver
17120005, Summer Lake
17120006, Lake Abert
17120007, Warner Lakes
17120008, Guano
17120009, Alvord Lake
18010101, Smith River
18010201, Williamson
18010202, Sprague
18010203, Upper Klamath Lake
18010204, Lost River
18010205, Butte
18010206, Upper Klamath River
18010209, Lower Klamath River
18020001, Goose Lake

Figure 2: Oregon sub-basins based on 4th field hydrologic unit codes (HUC).

Oregon Department of Fish and Wildlife
SENSITIVE SPECIES LIST
Organized by Category

An asterisk (*) indicates that the species, Distinct Population Segment (DPS) or Evolutionarily Significant Unit (ESU) is federally listed as threatened or endangered by either NOAA's National Marine Fisheries Service or the U.S. Fish and Wildlife Service. Parenthetical scientific names are proposed taxonomic changes not yet adopted by the American Fisheries Society Committee on Names of Fishes.

Sensitive Species: Fish. USGS Hydrologic Unit (HU) distribution is based on current known distribution as described in the ODFW Native Fish Status Report, literature review, or expert information. A species or Species Management Unit (SMU) may be distributed in all or a portion of the HU where appropriate habitat exists. For anadromous species, the distribution does not include migration corridors. Figure 2 displays the location of the hydrologic units in Oregon.

SENSITIVE – CRITICAL

Common Name	Scientific Name	USGS HU distribution (current)
FISH		
Modoc Sucker*	*Catostomus microps*	Goose Lake (18020001)
Westslope Cutthroat Trout	*Oncorhynchus clarki lewisi* (Behnke 2002)	Upper John Day (17070201)
Chum Salmon (Columbia River ESU)*	*Oncorhynchus keta*	Lower Columbia (17080006), Lower Columbia-Clatskanie (17080003), Lower Willamette (17090012), Lower Columbia-Sandy (17080001)
Chum Salmon (Coastal Chum Salmon SMU/Pacific Coast ESU)	*Oncorhynchus keta*	Nehalem (17100202), Necanicum (17100201), Wilson-Trask-Nestucca (17100203), Yamhill (17090008), Siletz-Yaquina (17100204)
Steelhead (Klamath Mountains Province ESU, Klamath Summer Steelhead SMU)	*Oncorhynchus mykiss*	Upper Klamath River (18010206)
Steelhead (Lower Columbia River ESU/SMU, winter run)*	*Oncorhynchus mykiss*	Lower Columbia (17080006), Lower Columbia-Clatskanie (17080003), Lower Willamette (17090012), Lower Columbia-Sandy (17080001), Clackamas (17090011), Middle Columbia-Hood (17070105)
Steelhead (Lower Columbia River ESU/SMU, summer run)*	*Oncorhynchus mykiss*	Middle Columbia-Hood (17070105)
Steelhead (Middle Columbia River ESU, summer run)*	*Oncorhynchus mykiss*	Lower Deschutes (17070306), Trout (17070307), Upper Deschutes (17070301), Lower Crooked (17070305), Upper John Day (17070201), North Fork John Day (17070202), Middle Fork John Day (17070203), Lower John Day (17070204), Umatilla (17070103), Walla Walla (17070102)
Great Basin Redband Trout (Catlow Valley Redband Trout SMU)	*Oncorhynchus mykiss newberrii* (Behnke 2002)	Guano (17120008)
Great Basin Redband Trout (Goose Lake Redband Trout SMU)	*Oncorhynchus mykiss newberrii* (Behnke 2002)	Goose Lake (18020001)

Common Name	Scientific Name	USGS HU distribution (current)
Great Basin Redband Trout (Warner Lakes Redband Trout SMU)	*Oncorhynchus mykiss newberrii* (Behnke 2002)	Warner Lake (17120007)
Great Basin Redband Trout (Fort Rock Redband Trout SMU)	*Oncorhynchus mykiss newberrii* (Behnke 2002)	Summer Lake (17120005)
Chinook Salmon (Upper Willamette River ESU, spring run/Willamette Spring Chinook SMU)*	*Oncorhynchus tshawytscha*	Molalla-Pudding (17090009), North Santiam (17090005), South Santiam (17090006), Mckenzie (17090004), Middle Fork Willamette (17090001), Coast Fork Willamette (17090002), Upper Willamette (17090003)
Chinook Salmon (Coastal Spring Chinook SMU)	*Oncorhynchus tshawytscha*	Wilson-Trask-Nestucca (17100203), Siletz-Yaquina (17100204), Alsea (17100205), Coquille (17100305), North Umpqua (17100301), South Umpqua (17100302)
Chinook Salmon (Lower Columbia River Chinook ESU/SMU, fall run)*	*Oncorhynchus tshawytscha*	Lower Columbia (17080006), Lower Columbia-Clatskanie (17080003), Lower Columbia-Sandy (17080001), Clackamas (17090011), Middle Columbia-Hood (17070105), Lower Willamette (17090012)
Chinook Salmon (Lower Columbia River Chinook ESU/SMU, spring run)*	*Oncorhynchus tshawytscha*	Lower Columbia-Sandy (17080001), Clackamas (17090011)
Oregon Chub*	*Oregonichthys crameri*	North Santiam (17090005), Upper Willamette (17090003), South Santiam (17090006), Mckenzie (17090004), Middle Fork Willamette (17090001), Coast Fork Willamette (17090002)
Umpqua Chub	*Oregonichthys kalawatseti*	Umpqua (17100303), North Umpqua (17100301), South Umpqua (17100302)
Bull Trout (Willamette Bull Trout SMU)*	*Salvelinus confluentus*	Mckenzie (17090004), Middle Fork Willamette (17090001)
Bull Trout (John Day Bull Trout SMU)*	*Salvelinus confluentus*	North Fork John Day (17070202), Middle Fork John Day (17070203), Upper John Day (17070201)
Bull Trout (Umatilla Bull Trout SMU)*	*Salvelinus confluentus*	Umatilla (17070103)
Bull Trout (Grande Ronde Bull Trout SMU)*	*Salvelinus confluentus*	Upper Grande Ronde River (17060104), Wallowa River (17060105), Lower Grande Ronde (17060106)
Bull Trout (Imnaha Bull Trout SMU)*	*Salvelinus confluentus*	Imnaha River (17060102)
Bull Trout (Hells Canyon Bull Trout SMU)*	*Salvelinus confluentus*	Brownlee Reservoir (17050201), Powder River (17050203)
Bull Trout (Hood River Bull Trout SMU)*	*Salvelinus confluentus*	Middle Columbia-Hood (17070105)
Bull Trout (Malheur River Bull Trout SMU)*	*Salvelinus confluentus*	Upper Malheur (17050116)
Bull Trout (Odell Lake Bull Trout SMU)*	*Salvelinus confluentus*	Upper Deschutes (17070301)
Bull Trout (Klamath Lake Bull Trout SMU)*	*Salvelinus confluentus*	Upper Klamath Lake (18010203), Sprague (18010202)

SENSITIVE - CRITICAL

Common Name	Scientific Name	Ecoregion
AMPHIBIANS		
Columbia Spotted Frog	*Rana luteiventris*	Columbia Plateau, Northern Basin and Range
Oregon Spotted Frog	*Rana pretiosa*	
Foothill Yellow-legged Frog	*Rana boylii*	Willamette Valley
Northern Leopard Frog	*Lithobates pipiens*	
REPTILES		
Western Painted Turtle	*Chrysemys picta bellii*	
Western Pond Turtle	*Actinemys marmorata*	
Western Rattlesnake	*Crotalus oreganus*	Willamette Valley
BIRDS		
Columbian Sharp-tailed Grouse	*Tympanuchus phasianellus columbianus*	
Red-necked Grebe	*Podiceps grisegena*	Breeding Population
Ferruginous Hawk	*Buteo regalis*	Columbia Plateau
Yellow Rail	*Coturnicops noveboracensis*	
Upland Sandpiper	*Bartramia longicauda*	
Yellow-billed Cuckoo	*Coccyzus americanus*	
Burrowing Owl	*Athene cunicularia*	Blue Mountains, Columbia Plateau, Eastern Cascades Slopes and Foothills, Klamath Mountains, Willamette Valley
Common Nighthawk	*Chordeiles minor*	Willamette Valley
Lewis's Woodpecker	*Melanerpes lewis*	
White-headed Woodpecker	*Picoides albolarvatus*	
Streaked Horned Lark	*Eremophila alpestris strigata*	Coast Range, Klamath Mountains, Willamette Valley
Purple Martin	*Progne subis*	
Yellow-breasted Chat	*Icteria virens*	Willamette Valley
Oregon Vesper Sparrow	*Pooecetes gramineus affinis*	Klamath Mountains, Willamette Valley
Sage Sparrow	*Amphispiza belli*	Columbia Plateau
Western Meadowlark	*Sturnella neglecta*	Willamette Valley
MAMMALS		
Townsend's Big-eared Bat	*Corynorhinus townsendii*	
Fisher	*Martes pennanti*	

SENSITIVE – VULNERABLE

Common Name	Scientific Name	USGS HU distribution (current)
FISH		
Goose Lake Sucker	*Catostomus occidentalis lacusanserinus* (Moyle 2002)	Goose Lake (18020001)
Alvord Chub	*Gila alvordensis* (*Siphateles alvordensis*)	Alvord Lake (17120009)
Miller Lake Lamprey	*Lampetra minima* (*Entosphenus minimus*)	Williamson (18010201), Sprague (18010202)
Western Brook Lamprey	*Lampetra richardsoni*	Columbia River system and coastal streams including the Rogue
Pacific Lamprey	*Lampetra tridentate* (*Entosphenus tridentata*)	Columbia River system and coastal streams including the Rogue
Coastal Cutthroat Trout (Lower Columbia Coastal Cutthroat Trout SMU/ Southwestern Washington/Columbia River ESU)	*Oncorhynchus clarkii clarkii*	Lower Columbia-Clatskanie (17080003), Lower Columbia (17080006), Lower Willamette (17090012), Middle Columbia-Hood (17070105), Lower Columbia-Sandy (17080001), Clackamas (17090011)
Coho Salmon (Coastal Coho Salmon SMU/Oregon Coast ESU)*	*Oncorhynchus kisutch*	Nehalem (17100202), Necanicum (17100201), Wilson-Trask-Nestucca (17100203), Siletz-Yaquina (17100204), Alsea (17100205), Siuslaw (17100206), Siltcoos (17100207), Umpqua (17100303), Coos (17100304), South Umpqua (17100302), Coquille (17100305), Sixes (17100306), North Umpqua (17100301)
Coho Salmon (Southern Oregon/Northern California Coasts ESU/Rogue (and Klamath) Coho SMU)*	*Oncorhynchus kisutch*	Middle Rogue (17100308), Lower Rogue (17100310), Illinois (17100311), Upper Rogue (17100307), Applegate (17100309)
Inland Columbia Redband Trout	*Oncorhynchus mykiss gairdneri*	Lower Owyhee (17050110), Jordan (17050108), Middle Owyhee (17050107), South Fork Owyhee (17050105), East Little Owyhee (17050106), Lower Malheur (17050117), Upper Malheur (17050116), Bully (17050118), Willow (17050119), Burnt River (17050202), Lower Snake-Asotin (17060103), Walla Walla (17070102), , Lower Grande Ronde (17060106), Middle Fork John Day (17070203), Lower John Day (17070204), Brownlee Reservoir (17050201), Powder River (17050203), Imnaha River (17060102), North Fork John Day (17070202), Upper Grande Ronde River (17060104), Wallowa River (17060105), Willow (17070104), Umatilla (17070103), South Fork Crooked (17070303), Upper Crooked (17070304), Upper John Day (17070201), Little Deschutes (17070302), , Lower Crooked (17070305), Upper Deschutes (17070301), Trout (17070307), Middle Columbia-Hood (17070105), Lower Deschutes (17070306)
Great Basin Redband Trout (Malheur Lakes Redband SMU)	*Oncorhynchus mykiss newberrii* (Behnke 2002)	Silvies (17120002), Harney-Malheur Lakes (17120001), Silver (17120004), Donner Und Blitzen (17120003),
Great Basin Redband Trout (Chewaucan Redband Trout SMU)	*Oncorhynchus mykiss newberrii* (Behnke 2002)	Lake Abert (17120006)
Great Basin Redband Trout (Upper Klamath Basin Redband Trout SMU)	*Oncorhynchus mykiss newberrii* (Behnke 2002)	Sprague (18010202), Upper Klamath Lake (18010203), Williamson (18010201), Lost River (18010204), Upper Klamath River (18010206)

Common Name	Scientific Name	USGS HU distribution (current)
Steelhead (Upper Willamette River ESU, winter run/Willamette Winter Steelhead SMU)*	*Oncorhynchus mykiss*	Tualatin (17090010), Yamhill (17090008), Molalla-Pudding (17090009), North Santiam (17090005), South Santiam (17090006), Upper Willamette (17090003), Middle Willamette (17090007)
Steelhead (Oregon Coast ESU, summer run/Coastal Summer Steelhead SMU)	*Oncorhynchus mykiss*	Siletz-Yaquina (17100204), North Umpqua (17100301)
Steelhead (Oregon Coast ESU, winter run/Coastal Winter Steelhead SMU)	*Oncorhynchus mykiss*	Nehalem (17100202), Necanicum (17100201), Wilson-Trask-Nestucca (17100203), Siletz-Yaquina (17100204), Alsea (17100205), Siuslaw (17100206), Umpqua (17100303), Coos (17100304), North Umpqua (17100301), South Umpqua (17100302), Coquille (17100305), Sixes (17100306)
Steelhead (Klamath Mountains Province ESU, summer run/Rogue Summer Steelhead SMU)	*Oncorhynchus mykiss*	Upper Rogue (17100307), Middle Rogue (17100308), Applegate (17100309), Lower Rogue (17100310)
Steelhead (Snake River Basin ESU/Snake Summer Steelhead SMU)*	*Oncorhynchus mykiss*	Imnaha River (17060102), Upper Grande Ronde River (17060104), Wallowa River (17060105), Lower Grande Ronde River (17060106)
Chinook Salmon (Mid-Columbia River ESU/SMU, fall run)	*Oncorhynchus tshawytscha*	Lower Deschutes (17070306)
Chinook Salmon (Rogue Spring Chinook SMU)	*Oncorhynchus tshawytscha*	Upper Rogue (17100307), Middle Rogue (17100308)
Chinook Salmon (Middle Columbia Spring Chinook SMU	*Oncorhynchus tshawytscha*	Lower Deschutes (17070306), Upper Deschutes (17070301), Lower Crooked (17070305), Upper John Day (17070201), North Fork John Day (17070202), Middle Fork John Day (17070203)
Chinook Salmon (Southern Oregon/Northern California Coast ESU, fall run/Rogue Fall Chinook SMU)	*Oncorhynchus tshawytscha*	Lower Rogue (17100310), Illinois (17100311), Chetco (17100312), Upper Rogue (17100307), Middle Rogue (17100308), Applegate (17100309), Sixes (17100306)
Millicoma Dace	*Rhinichthys cataractae* ssp.	Coos (17100304)
Bull Trout (Deschutes Bull Trout SMU)*	*Salvelinus confluentus*	Lower Deschutes (17070306), Upper Deschutes (17070301)

SENSITIVE - VULNERABLE

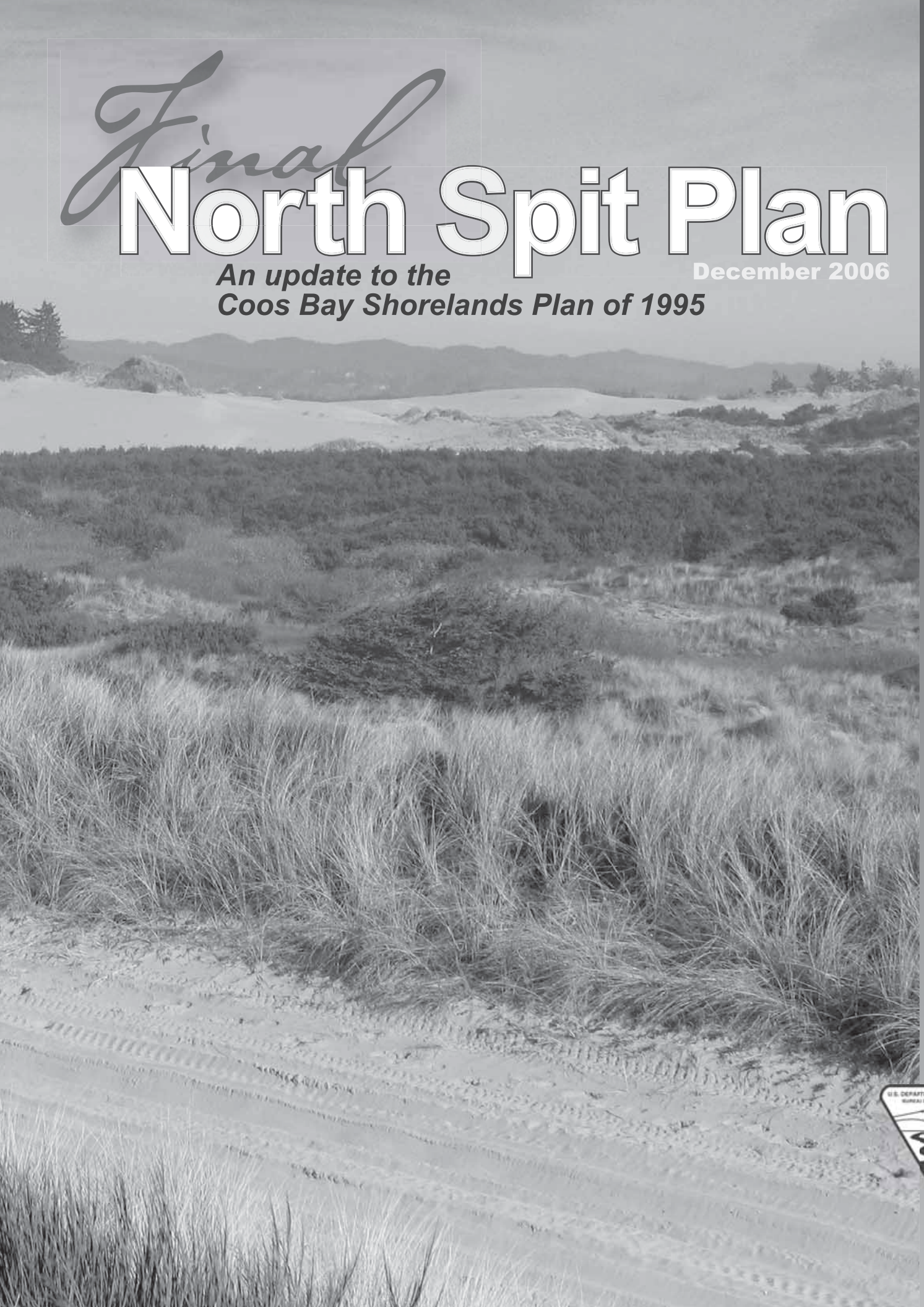
Common Name	Scientific Name	Ecoregion
AMPHIBIANS		
Cope's Giant Salamander	*Dicamptodon copei*	
Columbia Torrent Salamander	*Rhyacotriton kezeri*	
Southern Torrent Salamander	*Rhyacotriton variegatus*	
Cascade Torrent Salamander	*Rhyacotriton cascadae*	
Larch Mountain Salamander	*Plethodon larselli*	
Del Norte Salamander	*Plethodon elongatus*	
Siskiyou Mountains Salamander	*Plethodon stormi*	
Clouded Salamander	*Aneides ferreus*	
Black Salamander	*Aneides flavipunctatus*	
Oregon Slender Salamander	*Batrachoseps wrightorum*	
Rocky Mountain Tailed Frog	*Ascaphus montanus*	
Coastal Tailed Frog	*Ascaphus truei*	
Western Toad	*Anaxyrus boreas*	
Northern Red-legged Frog	*Rana aurora*	Klamath Mountains, Willamette Valley
Cascades Frog	*Rana cascadae*	
Columbia Spotted Frog	*Rana luteiventris*	Blue Mountains, Eastern Cascades Slopes and Foothills
Foothill Yellow-legged Frog	*Rana boylii*	Coast Range, Klamath Mountains, West Cascades
REPTILES		
Northern Sagebrush Lizard	*Sceloporus graciosus graciosus*	Columbia Plateau
Common Kingsnake	*Lampropeltis getula*	
California Mountain Kingsnake	*Lampropeltis zonata*	
BIRDS		
Greater Sage-Grouse	*Centrocercus urophasianus*	Blue Mountains, Columbia Plateau, Eastern Cascades Slopes and Foothills
Spruce Grouse	*Falcipennis canadensis*	
Mountain Quail	*Oreortyx pictus*	Northern Basin and Range
American White Pelican	*Pelecanus erythrorhynchos*	Breeding Population
Snowy Egret	*Egretta thula*	Breeding Population
Northern Goshawk	*Accipiter gentilis*	
Swainson's Hawk	*Buteo swainsoni*	
Ferruginous Hawk	*Buteo regalis*	Blue Mountains, Eastern Cascades Slopes and Foothills
American Peregrine Falcon	*Falco peregrinus anatum*	
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	
Greater Sandhill Crane	*Grus canadensis tabida*	Central Valley Population (Oregon Breeding Population)
Black Oystercatcher	*Haematopus bachmani*	
Long-billed Curlew	*Numenius americanus*	Blue Mountains, Columbia Plateau, Eastern Cascades Slopes and Foothills

SENSITIVE - VULNERABLE

Common Name	Scientific Name	Ecoregion
BIRDS continued		
Franklin's Gull	*Larus pipixcan*	
Cassin's Auklet	*Ptychoramphus aleuticus*	
Rhinocerous Auklet	*Cerorhinca monocerata*	
Tufted Puffin	*Fratercula cirrhata*	
Flammulated Owl	*Otus flammeolus*	
Burrowing Owl	*Athene cunicularia*	Northern Basin and Range
Great Gray Owl	*Strix nebulosa*	
Acorn Woodpecker	*Melanerpes formicivorus*	Willamette Valley
American Three-toed Woodpecker	*Picoides dorsalis*	
Black-backed Woodpecker	*Picoides arcticus*	
Pileated Woodpecker	*Dryocopus pileatus*	Blue Mountains, Eastern Cascades Slopes and Foothills, Klamath Mountains
Olive-sided Flycatcher	*Contopus cooperi*	
Willow Flycatcher	*Empidonax traillii adastus*	Blue Mountains, Columbia Plateau, Eastern Cascades Slopes and Foothills, Northern Basin and Range
Little Willow Flycatcher	*Empidonax traillii brewsteri*	Coast Range, Klamath Mountains, West Cascades, Willamette Valley
Loggerhead Shrike	*Lanius ludovicianus*	Blue Mountains, Columbia Plateau, Eastern Cascades Slopes and Foothills
White-breasted Nuthatch (=Slender-billed Nuthatch)	*Sitta carolinensis aculeata*	Coast Range, Klamath Mountains, West Cascades, Willamette Valley
Western Bluebird	*Sialia mexicana*	Coast Range, Klamath Mountains, West Cascades, Willamette Valley
Grasshopper Sparrow	*Ammodramus savannarum*	
Bobolink	*Dolichonyx oryzivorus*	
MAMMALS		
California Myotis	*Myotis californicus*	
Fringed Myotis	*Myotis thysanodes*	
Long-legged Myotis	*Myotis volans*	
Hoary Bat	*Lasiurus cinereus*	
Silver-haired Bat	*Lasionycteris noctivagans*	
Spotted Bat	*Euderma maculatum*	
Pallid Bat	*Antrozous pallidus*	
Pygmy Rabbit	*Brachylagus idahoensis*	
Black-tailed Jackrabbit	*Lepus californicus*	Willamette Valley
White-tailed Jackrabbit	*Lepus townsendii*	
Western Gray Squirrel	*Sciurus griseus*	Willamette Valley
Red Tree Vole	*Arborimus longicaudus*	Coast Range
Ringtail	*Bassariscus astutus*	
American Marten	*Martes americana*	Blue Mountains, Coast Range
Columbian White-tailed Deer*	*Odocoileus virginianus leucurus*	Coast Range (Columbia River Population)

APPENDIX P-8

BLM Coos Bay District Final North Spit Plan



Final North Spit Plan

An update to the Coos Bay Shorelands Plan of 1995

December 2006

BLM

Coos Bay District

Umpqua Field Office

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FINAL NORTH SPIT PLAN

December 2005

An update to the Coos Bay Shorelands Plan of 1995

Umpqua Field Office
Coos Bay District
Bureau of Land Management
US Department of the Interior

Approved by:

M. Elaine Raper
Umpqua Field Manager

December 8, 2005
Date

Table of Contents

Executive Summary . . . 3
Table S-1 Summary of Management Objectives and Actions . . . 6
Acronyms and Abbreviations . . . 11

Introduction . . . 13
Purpose and Scope . . . 13
Vision and Goals . . . 14
Plan Development and Public Scoping . . . 14

Part 1 – Planning Framework . . . 21
National and State Level . . . 21
District Level . . . 22
The North Spit Area of Critical Environmental Concern . . . 22
Special Recreation Management Area . . . 22
Motorized Access – Limited to Designated Roads and Trails . . . 24
Field Office Level . . . 24

Part 2 – The Coos Bay Shorelands Final Management Plan, 1995 . . . 27
Text Changes . . . 27
Management Actions . . . 29

Part 3 – North Spit Resources . . . 33
Introduction . . . 33
Physical: Water Resources . . . 33
Physical: Geology and Soils . . . 36
Physical: Minerals . . . 38
Physical: Coal Bed Methane, Oil and Gas . . . 38
Biological: Vegetation . . . 39
Biological: Wildlife . . . 43
Biological: Fisheries . . . 50
Cultural and Historical Resources . . . 50
Recreational Resources . . . 52
Visual Resources . . . 59

Part 4 - North Spit Management, 2005 . . . 61
Introduction . . . 61
Management Objectives . . . 61
Management Objective 1 – Cultural Resources . . . 61
Management Objective 2 – Environmental Education . . . 62
Management Objective 3 – Land Tenure . . . 64
Management Objective 4 – Recreational Resources . . . 64
Management Objective 5 – Site Protection and Administration . . . 66
Management Objective 6 – Vegetation and Wildlife Resources . . . 67
Management Objective 7 – Water Resources . . . 70
Management Objective 8 – Monitoring and Research . . . 71

Appendices

Appendix 1. North Spit Plant Species List 79
Appendix 2. North Spit Wildlife Species List 87
Appendix 3. Plan Conformance / NEPA Compliance Record 99
Appendix 4. History of Land Tenure on the North Spit 101
Appendix 5. Glossary 103

Bibliography

. 73

List of Maps

Map 1. Regional. 12
Map 2. Area of Critical Environmental Concern. 23
Map 3. Land Ownership and Landmarks. 25
Map 4. Visual Resource Management 60

List of Tables

Table 1. Summary of public comments received during 2003 Scoping for the North Spit Plan and BLM response 15
Table 2. Additional Public Input 16
Table 3. Management actions as described in the Coos Bay Shorelands Final Management Plan (USDI 1995) and their current status 29
Table 4. Bureau sensitive and assessment plant species documented and suspected on the North Spit by scientific name, common name or group, presence, status, and habitat. 41
Table 5. Special status wildlife species documented, suspected, and potentially on the North Spit by name, presence, status, and habitat 45

Executive Summary

Introduction

In 1995, the Bureau of Land Management completed the Coos Bay Shorelands Final Management Plan to guide the use of BLM lands on the North Spit of Coos Bay. Under that plan and its associated Environmental Assessment (EA), the BLM established specific management objectives to provide for public use and natural resource conservation. Since then, changes in land ownership, environmental conditions and the passage of time necessitated a plan update. The North Spit Plan (the Plan) was prepared to reflect the current situation. Any proposed actions outside the scope of the previous Environmental Assessment will require a new EA. This summary provides a brief outline of the Plan and describes management objectives and actions. The Plan focuses exclusively on comprehensive management of the 1,864 acres of BLM land on the North Spit (the Spit). The remainder of the Spit is managed by other federal agencies, state agencies, and private interests.

Prepared by an interdisciplinary team of specialists, the North Spit Plan:

- describes the resources on the North Spit;
- addresses changes that have occurred since the 1995 Shorelands Plan was completed;
- clarifies management direction for BLM lands on the Spit;
- reports accomplishments; and
- describes ongoing management actions.

Overarching goals are to:

- provide a broad range of recreational opportunities on the Spit while managing for the protection, maintenance, and rehabilitation of the area's natural systems;
- protect and interpret the Spit's biological, cultural and natural resources; and to
- involve and foster open communication among all interested parties during the development and implementation of the North Spit Plan.

Background

The North Spit of Coos Bay is a large, isolated peninsula northwest of the communities of Coos Bay, North Bend, and Charleston in Coos County, Oregon. The Spit supports a unique assemblage of habitats in a relatively confined area including estuarine, fresh water wetlands, mudflats, and forested uplands. The importance of this natural area is amplified by its proximity to one of the largest urban areas on the Coast. Consequently, the Spit experiences considerably high recreational use and pressure for industrial development.

In 1995, in recognition of the Spit's high ecological and recreational values, portions of it were given special designations by BLM to guide management and use. Approximately 725 acres of the Spit are classified as an Area of Critical Environmental Concern (ACEC). Areas of Critical Environmental Concern are public lands where special management attention is required to protect important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes. The Spit is also a BLM Special Recreation Management Area (SRMA). SRMAs are defined as areas where specific recreational activities and experience opportunities will be provided on a sustained yield basis. The North Spit Plan provides for the preservation of ACEC and SRMA values through specific and compatible management actions related to recreational access, cultural and historic preservation, wildlife and plant conservation and management, and educational and interpretive opportunities.

Public Scoping

Prior to drafting the North Spit Plan, public comments on North Spit management were solicited via letters, presentations, public service announcements, and newspaper notices. Thirty-six people responded and provided 56 specific comments. BLM determined from the comments the following general areas of concern:

Public access to the jetty and beaches
Western snowy plover management
Development of lands
All-terrain vehicle use
User fees
Protection of resources
Land exchanges
Flexibility of management
Boat dock use
Firearm use

Responses to these concerns are presented in the Plan's introduction and relevant issues are further discussed elsewhere in the document.

Plan Format

Part One describes BLM's planning framework. In the BLM planning system there are three levels or tiers:

1. National and State Level: Laws, regulations, directives, and policies
2. District Level: Coos Bay District Resource Management Plan (May 1995)
3. Field Office Level: Activity Plans (site-specific plans such as the North Spit Plan)

Each of these levels is discussed in terms of its relevancy to the North Spit Plan.

Part Two reviews the original 1995 Shorelands Plan and outlines the status of its management actions. The 1995 Coos Bay Shorelands Plan identified issues, concerns, and opportunities on the Spit, and included specific management actions pertaining to each of the following subjects:

- Education and Interpretation
- Land Tenure and Cooperative Agreements
- Law Enforcement
- Recreation
- Vegetation
- Wildlife Habitat

Management actions listed in the 1995 Shorelands Plan were reviewed and updated (Table 2 of the Plan). The actions fall into four categories: accomplished, accomplished in part, not accomplished, and ongoing. Actions in the the Shorelands Plan that were not accomplished include those where land exchanges have removed or precluded lands from BLM jurisdiction and therefore are no longer applicable to BLM management of the Spit.

Other changes to note include those pertaining to the threatened Western snowy plover. The 1995 Shorelands Plan proposed several actions pertaining to snowy plovers and ocean beach access that were never implemented (Table 2, Management Action 5). Changes to management actions are a result of a revised public access strategy implemented subsequent to the grounding of the New Carissa in 1999. The strategy pertains to the management of public lands on the Spit and allows for public use while protecting plovers and promoting their recovery (USDI FWS 2000).

Strategy details are described in Part Three under Species of Special Management Concern and are summarized in Table S-1.

The Shorelands Plan made some recommendations that were not listed as actions. Errors are noted and additions or changes to these recommendations are listed and explained.

Part Three describes the cultural, natural, and recreational resources on the Spit. Resources are grouped into five categories:

- Physical, including Water, Geology, Soils, Minerals, Coal Bed Methane, Oil and Gas
- Biological, including Vegetation, Wildlife, and Fisheries
- Cultural and Historical
- Recreational
- Visual

Part Four presents management actions on BLM-administered lands for the next ten years. The remainder of this summary focuses on Part Four as it brings the reader up to date on management objectives, accomplishments, and ongoing and proposed activities.

North Spit Management, 2005

Table S-1 summarizes management objectives and actions for BLM lands on the North Spit. The objectives and actions reflect the goal of the North Spit Plan to conserve the natural, cultural, and recreational values of the Spit. Due to the interrelationship of the various resources at the Spit, many actions apply to more than one objective. Objectives and actions in the North Spit Plan are consistent with BLM policies, state and federal regulations, ACEC planning documents, and the 1995 Shorelands Plan. For the North Spit Plan, objectives and proposed actions were reviewed and revised based on current conditions and needs, and will be implemented as funding allows. Objectives correspond to the resources described in Part 3 as well as to other BLM programs such as land tenure, environmental education and interpretation, site protection and administration, and monitoring and research. With the exception of the latter, the objective and actions for each resource or program are presented in alphabetical order, starting with Cultural Resources. The objective for Monitoring and Research is placed at the end because several of the resources and programs have actions under this heading.

Monitoring is used to: 1) ensure that the management goals, objectives, and actions are being followed (implementation monitoring); 2) verify if the actions are achieving the desired results (effectiveness monitoring); and 3) determine if the underlying assumptions of the Plan's goals and objectives are sound (validation monitoring). Ongoing or proposed monitoring actions are included for Cultural Resources, Environmental Education and Interpretation, Geology, Recreation, and Vegetation and Wildlife Resources.

Updated maps, tables, and appendices are presented to clarify information presented in the Plan. They include detailed descriptions, lists, and chronologies of key interest including site names, ownership boundaries, an update of 1995 management actions, wildlife and plant lists, and land tenure history. A glossary and a list of acronyms are presented to assist the reader with unfamiliar terms.

Table S-1. Summary of Management Objectives and Actions Accomplished, Ongoing, and Proposed for the North Spit. The North Spit Plan provides more detailed explanations and supporting references. See Part 4 for a complete description of the actions.

Management Objectives	Actions Accomplished	Actions Ongoing	Actions Proposed
CULTURAL RESOURCES **1:** Preserve important cultural resources on the Spit.	• A report was completed by noted historian Stephen Dow Beckham detailing the history of federal activities on the North Spit.	• Continue to preserve remaining historic cultural resources.	• Work with the Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians and the Coquille Indian Tribe to assure continued protection and preservation of prehistoric resources. • Remove damaged chain link fence from the perimeter of the World War II Quonset huts.
ENVIRONMENTAL EDUCATION and INTERPRETATION **2:** Promote awareness and appreciation for the Spit's many resource values and recreational opportunities, and support a minimum impact land use ethic through educational programs such as *Leave No Trace* and *Tread Lightly*.	• A brochure was developed to provide visitors with a map of the Spit and inform them of regulations and opportunities. • Interpretive signs and a kiosk were developed and installed. Seasonal interpreters were hired to educate the public about seasonal closures and recreational opportunities.	• Continue to host field trips for schools at the Spit for students to learn about the area. • Continue to work cooperatively with the interagency snowy plover working team on issues pertaining to public education and outreach.	• Develop an environmental education prospectus for the District and implement its recommendations on the North Spit. • Utilize seasonal or volunteers to contact visitors and disseminate information. • Conduct special educational opportunities and events that involve the public. • Interpret cultural or paleo-environmental history of the Spit in coordination with interested Indian tribes and the Coos Bay District Archaeologist. • Rotate or replace interpretive displays as needed. • Use the draft Western Snowy Plover Outreach Plan when planning plover outreach on the Spit. • Raise public awareness about the environmental and recreational values of riparian and wetland areas on the Spit.
LAND TENURE ADJUSTMENTS **3:** Prioritize land tenure adjustments based on natural resource values and recreational opportunities on non-BLM parcels, consolidate BLM properties, and safeguard public investments.	• The 1995 Shorelands Plan identified four potential land acquisitions and one disposal. Three acquisitions were accomplished.	• In accordance with the RMP, some BLM lands on the Spit within zoning districts 3-EWD, 4CS, and 6WD as delineated by the Coos County Comprehensive Plan could be offered for exchange, sale, or lease. A land disposal is currently in progress for an 80 acre BLM parcel north of the Roseburg Chip Facility along the Trans Pacific Lane. • Several utility and access rights-of-way were issued and are currently in use. Future applications for leases, permits, and right-of-ways will be reviewed and authorizations issued on a case-by-case basis.	• Consider land tenure adjustments to ensure access to public lands as appropriate to meet objectives. Appendix 3 contains a chronological history of the land tenure adjustments affecting public lands on the Spit.

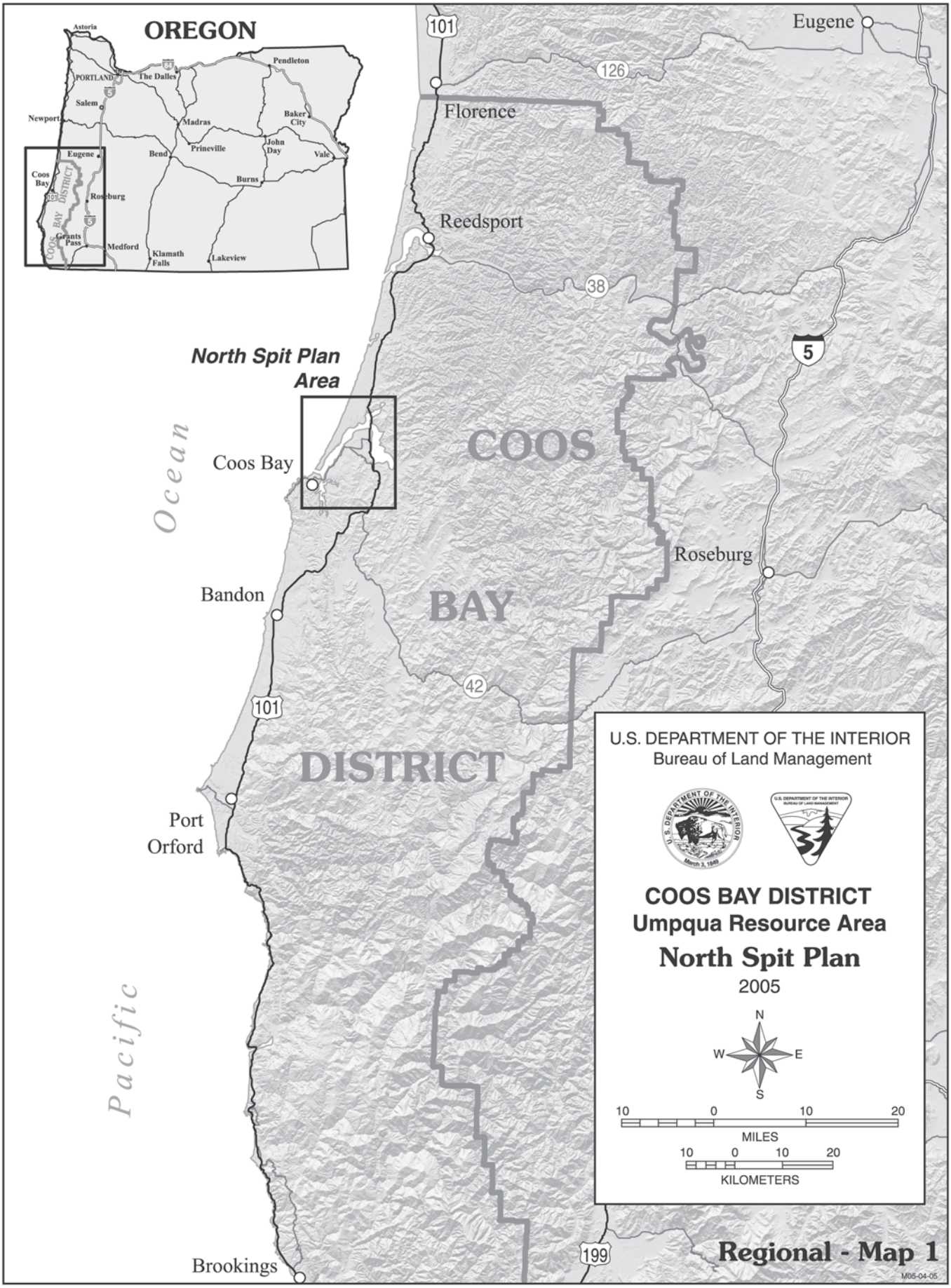
Management Objectives	Actions Accomplished	Actions Ongoing	Actions Proposed
RECREATION **4:** Manage the North Spit SRMA to provide for a range of recreation opportunities that contribute to meeting traditional as well as projected recreation demand within the region while protecting the area's natural, cultural, and scenic resources.	• Signs were placed at the ocean beach access points along the Foredune Road; other signs and maps were placed at various locations to inform visitors of regulations and recreational opportunities. • Roads and trails that were not designated as open were closed using logs, root wads, and signs. Many of these closed routes are disappearing through natural revegetation. • A sign strategy was developed to assist BLM in providing information to the public on regulations, recreational opportunities, and natural resources on the Spit.	• Continue to provide motorized access on the Spit to support the area's long-standing traditional recreation uses while protecting natural, cultural and scenic resources. • Retain a recreation setting compatible with the area's Rural and Semi-Primitive Motorized ROS classification. • Provide press releases related to seasonal access restrictions. • Clear sand and debris from the boat ramp each spring prior to reinstalling the docks for the summer season. • Continue to maintain the docks. • Continue to allow primitive camping on BLM lands on the Spit except where signed to protect sensitive plants and wildlife. • Continue to permit hunting and shooting on BLM lands on the Spit in conformance with applicable state and federal laws and regulations. These regulations prohibit shooting adjacent to and across public roadways and within developed recreation sites.	• Place improved signs along the sand roads and at ocean beach access points. Advise visitors the beach access points may be blocked and to look before driving over the foredune. • Remove dilapidated fences and fence posts from the intersection of the Foredune Road and Trans Pacific Lane, the WWII bunker fence, and from the southern interior. • Establish trails for pedestrian and equestrian use within the North Spit interior. Develop and support local partnerships to assist in maintaining and managing this trail system. • Create and maintain connections between trails on BLM, the Forest Service, OPRD and Weyerhaeuser lands. • Construct a small equestrian and hiking staging area to provide parking and visitor information at the portal to the trail system. • Implement completed sign strategy developed to improve communication with Spit visitors. Include information about wildlife viewing opportunities at the kiosk proposed for the boat ramp.
SITE PROTECTION and ADMINISTRATION **5:** Provide and maintain adequate visitor facilities, services, signing, and programs that are appropriate for the area's recreation opportunity setting and that serve to protect the Spit's sensitive resources.	**Fire Management** See Actions Ongoing. **Hazardous Materials Management** See Actions Proposed. **Law Enforcement** See Actions Ongoing. **Facility Management** See Actions Ongoing. **Road Maintenance and Improvement** None at this time.	**Fire Management** • BLM contracts with the Coos Forest Protection Association for fire response, including the lands on the Spit. **Hazardous Materials Management** See Actions Proposed. **Law Enforcement** • BLM Law Enforcement Officers enforce federal regulations on BLM lands. BLM may continue to contract with the Coos County Sheriff's Department and contribute funds to OPRD for seasonal assistance with beach patrol. • BLM Law Enforcement Officers enforce Federal and State firearm regulations and encourage shooter safety on the Spit. **Facility Management** • Maintain existing facilities at the boat launch recreation area. **Road Maintenance and Improvement** None at this time.	**Fire Management** None at this time. **Hazardous Materials Management** • Finish the Spit Life Guard Station Environmental Site Characterization. **Law Enforcement** None at this time. **Facility Management** • Consider placing alternative toilet facilities at high use areas. **Road Maintenance and Improvement** • Consider raising and widening the Re-route Road to minimize the risk of vehicular collisions.

Management Objectives	Actions Accomplished	Actions Ongoing	Actions Proposed
VEGETATION and WILDLIFE RESOURCES **6:** Conserve, enhance, or restore natural habitats, with an emphasis on habitats that support special status plant and wildlife species.	**Vegetation** • Plant communities were mapped and digitized. **Special Status Plant Species and Communities** • Pink sandverbena was reintroduced. • A permanent vehicle re-route was constructed to protect the Point Reyes bird's-beak population on the bay side. **Exotic Plants and Noxious Weeds** • Gorse was removed from the Coast Guard Lifesaving station. • Scotch broom was cleared from HRAs. **Wildlife** None at this time. **Special Status Wildlife Species** Nest boxes were installed for purple martins.	**Vegetation** • Coordinate with other agencies and institutions to restore degraded and disturbed plant communities. **Special Status Plant Species and Communities** • Facilitate the recovery of the pink sandverbena by collecting seeds for dispersal to other sites along the coast. • In cooperation with the Port and the DSL maintain protective barriers around the Point Reyes bird's-beak population. • Continue inventory and management for SSS. **Exotic Plants and Noxious Weeds** • European beach grass is removed annually from plover areas. **Wildlife** None at this time. **Special Status Wildlife Species** • Continue to implement snowy plover conservation actions: 1. Closing the upper, dry sand portion of the ocean beach to all public access from the FAA Tower south to the BLM boundary during the Western snowy plover nesting season (March 15- September 15 annually). The lower, wet sand beach is restricted to motorized use as authorized by OPRD. Inland snowy plover nesting areas on BLM land are also signed closed to all use during the nesting season, and are open to nonmotorized use the remainder of the year. 2. Removing beachgrass from the inland snowy plover areas to maintain open, sandy habitat suitable for nesting plovers. 3. Implement predator control to protect the plover population from further declines caused by predation. 4. Monitor plover nesting to gauge the success of management actions and progress toward plover recovery. • Continue to implement recovery plans for other species as necessary.	**Vegetation** • Refine the classification of plant associations on the Spit. • Conduct a complete inventory of all plant species. **Special Status Plant Species and Communities** On the North Spit Area of Critical Environmental Concern: • Implement beach and dune ecosystem restoration. • Establish additional special status plant populations. • Develop opportunities to increase the amount of habitat suitable for rare species and to link isolated populations. • Collect special status plant seeds for future use. • Identify opportunities to restore rare plant communities. **Exotic Plants and Noxious Weeds** • Continue treatments to remove noxious and exotic species. Restore treated areas with native seeds and plants. • Use best management practices to prevent the further spread of exotic plants and noxious weeds. **Wildlife** • Survey for great blue herons and great egret rookeries. • Conduct wildlife inventories at selected wetlands. • Survey for nesting raptor species. **Special Status Wildlife Species** • Develop and implement survey protocols to locate special status species. • Actively manage habitats to promote the conservation of special status species and raptors.
WATER RESOURCES **7:** Maintain wetland areas in a condition supportive of a healthy aquatic ecosystem.	• BLM participated in the creation of wetlands on BLM adjacent to Weyerhaeuser's Overlook wetlands site.	None at this time.	• Support wetland mitigation projects consistent with the Henderson Marsh Mitigation Plan.

Management Objectives	Actions Accomplished	Actions Ongoing	Actions Proposed
MONITORING and RESEARCH **8:** Facilitate improved management of the Spit through monitoring to learn more about the natural and cultural resources of the area and to assess the effects of management actions.	**Cultural Resources** None at this time. **Environmental Education and Interpretation** See Actions Ongoing. **Geology** None at this time. **Recreation** See Actions Ongoing. **Vegetation and Wildlife Resources** See Actions Ongoing.	**Cultural Resources** None at this time. **Environmental Education and Interpretation** • Evaluate the effectiveness of educational brochures and signs. **Geology** None at this time. **Recreation** • Continue to use traffic and trail counters and field staff observations to monitor visitor use and to report findings in the Recreation Management Information System. • Continue to monitor camping on BLM lands on the Spit. **Vegetation and Wildlife Resources** • Monitor noxious weed species to document existing population areas, effectiveness of management actions for removal, and the spread of these species to new sites. • Evaluate and explore effective management strategies to meet recovery goals for the Western snowy plover. Monitor human and natural disturbance effects on breeding plovers. • Continue to support the Oregon Natural Heritage Information Center in its efforts to monitor Western snowy plover reproductive success. • Continue to monitor great blue heron and great egret rookeries. • Continue to monitor selected special status species on the Spit. • Continue to monitor the condition of riparian-wetland vegetation. If signs of excessive disturbance caused by unauthorized motorized recreation become evident, adjust patrols, signing and barriers to reduce or prevent impacts	**Cultural Resources** • Monitor stability of important cultural resources and propose actions to continue their preservation. **Environmental Education and Interpretation** • Evaluate the effectiveness of environmental education programs and interpretive materials on a regular basis, and make modifications as necessary. **Geology** • Track elevation changes on the ocean foredune and monitor the effects of weather and beach grass removal on foredune erosion. **Recreation** • Monitor the condition of beach access routes. **Vegetation and Wildlife Resources** • Monitor special status species' population status and trends. Pursue collaborative efforts to study SSS reproductive ecology, threats, habitats, and effects of management treatments and practices. • Monitor the status and trends of globally ranked plant communities within the North Spit ACEC. • Seek collaborative opportunities to survey migratory shorebirds and waterfowl to establish population status and trends.

Acronyms and Abbreviations

ACEC	Area of Critical Environmental Concern
APHIS	Animal and Plant Health Inspection Service
ATV	All Terrain Vehicle
BA	Bureau Assessment, Biological Assessment
BLM	Bureau of Land Management
BO	Biological Opinion
BS	Bureau Sensitive
BT	Bureau Tracking
DEQ	Department of Environmental Quality (Oregon)
DSL	Division of State Lands (Oregon)
CFR	Code of Federal Regulations
COE	United States Army Corps of Engineers
CSU	Controlled Surface Use
EA	Environmental Assessment
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FC	Federal Candidate
FLPMA	Federal Lands Policy and Management Act
FS	United States Forest Service
FWS	United States Fish and Wildlife Service
HMMP	Henderson Marsh Mitigation Plan
HRA	Habitat Restoration Area
Mgal/d	Millions of gallons per day
NEPA	National Environmental Policy Act
NSO	No Surface Occupancy
NWI	National Wetlands Inventory
OAR	Oregon Administrative Rule
ODA	Oregon Department of Agriculture
ODFW	Oregon Department of Fish and Wildlife
ODNRA	Oregon Dunes National Recreation Area
OHV	Off-highway vehicle
ONHP	Oregon Natural Heritage Program
ORNHIC	Oregon Natural Heritage Information Center
OSMB	Oregon State Marine Board
OPRD	Oregon Parks and Recreation Department
RMP	Resource Management Plan
ROS	Recreation Opportunity Spectrum
SRMA	Special Recreation Management Area
SSS	Special Status Species
SSSP	Special Status Species Program
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USDOD	United States Department of Defense
UST	Underground Surface Tank
VRM	Visual Resource Management
The 1995 Shorelands Plan	The 1995 Coos Bay Shorelands Plan
The Jetty	The North Jetty of Coos Bay
The Port	The Oregon International Port of Coos Bay
The Spit	The North Spit of Coos Bay


OREGON
Astoria
PORTLAND
The Dalles
Pendleton
Salem
Newport
Madras
Baker City
Eugene
Bend
Prineville
John Day
Vale
Coos Bay
COOS BAY DISTRICT
Roseburg
Burns
Grants Pass
Medford
Klamath Falls
Lakeview
101
Eugene
126
Florence
Reedsport
38
5
North Spit Plan Area
Ocean
Coos Bay
COOS
Roseburg
Bandon
BAY
42
101
DISTRICT
Port Orford
Pacific
Brookings
199
U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
COOS BAY DISTRICT
Umpqua Resource Area
North Spit Plan
2005
N
W
E
S
10 0 10 20
MILES
10 0 10 20
KILOMETERS
Regional - Map 1
M05-04-05

INTRODUCTION

The North Spit of Coos Bay (the Spit) is a sandy, vegetated point of land separating the waters of Coos Bay from the Pacific Ocean (Map 1). It is northwest of the communities of Coos Bay, North Bend, and Charleston in Coos County, Oregon. The Bureau of Land Management (BLM) administers 1,864 acres of public domain lands on the Spit, primarily acquired from the Army Corps of Engineers (COE) in 1984. It is comprised of narrow, sandy beaches on the Pacific Ocean side and a combination of sand beaches, mudflats, and salt marshes on the bay side. The interior of the Spit is characterized by stabilized and shifting sand dunes, fresh water wetlands, and upland stands of shore pine and Sitka spruce. Non-native European beach grass and Scotch broom dominate much of the deflation plain.

The diverse natural resources and recreational opportunities found on the Spit attract a variety of people and present unique management challenges for state and federal agencies. The North Spit Plan combines background and current information on the Spit's major resources and recreational values, defines management objectives for those resources, and outlines BLM's planned actions to meet those objectives.

Purpose and Scope

The North Spit Plan provides updated direction for comprehensive management of the North Spit. Prior planning efforts by BLM for the Spit include the Coos Bay Shorelands Draft Management Plan (USDI BLM 1989) and the Coos Bay Shorelands Draft Management Plan and Environmental Assessment (USDI BLM 1994). The Final Supplemental Environmental Impact Statement on Management of Habitat for Late Successional and Old Growth Forest Related Species Within the Range of the Northern Spotted Owl and its Record of Decision (i.e. the Northwest Forest Plan; Interagency 1994) and the Coos Bay District's Resource Management Plan and Environmental Impact Statement and its Record of Decision (RMP; USDI BLM 1995) were incorporated into the Coos Bay 1995 Shorelands Final Management Plan (1995 Shorelands Plan; USDI BLM 1995). The purposes of the North Spit Plan are to address changes that have occurred since the 1995 Shorelands Plan was completed; clarify management direction for BLM lands on the Spit; report accomplishments; and describe ongoing management actions described in the 1989 plan. The 1994 Environmental Assessment (EA) associated with the 1995 Shorelands Plan remains valid. In the future, site specific EAs will be prepared when necessary to evaluate the effects of any new ground disturbing activities.

Lands on the Spit are owned and managed by several public agencies and private interests. BLM has no authority over lands not under its jurisdiction; hence management actions proposed in the North Spit Plan pertain only to the BLM-administered lands on the Spit. When necessary, BLM works with adjacent landowners per written agreements to accomplish joint management goals. The COE administers 245 acres on the Spit and their primary mission is to maintain the North Jetty (the Jetty) at the entrance to Coos Bay. The COE allows public access on their lands; however the Jetty itself was not designed for public use. The US Forest Service (FS) manages the Oregon Dunes National Recreation Area (ODNRA) to the north of the Spit. Many developed and undeveloped recreational opportunities are available in that area. The Oregon Parks and Recreation Department (OPRD) manages the Pacific Ocean beaches below the high tide line. The OPRD management guidelines for the Spit are described in the Draft Ocean Shore Management Plan and Habitat Conservation Plan for the Western snowy plover (Oregon Natural Heritage Information Center [ORNHIC] and OPRD 2004). The Division of State Lands (DSL) manages lands below the mean low tide, including submersed lands. The primary access to the bay side of the Spit is currently through lands owned by the Oregon International Port of Coos Bay (the Port). Coos County's zoning designations for the Spit are Conservation Shorelands, Natural Shorelands, Water-dependent Development Shorelands, and Development Shorelands (Coos County 1986). Privately owned lands include: a Roseburg Forest Resources chip facility and a Weyerhaeuser Company cardboard plant that is currently closed. In the past, BLM and Weyerhaeuser worked

together on wetland mitigation plans and actions, including wetlands creation. State (the Oregon Department of Fish and Wildlife [ODFW]) and federal (the US Fish and Wildlife Service [FWS]) agencies provide regulatory oversight for the fish and wildlife resources found on the Spit.

Vision and Goals

BLM's vision is to manage the public lands on the Spit as a predominately natural landscape by conserving botanical, cultural, and wildlife resources while providing recreational, educational, and interpretive opportunities for the benefit of local and regional visitors and economies. The two overarching goals of the North Spit Plan are:

- To provide a broad range of recreational opportunities on the Spit while managing for the protection, maintenance, and rehabilitation of the area's natural systems and cultural resources.

- To involve and foster open communication among local, regional, and national publics, and with other agencies and units of the government during the development of the North Spit Plan and as management of the Spit continues into the future.

Plan Development and Public Involvement

Scoping

As required under BLM's planning regulations (43 FR 1600), an interdisciplinary team of BLM specialists brought their professional expertise and experience to bear on the issues and concerns of managing the Spit (see below). Regulations also require public involvement and comment through the planning process. To this end, in 2003, BLM conducted public scoping to better understand the concerns regarding management of BLM-administered lands on the Spit. Public input was solicited via letters, presentations, public service announcements, and newspaper notices. Thirty-six people responded and provided 56 specific comments (Table 1).

Additional Public Involvement

The BLM conducted a formal comment period on the DRAFT North Spit Plan from August 1 through August 31, 2005. Public input was solicited via letters, newspaper notices, and through fliers handed out in the field. Comments are listed by categiry in Table 2. Some of the comments BLM received during and after the official comment period for the DRAFT Plan made it clear there was misinformation circulating concerning restrictions to assecc activities on the North Spit. BLM held a public forum on October 20, 2005, to clarify information and to listen to the public's interests and recommendations related to recreation and natural resources. Three new action items are presented in this Final North Spit Plan as a result of the public forum. The items are improving information available about the North Spit, possibly placing picnic tables at the boat launch facility and investigating the possible opening of the Foredune Road to motorized use from the South Dike Road intersection to the USFS boundary to the north.

Table 1. Summary of public comments received during 2003 scoping for the North Spit Plan and BLM response.

2003 Public Comment	BLM Response
Availability of Jetty access for COE	The COE's right-of-way over BLM lands for Jetty work is not affected by the North Spit Plan.
Concern about plover decisions including road and beach closures	BLM will cooperate with OPRD, ODFW, and the FWS regarding plover habitat and nesting season restrictions.
Develop commercial ocean front property	BLM does not have the authority to develop commercial property.
Opposes all-terrain vehicle use	Motorized travel off of designated routes on BLM lands on the Spit is prohibited. Route designation occurred in the 1995 Shorelands Plan, page 11.
Opposes development	No development by BLM is planned at this time.
Opposes fees	No fees are planned.
Opposes land exchange/wants free land	BLM does not have authority to give away the public lands. Land tenure adjustments will be assessed as necessary under NEPA.
Protect natural and cultural resources	BLM will continue with ongoing protection efforts.
Remain flexible with land use; work with the Port	BLM promotes good working relations with the Port and other partners.
Replace boat docks	Docks will be repaired and replaced as necessary.
Restrict target shooting	BLM, county, and state law enforcement will enforce safe use of firearms.
Retain bay and ocean beach access	Pedestrian and equestrian access to BLM lands will remain except for beach access in designated areas during the plover nesting season. Motorized access will remain available on the three designated open routes.
Storm water drainage issues	BLM will investigate these issues with the Port.
Supports day use fees	No fees are planned.
Supports off-road vehicle (ORV) use	ORVs are permitted on the designated open routes on BLM lands.

Table 2. Additional Public Input.

Comments on the DRAFT North Spit Plan	No. of Comments during Comment Period for Draft Plan	No. of Comments from Public Forum	BLM Response
Bicycle trails - supports	1		Bicycles are permitted on the Spit, however the loose sand makes bicycling difficult without paved trails. There are no plans to pave any trails at this time.
Bicycle trails - against	1		BLM will continue to support multiple use activities.
Build a boat ramp	1		This was completed in 1993. See Map 3 for location.
BLM should re-do the 2000 Biological Opinion for the western snowy plover	2		BLM is planning to reinitiate consultation to update the 2000 Biological Opinion, based on additional information on visitor use and to clarify areas and activities under BLM's jurisdiction.
Build a retaining wall at Half Moon Bay	1		This is on COE property and this Plan only addresses BLM-administered lands.
Cannot ride from Saunders Lake to the north jetty		1	BLM will investigate the possible opening of the Foredune Road north to the USFS boundary, as a Recreation Action item.
Concern about losing hunting grounds		1	BLM proposes no changes to legal hunting on the spit.
Equestrian trails - supports	59	3	BLM will continue to work with local volunteer groups to identify and maintain trails.
Equestrian and pedestrian trails - against	1		BLM will continue to support multiple use activities.
Grade area by paved road and South Dike Road intersection; add a sani-can		2	This parcel is being considered for sale at this time. The COE has a right-of-way for the area. It is possible BLM may create a small trailhead staging area there, pending current negotiations.
Improve information available about the North Spit		10	BLM staff is working on this now and it was added into the action items.
Keep it the way it is	2	10	No additional development or access restrictions by BLM are planned at this time.
Keep access to bay regardless of land sales		1	BLM only has jurisdiction on BLM lands.
Keep access to bay side open		1	This is Port land, not BLM

Table 2. Additional Public Input. (continued)

Comments on the DRAFT North Spit Plan	No. of Comments during Comment Period for Draft Plan	No. of Comments from Public Forum	BLM Response
Bicycle trails - supports	1		Bicycles are permitted on the Spit, however the loose sand makes bicycling difficult without paved trails. There are no plans to pave any trails at this time.
Bicycle trails - against	1		BLM will continue to support multiple use activities.
Build a boat ramp	1		This was completed in 1993. See Map 3 for location.
BLM should re-do the 2000 Biological Opinion for the western snowy plover	2		BLM is planning to reinitiate consultation to update the 2000 Biological Opinion, based on additional information on visitor use and to clarify areas and activities under BLM's jurisdiction.
Minimize signs, gates, fences and maps		1	BLM plans to remove some fences and possibly one gate. Signs are needed for safety and to inform those not familiar with the area.
Mitigation plan concerns (Henderson Marsh)		1	The wording in the draft was changed to clarify the issue.
Monitor effectiveness of signs and information; coordinate with USFS; use volunteers		3	This is standard procedure for BLM and it will continue for the North Spit.
Picnic tables should be installed at the boat ramp	1	5	This will be considered and was added as an Action item.
Plan departs from its underlying EA	1		There are no additional ground disturbing actions in the Plan, or additional environmental impacts, thus NEPA is not required.
Planning – Evidence suggests its preparation could be in violation of NEPA, FLPMA, and the Federal Advisory Committee Act	1		There are no ground disturbing actions in the Plan, thus additional NEPA is not required. The trail work was conducted under a volunteer agreement and it implemented MA13 in the 1995 Shorelands Plan, thus it would not be a FACA violation.
Plan proposals cultivate conflict. They erode traditional uses, further segregate uses, and elevate some uses above others.	2	1	The Plan makes no changes to the existing motorized and non-motorized (segregated use) access designations that have been in effect since 1985 when BLM amended the Master Framework Plan for the Coos Bay District and in 1995 with the Coos Bay District RMP and the Coos Bay Shorelands Plan. Traditional uses are not restricted and BLM welcomes volunteer groups to help us maintain trails.
Plan relies on irrelevant and inaccurate data (SCORP, Oregon State Parks Surveys)	1		The SCORP is the best available survey resource for recreational activities and is used to assess current uses, trends and demand at the state level and subregional level. The Ocean Shore Plan survey is also relevant as it included a subsurvey from Ten Mile Creek to Coos Bay, including the North Spit. BLM also utilizes three traffic counters on the spit.

Table 2. Additional Public Input. (continued)

Comments on the DRAFT North Spit Plan	No. of Comments during Comment Period for Draft Plan	No. of Comments from Public Forum	BLM Response
Bicycle trails - supports	1		Bicycles are permitted on the Spit, however the loose sand makes bicycling difficult without paved trails. There are no plans to pave any trails at this time.
Bicycle trails - against	1		BLM will continue to support multiple use activities.
Build a boat ramp	1		This was completed in 1993. See Map 3 for location.
BLM should re-do the 2000 Biological Opinion for the western snowy plover	2		BLM is planning to reinitiate consultation to update the 2000 Biological Opinion, based on additional information on visitor use and to clarify areas and activities under BLM's jurisdiction.
Plan will cost BLM money and work the agency cannot afford	1		The Coos Bay District BLM receives funding to support outdoor recreation on the public lands from a variety of appropriated funding sources. The minimal improvements proposed in the Update are well within the fiscal constraints of the Coos Bay District recreation and maintenance budget. In addition, group volunteer agreements assist in long term maintenance of trails and other projects.
Shooting - concerned you cannot shoot a firearm across a trail	1		BLM trails and the unmaintained sand roads are not considered public roads, thus shooting is not restricted.
Shooting - restrict firearms	1		BLM staff will track this as an issue identified by the public.
Shooting (firearms) safety concerns	5		BLM will track this as an issue identified by the public. BLM will also include firearm safety messages in North Spit information.
Supports crab dock construction	2	4	This popular suggestion is hampered by funding constraints. Estimates to construct a crab dock are several hundred thousand dollars. The location is questionable with known sand and wood debris deposition, and so there are no plans for construction.
Supports OHV trails	2	2	This triggered a new action item in the Recreation section that will investigate the possibility of opening the Foredune Road north to the USFS boundary.
Weeds Program – use "Casoron" herbicide; Policy questions		1	BLM is not authorized to use certain chemicals on public lands. Beach grass is not listed as "noxious," therefore, BLM cannot use "Caroson." BLM weed policy is set at the national level and cannot be changed at the field level.

Comments received which are outside the scope of this planning document:

- It could lead to prolonging the Coos Bay District RMP revision process
- Its ties to the New Carissa DARP are obvious and the DARP is itself a NEPA/FLPMA concern
- The ACEC designation on the North Spit should be eliminated
- BLM is over emphasizing Policy 6840
- The Draft should note that the ocean beach was declared a road in 1913 and the Coos County Board of Commissioners declared a county road across the north spit at the old ferry crossing and up the beach to Tenmile Creek in 1856.

BLM Interdisciplinary Team Members

Tim Barnes	Geologist
Nancy Brian	Botanist
John Colby	Hydrologist
Linda Petterson	Realty Specialist
Sharon Morse	Interpretive Specialist
Steve Samuels	Archaeologist
Madeleine Vander Heyden	Wildlife Biologist, ACEC Manager
Dan VanSlyke	Fisheries Biologist
Tim Votaw	Hazardous Materials Coordinator
Dave Wash	Outdoor Recreation Planner
Nancy Zepf	Outdoor Recreation Planner

This plan consists of four parts: Part One describes BLM's planning framework; Part Two reviews the original 1995 Shorelands Plan and outlines the status of its management actions; Part Three provides current information on the cultural, natural, and recreational resources on the Spit; and Part Four presents management actions on BLM-administered lands for the next ten years.

PART 1 – PLANNING FRAMEWORK

Part One describes BLM's planning framework. In the BLM planning system there are three levels or tiers which are described below:

1. National and State Level: Laws, Regulations, and Policy
2. District Level: Coos Bay District Resource Management Plan (May 1995)
3. Field Office Level: Activity Plans (site-specific plans such as this one)

These levels are described in detail below.

National and State Level

The management actions put forth in the North Spit Plan are guided by public laws, Executive Orders, regulations, and directives of the Secretary of the Interior. BLM policy must be consistent with these higher authorities as they provide a framework to ensure that management actions will maintain, enhance, or rehabilitate the natural resources present on the Spit while providing for public access. Pertinent federal laws, regulations and policies are summarized below.

- *Federal Land Policy and Management Act (FLPMA)* — Directs the BLM to plan for and manage the public lands in a manner that "protects the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use by encouraging collaboration and public participation throughout the planning process. In addition, the public lands must be managed in a manner that recognizes the Nation's need for domestic sources of minerals, food, timber, and fiber from the public lands."

- *National Environmental Policy Act (NEPA)* — Requires environmental analysis prior to surface disturbing activity on federal lands.

- *National Historic Preservation Act (NHPA)* — Protects important historic properties.

- *Endangered Species Act (ESA)* — Protects flora and fauna listed as threatened or endangered and at risk of extinction.

- *Code of Federal Regulations, Title 43, 8300 — Recreation Management*
  Recreation regulations guiding the inventory, planning, and management of recreational resources, including off-highway vehicle management on the public lands.

- *Executive Orders 11644 and 11988, Use of Off-Road Vehicles on Public Lands* —
  Provides a uniform federal policy for the management of off-highway vehicles on lands administered by the Departments of Interior, Agriculture, Defense and Tennesee Valley Authority.

- *Executive Order 11990, Protection of Wetlands, and BLM Manual 1737, Riparian-Wetland Area Management* — Describes the policies, responsibilities, and guidance for the identification, protection, restoration, and maintenance of fresh, brackish, and saline wetlands.

- *Special Status Species Policy (SSSP)* — Directs the BLM to conserve special status species (SSS) and the ecosystems upon which they depend so as not to contribute to the need to list these species under the ESA (USDI BLM 2001a).

District Level

The Coos Bay District operates under its Resource Management Plan (RMP) and its Record of Decision as supplemented and amended (USDI BLM 1995a., 1995), which is in conformance with the Final Supplemental Environmental Impact Statement on Management of Habitat for Late Successional and Old Growth Forest Related Species Within the Range of the Northern Spotted Owl and its Record of Decision as supplemented and amended (i.e., the Northwest Forest Plan; Interagency 1994). The RMP addresses the designation and management of special areas such as the Spit to protect their unique natural, cultural, and recreational values.

The RMP made four specific designations for lands on the Spit:

- Area of Critical Environmental Concern (ACEC)
- Special Recreation Management Area (SRMA)
- Motorized Access Limited to Designated Roads and Trails
- Visual Resource Management Classes II, III and IV

The North Spit Area of Critical Environmental Concern

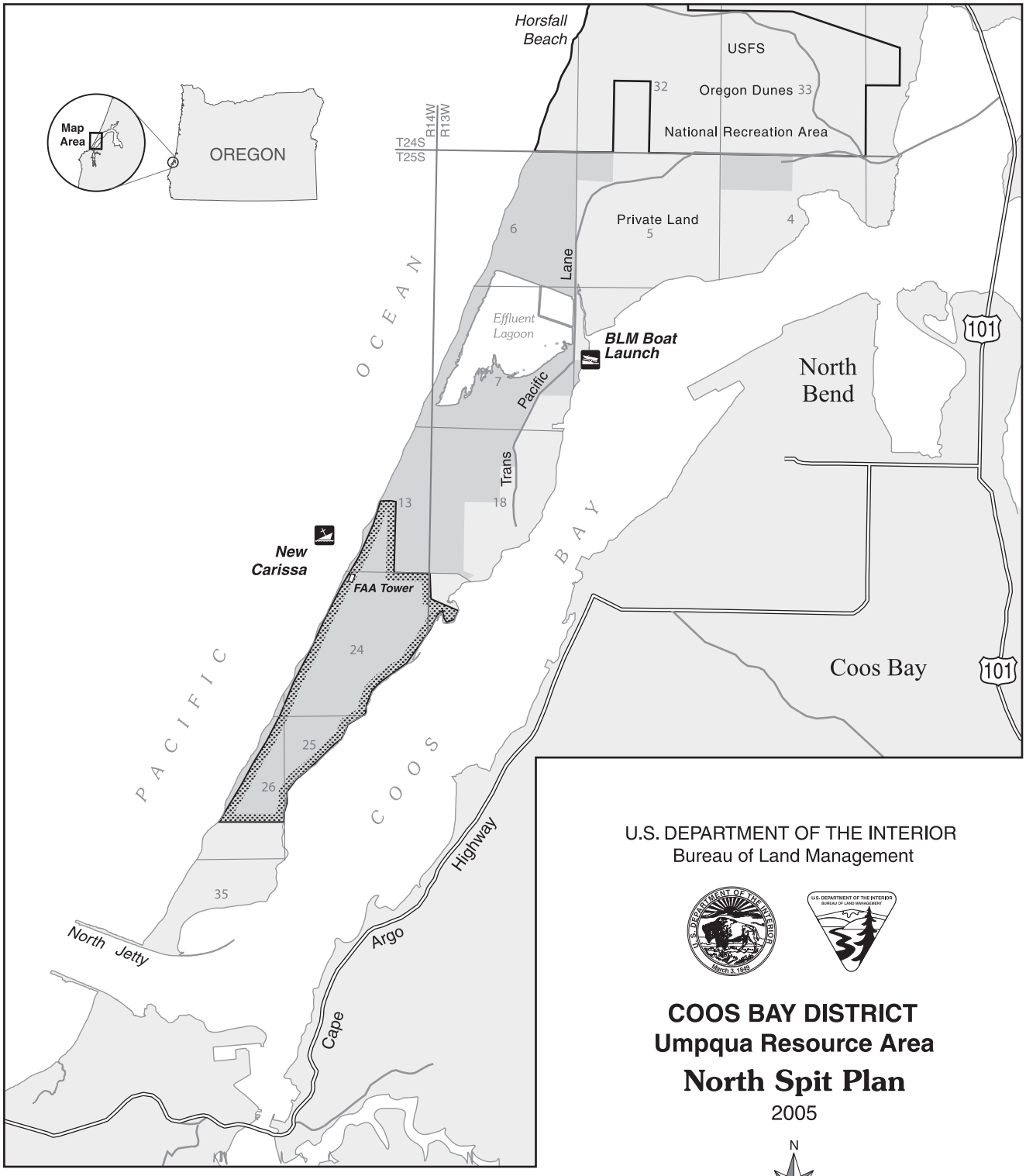
Areas of Critical Environmental Concern (ACECs) are public lands where special management attention is required to protect important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes (43 CFR 1601.0-5). The District RMP designated 580 acres of the Spit as an ACEC primarily for the conservation of its outstanding biological values (USDI BLM 1995; Map 2). An additional 145 acres were obtained from private ownership, raising the ACEC's total to 725 acres.

Prior to 1995, the Audubon Society, FWS, ODFW, The Nature Conservancy, and the COE (USDI FWS 1980) recognized the Spit's high value for wildlife and expressed concern for its conservation. As one of the largest undeveloped spits on the Oregon Coast, its close proximity to a populated urban area was creating a high demand for resources and recreational use (Wilson-Jacobs 1983; USDI BLM 1980). Although adjacent private lands provided important natural areas they were under development pressure, and management objectives for the adjacent ODNRA focused primarily on motorized recreation. Consequently, protecting and preserving natural resources under BLM management was determined imperative to the conservation of the Spit's rich biological community (USDI BLM 1994). The Spit was also designated as an ACEC for its cultural and historic resources, and its scenic value to the communities of North Bend and Coos Bay (USDI BLM 1994).

In 1992, three broad objectives were identified by an interdisciplinary team tasked with developing a management strategy for the North Spit ACEC: 1) no net loss of wetlands; 2) maintain and enhance threatened and endangered species habitat; and 3) maintain and enhance a diversity of habitats for animals and plants (USDI BLM 1992). In addition, cultural and historic values would be preserved, and educational and interpretive information provided to the public. In accordance with BLM policy, recreational and other uses would be managed to provide for visitor access and enjoyment while leaving all other ACEC values unimpaired (USDI BLM 1988). The North Spit Plan incorporates these objectives and goals by providing for the preservation of ACEC values through specific and compatible management actions related to recreational access, cultural and historic preservation, wildlife and plant conservation and management, and educational and interpretive opportunities.

Special Recreation Management Area

The designation of the North Spit as a Special Recreation Management Area (SRMA) in the District RMP formally recognized the high recreational value of the Spit's public lands. SRMAs are defined as areas "…where a commitment has been made to provide specific recreation activity and experience opportunities on a sustained yield basis." Through the SRMA designation in the



U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

COOS BAY DISTRICT
Umpqua Resource Area

North Spit Plan

2005

N
W E
S

0.5 0 0.5 1
MILES

0.5 0 0.5 1
KILOMETERS

Legend

- Area of Critical Environmental Concern
- Highway
- Paved Road
- Bureau of Land Management (BLM) Administered Land

Area of Critical Environmental Conern - Map 2

M05-12-05

RMP, the BLM has made a long-term commitment to manage the physical, social, and managerial settings on the North Spit to sustain recreational activities and experience opportunities.

In addition to SRMA designations, the RMP identified recreation management objectives for the entire Coos Bay District. Specific objectives from the RMP that direct recreation management are:

- Manage scenic, natural, and cultural resources to enhance visitor experience expectations and to satisfy public land users.
- Support locally-sponsored tourism initiatives and community economic strategies by providing recreation projects and programs that benefit both short- and long-term implementation.
- Manage off-highway vehicle use on BLM-administered land to protect natural resources, provide visitor safety, and minimize conflicts among various users.
- Continue to provide non-motorized recreation opportunities and create additional opportunities where consistent with other management objectives.

The BLM planning process defers the specific details on how these resources are to be managed to the activity planning stage, in this case through the Coos Bay Shorelands Management Plan and subsequent updates such as this document.

Motorized Access – Limited to Designated Roads and Trails

In 1972, Executive Order 11644 established a unified federal policy for motorized vehicle management on public lands administered by the Departments of the Interior and Agriculture, the Secretary of the Defense and the Tennessee Valley Authority. This Executive Order required each respective agency to develop and issue regulations and administrative procedures to provide for the designation of specific areas and trails where motorized use would be permitted and where it would be prohibited. As directed, each of these agencies developed regulations through the Code of Federal Regulations to govern the designation and management of off-highway vehicles.

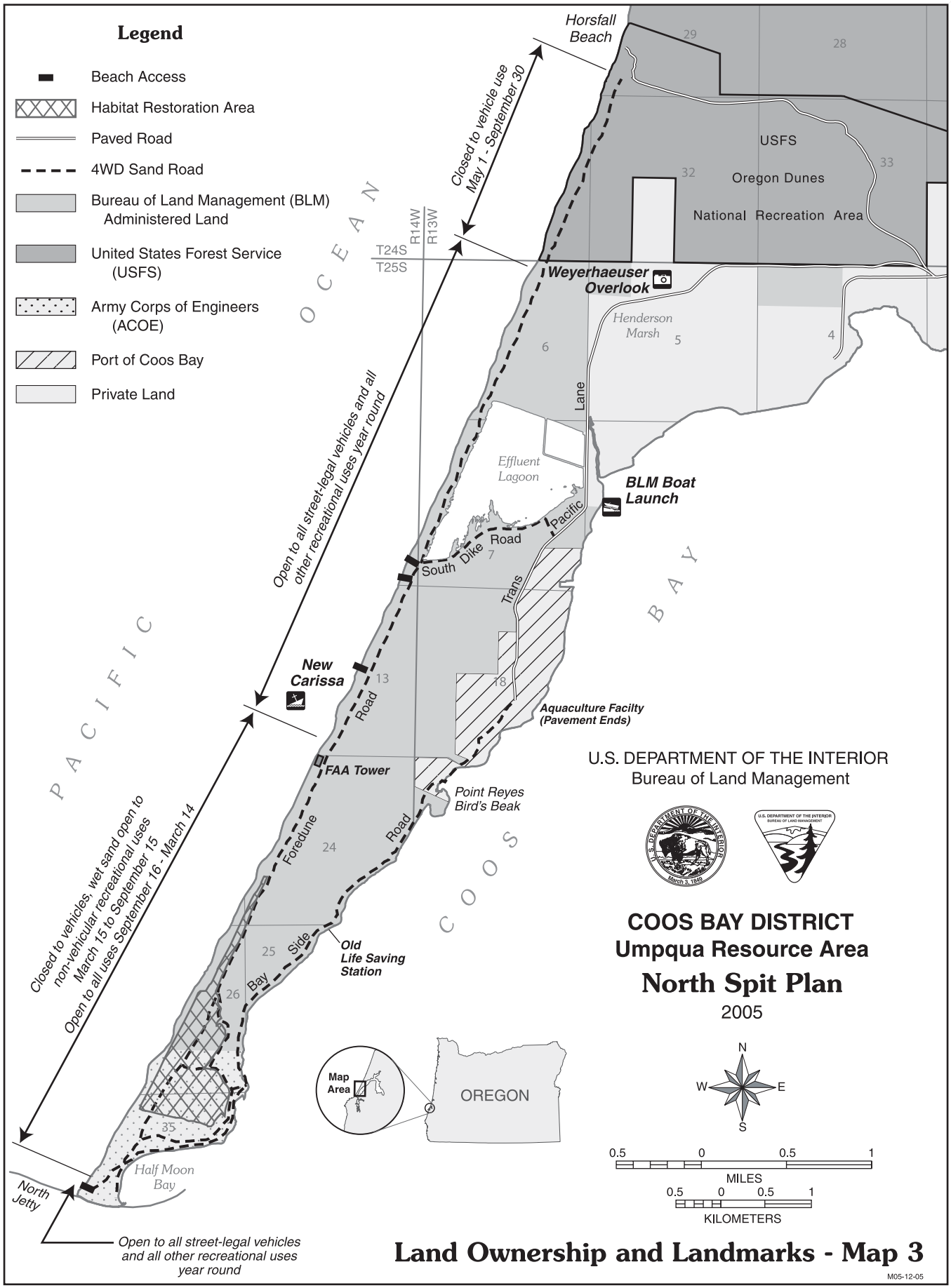
On the public lands of the North Spit, administered by the Secretary of the Defense through the US Army Corps of Engineers, off highway vehicle management has been directed by the Rules and Regulations Governing Public Use of Water Resource Development Projects Administered by the Chief of Engineers (36 CFR Part 327). Through these regulations, the operation of a vehicle off authorized roadways is prohibited except at locations and times designated by the District Commander. Since no designation had been made by the Corps of Engineers on the North Spit, these parcels were effectively closed to off-highway vehicle use prior to these lands being transferred to the BLM.

The BLM's management of off-highway vehicles is directed through the Federal Land Policy and Management Act and the Code of Federal Regulations in 43 CFR to designate areas and trails as open, limited, or closed to motorized access through the resource management planning process. The public lands on the Spit were designated through the Coos Bay District RMP as Limited to Designated Roads and Trails. The individual roads and trails were then inventoried and designated as open or closed through the Coos Bay Shorelands Plan of 1995. The four roads/trails designated as open by this plan were the South Dike Road, the Foredune Road, the Re-route Road, and the Bay Side Road (Map 3). The remaining trails were designated as closed to motorized use.

Field Office Level

The North Spit is managed by the Umpqua Field Office of the Coos Bay District. At the field office level, site specific plans are developed to guide management activities. A chronology of planning efforts for the Spit includes:

- The Coos Bay Shorelands Draft Management Plan (USDI BLM 1989);
- The Coos Bay Shorelands Draft Management Plan and Environmental Assessment (USDI BLM 1994; EA No. OR120-93-07);
- The Coos Bay 1995 Shorelands Final Management Plan (USDI BLM 1995b), and lastly;
- The North Spit Plan, 2005.


Legend
Beach Access
Habitat Restoration Area
Paved Road
4WD Sand Road
Bureau of Land Management (BLM) Administered Land
United States Forest Service (USFS)
Army Corps of Engineers (ACOE)
Port of Coos Bay
Private Land
Horsfall Beach
Closed to vehicle use May 1 - September 30
USFS
Oregon Dunes
National Recreation Area
T24S
T25S
R14W
R13W
Weyerhaeuser Overlook
Henderson Marsh
Lane
Effluent Lagoon
BLM Boat Launch
Pacific
South Dike Road
Trans
Open to all street-legal vehicles and all other recreational uses year round
New Carissa
Road
Aquaculture Facilty (Pavement Ends)
FAA Tower
Point Reyes Bird's Beak
Foredune
Road
Closed to vehicles, wet sand open to non-vehicular recreational uses March 15 to September 15
Open to all uses September 16 - March 14
Side
Bay
Old Life Saving Station
Map Area
OREGON
Half Moon Bay
North Jetty
Open to all street-legal vehicles and all other recreational uses year round
OCEAN
PACIFIC
COOS BAY
U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
COOS BAY DISTRICT
Umpqua Resource Area
North Spit Plan
2005
N
W
E
S
0.5 0 0.5 1
MILES
0.5 0 0.5 1
KILOMETERS
Land Ownership and Landmarks - Map 3
M05-12-05

PART 2 – THE COOS BAY SHORELANDS FINAL MANAGEMENT PLAN, 1995

Part Two reviews the original 1995 Shorelands Plan and outlines the status of its management actions. In 1995, the Coos Bay Shorelands Plan was approved to guide management of lands on the Spit. It identified issues, concerns, and opportunities on the Spit, and included specific management actions pertaining to each of the following subjects:

- Education and Interpretation
- Land Tenure and Cooperative Agreements
- Law Enforcement
- Recreation
- Vegetation
- Wildlife Habitat

Management actions listed in the 1995 Shorelands Plan were reviewed and updated (Table 3). The actions fall into four categories: accomplished, accomplished in part, not accomplished, and ongoing. Actions in the plan that were not accomplished include those where land exchanges have removed or precluded lands from BLM jurisdiction, consequently these actions are no longer applicable to BLM management of the Spit. All ongoing and planned actions are listed in Part Four of the North Spit Plan.

In the case of Western snowy plover management, actions have evolved through a multi-agency process. The 1995 Shorelands Plan proposed several actions pertaining to snowy plovers and ocean beach access that were never implemented (Table 3, Management Action 5). Changes to management actions are a result of a revised public access strategy implemented subsequent to the grounding of the New Carissa in 1999. The strategy pertains to the management of public lands on the Spit and allows for public use while protecting plovers and promoting their recovery (USDI FWS 2000). Strategy details are described in Part Three under Species of Special Management Concern.

The following actions described in the text of the 1995 Shorelands Plan (Actions 4, 7, 11, 12, 13, 16, and 20) were not incorporated into the original Management Action Chart. Action 4 – Bay Beach Access is not BLM land; Action 7 –Campground Construction - No construction will be developed; Action 11RV Dump Station – no RV dump station will be installed; Action 12 – Equestrian Staging Area – No area to be developed at this time; Action 13 – Non-motorized trails – trails will be available but not maintained; Action 16 – Barrier-free interpretive loop – No loop will be developed; Action 20 – Coos Head – no day use site will be developed.

Text Changes

The 1995 Shorelands Plan made some recommendations that were not listed as actions. Errors, additions, or changes to these recommendations are as follows:

1. Page 10, first paragraph – "The BLM will petition to Oregon State Parks to prohibit the following activities on the CBS (Coos Bay Shorelands) ocean beaches: removing surfcast kelp and driftwood, allowing dogs to run free, and falcon flying." This action is no longer under consideration as the ocean beaches are under the OPRD's jurisdiction.

2. Page 10, second paragraph related to the potential discovery of a plover nest on the Foredune Road – Delete: "In addition, the road will be seasonally closed for 200 feet from the nest site until chicks have left the nesting area, or rerouted temporarily to avoid active nests." The road

is currently re-routed every six months. Other actions that may occur to protect nesting plovers will be done in cooperation with the FWS and other agencies as required.

3. Pages 11, OHV Access – There are seven bullets describing allowable motorized access.The three items below are no longer applicable.

   - Remove – "Wet sand along the ocean beaches year round." Wet sand is under the jurisdiction of OPRD.
   - Remove – "260-acre open sand area (by permit only…)". This management action was inconsistent with the regulations and policies that were in effect in 1995 and was inconsistent with the land use allocations identified in the Coos Bay District RMP of 1995. An activity level plan, such as the Shorelands Plan, was not sufficient for changing the OHV designation status of this 260 acre parcel from Limited to Open. This statement was removed through a plan maintenance action in 2000. This area remains a Limited Area as per the Record of Decision in the RMP.
   - Remove – "80-acre parcel near the Roseburg Chip Facility (by permit only…)." This management action was inconsistent with the regulations and policies that were in effect at that time and was inconsistent with the land use allocations identified in the Coos Bay District RMP of 1995. An activity level plan, such as the Shorelands Plan, was not sufficient for changing the OHV designation status of this 80 acre parcel from Limited to Open. This statement was removed through a plan maintenance action in 2000. This area remains a Limited Area as per the Record of Decision in the RMP.

4. Pages 13, 14 – Management Action 5 – Ocean Beach Access:BLM was to petition OPRD to enact restrictions on the ocean beach. There are 14 action items, including rationale. Remove all actions as the wet sand beach is under the jurisdiction of OPRD.

5. Page 16 – Management Action 12 – Equestrian Staging Areas.Equestrian use in the Central Coast Region of the Oregon Coast has increased by 39% since the last Shorelands Plan was written. The Spit has become one of the more popular equestrian riding areas in the region and a need has been identified to provide an adequate staging area for the off-loading/loading of horses.

6. Page 16 – Management Action 13 - Non-Motorized Trails.The BLM proposed the designation of approximately 12 miles of hiking/equestrian trails in the 1995 Shorelands Plan. The BLM will implement this action and will identify a trailhead/staging area. The agency may develop new trail segments and will establish local partners to assist in the management and maintenance of the trail system (see Recreation, Part Three).

Table 3. Management actions as described in the Coos Bay Shorelands Final Management Plan (USDI 1995) and their current status.

Management Action	Status	Comments
Biological mapping of plant communities and wildlife habitats.	Accomplished.	Plant communities were mapped and preliminary information reported for plant alliances and vegetation classes based on the Oregon Dunes NRA assessment (Christy et al. 1998). Information on wildlife habitats may be obtained from the mapped plant alliances.
Cadastral survey (to determine mean high tide on the bay side).	Not accomplished.	This action was originally proposed in relation to the Point Reyes bird's-beak. The plant has been protected by re-routing vehicles around it and placing root wads to protect the area as authorized by the management agency (Port and DSL). Additional maintenance actions on state lands will be conducted per written agreements from the appropriate agency.
Land tenure adjustments (Page 10 in 1995 Shorelands Plan).	Accomplished, in part.	Priorities 2, 3, and 4 have been accomplished. If Priority 1 is accomplished, the bay side access road will come under BLM jurisdiction and will be designated as open for motorized access.
MA-1. North Dike road improvement and turnaround construction.	Not accomplished.	This road is owned by Weyerhaeuser.
MA-2. Extension of Trans Pacific Parkway (now called Trans Pacific Lane) for 1/3 mile to day-use facility.	Not accomplished.	The area proposed for the road extension belongs to the Port. If the lands are acquired by BLM, the extension would not be paved, nor would a day use area be built. The road would be designated as open for motorized access.
MA-2. Bay Side road construction, includes post and cable installation.	Accomplished, in part.	This area is under the Port's jurisdiction. Post and cable installation and a road reroute to protect the Point Reyes bird's-beak was completed and will be maintained.
MA-3. Petition DSL to prohibit motor vehicles on 1/2 - 3/4 mile section of bay beach around salt marshes.	Not accomplished.	BLM's re-route has been effective thus precluding the need for the prohibition (see above).
MA-5. Petition to OPRD to close dry sand portion of ocean beaches, south of effluent pond between March 15 and Sept 15 (Western snowy plover nesting season).	Not accomplished.	Because much of the dry sand portion of the ocean beach is under BLM jurisdiction, the annual closure request to OPRD is not necessary. However, changes in plover management are reflected in a different closure area: BLM closes the dry sand from the FAA (Federal Aviation Administration) tower (not the effluent pond) south to within one mile of the Jetty.
MA-5. Petition OPRD to close ocean beaches from south end of effluent pond to Forest Service boundary.	Not accomplished.	This did not occur and is not necessary for the protection of snowy plovers. BLM will cooperate with OPRD when the final Ocean Shores Management Plan is completed (OPRD 2004).

Management Action	Status	Comments
MA-5. Petition OPRD to close ocean beaches from 30 minutes after sunset to 30 minutes prior to sunrise.	Not accomplished.	BLM will cooperate with OPRD's final Ocean Shores Management Plan when it is completed (OPRD 2004).
MA-5. Signs indicating designated access routes to ocean beaches, south of effluent pond.	Ongoing.	Signs are maintained as necessary.
MA-5. Signs indicating non-authorized access points to ocean beaches south of effluent pond.	Not accomplished.	Non-authorized access points to the ocean beach were not signed. Signs indicating authorized access points were placed.
MA-5. Informational signs explaining beach access.	Ongoing.	Signs are in place. New OPRD signs will be used in the future.
MA-5. News releases and updates on ocean beach access.	Ongoing.	Information is provided to the media as needed.
MA-5. Public meetings discussing beach access.	Ongoing.	Meetings primarily occur through OPRD'S planning effort and North Spit Plan public scoping. BLM accepts public comments and suggestions at any time.
MA-6. 260-acre and 80-acre open sand areas open to OHVs by permit only.	Not accomplished.	No permits were requested. Motorized access is permitted on sand roads designated as open. This policy was inconsistent with the OHV designations created in the RMP.
MA-6. Signs marking perimeter of open sand areas.	Not accomplished.	Motorized access remains open on designated sand roads. This action was inconsistent with the OHV designations created in the RMP.
MA-8. Pack-in camping permitted throughout the CBS with length of stay not to exceed 14 days.	Ongoing.	Allowed except in designated snowy plover areas during the nesting season.
MA-8. Vehicles remain within 100 feet of designated roads.	Ongoing.	Allowed except where signed to protect natural resources.
MA-10. MA-10. Placement of garbage cans and vault toilets at day-use facility (near anadromous facility).	Not accomplished.	The area is not under BLM jurisdiction. No new developments are planned on BLM lands. The correct name of the anadromous plant is the North Bay Aquaculture Facility and it is owned by the Port.

Management Action	Status	Comments
MA-10. Maintenance of vault toilets and garbage cans at day-use facility.	Not accomplished.	The area is not under BLM jurisdiction.
MA-14. Firearms policy.	Not accomplished.	Federal and state regulations cover the discharge of firearms in developed and undeveloped areas. Enforcement occurs through federal, state, and county patrols.
MA-15. Development and installation of Watchable Wildlife signs along bay and at north dike day-use facility.	Not accomplished.	These areas are not under BLM jurisdiction. Wildlife information may be provided at the proposed boat launch information kiosk. The potential remains for a "Watchable Wildlife" site to be developed.
MA-17. Closing of non-designated roads and trails using logs or root wads.	Ongoing.	BLM will maintain vehicle barriers to the interior of the Spit as necessary to deter resource damage from unauthorized motor vehicle use.
MA-18. Management of European beach grass.	Ongoing.	Occurs within the snowy plover Habitat Restoration Areas.
MA-19. Noxious weed control.	Ongoing.	Occurs under BLM's weed management program.
MA-21. Timber, standing or down, cutting prohibited.	Ongoing.	Dependent upon standard Bureau procedures including NEPA compliance and Small Sales Permits.
MA-22. Development of interagency, inter-tidal agreement to manage salt marshes within the Coos Bay estuary.	Not accomplished.	These areas are not under BLM jurisdiction. Any work done in the salt marshes necessitates permits from the appropriate agencies prior to the start of the project. No new projects are proposed.
MA-23. Salt marsh restoration (depends on rate of natural re-vegetation of salt marsh).	Not accomplished.	See above.
MA-24. Introduction of pink sand verbena.	Accomplished.	Pink sand verbena seeds are collected for dispersal at other coastal sites.
Monitoring of dry sand closure during Western snowy plover nesting season.	Ongoing.	Occurs in compliance with FWS' Biological Opinion.

Management Action	Status	Comments
Monitor permanent traffic counters.	Ongoing.	Traffic counters are maintained and data collected. Counters may be moved to different locations as warranted.
Monitor salt marsh bird's-beak population.	Ongoing.	The correct name is Point Reyes bird's beak. No additional protections are required, however BLM will maintain the existing vehicle re-route and root wad barrier on the bay side of the Spit, as permitted by DSL.
Monitor Western snowy plover nesting exclosure and brood success.	Ongoing.	Cooperative effort with ORNHIC, OPRD, ODFW, FWS, and COE.
Monitor great blue heron and great egret rookery.	Ongoing.	The rookery was abandoned in 2000. Surveys will be conducted to locate additional rookeries on BLM lands. A new rookery was discovered in 2002 on ODNRA lands and in 2004 on the northeast side of the Spit on BLM.

Part 3 –North Spit Resources

Introduction

Part Three describes the cultural, natural, and recreational resources on the Spit. Management actions are listed in Part Four. Resources are grouped into five categories:

- Physical, including Water, Geology, Soils, Minerals, Coal Bed Methane, Oil and Gas
- Biological, including Vegetation, Wildlife, and Fisheries
- Cultural and Historical
- Recreational
- Visual

Physical: Water Resources

Climate

The Central Oregon Coast has a temperate maritime climate characterized by cool, dry summers and mild, wet winters. Rainfall occurs primarily from November through March and averages 63 inches per year at the North Bend Municipal Airport near the Spit. The average annual maximum and minimum temperatures at the North Bend Municipal Airport for the period January 1931 to December 2004 are 60ºF and 45ºF respectively. Temperatures above 90ºF or below 20ºF are rare (Western Regional Climate Center 2004).

Prevailing winds are from the north-northwest in the summer and from the south-southeast in the winter (Oregon Climate Service 2004). Summer days are characterized by foggy mornings, sunny afternoons, and cool evenings. Afternoon northwesterly winds are quite cool. Precipitation is light and spotty; however, fog or low overcast clouds may persist all day, and fog drip may contribute to available moisture. Winter weather is characterized by frequent rains with intermittent clearing periods. Snow may fall on the beach every few years when Arctic air meets an onshore flow of moist air.

Groundwater

The groundwater supply in the Coos Dune Sheet aquifer is large. The Coos Bay – North Bend Water Board has 18 freshwater production wells just north of the BLM-administered lands on the Spit. Although these 90 to 120 foot deep wells can produce up to 4 million gallons per day (Mgal/d), they are currently not being used (Schab 2004). According to Jones (1992), model simulations indicate that 10 Mgal/d could be pumped with minimal risk of seawater intrusion into the dune aquifer. The model also indicates that a maximum of 17 Mgal/d could be pumped without causing intrusion, but the risk associated with pumping this quantity over time is uncertain.

Both the Water Board and the Weyerhaeuser Company monitor groundwater levels and groundwater quality (Souza 2004). The Water Board maintains 55 monitoring wells in the dunes between the Spit and Tenmile Creek. Eight of the wells are sampled for chlorides and the

remainder of the wells are used to measure static water levels. The production wells mentioned previously are monitored monthly for seven water quality parameters.

Between 1982 and 1997, several groundwater monitoring wells were installed near the Weyerhaeuser containerboard mill and the former effluent lagoon, and on adjacent property managed by the Bureau of Land Management. The wells were installed for environmental assessment, and permit-required characterization and water quality monitoring related to wastewater discharge an solid waste disposal.

Weyerhaeuser currently has 9 serviceable groundwater monitoring wells in or adjacent to the former effluent lagoon. Twenty-five other wells in the same area were decommissioned between October 2004 and January 2005 to reduce maintenance and eliminate potential risks related to the integrity of wellheads and surface seals.

Weyerhaeuser also has 13 serviceable groundwater monitoring wells in the vicinity of the former containerboard mill on the Spit. Seven additional wells in the same area were decommissioned in October 2004 (Souza 2005)

Wetlands

Vegetation mapping using 1999 aerial photographs and ground-truthing indicates that roughly 27% (669 acres) of the North Spit is open water or supports vegetation indicative of semipermanently flooded, seasonally flooded, and saturated areas. The US Fish and Wildlife Service's National Wetlands Inventory (NWI) identifies several wetland types on the Spit. Marine, intertidal habitats of high salinity are found along the Pacific Ocean shore, and intertidal and subtidal estuarine wetlands of moderate salinity are located on the bay side of the Spit. Freshwater, nontidal (palustrine) wetlands are scattered in low lying portions of the deflation plain east of the ocean and foredune.

The goals of the NWI is to classify and map the nation's wetlands and evaluate wetland status and trends. National Wetlands Inventory maps covering the Spit were published in 1989 and contain information on the location and classification of wetlands. This information is overlaid on the Charleston and Empire 7.5 minute (1:24,000) US Geological Survey topographic maps. The NWI maps were based on interpretation of visible hydrologic features and wetland vegetation using high-altitude aerial photographs (1:58,000) taken in August and September 1982. Because dynamic systems like the Spit wetlands vary seasonally and annually, these maps likely differ from current conditions.

Wetlands mapped by the NWI must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes (plants adapted to live in anaerobic (oxygen free) soil conditions; (2) the substrate is predominantly undrained hydric soil (soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part); and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al. 1979).

The NWI maps were not intended to delineate regulated wetlands. Delineation is defined as a determination of wetland presence that includes marking the wetland boundaries on the ground and/or on a detailed map prepared by a professional land surveyor or similar accurate methods (Oregon Administrative Rules 141-090-0020). Delineation of jurisdictional (regulated) wetlands is determined by on-the-ground examination of hydrology, vegetation, and soils (USDOD 1987). It requires that specific vegetation, soils, and hydrology attributes be found to make a positive wetland determination.

Palustrine Wetlands. Seasonal precipitation that infiltrates into the relatively porous dune sheet recharges groundwater and sometimes appears as standing water in relatively small, freshwater deflation plain wetlands east of the foredune. The 1989 NWI maps covering the Spit show roughly 300 acres of unconsolidated shore, emergent, scrub-shrub, and forested wetlands scattered throughout BLM-administered land. Unconsolidated shore habitats include beaches, bars, and flats with less than 30% areal vegetative cover other than pioneering plants. Emergent wetlands (marshes) are characterized by erect, rooted, herbaceous hydrophytes. This vegetation is present for most of the 335 day growing season (USDA FS 1993) and these wetlands are usually

dominated by perennial plants. Scrub-shrub wetlands are dominated by woody vegetation less than 6 meters (20 feet) tall, and forested wetlands have woody vegetation that is 6 meters tall or taller. Swamps are wetlands dominated by trees or shrubs. A shrub swamp often occurs as a transitional phase between habitats evolving from a marsh to a swamp.

Temporarily and seasonally flooded unconsolidated shore, emergent, and scrub-shrub habitats were mapped on the Spit. Temporarily flooded areas occur where the surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface. Seasonally flooded wetlands have surface water present for extended periods, especially early in the growing season. Surface water is absent by the end of the growing season in most years.

Deflation plain wetlands are a direct result of foredune establishment (USDA FS 1993). Over the past several decades, the foredune has essentially cut off the supply of wind blown sand to the inland open sand dunes. Winds continue to move the remaining inland dune sands toward the bay, stripping sand from the eastern edge of the deflation plain and further exposing the water table. This deflation also occurs further inland in troughs among dunes. Rapid plant succession follows exposure of the water table and early seral stage wetlands (e.g.: grass, sedge, rush, low shrub) progress toward later seral stages (tall shrub, shore pine). Because the surface of the deflation plain is at the summer ground water level, only plants tolerant of perennially wet soils can survive.

Estuarine Wetlands. Based on the 1989 NWI maps, roughly 300 acres of intertidal, estuarine wetlands are located on the bay side of the Spit south of the North Bay Aquaculture Facility. A majority of these habitats (nearly 265 acres) are classified as aquatic bed and unconsolidated shore wetlands that are regularly flooded (tidal water floods and exposes the land surface at least once daily) and irregularly flooded (tidal water floods the land surface less than daily). Aquatic bed habitats are dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years. Approximately 35 acres of regularly and irregularly flooded, emergent wetlands (marshes) border the beach on both sides of the dredge disposal lobe. Vegetated marshes develop on deposits of fine sediment in low velocity areas of the estuary. Additional deposition in areas of established vegetation alters site characteristics and suitability of the habitat for different plant species (Coats 1995).

Marine Wetlands. Marine, intertidal habitats are found along the high energy Pacific Ocean shore. Two habitats are recognized by the NWI: unconsolidated shore (beach) that is regularly flooded (inundated daily), and unconsolidated shore that is irregularly flooded (inundated less than daily).

Henderson Marsh Mitigation Plan. Although not a signatory party, BLM has been involved with the Henderson Marsh Mitigation Plan (HMMP) because the original plan identified sites on federal lands to be used for wetland mitigation.

Historically the lands known as Henderson Marsh were owned by private individuals and used for grazing. Menasha Woodenware Corporation acquired the land and, in 1959, developed plans for a paper mill which required the construction of a waste water treatment lagoon. The original plan was to place the lagoon in Henderson Marsh. Through the intervention of state and federal wildlife management agencies, the lagoon was sited on federal land in the deflation plain southwest of Henderson Marsh (Map 3). Menasha agreed to hold the lands in Henderson Marsh available for waterfowl management, including public hunting, and to construct and maintain dikes, spillways, and tidegates to improve waterfowl habitat.

In 1978, plans were developed to fill a significant portion of the Henderson Marsh. Because filling required compensation for wetland losses, a task force was formed in 1979 to create a mitigation plan. In 1981, Weyerhaeuser purchased the Menasha holdings on the Spit including Henderson Marsh. The HMMP was finalized in 1984 and signed by Weyerhaeuser, the Oregon Department of Fish and Wildlife, and the US Fish and Wildlife Service. The HMMP allows for the filling of 160

acres of freshwater and saltwater wetlands and identifies mitigation actions on public and private lands to compensate for the loss of these wetlands.

BLM has provided technical advice to Weyerhaeuser on mitigation projects, and participated in the development of a wetlands monitoring protocol. In addition, a limited amount of open water pond and wetland habitat was constructed on federal land for mitigation. A weir and reverse tidegate system was installed in upper Jarvis Creek when the Trans Pacific Lane was built to create a brackish water regime west of the road corridor and hold open water to a larger surface area. This area immediately north of the effluent lagoon is permanently flooded and classified as a subtidal, estuarine wetland on the Empire NWI map. Approximately 5 acres of estuarine and 24 acres of freshwater habitat were created or enhanced by installing the water control structure. Another 6 acres of ponds were created further north on BLM-administered land.

Physical: Geology and Soils

Eolian and Oceanic Processes

Two separate, but interrelated, geomorphologic forces on the earth's surface occur to form and shape a sediment dominated beach and its associated dunes. These processes are oceanic and eolian (wind). The oceanic process is the mechanism that delivers eroded sediment to the beach front. The eolian process is the mechanism that mobilizes unincorporated beach sediment inland. The oceanic process creates, molds, and removes beaches, spits, and headlands. The eolian process creates and mobilizes the ridges, dunes, dune fields, and deflation plains.

Eolian Process. Numerous dune fields exist along the Oregon Coast, including the Coos Bay Dune Sheet, located north of Coos Bay. Components needed for dune formation are abundant loose sand, wind, and a favorable terrain. Other ingredients that play important roles in dune-



North Spit deflation plain.

forming include water and vegetation. Human alteration of these components influence the sand migration process (Lund 1973). The coastal dune fields are within two miles of the ocean shore with most immediately adjacent to sand beaches.

Three episodes of dune advance in the Coos Bay dune sheet and other dune fields are documented (Cooper 1958). The earliest is represented today by a strip of thoroughly vegetated dunes that in most places achieved the greatest landward advance. The second advance generally fell short of the first, and its present condition ranges from complete stabilization to still vigorous activity. The third episode is represented by the large areas of active dunes that until recently had open access to the ocean beaches that supplied them with sand. The landward edges of these dune fields are well defined by the presence of precipitation ridges with steep slip faces that slowly invade and bury adjacent vegetation, including forested areas. The precipitation ridge often blocks stream drainage, creating ponds and lakes (Komar 2000).

The eastern face of the migrating dune, called the precipitation ridge (Cooper 1958) will migrate several feet a year by the accumulation of sand along a slope on the inner boundary of the active dune belt. Because both winter and summer wind patterns are landward, sand supply is provided year-round (Lund 1973). This migration of sand is sufficient to cover existing forests as well as other vegetation (Lund 1973; Komar 2000). Along the dune field north of Coos Bay, dune advancement has been measured at 6 to 18 feet per year (Alt and Hyndman 2001).

Water and vegetation reduce the rate at which sand shifts (Lund 1973). In many areas dunes are being actively molded by winds while in other areas vegetation now covers formerly mobile dunes (Komar 2000). Where eolian sand moving across a smooth surface meets an obstruction, the carrying velocity is lost behind the obstruction. This causes the sand to be deposited. Such evidence can be seen in summer at many places along the dry sand part of the beach where sand is accumulating on the lee side of a log or some other object. Native vegetation and natural debris have naturally stopped enough sand to create a low beach ridge, but much of the sand was able to move past the ridge and enter the dune-building activity behind the shore (Lund 1973).

However, as described by Lund (1973):

> *"... with the introduction of European beach grass on the West Coast, the conditions along the shore underwent a pronounced and rapid change, and in the past 25 or 30 years a foredune has built up along the shore that has effectively shut off movement of sand from the beach at all but a few places along the Oregon coast..."*

The newly created foredune is a ridge of coalesced (grown together) hillocks superimposed on an earlier, low beach ridge. The hillocks nearest the beach stop most of the sand and continue to grow while the ones farther from the beach stay about the same size or grow slowly. During winter storms, waves reach the base of the foredune ridge and erode it back to an abrupt edge. Thus in places, banks several feet high are formed which block the inland migration of sand, increasing the effectiveness of the foredune as a barrier (Lund 1973). The Spit foredune is representative of the stabilizing affects of European beach grass (Beckham 2000).

With the foredune stopping the supply of sand to the dunes along most of the Oregon coast, the interior dunes are now consuming themselves. As the dune field narrows at the expense of the western sand supply, a deflation plain forms and expands. The deflation plain is caused by the vertical removal of loose sand to the point that the summer groundwater table is reached. The saturation of the sand makes it harder for wind to move it, increasing its stability in wind velocities. As erosion stops, vegetation propagates in the deflation plain. This zone at the western edge of the active dune belt or field thereby demarks the end of dune activity (Lund 1973). However, when stabilizing vegetation is removed from the dunes, the mobilization of sand can be reinitiated (Komar 2000).

Oceanic Process. Oceanic processes supply material to the beach front, circulate the sediment within the littoral (situated near a shore) cell, and are the cause of beach and dune alteration.

Along the Oregon Coast, waves tend to arrive from the southwest during the winter and from the northwest during the summer, corresponding to prevailing wind directions. As a result, there is a seasonal reversal in the direction of littoral drift (migration of sand within the oceanic process); north during the winter, south during the summer. The net littoral drift is the difference between these northward and southward sand movements (Komar 2000).

In general and with few exceptions, net littoral drift is zero due to the large rocky headlands that extend sufficiently into deep water to prevent sand and coarse sediment migration. On many coasts, sand spits grow in the direction of littoral drift. However, sand spits are documented in both north and south directions within zero net drift littoral cells (Komar 2000). Human made features such as jetties impact this sand migration, causing deposition behind the jetties, with accompanying erosion from other areas of the beach front. The Spit grew as sand accumulated southward (Beckham 2000).

The erosion mechanism of the oceanic process is aided by a number of systems, individually or in combination, such as raising ocean levels, storm energies, upland landslides, and rip current embayments (landward erosion of the beach, forming steeper sloped scallops in the beach front). It is estimated that currently the Oregon Coast is retreating by two feet per year (Orr and Orr 2000). The oceanic processes that supply sediment to create beaches, spits, ridges and dunes (foredunes) also supplies the energies needed to destroy and reshape these features.

Breaching and overwashes are common on spits and barrier islands along the East and Gulf Coasts of the United States, where the sea level is rising with respect to the land. Natural breaching of well established spits along the Oregon Coast is not common. The Northwest Coast is rising tectonically, and this probably accounts for the rarity of spit breaching (Komar 2000). However, northwest spit erosion was documented on the Siletz Spit where the foredune retreated a hundred feet within three weeks during winter storms in 1973 (Komar 2000).

Other events may deliver a series of waves related or unrelated to plate subsidence. These tsunamis, whether from a Cascadia Event, other distant plate movements, or submarine landslides, may deliver waves with sufficient height and energy to overtop the spit, relocating sand and dunes and creating breaches. Such effects were witnessed on the New River Spit from tsunamis delivered by the 1964 Good Friday Earthquake in Alaska (Komar et al. 1999). Large portions of the North Spit are within the tsunami runup boundary (Priest 1995a and 1995b).

European beach grass trapped the migrating sand causing the creation and elevation of the foredune thus greatly increasing the Spit's stability (Beckham 2000). The Spit's existence, alterations, and dynamics were created and are maintained by the manipulation of oceanic and eolian processes common to the Northwest Coast, and actions that alter these processes may potentially impact Spit dynamics. Grass removal may compromise the stability of the Spit, exasperating erosional conditions and potentially leading to overwash where dune elevations are sufficiently lowered.

Physical: Minerals

Silica

Historical investigations have been made as to the silica value of Spit sands. Production of silica sands from the Spit, used in glass manufacturing, was documented at 25,000 tons per year (Geitgey 1990). Preliminary studies indicate that the Spit may have mineral potentials for glass and foundry sands, (and other minerals), however current economics may not be sufficient for their development.

Physical: Coal Bed Methane, Oil and Gas

Coal Bed Methane (CBM) is a relatively recent resource, with development occurring within the last 20 years. Although considered an unconventional resource, it currently reflects 8% of the country's reserves. Potential economic reserves lie between 1,000 and 4,000 feet below

the ground. Surface coals have lost the CBM to atmospheric escape. Coal extraction can be developed after methane extraction; however, the depth, with current economics and technology, is usually beyond resource development. Removal of CBM does not reduce the energy capability of the coal bed.

The coal bed methane is held within the molecular structure of the coal, kept below vapor pressure by water confinement. This is different than natural gases and oils, which are formed from mature organics, separated from the source rock, and migrate to a trapping structure. In CBM extraction, the drilling first encounters water within the coal seam. As this water is removed, the pressure is reduced, releasing the methane from the coal seam. This is then collected from a wellhead system (Pappajohn 2002).

Geologic mapping indicates that the Spit is located within the Coos Basin, which includes numerous coal and organic bearing formations. It is inferred that the Spit is underlain by the Coaledo Formation, consisting of coal bearing sediment beds (Madin et al. 1995). Currently, mineral leases have been granted by DSL for the exploration and mineral extraction of submerged lands adjacent to the Spit. While speculative, the potential for oil and gas development does exist under the Spit. Historically, oil and gas leases were issued on the Spit (Fritz 1992).

The BLM has a well developed mineral leasing program, and the Spit lands maintain a "No Surface Occupancy" (NSO) and "Controlled Surface Use" (CSU) for leaseable minerals. The lands have been withdrawn from location and entry for locatable and salable minerals. Leaseable, locatable, and salable minerals are difficult to list because the history of the law has resulted in a definition of minerals that includes economics of minerals. As an example, sand can be considered as a "salable" material, sold by competitive and noncompetitive sales by the unit for construction. Sand can also be claimed under the locatable laws because of the economically valuable silica component of sand, provided the silica content is sufficient to meet an "uncommon" mineral definition.

Biological: Vegetation

Botanical Surveys

Inventory of the flora of the Spit is incomplete (Appendix 1). Only four botanical surveys were conducted on the Spit. In 1989, an informal vascular plant survey was conducted for a small portion of the western shore of the Spit between the North Bay Aquaculture Facility and the site of the 1892 US life-saving station (Stansell 1989). In 1998, a sedge (Carex spp.) survey was conducted as part of a Challenge Cost Share project (Zika et al.1998). In 2003, BLM staff prepared a preliminary map of the vegetation alliances (see below). A vegetation alliance is a plant association based on the National Vegetation Classification System, a hierarchical classification designed to standardize vegetation classification in the United States. In 2004, BLM staff conducted a survey of the 80 acre BLM parcel located south of the Trans Pacific Lane (Sperling 2004).

The vegetation alliances of the Spit were mapped using June 1999 aerial photography and ground-truthing. Alliance polygons were digitized and represent vegetation classes as defined by the National Vegetation Classification Standard (The Nature Conservancy 1994). They are similar to the plant associations found in the ODNRA (Christy, Kagan, and Wiedemann 1998). The five vegetation classes on the Spit and their overall percentage are as follows: forest (25%), woodland (2%), shrubland (17%), dwarf-shrubland (trace %), and herbaceous (32%). Approximately 24% of the Spit is not vegetated, but is characterized by open sand, disturbed areas, blacktop, and open water.

Further refinement of the vegetation map is needed, however some characteristics can be described. The Spit forest and woodland areas commonly include shore pine (*Pinus contorta* ssp. *contorta*) and Sitka spruce (*Picea sitchensis*). The shrubland is characterized by salal (*Gaultheria shallon*), evergreen huckleberry (*Vaccinium ovatum*), willow (*Salix* spp.), wax myrtle (*Morella californica*), sword fern (*Polystichum munitum*), European beach grass (*Ammophila arenaria*),

rhododendron (*Rhododendron macrophyllum*), coyote brush (*Baccharis pilularis*), and Scotch broom (*Cytisus scoparius*). The dwarf-shrubland is composed of bog blueberry (*Vaccinium uliginosum*) and tufted hairgrass (*Deschampsia caespitosa*). The herbaceous community includes salt rush (*Juncus lesueurii*), slough sedge (*Carex obnupta*), Pacific silverweed (*Argentina egedii*), seashore lupine (*Lupinus littoralis*), beach morning-glory (*Calystegia soldanella*), beach silver-top (*Glehnia littoralis*), American bluegrass (*Poa macrantha*), American dunegrass (*Leymus mollis*), floating-leaved pondweed (*Potamogeton natans*), and European beach grass (*Ammophila arenaria*). The salt water marsh is a type of herbaceous community and is characterized by pickleweed (*Salicornia virginica*), fleshy jaumea (*Jaumea carnosa*), and salt grass (*Distichlis spicata*).

Botanical Resources

The Spit marks the southern limit of the subarctic beach flora and the northern limit of the dry Mediterranean beach flora (USDI BLM 1994). It has approximately 75 nonvascular and over 140 vascular plant species (Appendix 1). Additional species will undoubtedly be discovered as the area is botanically explored and a systematic survey is conducted. As a comparison, about 260 vascular plant species are reported from the adjacent ODNRA (Christy, Kagan, and Wiedemann 1998).

Four sites within the ODNRA (South Horsfall Campground, Tenmile Creek Research Natural Area, Umpqua Lighthouse State Park, and Eel Creek) located directly north of the Spit have been identified as having ecological cells and special species unique to the Coast Range Ecoregion (Natural Heritage Advisory Council 2003). Similar cells and species are present at the Spit.

One globally significant community on the Spit is the unstabilized coastal dune wildrye and beach pea vine (*Leymus mollis* ssp. *mollis – Lathyrus japonicus*) community. The Natural Heritage Program uses a prioritization system for determining global significance of plant communities (Kagan et al. 2004). Globally, species are ranked from 1-5 based on the number, quality, and condition of the occurrences; the narrowness of range; the trends in populations and habitats; and the threats to and the fragility of the element being assessed. The wildrye and beach pea vine community is a G1 plant community that is considered critically imperiled globally with typically five or fewer occurrences (Kagan et al. 2004). This community type was likely much larger on the Spit prior to the 1930s. Currently, only isolated patches remain and are threatened by invasion of European beach grass. The occurrence of this unique plant community on the federally managed lands on the North Spit is important to the conservation of the community. The District's RMP calls for recognition, protection, and restoration of unique special habitats (USDI BLM 1995).

Special Status Species

Twenty-two special status plant species within the Bureau sensitive and assessment categories are located on BLM lands on the Spit. These include nine vascular plant species and thirteen nonvascular plant species (Table 4). Populations of the two vascular Bureau sensitive species, the pink sand verbena (*Abronia umbellata* ssp. *breviflora*) and the Point Reyes bird's-beak (*Cordylanthus maritimus* ssp. *palustris*), are discussed below.

Pink sand verbena is a federal species of concern, is listed as endangered by the State of Oregon, and is a Bureau Sensitive species. This annual herb historically occurred from British Columbia, Canada, to Marin County, California. It is believed to be extirpated from Washington; two plants were observed in 2000 on Vancouver Island. Habitat for pink sand verbena includes sandy beaches above the high tide line and possibly dunes further inland. The primary threats to pink sand verbena are loss of habitat from the encroachment of European beach grass and disturbance from OHVs. In 1993, a population of this species was established on the Spit on COE land within a Western snowy plover Habitat Restoration Area (HRA). The practice of removing European beach grass each year to promote open sand habitat for nesting plovers has benefited the pink sand verbena. The population has gradually increased in number and aerial extent. In 2003, over 111,500 reproductive plants were documented within the COE lands. The population now extends onto neighboring lands outside of the HRA enclosure.



Pink sand verbena.

Point Reyes bird's-beak is a federal species of concern, is listed endangered by the State of Oregon, and is a Bureau Sensitive species. Historically, this annual, hemi-parasitic herb occurred along a 900 mile section of coastline, from Netarts Bay, Oregon, south to Morrow Bay, California. Today, it is known only from Netarts Bay, Yaquina Bay, and Coos Bay. The primary threat to the Point Reyes bird's-beak is habitat loss from development, OHVs, and water pollution from petroleum spills. A population of the species is located on the bay side on lands managed by the Port and BLM (Map 3). The 2001 population at Spit was estimated at about 20,000 plants.

Table 4. Bureau sensitive and assessment plant species documented (D) and suspected (S) on the North Spit by scientific name, common name or group, presence, status, and habitat. Bureau tracking species are noted in Appendix 1. Note: BA = Bureau assessment, BS = Bureau sensitive, SE = State Endangered, and SoC = Federal Species of Concern.

Scientific Name (Common Name or Group)	Presence	Status	Habitat
Vascular Plants			
Abronia umbellata ssp. *breviflora* (pink sandverbena)	D	BS, SoC, SE	Coastal beaches and dunes
Brodiaea terrestris (dwarf brodiaea)	S	BA	Stabilized dunes
Carex brevicaulis (short-stemmed sedge)	S	BA	Stabilized dunes and meadows
Cicendia quadrangularis (timort)	S	BA	Coastal wetlands, valley grasslands, northern oak woodlands, foothills, and woodlands
Cochlearia officinalis (spoonwort)	S	BA	Coastal headlands
Cordylanthus maritimus ssp. *palustris* (Point Reyes bird's-beak)	D	BS, SoC, SE	Salt marshes
Hydrocotyle verticillata (whorled marsh pennywort)	S	BA	Swampy ground, lake margins, and wetlands
Limonium californicum (western marsh-rosemary)	D	BA	Salt marshes
Ophioglossum pusillum (adder's-tongue)	S	BA	Marsh edges, low pastures, grassy roadside ditches, and coastal wetlands

Scientific Name (Common Name or Group)	Presence	Status	Habitat
Nonvascular Plants			
Bryoria pseudocapillaris (Lichen)	D	BS	Rock, conifer bark, and Sitka spruce in exposed coastal headlands
Bryoria spiralifera (Lichen)	D	BS	Shore pine and Sitka spruce in coastal habitats, often with *Ramalina menziesii*
Bryoria subcana (Lichen)	S	BA	Bark and wood of Sitka spruce, Western hemlock, Douglas-fir, and hardwood forests along coastal bays, streams, and dune forests within 30 miles of ocean
Diplophyllum plicatum (Liverwort)	D	BA	Tree boles of old-growth western hemlock, western red cedar, and Douglas-fir
Erioderma sorediatum (Lichen)	D	BA	Ericaceous shrubs in coastal forests, documented at North Spit and Eel Creek Campgrounds (ODNRA)
Heterodermia leucomelos (Lichen)	D	BA	Spruce and shore pine branches on forested headlands in the coastal fog zone
Leioderma sorediatum (Lichen)	D	BA	Thin moss mats on rhododendron and huckleberry branches near coast, documented at North Spit and Eel Creek Campground (ODNRA)
Ramalina pollinaria (Lichen)	S	BA	Coastal, reported from New River ACEC
Rhizopogon exiguous (Fungi)	S	BS	Coastal, known site at Mapleton, hypogenous fungi in coniferous forests
Sulcaria badia (Lichen)	S	BA	Hardwood, conifer bark, and spruce branches in lowlands, valley fringes, and coast, 300-600 m
Teloschistes flavicans (Lichen)	S	BA	Coastal forests, shore pine and Sitka spruce
Thaxterogaster pavelekii (Fungi)	S	BS	Coastal forests in Washington, Oregon, and California
Triquetrella californica (Moss)	S	BA	Exposed to shaded soil, rocks, or sand in coastal shore pine and Sitka spruce

Exotic and Noxious Weed Species

Approximately 24 exotic or non-native plant species occur on the Spit (Appendix 1). Additional exotic species are expected as the area is botanically explored and a systematic survey is conducted. Exotic plants are those that did not occur before the arrival of European culture, are not indigenous to a given area, occur as a result of introduction, or have escaped from gardens and become naturalized. Some exotic species are pioneer plants that are normally limited to a single generation before a dense cover of other native plants develop. Others, like European beach grass, colonize or invade a habitat by vegetative reproduction and exclude native species. Invasive plants displace native vegetation and consequently may diminish habitat quality for wildlife. Invasive weedy species at the Spit are found primarily in terrestrial habitats.

The history of European beach grass exemplifies the impact of an exotic species. During 1891-93, rooted plants were hand planted by the COE in an effort to reclaim the Spit (Beckham 2000). Between 1910 and 1934, additional plantings were also made along the southwestern Oregon coast (McLaughlin and Brown 1942). European beach grass now covers approximately 19% of the Spit. It is found in pure stands, intermixed with other herbaceous species, and as an understory associate

within forest and woodland communities. European beach grass reduces the native plant richness (the number of species) by as much as half (Barbour and Johnson 1988). It has the ability to out compete native foredune plant species (Barbour, Dejong, and Paulik 1985) by altering the habitat (Pickart, Brown, and Avery 1990). Blowing sand is trapped, burying other species and precluding resource competition. European beach grass can withstand sand burial of up to one meter per year. In fact, sand burial promotes leaf elongation and underground stem development (Ranwell et al. 1959). Runners in the root system are the primary means of beach grass reproduction. Despite high seed production of up to 20,000 seeds per plant per year, most beach grass seedlings die within a few weeks of germination (Huiskes 1979). Significant differences are seen when comparing areas dominated by European beach grass with those covered by native dune species, such as American dunegrass. Foredunes dominated by European beach grass are steep and give way to a series of dunes and swales parallel to the coast. In contrast, dunes dominated by American dunegrass rise gradually and lead to dunes and swales perpendicular to the coast (Barbour and Johnson 1988).

Some exotic plant species are designated as noxious weeds by the state's Noxious Weed Control Program. Noxious weeds are considered injurious to public health, agriculture, recreation, and wildlife on any public or private property by the (Oregon Department of Agriculture 2003). The seven noxious weeds present or suspected at Spit include: Scotch broom (*Cytisus scoparius*), French broom (*Genista monospessulana*), common gorse (*Ulex europaeas*), Himalayan blackberry (*Rubus armeniacus*), English ivy (*Hedera helix*), Canadian thistle (*Cirsium arvense*), and bull thistle (*C. vulgare*). Methods to remove noxious weeds on the Spit may include herbicides, mechanical means, hand cutting and pulling, and the application of fire.

Timber and Special Forest Products

The Spit was designated as a non-commercial forest in the RMP. Consequently, no commercial timber management occurs on the Spit. No commercial harvest of Special Forest Products is permitted within the North Spit ACEC unless the harvest benefits the ACEC or clearly does not impact any special status plants or animals (USDI BLM 2003b).

Biological: Wildlife

The BLM is responsible for managing habitats of all existing native vegetation and wildlife species on BLM land. Therefore, wildlife management on the Spit focuses on the management of habitats for native wildlife species (Appendix 2), with special emphasis on the protection of rare habitats and sites important to special status species (Table 5; see below).

Wildlife Habitats

A mosaic of habitats supports an abundant and diverse array of wildlife on the Spit. The interspersion of coastal environments and upland late-seral forest combined with the relative isolation of the Spit creates a very rich and productive wildlife area heavily used by shorebirds, waterfowl, raptors, and many other species (Northwest Biological Consulting; Appendix 2). Although not all the habitats described below are under BLM administration, wildlife species cross jurisdictional boundaries as they travel among habitats to forage or nest. Additionally, species using the Coos Bay estuary may be directly affected by adjacent uplands management, including recreational use of the Spit.

The Coos Bay Estuary. Including saltmarshes, open water, mudflats, and sandflats, estuaries are among the most productive environments in the world due to the dynamic interaction of riverine and marine systems (Buchanan et al. 2001). As interfaces between salt and freshwater and between terrestrial and aquatic habitats, they receive large influxes of nutrients from watersheds, marshes, and tidal action. Consequently, the habitats found in this environment support a rich wildlife community. The estuary supports some of the highest numbers of dabbling ducks using Coos Bay (Varoujean 1985) and a March 1992 aerial survey placed Coos Bay with the third highest waterfowl count on the Oregon coast (Oregon Wetlands Joint Venture 1994).

Salt marshes are an important component of estuarine ecosystems, providing roosting areas for shorebirds and gulls, and haul-out areas for harbor seals. Raptors, including bald eagles,

falcons, and hawks, hunt over the salt marsh, and use logs as resting or hunting perches (USDI BLM 1994). Approximately 90% of the salt marshes associated with the Coos Bay estuary were eliminated following European settlement (Buchanan et al. 2001), thus accentuating the value of the remaining marshes.

The open water habitats of the Coos Bay estuary include both shallow and deep water habitats used by many species of wildlife (USDI FWS 1980). Waterfowl and seabirds forage on fish and invertebrates, their numbers and species diversity varying throughout the year but highest during the spring and fall migrations. Bald eagles and osprey feed on fish and waterfowl using the Bay, and peregrine falcons hunt waterfowl and shorebirds during their spring and fall migration.

Harbor seals and California sea lions forage within the bay throughout the year and use the dredge material islands as haul-out sites. Occasionally they may be found resting on the Spit's beaches. Although foraging seals do not appear to be affected by activities on the Spit, they are very sensitive to disturbance on their haul-out sites.



Snowy Plover with chick.

Table 5. Special status wildlife species documented (D), suspected (S) and potentially (P) on the North Spit by name, presence, status, and habitat. Note: BA = Bureau assessment, BAO = Bureau assessment Oregon only, BS = Bureau sensitive, BSO = Bureau sensitive Oregon only, FE = Federally Endangered, FT = Federally Threatened, and FC = Federal Candidate.

NAME	Presence	Status	Habitat
AMPHIBIANS			
California Slender Salamander *Batrachoseps attenuatus*	S	BAO	Late seral forests, large down logs
REPTILES			
Northwestern Pond Turtle *Clemmys marmorata*	D	BSO	Lentic water (ponds, slow sections of rivers) Nests in open areas adjacent to water, can overwinter in forest
BIRDS			
Arctic Peregrine Falcon *Falco peregrinus tundrius*	D	BS	Cliffs, may perch in trees
American Peregrine Falcon *Falco peregrinus anatum*	D	BS	Cliffs, may perch in trees
Cacklin Goose *Branta canadensis leucopareia*	D	BS	Coastal grasslands
Dusky Canada Goose *Branta canadensis occidentalis*	D	BSO	Open grasslands, wet meadows
Bald Eagle *Haliaeetus leucocephalus*	D	FT	Large trees for nesting/perching, near water
Bobolink *Dolichonyx oryzivorus*	D	BAO	Grasslands, open areas
Brown Pelican *Pelecanus occidentalis*	D	FE	Forages off shore, uses jetties and beaches to roost
Marbled Murrelet *Brachyramphus marmoratus*	D	FT	Late-seral forest, remnant large trees
Oregon Vesper Sparrow *Pooecetes gramineus affinis*	D	BSO	Grassland
Purple Martin *Progne subis*	D	BSO	Large remnant trees and snags, near water, edges
Streaked Horned Lark *Eremophila alpestris strigata*	D	FC	Coastal dunes; open ground with short grass or scattered bushes
Trumpeter Swan *Cygnus buccinator*	P	BAO	Marsh, wet meadows, bogs, ponds
Upland Sandpiper *Bartramia longicauda*	D	BSO	Coast; open grasslands
Western Snowy Plover *Charadrius alexandrinus nivosus*	D	FT	Beaches and inland areas of open sand
White-tailed Kite *Elanus leucurus*	D	BAO	Pastures, open grasslands; typically low elevations
MAMMALS			
Fisher *Martes pennanti*	P	FC	Closed or multi-canopy forest, snags, dead parts of live trees, large live branches
Townsend's Big-eared Bat *Corynorhinus townsendii*	P	BSO	Breed in caves and mines, bridges for night roosts
INVERTEBRATES			
Salamander Slug *Gliabates oregonius*	P	BSO	Moist coniferous forest with leaf litter
Spotted Tail-dropper *Prophysaon vanattae pardalis*	P	BSO	Moist, mature forests
Newcombs Littorine Snail *Algamorda newcombiana*	*P*	BSO	Saltwater at edge of bays and estuaries

Mudflats and sandflats are found on the Spit's bay side. These areas are tidally-inundated, and support an abundance of marine invertebrate species, including many of the most productive shellfish beds on Oregon's south coast (Northwest Biological Consulting 1980). These sandflats and mudflats also provide foraging habitat for a variety of birds and mammals. Resident and migrant shorebirds congregate there, especially during low tides, to forage on the invertebrates in the shallow waters and exposed mudflats (Varoujean 1985). Coos Bay is one of the six most important areas for shorebirds between San Francisco Bay and British Columbia (Oregon Wetlands Joint Venture 1993) and the Spit's mudflats consistently support the greatest number of wading birds in the Coos Bay estuary (Varoujean 1985). The concentration of shorebirds and wading birds in these habitats provide prey for bald eagles, northern harriers, and peregrine falcons, and ravens, gulls, raccoons, mink and skunks forage in the shallow waters and exposed flats for shellfish, invertebrates and carrion.

Jetties. The Jetty and the training jetty on the southern tip of the Spit provide roosting habitat for gulls and cormorants, and shorebirds (e.g., turnstones and surfbirds) forage on invertebrates inhabiting the rocks (Map 3). Flocks of California brown pelicans, a federally-listed endangered species, use the jetties for roosting and feeding (Northwest Biological Consulting 1980).

Beaches and Sand Dunes. Aquatic and terrestrial invertebrates, fish, and carrion found on the beach provide a rich food source which attracts a variety of wildlife species. Shorebirds are among the most abundant groups using the beach habitats, and are an important food source for raptors, particularly peregrine falcons during their fall and spring migration along the Oregon coast (Wilson-Jacobs 1983). Shorebirds forage primarily on the beaches and mudflats and eat insects, shellfish, and other marine invertebrates. The threatened Western snowy plover also nests on the upper beach, laying its eggs in small hollows (scrapes) above the high tide line and behind the foredune. After hatching, the flightless chicks forage in the vicinity of the nest sites until they fledge. In combination with the inland sandy sites east of the foredune, the Spit provides nesting habitat for the largest breeding population of coastal snowy plovers in Oregon (USDI FWS 1993). Larger birds such as gulls, terns, ravens, and crows feed opportunistically along the shoreline on a variety of shellfish, carrion, insects, eggs, and chicks, and often rest in large flocks at the ocean's edge. In addition to peregrine falcons, several other raptors occur on the Spit, including bald eagle, osprey, northern harrier, and turkey vulture. Most raptor species forage opportunistically on both live animals and carrion found on the beach. Terrestrial mammals that forage along the beach for shellfish, carrion, and invertebrates include raccoons, mink, skunks, gray foxes, opossums, and various small rodents. Although less frequently than other animals, black bears, bobcats, Roosevelt elk, and black-tailed deer feed on the beach too, and drift logs washed up onto the beach are used as foraging and resting perches for falcons and as windbreaks by roosting shorebirds (Buchanan et al. 2001).

Inland sand dunes with little or no vegetation are used extensively by certain species of terrestrial insects, primarily beetles, centipedes, and millipedes. Flying insects found just off the surface of the sand are common and fed upon heavily by barn swallows. The small amount of hiding cover in the open sand renders prey species vulnerable, thus making these areas valuable foraging habitat for many predators, including raptors (e.g., northern harriers and kestrels), gray foxes, coyotes, and other species that eat insects, rodents and reptiles. Crows, ravens, turkey vultures, and other birds use the dunes for resting and foraging, and burrowing owls have been documented foraging and roosting in the open sand during the winter (USDI BLM 1994).

In contrast to the homogeneity of the open sand dunes, stabilized sand communities are quite variable, ranging from sparsely vegetated areas with scattered beach grass hummocks, to habitats with more developed plant communities dominated by dense beach grass containing scattered clumps of shrubs and conifers (see Botanical Resources). The amount of cover and available prey or plant foods determine which species occur in these habitats. Black-tailed deer and rabbits occur throughout these communities, and passerine bird species feeding on plant seeds and insects take cover in the dense shrubbery. Mammalian predators such as skunks, foxes, coyotes, raccoons, mink, and bobcats prey on small mammals, birds, eggs, reptiles, and insects in and under logs deposited by winter storms.

Sparsely-vegetated hummock areas are used for foraging throughout the year by northern harriers, red-tailed hawks and bald eagles (USDI BLM 1994) and shrubs and logs are used as perch sites. Raptors use all of the stabilized sand habitats, but the sparsely-vegetated areas are believed to provide better hunting because small mammals and reptiles are more vulnerable to attack by aerial predators.

Freshwater Wetlands and Ponds. The freshwater wetlands of the deflation plain support a diverse wildlife community and are some of the most productive habitats on the Spit (Wilson-Jacobs 1983). Ranging from areas dominated by grasses and sedges to tall shrub thickets, the wetlands are used by many wildlife species to fulfill all or a portion of their habitat requirements. Wetlands provide critical breeding and rearing habitat for amphibians, including red-legged frogs and numerous invertebrates provide prey for various species of wildlife.

The structurally diverse low shrub and thicket habitats contain the highest number of species in the wetland environment (USDA FS 1972). Muskrats, voles, rabbits, and other small mammals find food and shelter in the diverse vegetation and vertical structure of these areas. Predatory mammals (including shrews, mink, skunks, bobcats, foxes, and coyotes) forage on invertebrates, amphibians, birds, and small mammals, and during the spring and summer, bats forage extensively on flying insects.

A combination of structurally complex habitat features and an abundant variety of available food sources support a variety of bird species. Waterfowl, shorebirds, passerines and raptors nest or forage in the freshwater wetlands, and migratory birds rest and feed there while traveling. Approximately one-third of all North American bird species depend upon wetlands during some part of their life, and approximately three-quarters of these species are non-game birds whose ecological significance is poorly understood (USDI FWS 1984).

Ponds provide areas of open water adjacent to the more heavily vegetated freshwater shrublands and thickets, and support a community of aquatic invertebrates, fish and amphibians. Many of the species inhabiting the ponds are important food sources for other animals. Although the inland open water sites of the Spit are not considered high quality nesting habitat for most species of waterfowl, they are used for foraging by a variety of migrating waterfowl during the spring, fall, and winter (Thornburgh 1991).

Forests. The shorepine and Sitka spruce forests found on the eastern edge of the deflation plain constitute the habitat with the greatest structural complexity on the Spit; on the adjacent ODNRA, this type of habitat supported the greatest diversity of wildlife species (USDA FS 1972). The trees, snags and down logs not found in other plant communities on the Spit provide important breeding, foraging, and cover habitat for a variety of wildlife species. Upland amphibians (e.g., the western redback salamander and ensatina) seek cover in down logs, and many bird species (including raptors, woodpeckers, and passerines) nest and forage in these habitats. In past years, the stand of late-seral Sitka spruce on BLM land contained the largest mixed heronry of great blue herons and great egrets on Coos Bay (Northwest Biological Consulting 1980). That heronry was abandoned in 2000 for unknown reasons. Two new rookeries were subsequently discovered: one on the ODNRA in 2002 and one on BLM in 2004. It is possible that these heronries may contain birds from the abandoned site. Coos Bay is the most northerly nesting site for great egrets.

Wildlife Species of Special Management Concern

The interface of the marine, freshwater, and terrestrial environments described above provides habitat for many special status wildlife species (SSS Table 5). Several are dependent upon snags, large trees, and coarse woody debris: habitat elements characteristic of older forests that have become limited in availability and distribution throughout Western Oregon. Others are associated with wetlands, or habitats uniquely identified with areas of open sand and coastal grasslands. In addition to SSS, special management provisions are in place for the conservation of other species collectively termed Buffer Species. Specifically, BLM is directed to establish protective buffers around the nests of great blue herons, great egrets, and certain raptor species such as ospreys, red-tailed hawks, sharp-shinned hawks, and Cooper's hawks (USDI BLM 1995a). Depending upon

the species, up to 15 acres may be delineated near nest sites to minimize human disturbance, and nest platforms, boxes and other structures may be constructed where natural availability is low. Management for great blue herons and great egrets includes monitoring known rookeries and surveying appropriate habitat for new ones.

Little is known about the distribution and abundance of most of these species on the District; consequently much of the information related to wildlife on the Spit is based on literature pertaining to wildlife-habitat associations and incidental observations. As discussed above, in the absence of site-specific information, recreational and other activities are managed to minimize effects to wildlife habitats thus minimizing potential impacts to species. When assessing the effects of a proposed project, species are assumed present given the availability of suitable habitat. Special status species that are designated as "potentially" present on the Spit are those for which suitable habitat is present but no individuals have been documented (Table 5). One such species is the Pacific fisher, a Federal Candidate for listing under the ESA. Consequently, there is heightened concern for their population status and conservation needs.

In Oregon, fishers appear to have been extirpated from their historical range with the exception of two small disjunct populations in the Siskiyou Mountains and in the southern Cascade Range (Aubry and Lewis 2003). Although possible, the presence of fisher on the Spit is unlikely given the rarity of the species and the lack of large, well-connected tracts of mature forest with continuous canopies. Most forested areas on the Spit are interspersed with areas of open sand and research indicates that fishers are reluctant to cross openings greater than 25 meters (Powell and Zielinski 1994). Furthermore, fishers on the Spit would be separated from Coast Range populations by Highway 101, human developments, and fragmentation of mature forest. It is uncertain the extent to which fishers can recover from extirpation given that their populations are isolated and their apparent inability to colonize unoccupied areas (Aubry and Lewis 2003).

The Coos Bay District wildlife sightings database contains several fisher observations in Coos County; none of these sightings were in the vicinity of the Spit. Remote camera surveys for fisher in other parts of the District between 1994 and 1997 failed to detect fishers. Efforts are underway to further refine the species' distribution in Oregon.

Several other species of interest are discussed below.

Marbled Murrelet and Bald Eagle. The occurrence of large diameter trees with large branches in close proximity to the ocean renders the Spit suitable for marbled murrelets and bald eagles. Limited surveys for murrelets were initiated in 2005, and surveys for bald eagles conducted in the area by the Oregon Cooperative Wildlife Research Unit have not documented nesting eagles on BLM land. The area is suitable for roosting and hunting, and eagles are occasionally seen foraging on Spit beaches.

Purple Martin. Purple martins are the largest members of the swallow family in North America. They forage above many types of open habitats, particularly near water and nest in snags with cavities. They were once much more common in Oregon prior to the removal of snags by logging and competitive exclusion from the remaining snags by introduced European starlings (Sharp 1996). Oregon nest sites include snags in forest clearcuts and burns and snags in coastal dunes (Rodenkirk 2003). Suitable nest trees occur on the Spit, many located near ponds and wetlands in close proximity to the bay and ocean beaches. In addition to natural structures, purple martins readily nest in bird houses. Currently, there are 24 nest boxes on pilings in the bay near the boat launch facility (Map 3). Twenty-one of these boxes were used by purple martins in 2004. The boxes are maintained and monitored yearly.

Peregrine Falcons. The American peregrine falcon (*Falco peregrinus anatum*) and the Arctic peregrine falcon (*Falco peregrinus tundrius*) require cliffs for nesting but may be found perching in trees while hunting or migrating. Whereas the Arctic peregrine is an occasional winter migrant, the American peregrine nests on the Coos Bay District and may occasionally be seen on the Spit while hunting or migrating.

Northwestern Pond Turtle. One of two freshwater turtles of the Pacific Northwest, the northwestern pond turtle is in decline in Oregon because mortality exceeds reproduction for a number of reasons. Threats include habitat loss and degradation, which in conjunction with predation and disease, has led to small disjunct populations with low recruitment rates (Marshall et al. 1996). Western pond turtles may inhabit a variety of aquatic habitats providing that suitable sites are available for basking (e.g., logs, rocks, and islands) and there is sufficient aquatic and emergent vegetation. Mud substrates and leaf litter are important components for breeding and hibernating, as are shallow bank margins for traveling between the water and the adjacent upland (O'Neil et al. 2001). A western pond turtle was documented on the adjacent ODNRA. Wetlands on BLM land likely contain western pond turtles.

Western Snowy Plover. The coastal population of the Western snowy plover uses sandy beaches along the Pacific Coast from southern Washington to Baja California for breeding and wintering. It receives the highest priority for management on the Spit due to its low population numbers and the significance of the Spit as nesting habitat. In 1993, the coastal population of the Western snowy plover was listed as a Federally threatened species due to declining population numbers and loss of nesting habitat (USDI FWS 1993).

In February 1999, the ocean freighter New Carissa grounded on the Spit and began leaking oil. To ensure public safety, the Spit was closed through an emergency order to public access. At the end of 1999, two portions of the New Carissa wreck remained mired, releasing oil and depositing tar balls (Map 3). To address concerns related to impacts on snowy plovers, BLM, FWS, ODFW, and COE collaborated on a Biological Assessment to allow public use of the Spit while protecting plovers and promoting their recovery (USDI BLM 2000). The following ongoing actions are a result of the subsequent Biological Opinion for management of federal lands on the North Spit of Coos Bay (USDI FWS 2000).

Public Access and Snowy Plovers. From the FAA Tower south to the BLM boundary, the upper, dry sand portion of the beach is closed to all public access during the Western snowy plover nesting season (March 15- September 15 annually; Map 3). The area is clearly marked with ropes and signs. Restrictions on motorized use of the adjacent lower, wet sand area are authorized by OPRD. Inland snowy plover nesting areas on BLM land are also signed closed to all use during the nesting season, and are open to nonmotorized use the remainder of the year.

Habitat Restoration Areas. Approximately 170 acres of the inland Spit area are managed for snowy plovers; 100 acres by COE and 70 acres by BLM. The Habitat Restoration Areas (HRAs) were largely unsuitable for plovers prior to restoration due primarily to the presence of European beach grass. BLM annually removes beach grass to create suitable open, sandy habitat for snowy plovers. No new HRAs are currently planned.

Predator Control. In 2000, the BLM led a multi-agency effort to produce an EA on predator control throughout the range of the coastal population of snowy plovers (USDA FS and USDI BLM 2002). The selected action consists of an integrated predator damage management program to protect the plover population from further decline. Actions were initiated in 2003 and include an expanded assessment to determine and reduce the predator species responsible for nest, chick, and adult predation. The Animal Plant and Health Inspection Service (APHIS) conducts these activities. Targeted species include American crows, common ravens, and small mammalian predators. Most traps are located in areas closed to the public (e.g., the HRAs and the upper beach), clearly signed, and unlikely to cause injury to domestic animals and humans.

Population Monitoring. The Oregon Natural Heritage Information Center monitors plover nesting. Intensive surveys are conducted throughout the six month nesting season to determine population size and reproductive success. All chicks are banded for identification and an attempt is made each year to locate them to assess survivorship and track their productivity. From this information, it was determined that the Spit contains the most productive snowy plover population segment on the Oregon Coast. Since 1990, the Spit has produced over 40% of all plovers

fledged each year in Oregon (Lauten et al. 2003). Through intensive monitoring, the success of management actions can be assessed and progress toward plover recovery determined.

Designated Snowy Plover Critical Habitat. On December 7, 1999 the FWS published a Final Rule designating critical habitat for the Pacific coast population of the Western snowy plover (USDI FWS 1999). Critical habitat on the Spit includes the ocean beach from Horsfall to the Jetty and all of the federal lands at the south end of the Spit.

Other Planning Efforts for the Snowy Plover. The FWS is preparing a final recovery plan for the Pacific Coast population of the western snowy plover in Washington, Oregon, and California. OPRD has a leading role in managing plover habitat in Oregon. To guide beach management, it is preparing management and conservation plans (ORNIC and OPRD 2004; OPRD 2004). BLM will implement the final plans on BLM lands.

Biological: Fisheries

No fish surveys have been conducted on BLM lands on the Spit. Potential fish-bearing waters on BLM lands occur above the mean high tide. They include natural ponds and a created mitigation pond and wetland to the north of the effluent lagoon (see Water Resources). These areas are likely to contain introduced largemouth bass, other sunfish species, such as bluegill, and threespine stickleback. There are no SSS fish species on BLM land on the Spit due to lack of suitable habitat.

Cultural and Historical Resources

Social and Historical Setting

Before the introduction of European beach grass, the North Spit of the Coos River was highly unstable and subject to major changes during the heavy winds of summer and winter (Beckham 2000). At least two river channels cut through the Spit, turning a portion of the area into an island during much of the year (Pullen 2004). Despite these changes, historical records indicate the area was heavily utilized prehistorically.

The North Spit of Coos Bay was an ideal place for a wide variety of food procurement for native peoples. The Coos Indians built fish weirs along the shore to catch salmon, gathered clams and crabs at low tide, hunted for deer, elk, and waterfowl in the Spit's marshes, and gathered various types of berries that grew abundantly along the edges of the marshes (Peterson and Powers 1977; Zenk 1990).

In the 1940s, John Harrington was able to obtain information about villages on the Spit while interviewing elders of the Coos Indian tribe. Prior to the changes introduced by American exploration and settlement, there were at least half a dozen villages along the inner shoreline of the Spit, although their locations are not precisely known (Zenk 1990). There are also undoubtedly native burial sites or cemeteries on the Spit, as the Coos people usually buried their dead within or adjacent to their villages (Zenk 1990).

Between 1820 and 1850, British and American trappers camped up and down the coast. Documented parties camped on the Spit in 1826 and again in 1828 (Beckham 1986, 2000; Peterson and Powers 1977). Between this time and the beginning of Euro-American settlement in 1851, the Native population of the area was decimated by the spread of infectious diseases (Boyd 1999). In 1855, violence between settlers and Native Americans flared to the south along the Rogue River, resulting in a response by the US Army. Along with other southwest Oregon coastal groups, the Coos people were forcibly removed from their homes and relocated, first to Fort Umpqua near Reedsport, and then to a new reservation at Yachats in 1860 (Zenk 1990). In 1875, some of the survivors of this relocation were moved to the Coast reservation at Siletz, while others, refusing to be moved again, returned to their ancestral homelands around Coos Bay (Zenk 1990).

Located adjacent to the largest estuary between the Columbia River and San Francisco, the Spit served as an important transportation link between Coos Bay and settlements on the Lower Umpqua during the late 1800s. Wagons and stagecoaches traveled down the beach during low tide from Winchester Bay to a point across from Empire, where, weather permitting, scows carried the passengers across the bay (Beckham 1986, 2000). In the 1880s, Fred Jarvis took over the Coos-Umpqua stage route and established what is known as the Jarvis Landing Beach Road on the Spit.

As the industrial capacity of the fledgling coastal towns increased, so did the need to improve the harbor and the bar at the mouth of the bay. Roads were almost non-existent, and the only markets for fish, lumber, farm produce, and coal lay far to the south in San Francisco. However, traversing the Coos Bay bar was often a dangerous enterprise, and when the weather closed in, it could be months before safe passage was assured. This was an untenable situation for a community focused on water transportation for its goods. In 1880, the COE was awarded a contract to construct a jetty near Barview. By the fall of 1881, the jetty cribs extended 1,384 feet into the bay (Beckham 2000). Throughout the rest of the 1880s, the COE monitored the jetty and realized that further work was needed before the harbor mouth could be stabilized.

In 1890, at the southern tip of the North Spit the COE began construction of the North Jetty, a rock sea wall nearly two miles long (Beckham 2000). Government Works, a village of laborers and engineers, was built on pilings along the inner shoreline near the North Jetty construction site. An aggressive program of sand stabilization was begun by the COE along with jetty construction. Nearly 1,000 acres of European beach grass eventually was hand-planted to stabilize the dunes (Beckham 2000).

In 1892, a US life-saving station was built on the Spit to rescue sailors stranded by adverse weather conditions (Map 3). It was located on the bay side about two miles north of the harbor entrance. Between 12 and 16 families lived at the station during its peak use. The facility included a dock, workshops, and two crew buildings (Beckham 2000).

The ocean took a heavy toll on the Jetty. During the 1920s, Congress funded the construction of a South Jetty and the reconstruction of the North Jetty (Beckham 2000). Major reconstruction work was again completed on the North Jetty during 1939 and 1940, when a railroad was used to transport materials (Beckham 2000). The railroad route came around Jordan Cove and down the bay side, cut across the Spit at the dike road (along the south edge of the effluent pond), turned south through an unstabilized dune field and followed the foredune south around the southern tip of the Spit and ended at Government Works.

Concrete bunkers were erected along the Spit during World War II, in hopes of slowing the anticipated Japanese invasion of the West Coast. There were no recorded conflicts during WWII in the Coos Bay area.

Prehistoric Sites

Although considerable documentation supports the presence of numerous Native American sites on the Spit, only two sites are officially on record with the Oregon State Historic Preservation Office. Site 35CS26 was located between Jordan Cove and the North Slough. Site 35CS27 was reportedly along the inner shoreline on the southern end of the spit, but was never specifically located. A recent intensive survey of this shoreline failed to reveal any evidence of this site (Pullen 2004).

The Coos Indians unquestionably used the Spit for various activities. However, this area is very unstable and any remaining evidence could have been destroyed either by erosion or shifts in the river channel, or could have been covered by sand movement. Continued dumping of dredge spoils along the shoreline has further clouded the identification of prehistoric middens, as both types of deposits are largely composed of shells. Although there is little evidence of extant prehistoric archaeological deposits on BLM-administered land, the instability of the sand dunes on the Spit may uncover cultural sites in the future.

Historic Sites

Preservation and identification of historic sites is constrained by the potential for dynamic changes to the Spit landforms. Campsites used by trapping expeditions during the 1820s probably left little evidence, long since removed. However, the four month-long camp (Camp Castaway) created by the US Army survivors of the beached vessel *Captain Lincoln* in 1852 (Beckham 2000; Dodge 1898; Peterson and Powers 1977) may have left more substantial evidence.

The sand road across the Spit used by the Coos-Umpqua stage route isn't likely to have any remnants as the effluent ponds and South Dike Road have substantially altered the land surface on that part of the Spit. Initial Jetty construction transported jetty materials (piling and rock) via barge from Empire to Government Works. Subsequent reconstruction efforts involved creation of a railroad. Evidence of this railroad line has been found both under the present day Foredune Road and in open dunes near the intersection of the South Dike and Foredune Roads.

Other remnants of construction and reconstruction of the Jetty are likely to be concentrated in the area occupied by Government Works (Beckham 2000). Today, this area has largely been reclaimed by the Coos River, and is known as Half Moon Bay (Map 3).

The life-saving station retains historic interest, although most structures have been removed. Remnants of the dock remain, as do building foundations, walkways and other landscape improvements. Because there were numerous fatal shipwrecks during the station's operation there exists a possibility that a cemetery exists on the "tree island" just west of the station. This is a likely location for the cemetery because prior to sand stabilization by introduced European beach grass, this area was the only portion of the Spit with sufficient elevation to withstand winter storm wave action (Beckham 2000). Today, this "tree island" is densely vegetated and cultural site locations are unknown.

Nearby, three World War II vintage Quonset huts remain open to the public. These structures are over 50 years old, and therefore may be considered for inclusion onto the National Register of Historic Places.

Recreational Resources

The diversity of environments and landforms (dunes, wetlands, seasonal ponds, extensive ocean and bay beaches, forests, and meadows) that make the Spit valuable for wildlife also place these lands in demand for outdoor recreation. The value to these public lands for outdoor recreation is further amplified by its close proximity to one of the largest population centers on the Oregon Coast, Coos Bay/North Bend. Most of the private and Port of Coos Bay property on the Spit is zoned for development. It is reasonably foreseeable that these private and Port of Coos Bay parcels will eventually become closed to public access and recreation as further development occurs on the bay front. The public lands managed by the BLM on the Spit are destined to become the largest and most accessible tract of public green space available for the Coos Bay area communities.

In 1992, the BLM developed a boat launch facility and courtesy dock to provide access to the Coos Bay estuary on the Spit. This recreation complex includes a paved parking lot, flush restrooms, interpretive wayside exhibits, and facilities for a volunteer host. The boat launch facility was developed with funding from the Oregon State Marine Board (OSMB), Oregon Department of Fish and Wildlife, Coos County, and the Northwest Steelheaders.

In recognition of the site's value for outdoor recreation, the Spit was designated as a Special Recreation Management Area (SRMA) in the Coos Bay District Resource Management Plan in May 1995. Through the SRMA designation, the BLM made a long-term commitment to manage the Spit to sustain outdoor recreation and the experience opportunities these activities depend upon in a manner that is compatible with the conservation of the areas' wildlife and cultural resources. Recreation management projects completed by the BLM on the Spit include:

- Designation of routes and trails as open, limited, and closed for off-highway vehicle use through the 1995 Coos Bay District RMP and Coos Bay Shorelands Plan of 1995.
- Installation of visitor management signs within the Spit interior to manage OHV recreation and to protect wetland and snowy plover nesting habitat.
- Providing BLM law enforcement and Coos County contract law enforcement support as well as funding a visitor assistance/biological technician position to implement visitor services and resource protection patrols throughout the year.
- Inventory and preliminary planning for a 12-14 mile hiking and equestrian trail system.

Visitor Use

In the BLM's national recreation tracking data base, the Recreation Management Information System (RMIS), the North Spit reported 27,100 visits and 9,774 visitor days for the period of October 1, 2003 to September 31, 2004. These estimates were developed using electronic, seismic and laser counters at key locations. The counter numbers are recorded weekly in summer and monthly in winter. While counters may not be 100% accurate, they are a standard, valid method to collect visitor use data. There are counters at the boat ramp, one nearer to the jetty, and one on the South Dike Road. Visitor numbers from the counters show that in FY 2003, about 7,250 people used the restrooms at the boat launch, 13,100 vehicles entered the boat ramp, and about 420 boats were launched. Data from the counter near the Jetty shows the average number of vehicles per month at 200, or about 2, 460 vehicles per year. Using a visitor/vehicle estimate of 2.5 (based on a visitor survey in the summer of 2000), approximately 6,150 people travel the sand road out to the Jetty each year by 4-wheel drive or ATV.

Recreation Demand and Trend. Every five years, state park and recreation departments around the United States are required to conduct a statewide assessment of outdoor recreation demand, needs and trends to qualify for Federal Land and Water Conservation Fund Act grants. The Oregon Statewide Comprehensive Outdoor Recreation Plan for 2003-2007 (SCORP) offers the best view into outdoor recreation demand within the state on a region by region basis. BLM Manual 8332.08 – Recreation Area Management Plans encourages the use of SCORP data to obtain statewide and regional trends. The SCORP is the product of extensive phone and mail-in surveys of Oregon households as well as out-of-state residents from Washington, Idaho and California. Based on this statistically valid study, a number of observations can be made about the recreation potential on the North Spit:

- The North Spit offers good opportunities for six of the top ten highest demand recreation activities in the state. In ranking order these are: 1. Running/Walking for Exercise; 2. Walking for Pleasure; 3. Bird Watching; 4. Nature/Wildlife Observation; 5. Sightseeing; and 10. Ocean Beach Activities.
- Statewide, ocean beach-related activities rose significantly from 4.45 million user occasions in 1987 to 7.6 million user occasions in 2001. For the North and Central coastal regions, "beach activities" were the #1 growth activity from 1987 to 2002 (an increase of 2.7 million user occasions). On the South Coast, "beach activities" were the #2 growth activity during this same time period (an increase of 0.4 million user occasions).
- The #1 growth activity in the South Coast region was ATV recreation – up 144% (185,181 annual user occasions) from the 1987 survey estimates. This growth reflects the sharp increase in ATV sales over the last decade and the corresponding growth in off-highway vehicle recreation in the Oregon Dunes National Recreation Area – the premier dune riding location in the Pacific Northwest.
- The SCORP also identified the highest recreation priorities for the state on a region by region basis. Within the South Coast Region, residents responded that one of their top three recreation management priorities was to "Conserve Coastal Areas and Preserve Coastal Access for Recreation."

Ocean shore related recreational use was further studied by the Oregon Department of Parks and Recreation in 2001 as part of the Ocean Shore Management Plan. The Ocean Shore Recreational Use Study conducted by Oregon State University examined activities and management preferences of actual beach users during the summer of 2000. While the BLM does not directly manage the

thin strip of land that comprises the Ocean Shore Management Area, it does manage the dry sand and foredune adjacent to this area. Therefore, the data provides a good perspective into actual user behavior, values and activities within the ocean shore areas managed by both the BLM and OPRD.

- Within the South Coast Region, from the Umpqua River to the California border, the top 10 recreational activities among those surveyed were: Walking 93.2%, Scenic Enjoyment 81.9%, Picnicking 56.7%, Exercise 51.2%, Beachcombing 38%, Recreation Activities Involving Dogs 35.2% (highest rate on the coast), Driftwood Collection 26.4%, Birding 24.3 %, Kite Use 22.4% and Camping 16.8%.
- On a much more localized level, within Segment 5 of the South Coast Region- the 15 mile section from Ten Mile Creek to Coos Bay, the top activities were: Vehicle Use 54% (highest rate in the study), Relaxing 21%, Walking 16%, and Recreation Activities Involving Dogs 4%. The high rate of OHV use in this study is partially due to the fact that nearly 2/3 of this survey unit is within the popular riding areas offered in the ODNRA.

The Spit directly supports or provides immediate access to a wide variety of outdoor recreation activities, including most of the high demand activities identified in the SCORP and Ocean Shore studies. These activities include: hiking, walking/running, horseback riding, motorized boating, primitive dispersed camping, motor-vehicle touring/sightseeing, 4-wheel drive and ATV trail riding, picnicking and social gatherings, waterfowl and deer hunting, backpacking, berry and mushroom picking, outdoor photography, dog exercise and training, recreational shooting, ocean and bay shore fishing, crabbing, clamming, birding and wildlife viewing, surfing, sea kayaking, canoeing, and wind surfing.

The Spit has been an important local recreation resource for generations, supporting traditional uses such as beach combing, fishing, crabbing, clamming and surfing. Motorized use is a key element in supporting these activities on the spit.

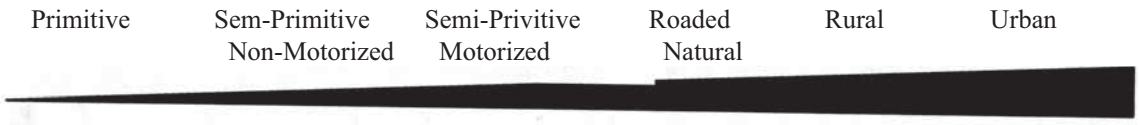
Since the 1995 Shorelands Plan was written, a number of new outdoor recreation activities have made an appearance in the region and are likely to find a place on the Spit. These include kite sailing, paint ball, geo-caching, sand boarding, and long distance hiking on the Oregon Coast Trail, to name a few. The public lands are generally open to any and all new recreation activities, unless and until adverse resource impacts occur or serious visitor conflicts develop.

Recreation Opportunity Spectrum

The concept of managing recreation opportunities and visitor experiences is a dominant theme throughout the objectives presented in the Coos Bay RMP. However, the actual details of which opportunities would be provided for and where they would occur are not well defined. The classification and management of recreation opportunities is typically accomplished through a planning process known as the Recreation Opportunity Spectrum or ROS.

The ROS provides a conceptual framework for the inventory, planning and management of the

Recreational Opportunity Spectrum



recreation resource setting and recognizes that people differ in their needs and in the outdoor experiences they desire. The ROS is used to classify lands into a range of recreation opportunity classes based on the physical, social, and managerial setting inherent in the landscape. Six opportunity classes are identified in this planning framework and range from the Primitive at one end of the spectrum to Urban at the other.

Applying this recreation planning framework to the current physical, social and managerial setting that exists on the Spit provides for two distinct recreation opportunity settings – Rural and Semi-Primitive Motorized. A strong theme heard from the public during the scoping process for this plan update was for the Spit to remain essentially unchanged from its current condition. The ROS is an excellent tool to ensure that landscapes and recreation settings do not undergo incremental changes that degrade the quality of the recreation opportunity that the place provides.

Rural Setting. The immediate area surrounding the developed North Sit Boat Ramp and the public lands within 100 feet of the paved section of the Trans Pacific Parkway fit well within the setting descriptions and management parameters common to a Rural ROS setting. The characteristics that comprise this setting include:

- The natural environment is culturally modified. The setting backdrop may range from locations where cultural alterations are not obvious to the casual observer to places where alterations are a dominant aspect of the landscape.
- For the visitor, self reliance on outdoor skills is of little importance in this setting and there is an expectation that recreation activities will involve very little challenge or risk.
- The opportunity to observe and affiliate with other users may be important to visitors in this setting. Interactions between users and evidence of other visitors may be high at times.
- The convenience of facilities to support outdoor recreation is expected by visitors.
- There are obvious and prevalent on-site controls (i.e., gated roads, barriers, fences, and regulatory signs).
- Access and travel facilities are designed to accommodate conventional motorized vehicle access.

Management objectives in this setting are intended to provide an environment that is natural appearing while providing easy access to recreation opportunities. Objectives for recreation management within a Rural ROS setting include the following:

- Access to recreation opportunities for people with disabilities is “easy” and meets Americans with Disabilities Act (ADAAG) standards.
- Some facilities are designed primarily for user comfort and convenience. Synthetic materials may be used in fabricating facilities, but more harmonious materials may also be incorporated. Facility designs can be more complex and refined than in more primitive settings.
- Moderate to heavy site modifications are allowed in order to provide for outdoor recreation facilities.
- Interpretation may be accomplished through the use of complex wayside exhibits and some personalized services.

Semi-Primitive Motorized Setting. The majority of the North Spit, except for the developed recreation complex at the boat ramp and the areas immediately adjacent to the Trans Pacific Lane, would best be characterized by a physical and social setting comparable to a Semi-Primitive Motorized ROS classification. The characteristics common to this ROS setting includes the following:

- The overall setting is characterized by a predominantly natural appearing environment.
- Visitors have a moderate probability of experiencing solitude, closeness to nature, and tranquility.
- The concentration of users is low, but there is often evidence of other visitors on trails.
- Motorized access may require the use of 4-wheel drive vehicles and may impose a high degree of self-reliance, challenge and risk
- Visitors encounter a minimum of subtle on-site controls and restrictions.

In addition to these general characteristics, the North Spit possesses several other factors that further support this more primitive recreation setting classification. These are:

- The necessity to use 4-wheel drive to access the sandy interior roads, ocean shore and bay beaches combined with the dynamic nature of traveling in an environment that frequently changes due to the effects of tide, storms and wind.
- The dense coastal vegetation and rolling topography provide effective screening between the interior trails and the motorized network. In addition, the vegetation and pounding surf tends to absorb many of the sounds generated by human activity on the Spit. These physical factors make for a recreation setting that provides an experience of isolation within a relatively small area.
- The inherent challenges common to a semi-primitive setting impose limitations that help to keep visitor use numbers relatively low. Due to this factor, this management setting is more compatible with the BLM's wildlife management goals for the North Spit by protecting sensitive species habitat from over use and excessive impact.

In keeping with this ROS classification, recreation development and management would be constrained within the following parameters:

- Recreation facilities, when developed, are primarily for the purpose of resource protection.
- Facilities are rustic and rudimentary and make use of undimensioned native materials rather than synthetic materials.
- Access for people with disabilities is "difficult" and challenging.
- Interpretation, when it occurs, is accomplished through very limited on-site facilities, maps, brochures and guidebooks.

The Oregon Statewide Trail Plan showed that users who engaged in trail-based outdoor recreation activities, both motorized and non-motorized, strongly preferred to participate in these activities in settings at the more primitive end of the opportunity spectrum (e.g., semi-primitive motorized to primitive). This quality was also brought out in the public scoping that was done for this plan update by the large number of comments stating that people wanted the North Spit to "stay the same."

Adjacent Recreation Resources

The BLM public lands on the Spit are surrounded by regionally and nationally significant outdoor recreation resources. The most notable of these is the Oregon Dunes National Recreation Area managed by the US Forest Service. This vast recreation area extends for 40 miles along the Oregon Coast and supports a wide variety of human-powered as well as off-highway vehicle recreation opportunities. The segment of the ODNRA, north of the Spit, supports extensive opportunities for OHV recreation and attracts over 400,000 visitors per year. In the area immediately between the Horsefall Beach OHV staging area and BLM public lands, the Forest Service offers a non-motorized setting favoring hiking and equestrian opportunities.

In 2001, Weyerhaeuser created a wetland adjacent to the Trans Pacific Lane as a mitigation measure under the Henderson Marsh Mitigation Plan (see Water Resources). A hiking trail and parking lot was created at the site along with interpretive signs, a picnic area and an overlook (Map 3).

On the ocean side of the Spit, the Oregon Parks and Recreation Department administers the Ocean Shore Management Unit and the Oregon Coast Trail. One of the more popular sightseeing destinations on the North Spit, the wreckage of the New Carissa, is located within the Ocean Shore Management Unit and can be seen from a viewpoint along the Foredune Road.

Motorized Access

The public lands on the North Spit were never legally open to cross country off-highway vehicle travel. Under the management of the US Army Corps of Engineers, these lands were officially closed, except for access via established roadways, by the Code of Federal Regulations 36 CFR.



Bay side camping.

After the BLM acquired these lands in 1984, the agency prepared the North Spit Plan Amendment to the Master Framework Plan (MFP) and placed these lands under an interim designation of Limited to Designated Existing Roads and made limited OHV use legal on the North Spit for the first time. The December 1985 MFP makes reference to the off highway vehicle opportunity presented by the dunes, but defers this decision until a full analysis of the impacts could be conducted. The full analysis of impacts and final motorized vehicle designations for the Coos Bay District, including the North Spit, did not take place until the Coos Bay District RMP was completed ten years later in 1995.

During the RMP planning process, a range of alternatives for motorized vehicle access were analyzed after extensive public participation through the Final Coos Bay District Proposed Resource Management Plan/Environmental Impact Statement. Through the Record of Decision and Resource Management Plan that followed the EIS, all of the 1,660 acres in the Coos Bay Shorelands SRMA were formally designated as Limited to Designated Roads and Trails in May 1995. This more controlled alternative was chosen over a Limited to Existing Roads and Trails designation to make this activity more manageable, control route proliferation and to ensure the conservation of sensitive resources on the Spit.

The decision on which roads and trails would be open for use was later resolved through the Coos Bay Shorelands Plan of 1995 when the individual roads and trails were inventoried and then designated as open or closed. The four roads/trails designated as open by this plan were the South Dike Road, the Foredune Road, the Re-Route Road, and the Bay Side Road (Map 3). The remaining trails were then designated as closed to motorized use.

The Coos Bay Shorelands Plan included two management actions that stated OHV use in the sand dune areas on the Spit would be allowed to occur under a permit. Implementation of this permit concept would have made these areas defacto open areas and would have been in conflict with the

land use allocation handed down by the Coos Bay District Resource Management Plan. Because this management action was inconsistent with the BLM's own policy and regulations and the Record of Decision for the RMP, these management actions were removed from the Coos Bay Shorelands Plan through a plan maintenance action in 2000.

On the lands immediately adjacent to the BLM parcels on the Spit, OHV recreation is prohibited on the beach between the northern BLM boundary and the Bull Run Sand Road north of Horsfall Beach from May 1 to September 30 to provide for a non-motorized recreation setting. The foredune and forest lands in the ODNRA south of the Horsfall Beach Road to the BLM boundary are closed year-round to OHV use to provide for non-motorized recreation and to protect sensitive resources. The COE lands on the North Jetty are still closed to OHV use, except for motorized use on established roadways. The Oregon Department of Parks and Recreation Department has closed the ocean beach adjacent to BLM to all ATV use and closes the ocean shore to motorized use from March 15 to September 15. On the private parcels and on Port of Coos Bay lands, use is controlled and limited to established roadways where access is allowed.

While OHV cross country use on the North Spit has been officially controlled by federal and state regulations for a long time, actual enforcement of these restrictions is relatively recent. The listing of the snowy plover in 1993 and the grounding of the New Carissa and the subsequent emergency closure in 1999 promoted the agency to place more resources and management focus toward controlling this use on the Spit.

The BLM has placed most of its enforcement efforts in those areas on the Spit with the highest resource values (e.g. snowy plover nesting habitat and interior wetlands). Compliance with OHV designations in these areas has been goodin the interior of the Spit. Compliance varies on the beach and in plover areas. This is not the case in the 80 acre dune area located next to the Roseburg chip facility. This area is used as a defacto "open area" by people who choose not to use the legal and managed OHV open areas, located 1.5 miles away, in the ODNRA.



New Carissa 2002.

Visual Resources

The public lands on the south shore of the North Spit are a dominant visual resource element in the overall scenic backdrop of the Coos Bay estuary. The quality of visual resources directly influences a community's potential for tourism, high-end real estate development, and the area's desirability for business and residential relocation.

Visual resources on the public lands are managed through the BLM's land use planning process. Through this inventory and classification process, public lands are placed in one of four visual resource management classes. These management classes range from the total preservation of the existing landscape in Class I, to allowing major modifications of the landscape character in Class IV (Map 4). The lands on the North Spit were classified in the Coos Bay District RMP as follows:

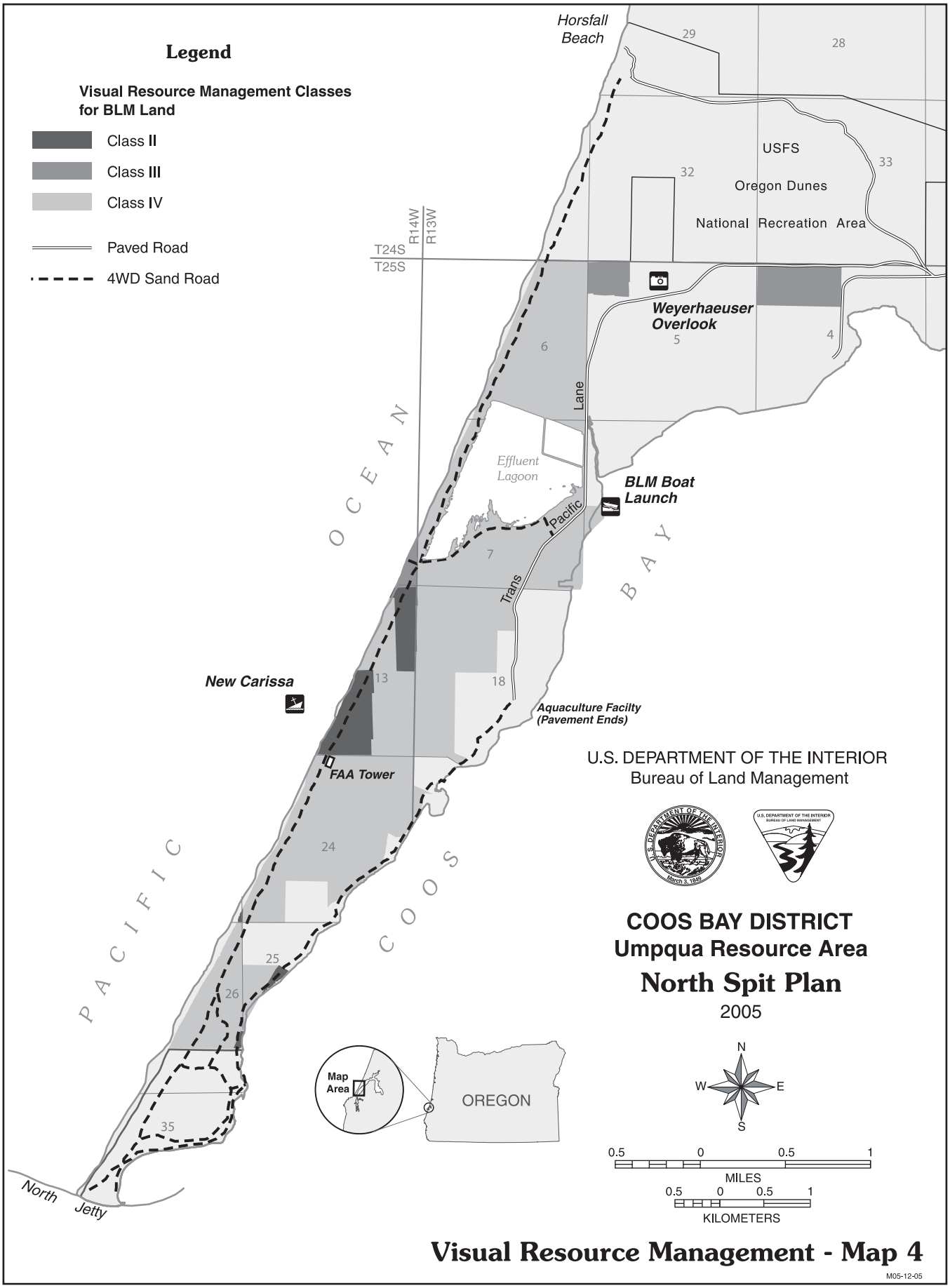
- Class II. The public lands in the northwest corner of the ACEC and within the SRMA in T25S, R14W, Section 13 and T25S, R13W Section 18 were given this fairly protective classification to preserve the quality of the recreation setting. Objectives for Visual Resource Management in this area are to retain the existing character of landscape. Changes in any of the basic elements (form, line, color, texture) caused by a management activity should not be evident in the characteristic landscape. Contrasts are seen, but must not attract attention.

- Class III. Within two parcels adjacent to the Trans Pacific Lane in T25S, R13W in Sections 5 and 4, public lands were classified as Class III. Objectives for VRM management in these parcels would be to partially retain the existing character of landscape. Contrasts to the basic elements caused by a management activity are evident, but should remain subordinate to the existing landscape.

- Class IV. The majority of the public lands on the North Spit are VRM Class IV. VRM objectives in these areas allow for major modifications of the existing character of the landscape. Contrasts that are created by management activities may attract attention and be a dominant feature of the landscape in terms of scale, but should repeat the form, line, color, and texture of the characteristic landscape.



Driving the sand roads on the North Spit.


Legend
Visual Resource Management Classes for BLM Land
Class II
Class III
Class IV
Paved Road
4WD Sand Road
Horsfall Beach
29
28
USFS
33
32
Oregon Dunes
National Recreation Area
T24S
T25S
R14W
R13W
Weyerhaeuser Overlook
5
4
6
Lane
Effluent Lagoon
BLM Boat Launch
Pacific
7
Trans
OCEAN
BAY
New Carissa
13
18
Aquaculture Facilty (Pavement Ends)
FAA Tower
24
25
26
35
PACIFIC
COOS
North Jetty
Map Area
OREGON
U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
COOS BAY DISTRICT
Umpqua Resource Area
North Spit Plan
2005
N
W
E
S
0.5 0 0.5 1
MILES
0.5 0 0.5 1
KILOMETERS
Visual Resource Management - Map 4
M05-12-05

PART 4 –NORTH SPIT MANAGEMENT, 2005

Introduction

Part Four presents management actions on BLM-administered lands for the next ten years. Management actions are described in alphabetical order except for Monitoring and Research which is found at the end of the section. There are no management actions for fish on BLM lands on the Spit. Geology management actions are located under Monitoring and Research.

The aim of the North Spit Plan is to conserve the natural, cultural, and recreational values of the Spit. Management objectives reflect that aim and are consistent with BLM policies and state and federal regulations. These objectives were described in detail in the Draft Shorelands Plan (USDI BLM 1989), incorporated in the Final Shorelands Plan (USDI BLM 1995), and included in North Spit ACEC planning documents (USDI BLM 1999). For the North Spit Plan, these objectives were reviewed and revised based on current conditions and needs, and will be implemented as funding allows. They are listed below, followed by the reasons for action, planned actions, and actions accomplished or ongoing since the 1995 Shorelands Plan. Due to the interrelationship of the various resources at the Spit, many actions apply to more than one objective.

Management Objectives

Objective 1 – Preserve important cultural resources on the Spit.

Objective 2 – Promote awareness and appreciation for the Spit's many resource values and recreational opportunities, and support a minimum impact land use ethic through educational programs such as *Leave No Trace* and *Tread Lightly*.

Objective 3 – Prioritize land tenure adjustments based on natural resource values and recreational opportunities on non-BLM parcels, consolidation of BLM properties, and the safeguarding of public investments.

Objective 4 – Manage the North Spit SRMA to provide for a range of recreational opportunities that contribute to meeting traditional as well as projected recreation demand within the region while protecting the area's natural, cultural, and scenic resources.

Objective 5 – Provide and maintain adequate visitor facilities, services, signing, and programs that are appropriate for the area's recreation opportunity setting and that serve to protect the Spit's sensitive resources.

Objective 6 – Conserve, enhance, or restore natural habitats, with an emphasis on habitats that support special status plant and wildlife species.

Objective 7 – Maintain wetland areas in a condition supportive of a healthy aquatic ecosystem.

Objective 8 – Facilitate improved management of the Spit through monitoring to learn more about the natural and cultural resources of the area and to assess the effects of management actions.

Cultural Resources

Objective 1. Preserve important cultural resources on the Spit.

Reasons for Action

- By law, BLM is required to protect cultural resources. These laws include the Archaeological Resources Protection Act, American Indian Religious Freedoms Act, National Historic Preservation Act, and the Native American Graves and Repatriations Act.

- The Coquille Indian Tribe (CIT) and Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians (CTCLUSI), both federally-recognized tribes, have expressed concern about protection of cultural sites along the Southern Oregon Coast. The Spit is within the ancestral territory of the CTCLUSI.

Actions Accomplished or Ongoing

- In 2000, a report was completed by noted historian Stephen Dow Beckham detailing the history of federal activities on the North Spit (Beckham 2000). The majority of this report concerns the construction and maintenance of the North Jetty, beginning in 1890. The history of the U.S. Lifesaving Service station is also described in detail.

- Continue to preserve remaining historic cultural resources.

Proposed Actions

- Work with the Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians as well as the Coquille Indian Tribe to assure continued protection and preservation of prehistoric resources.

- Remove damaged chain link fence from the perimeter of the World War II Quonset huts.

Environmental Education and Interpretation

Objective 2. Promote awareness and appreciation for the Spit's many resource values and recreational opportunities, and support a minimum impact land use ethic through educational programs such as *Leave No Trace* and *Tread Lightly*.

Reasons for Action

- Environmental education and interpretation can encourage responsible use of the Spit area, thereby reducing resource degradation, violations, and vandalism. Education and interpretation can enhance the visitors' experience.

- Education and interpretation may be used to communicate the BLM's management goals to visitors.

Environmental Education and Interpretive Themes

The environmental education and interpretation conducted at the Spit should be planned and implemented according to the following themes:

Theme #1: The Spit landscape is an intricate web of related parts that is constantly changing due to natural and human actions.

> **Topics:** natural history · system dynamics · interrelationships · ecosystem concepts · plants and animals found at the Spit · dune systems · introduced species · hydrology · biodiversity · threatened and endangered species · habitats

Theme #2: Due to its close proximity to both the ocean and Coos Bay, people have used the Spit for a variety of purposes, including recreation, industry, military installations, commerce, transportation, etc.; all of these actions have shaped the land in some way.

> **Topics:** human history · human impacts · land use planning · introduced species · weeds · management goals · New Carissa · recreation opportunities

Theme #3: Good stewardship is essential in maintaining the health and integrity of the Spit.

> **Topics:** appropriate behavior · Watchable Wildlife methods · Leave No Trace / Tread Lightly outdoor ethic · management support and challenges · involving visitors

Actions Accomplished

- A brochure was developed to provide visitors with a map of the Spit and inform them of regulations and opportunities.

- A variety of interpretive signs and a kiosk have been developed and installed at the boat launch ramp, the overlook to the New Carissa, and various access points. Seasonal interpreters have been hired in past summers to educate the public about seasonal closures and recreational opportunities.

Ongoing Actions

- Continue to host field trips for schools at the Spit for students to learn about the area.

- BLM will continue to work cooperatively with the interagency snowy plover working team on issues pertaining to public education and outreach.

Proposed Actions

- When a prospectus for environmental education and interpretation is developed for the District, include a section concerning the Spit. Use its recommendations when developing and conducting programs and interpretive materials.

- Utilize seasonal or volunteer interpreter(s) when feasible to contact visitors and disseminate information about the Spit on areas suited for recreation, seasonally closed areas, compliance issues, etc.

- Special educational opportunities may include: National Public Lands Day events, Elderhostel tours, beach clean ups, Christmas bird counts, or similar activities that involve the public.

- Ensure that any interpretation which deals with cultural or paleo-environmental history is coordinated with interested Indian tribes and the Coos Bay District Archaeologist.

- Rotate or replace interpretive displays as needed. Where applicable develop supplemental materials to support interpretation and environmental education, such as informational kiosks, trail guides, brochures, and educational kits.

- Use the draft Western Snowy Plover Outreach Plan (Western Snowy Plover Working Team 2004) when considering any outreach that deals with plovers on the Spit.

- Raise public awareness about the environmental and recreational values of riparian-wetland areas on the Spit.

Land Tenure Adjustments

Objective 3. Prioritize land tenure adjustments based on natural resource values and recreational opportunities on non-BLM parcels, consolidation of BLM properties, and the safeguarding of public investments.

Reasons for Action

- Adjacent landowner management objectives may not be consistent with BLM's objectives. For example, land ownership patterns on the Spit could limit or stop access to much of the public land.

Actions Accomplished

- The 1995 Shorelands Plan identified four potential land acquisitions and one disposal. Three acquisitions were accomplished.

Ongoing Actions

- In accordance with the RMP, BLM-administered lands on the Spit within zoning districts 3-EWD, 4CS, and 6WD as delineated by the Coos County Comprehensive Plan could be offered for exchange, sale, or lease to accommodate local economic expansion and industrial development. A land disposal is currently in progress for an 80 acre BLM parcel north of the Roseburg Chip Facility along the Trans Pacific Lane.

- All of the lands on the Spit administered by the BLM are public domain lands and therefore subject to public land laws. Under these laws, BLM manages for specific uses such as permits, rights-of-way, leases, special use permits, etc. Several utility and access rights-of-way were issued and are currently in use. Future applications for leases, permits, and right-of-ways will be reviewed and authorizations issued on a case-by-case basis.

Proposed Actions

- Consider land tenure adjustments to ensure access to public lands as appropriate to meet objectives.

Recreation

Objective 4. Manage the North Spit SRMA to provide for a range of recreation opportunities that contribute to meeting traditional as well as projected recreation demand within the region while protecting the area's natural, cultural, and scenic resources.

Reasons for Action

- The BLM designated the North Spit as an SRMA to preserve opportunities for outdoor recreation and to manage this activity in a manner that is compatible with protecting the natural and cultural resource values of the ACEC.

- Visitors differ widely in their preferences for recreation activities, settings and facilities. Balancing these needs within the limited space available on the North Spit is necessary to provide for a quality resource-based experience, reduce conflicts between users and protect natural resource values.

- The Oregon Parks and Recreation Department Statewide Trail Plan identified trail connectivity between agency management jurisdictions as a key statewide trail management goal. Creating and maintaining connectivity between trail opportunities on BLM lands

on the North Spit and the adjacent trail systems managed by the USFS, OPRD, and Weyerhaeuser would enhance overall trail opportunities in the region.

Actions Accomplished

- Signs were placed at the ocean beach access points along the Foredune Road; other signs and maps were placed at various locations to inform visitors of regulations and recreational opportunities.
- Roads and trails that were not designated open were closed using logs, root wads, and signs. Many of these closed routes are disappearing through natural revegetation.
- A sign strategy was developed to assist BLM in providing information to the public on regulations, recreational opportunities, and natural resources on the Spit.

Ongoing Actions

- Continue to provide and manage motorized access on the Spit to support the area's long-standing traditional recreation uses while protecting natrual, cultural and scenic resources.
- Manage the North Spit to retain a recreation setting compatible with the area's Rural and Semi-Primitive Motorized ROS classification.
- Provide timely press releases for public service announcements and newspaper notices prior to any seasonal access restrictions as needed.
- Clear sand and debris from the boat ramp each spring prior to reinstalling the docks for the summer season.
- Continue to allow primitive camping on BLM lands on the Spit, except in areas where signed to protect sensitive plants and wildlife.
- Continue to maintain the docks at the boat launch as funding allows.
- Continue to permit hunting and shooting on BLM lands on the Spit in conformance with applicable state and federal laws and regulations. These regulations prohibit shooting adjacent to and across public roadways and within developed recreation sites.

Proposed Actions

- Increase information available about theNorth Spit,
- Place improved regulatory and information signs along the sand roads and at ocean beach access points. Advise visitors to inspect the three existing access points before they commit to driving onto the beach – the passability of these access points can change on a daily basis due to waves, high tides and winter storms.
- Remove dilapidated fences and fence posts from three locations on the Spit: the fence at the intersection of the Foredune Road and Trans Pacific Lane, the WWII bunker fence, and fencing material from the southern interior.
- Establish trails for pedestrian and equestrian use within the North Spit interior. Develop and support local partnerships to assist in maintaining and managing this trail system.
- Create and maintain connections between trail opportunities on BLM lands and the adjacent trail systems on Forest Service, OPRD and Weyerhaeuser lands.
- Determine feasibility of designating the Foredune Road open to motorized access from the South Dike Road north to the USFS boundary
- Construct a small equestrian and hiking staging area to provide parking and visitor information at the portal to the trail system.

- Implement the completed sign strategy developed to improve communication with Spit visitors.
- Explore the potential for placing picnic tables at the boat launch facility.
- Include information about wildlife viewing opportunities into the educational kiosk proposed for the boat ramp area.

Site Protection and Administration

Objective 5. Provide and maintain adequate visitor facilities, services, signing, and programs that are appropriate for the area's recreation opportunity setting and that serve to protect the Spit's sensitive resources.

Reasons for Action

- Visitation to the Spit is expected to grow as more people become aware of the area, and as tourism along the southern Oregon Coast increases.
- Facilities, designated roads and trails, signs, and other management tools (e.g., on-site hosts) reduce and prevent resource damage.
- Contracted services with Coos County agencies enhance fire response and law enforcement support for the area.

Fire Management

Accomplished and Ongoing Actions

- BLM contracts with the Coos Forest Protection Association for fire response, including the lands on the Spit. Contracted duties might include: specific action and preparedness plans; prevention, detection, initial attack, and suppression services; resource protection; fire notification services; fire investigation; debriefings and contract reviews; and reports.

Proposed Actions

None at this time.

Hazardous Materials Management

Accomplished and Ongoing Actions

See below.

Proposed Actions

- Finish the sampling and report for the Spit Life Guard Station Environmental Site Characterization.

The structures at the Spit Life Guard Station were serviced by a variety of fueled devices such as generators and power plants. In 1991, the Bureau of Land Management initiated a demolition and removal of the structures, and contracted for the location, assessment and removal of four known underground petroleum storage tanks (USTs) from the site. In late 2002, Oregon Department of Environmental Quality (DEQ) informed the Coos Bay District Hazardous Materials Coordinator that the removal of the USTs had not been finalized and documented under the UST program closure rules. A subsequent records search by BLM concurred. In consultation with DEQ, it was determined that a site assessment was necessary to comply with the state rules and to receive a No Further Action Required determination and closure of the case file. A draft plan for this site assessment and a report to DEQ was prepared, and implementation is planned pending funding. This project is known as the Spit Life Guard

Station Environmental Site Characterization, OR DEQ Log Number 06-91-0030; UST Facility ID # 10718. This is the only hazardous materials project on public lands on the Spit.

Law Enforcement

Accomplished and Ongoing Actions

- BLM Law Enforcement Officers are trained and authorized to enforce federal regulations on BLM lands. The BLM also continues to contract with the Coos County Sheriff's Department, and contribute funds to OPRD for seasonal assistance with beach patrol.

- Continue to have law enforcement officers enforce Federal and Oregon State firearm regulations and encourage shooter safety while on patrol on the Spit.

Proposed Actions

None at this time.

Facility Management

Accomplished Actions

None at this time.

Ongoing Actions

- Maintain existing facilities at the boat launch recreation area.

Proposed Actions

- Consider placing alternative toilet facilities at high use areas.

Road Maintenance and Improvement

Accomplished and Ongoing Actions

None at this time.

Proposed Actions

- Consider raising and widening the Re-route Road to minimize the risk of vehicular collisions.

Vegetation and Wildlife Resources

Objective 6. Conserve, enhance, or restore natural habitats, with an emphasis on habitats that support special status plant and wildlife species.

Reasons for Action

- The BLM is required to follow federal laws and regulations and has established a policy to prevent the need to list fish, wildlife, and plants under the Endangered Species Act. Furthermore, the BLM is directed to encourage management which will lead to the successful recovery and eventual delisting of federally recognized Endangered Species.

- Over the years, alterations to the habitat have interfered with natural community succession. For example, fires were suppressed, groundwater was pumped, and open sandy areas were vegetated by exotic plants.

- Exotic (non-native) vegetation species, such as European beach grass, and noxious weeds, such as Scotch broom, are replacing native vegetation and opportunistically becoming established on sites otherwise unoccupied by grass or shrub species. This spread of exotic and noxious vegetation is altering habitats and interfering with natural succession.

- Resource and vegetative management is necessary to maintain the natural communities, successional processes, and ecosystem health.

- Historic nesting areas of the Western snowy plover were altered by the introduction of European beach grass, increased predation, and accelerated human access and activity on beaches.

- Balanced management actions ensure protection and limit disturbance to plants and wildlife.

Vegetation

Actions Accomplished

- Plant communities were mapped and digitized for use with a Geographic Information System (GIS).

Ongoing Actions

- Coordinate with other agencies and institutions to restore degraded and disturbed plant communities.

Proposed Actions

- Complete the study of vegetation alliances to determine the plant associations of the Spit.

- Conduct a complete inventory of the vascular and non-vascular flora of the Spit to document all the present plant species.

Special Status Plant Species and Communities

Actions Accomplished

- Pink sandverbena was reintroduced under a cooperative agreement with the Institute of Applied Ecology.

- A permanent vehicle re-route was constructed along the bay side and barriers were installed to protect the Point Reyes bird's-beak population in the saltmarsh.

Ongoing Actions

- Facilitate the recovery of the pink sandverbena by collecting seeds for dispersal to other sites along the coast. Coordinate conservation activities with management of Western snowy plover.

- In cooperation with the Port and the DSL, maintain protective barriers around the Point Reyes bird's-beak population on the bay side of the Spit.

- Continue inventory and management for SSS.

Proposed Actions

The following actions only pertain to the North Spit Area of Critical Environmental Concern:

- Implement beach and dune ecosystem restoration for multiple species.
- Establish additional special status plant populations as warranted.
- Develop opportunities for collaborative habitat management to increase the amount of habitat suitable for rare species and to link isolated populations with one another.
- Collect special status plant seeds as necessary for storage at the Berry Botanic Garden's Cryogenic Seed Bank.
- Identify opportunities for restoration of globally ranked plant communities.

Exotic Plants and Noxious Weeds

Actions Accomplished

- Gorse was removed from the Coast Guard Lifesaving station.
- Scotch broom was cleared from HRAs.

Ongoing Actions

- European beach grass is removed annually from HRAs.

Proposed Actions

- Continue weed treatments on the Spit to remove exotic and noxious species. Use integrated pest management practices, such as fire, mechanical or manual removal, and herbicide application. Restore treated areas by spreading native seed and planting native plants.
- Use best management practices to prevent the further spread of exotic plants and noxious weeds.

Wildlife

Actions Accomplished or Ongoing

None at this time.

Proposed Actions

- Survey suitable habitat for great blue herons and great egret rookeries.
- Conduct wildlife inventories at selected wetlands.
- Survey to locate the nests of protection buffer species raptors: osprey, red-tailed hawk, sharp-shinned hawk and Cooper's hawk.

Special Status Wildlife Species

Actions Accomplished or Ongoing

- Continue to implement Western snowy plover conservation actions as directed by the Biological Opinion (USDI FWS 2000). BLM will implement the Western snowy plover Pacific Coast Recovery Plan when finalized. Ongoing actions include the following:

  1. Closing the upper, dry sand portion of the ocean beach to all public access from the FAA Tower south to the BLM boundary during the Western snowy plover nesting season (March 15- September 15 annually; Map 3). The area is clearly marked with ropes and signs. Restrictions on motorized use of the adjacent lower, wet sand area are authorized by OPRD. Inland snowy plover nesting areas on BLM land are also signed closed to all use during the nesting season, and are open to nonmotorized use the remainder of the year.

  2. Removing beachgrass from the inland snowy plover Habitat Restoration Areas (HRAs) to maintain suitable open, sandy habitat suitable for nesting plovers (Map 3).

  3. Administering a contract with the Animal Plant and Health Inspection Service (APHIS) that implements an integrated predator damage management program to protect the plover population from further declines caused by predation. Targeted species include American crows, common ravens, and small mammalian predators. Most traps are located in areas closed to the public (e.g., the HRAs and the upper beach), clearly signed, and are designed to prevent injury to domestic animals and humans.

  4. Administering a contract with the Oregon Natural Heritage Information Center to intensively monitor plover nesting efforts and thereby gauge the success of management actions and determine progress toward plover recovery.

- Continue to coordinate with the FWS to implement recovery plans to protect other threatened and endangered species, as necessary.

- Nest boxes were installed for purple martins.

Proposed Actions

- Develop and implement survey protocols to locate special status species.

- Actively manage habitats to promote the conservation of special status species and protection buffer species.

Water Resources

Management Objective 7. Maintain wetland areas in a condition supportive of a healthy aquatic ecosystem.

Reasons for Action

- The BLM has a responsibility to conserve native wildlife and plant species and the ecosystems upon which they depend. Many of these species are associated with wetlands.

Actions Accomplished

- BLM participated in the creation of wetlands on BLM adjacent to Weyerhaeuser's Overlook wetlands site as part of the Henderson Marsh Mitigation Plan.

Ongoing Actions

- Consider wetland project proposals consistent with the 1984 Henderson March Mitigation Plan. Proposal will require environmental review.

Proposed Actions

None at this time.

Monitoring and Research

Objective 8. Facilitate improved management of the Spit through monitoring to learn more about the natural and cultural resources of the area and to assess the effects of management actions.

Reasons for Action

- Ensure compliance with federal and state laws and regulations.
- Fill existing information gaps to enable the BLM to better manage the area in the future.
- Evaluate existing management strategies to provide feedback on meeting established objectives.
- Broaden human understanding of the area.
- Identify recovery and conservation needs for special status species.
- Identify the nature and extent of human-caused impacts to sensitive resources early enough to take effective action to minimize adverse affects.
- Understand the dynamics of coastal ecosystems.

Cultural Resources

Actions Accomplished or Ongoing

None at this time.

Proposed Actions

- Monitor stability of important cultural resources and propose actions to continue their preservation.

Environmental Education and Interpretation

Actions Accomplished or Ongoing

- Evaluate the effectiveness of educational brochures and signs.

Proposed Actions

- Evaluate the effectiveness of environmental education programs and interpretive materials on a regular basis, and make modifications as necessary.

Geology

Actions Accomplished or Ongoing

None at this time.

Proposed Actions

- Track elevation changes on the ocean foredune and monitor the effects of weather and beach grass removal on foredune erosion.

Recreation

Actions Accomplished or Ongoing

- Continue to use traffic and trail counters and field staff observations to monitor visitor use and to report findings in the Recreation Management Information System.
- Continue to monitor camping on BLM lands on the Spit.

Proposed Actions

- Monitor the condition of beach access routes.

Vegetation and Wildlife Resources

Actions Accomplished or Ongoing

- Monitor noxious weed species to document existing population areas, effectiveness of management actions for removal, and the spread of these species to new sites.
- Evaluate and explore effective management strategies to meet recovery goals for the Western snowy plover. Monitor human and natural disturbance effects on breeding plovers.
- Continue to support the Oregon Natural Heritage Information Center in its efforts to monitor Western snowy plover reproductive success.
- Continue to monitor great blue heron and great egret rookeries.
- Continue to monitor selected special status species on the Spit.
- Continue to monitor the condition of riparian-wetland vegetation. If signs of excessive disturbance caused by unauthorized motorized recreation become evident, adjust patrols, signing and barriers to reduce or prevent impacts.

Proposed Actions

- Monitor special status species' population status and trends. Pursue collaborative efforts to study SSS reproductive ecology, threats, habitats, and effects of management treatments and practices.
- Monitor the status and trends of globally ranked plant communities within the North Spit ACEC.
- Seek collaborative opportunities to survey migratory shorebirds and waterfowl to establish population status and trends.

Bibliography

Alt, D. D., and D. W. Hyndman. 2001. Roadside geology of Oregon. Mountain Press Publishing Company, pp. 91-99.

Aubry, K. B., and J. C. Lewis. 2003. Extirpation and reintroduction of fishers (*Martes pennanti*) in Oregon: implications for their conservation in the Pacific states. Biological Conservation 14:79-90.

Barbour, M. G., and A. F. Johnson. 1988. Beach and dune. Pages 223-262 *in* Terrestrial vegetation of California. M.G. Barbour and J. Major, editors. California Native Plant Society, Special Publication Number 9.

Barbour, M. G., T. M. DeJong, and B. M. Pavlik. 1985. Marine beach and dune plant communities. Pages 296-322 *in* Physiological ecology of North American plant communities. B. F Chabot and H. A. Mooney, editors. Chapman and Hall, New York, NY.

Beckham, S. D. 1986. Land of the Umpqua: A history of Douglas County, Oregon. Douglas County Commissioners, Roseburg, OR.

Beckham, S. D. 2000. Coos Bay North Spit: Historical investigations of federal activities in coastal Oregon. Unpublished report on file at the Coos Bay District, North Bend, OR. 140 pp.

Boyd, R. 1999. The coming of the spirit of pestilence: Introduced infectious diseases and population decline among Northwest Coast Indians, 1774-1874. University of Washington Press, Seattle, WA.

Buchanan, J. B., D. H. Johnson, E. L. Greda, G. A. Green, T. R. Wahl, and S. J. Jeffries. 2001. Wildlife of coastal and marine habitats. Chapter 15 *in* Wildlife-habitat relationships in Oregon and Washington. D. Johnson and T. O'Neil, editors. Oregon State University Press, Corvallis, OR. 736 pp.

Christy, J. A., J. S. Kagan, and A. M. Wiedemann. 1998. Plant associations of the Oregon Dunes National Recreation Area, Siuslaw National Forest, Oregon. USDA, Forest Service, Pacific Northwest Region, Tech. Paper R6-NR-ECOL-TP-09-98. Portland, OR. 183 pp.

Coats, R. N. 1995. Design guidelines for tidal channels in coastal wetlands. Philip Williams and Associates, San Francisco, CA.

Contreras, A. 1998. Birds of Coos County, Oregon: Status and distribution. Cape Arago Audubon Society in cooperation with Oregon Field Ornithologists (OFO), OFO Special Publication Number 12. 161 pp.

Cooper, W. S. 1958. Coastal sand dunes of Oregon and Washington. The Geological Society of America. Memoir 72. 169 pp.

Coos County. 1986. The Coos County Zoning and Land Development Ordinance.

Cowardin, L. M., V. Carter, F. C. Golet, F. C., and E. T. LaRoe. 1979. Classification of wetland habitats and deepwater habitats of the United States. FWS/OBS-79/31. US Department of the Interior, Fish and Wildlife Service, Office of Biological Services. 131 pp.

Dodge, O. 1969. Pioneer history of Coos and Curry Counties 2nd Edition with Errata. Republished by Coos-Curry Pioneer and Historical Association, Coquille, OR.

Executive Order 11644. Use of Off-Road Vehicles on the Public Lands, Richard M. Nixon, February 8, 1972, The White House. 2 pp.

Federal Interagency Committee for Wetland Delineation. 1989. Federal manual for identifying and delineating jurisdictional wetlands. Cooperative technical publication: US Army Corps of Engineers, US Environmental Protection Agency, US Fish and Wildlife Service, and USDA Soil Conservation Service. Washington, D.C. 76 pp.

Fritz, L., 1992. Mineral resources potential report for the withdrawal of the North Spit of Coos Bay, Oregon from mineral entry under the Mining Law of 1872: United States Department of the Interior, Bureau of Land Management internal report, Coos Bay District, North Bend, OR. 13 pp. + Appendices.

Geitgey, R. P. 1990. Silica in Oregon: State of Oregon Department of Geology and Mineral Industries Special Paper No. 22. Portland, OR. 18 pp. + 2 Plates.

Huiskes, A. H. L. 1979. The natural establishment of *Ammophila arenaria* from seed. Oikos 29: 133-136.

Interagency. 1994. Final supplemental environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Vol. I and II. USDA Forest Service and USDI Bureau of Land Management (Lead agencies), Portland, OR.

Jones, M. A. 1992. Ground-water availability from a dune-sand aquifer near Coos Bay and North Bend, Oregon. US Geological Survey Open-File Report 90-563. Portland, OR. 76 pp.

Kagan, J. S., J. A. Christy, M. P. Murray, and J. A. Titus. 2004. Classification of native vegetation of Oregon.

Komar, P. D. 1992. Ocean processes and hazards along the Oregon coast. Oregon Geology 54 (1):3-19.

Komar, P. D. 1997. The Pacific Northwest coast: living with the shores of Oregon and Washington. Duke University Press. London, UK. 195 pp.

Komar, P. D., J. J. Marra, and G. Diaz-Mendez. 1999. A study of the New River Spit, Oregon, to acquire information relevant to an adjustment of the statutory vegetation line. Report to the Oregon Parks and Recreation Department, Salem, OR. 44 pp.

Lauten, D. J., K. A. Castelein, B. V. Smithers, K. C. Jander, E. Elliott-Smith, and E. P. Gaines. 2003. The distribution and reproductive success of the Western snowy plover along the Oregon coast – 2003. Unpublished report. The Oregon Natural Heritage Information Center, Portland, OR. 52 pp.

Lund, E. H. 1973. Landforms along the coast of southern Coos County, Oregon. Ore Bin 35(12):189-210.

Madin, I. P., G. W. McInelly, and H. M. Kelsey. 1995. Geologic map of the Charleston Quadrangle, Coos County, Oregon. State of Oregon Department of Geology and Mineral Industries Geological Map Series GMS-94.

Marshall, D. B., M. W. Chilcote, and H. Weeks. 1996. Species at risk: sensitive, threatened and endangered vertebrates of Oregon. 2nd ed. Oregon Department of Fish and Wildlife. Portland, OR.

McLaughlin, W. T., and R. L. Brown. 1942. Controlling coastal sand dune in the Pacific Northwest. US Department of Agriculture. 46 pp.

Natural Heritage Advisory Council. 2003. Oregon Natural Heritage Plan. [Online] Available http://oregonstate.edu/ornhic/draftplan.pdf.

Northwest Biological Consulting. 1980. Wildlife and biological profile of the North Spit of Coos Bay, OR. A report submitted to the US Fish and Wildlife Service, Boise Area Office, Boise, ID. 90 pp.

O'Neil, T. A., D. H. Johnson. C. Barrett, M. Trevithick. K. A. Bettinger, C. Kiilsgaard, M. Vander Heyden, E. L. Greda, D. Stinson, B. G. Marcot, P. J. Doran. S. Tank, and L. Wunder. 2001. CD-ROM: Matrices for wildlife-habitat relationships in Oregon and Washington. *In* D.J. Johnson and T.A. O'Neil, eds. Wildlife habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, OR. 736 pp.

Oregon Climate Service. 2004. Wind Rose Tables – Zone 1. [Online] Available http://www.ocs.oregonstate.edu/index.html.

Oregon Department of Agriculture. 2003. 2003 noxious weed policy and classification system. Noxious Weed Control Program, 9 pp.

Oregon Natural Heritage Information Center and the Oregon Parks and Recreation Department. 2004. Draft Habitat Conservation plan for the Western snowy plover. [Online] Available www.prd.state.or.us/osmp_hcp.php

Oregon Parks and Recreation Department. Oregon Statewide Comprehensive Outdoor Recreation Plan 2003-2007. Salem, OR [Online] Available www.oregon.gov/OPRD/PLANS/scorp_review.shtml

Oregon Parks and Recreation Department. Oregon Statewide Trails Plan 2004. Salem, OR [Online] Available www.oregon.gov/OPRD/PLANS

Oregon Parks and Recreation Department. 2004. Draft ocean shores management plan. Salem, OR. [Online] Available www.prd.state.or.us/osmp_hcp.php

Oregon Natural Heritage Information Center. 2004. Rare, threatened, and endangered species of Oregon. [Online] Available http://oregonstate.edu/ornhic.

Oregon Wetlands Joint Venture. 1994. Southern Oregon coast implementation plan. West Linn, OR. 17 pp.

Orr, E. L. and W. N. Orr. 2000. Geology of Oregon. Fifth Edition, Kendall/Hunt Publishing Company. 254 pp.

Peterson, E. R. and A. Powers. 1977. A century of Coos and Curry: history of Southwest Oregon. Coos-Curry Pioneer and Historical Association, Coquille, OR.

Pickart. A. J., D. R. Brown, and W. Avery. 1990. Experimental eradication of European beach grass (*Ammophila arenaria*), Humboldt County, California. Unpublished report submitted to J. O. Sawyer Jr. Menzies' wallflower research program, Humboldt State University, CA.

Powell, R. A. and W. J. Zielinski. 1994. Fisher. Pages 38-73 *In* L.F. Ruggiero et al., editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. US Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station Gen. Tech. Rep. RM-254. Fort Collins, CO. 167pp.

Priest, G. R. 1995a. Tsunami hazard map of the Empire Quadrangle, Coos County, Oregon. State of Oregon Department of Geology and Mineral Industries open file report O-95-44. Portland, OR.

Priest, G. R. 1995b. Tsunami hazard map of the Charleston Quadrangle, Coos County, Oregon: State of Oregon Department of Geology and Mineral Industries open file report O-95-47. Portland, OR.

Ranwell, D., W. Newborough, and I. Anglesey. 1959. The dune system and dune slack habitat. Journal of Ecology 47: 571-601.

Rodenkirk, T. 2003. Purple martin nest box project 2003. Annual report prepared for the Bureau of Land Management, Coos Bay District, North Bend, OR. 12 pp.

Sharp, B. E. 1996. Avian population trends in the Pacific Northwest. Bird Populations 3:26-45.

Souza, S. 2005. Principal, Environmental Consulting Division, Sol Coast Consulting and Design, LLC. Personal communicaton June 21, 2005

Sperling, J. 2004. Amendment to Environmental Assessment EA-95.001.1792. Botanical assessment of proposed land sale on the North Spit of Coos Bay, OR. Unpublished report, Coos Bay District, North Bend, OR.

Stansell, V. 1989. Partial plant list beach front from the Port's Aquaculture facility to Life-saving Station. Unpublished species list on file at the Coos Bay District, North Bend, OR.

The Nature Conservancy. 1994. Final Draft Standardized National Vegetation Classification System. [Online] Available http://biology.usgs.gov/npsveg/classification/indexdoc.htm.

Thornburgh, L. 1991. Site guide: Coos Bay and Bandon area, Coos County, Oregon. Birds 17(3)82-84.

US Code of Federal Regulations, Title 36, Corps of Engineers, Army, DoD, Ch. III, 2004 Edition, Part 327 – Rules and Regulations Governing Public Use of Water Resource Development Projects Administered by the Chief of Engineers. Section 327.2 Vehicles, pages 6 - 7.

US Code of Federal Regulations, Title 43, Public Lands: Interior, Parts 1000 to End. 2003 Edition, Subchapter H – Recreation Programs, 8340 – Off Road Vehicles, pages 905 – 908.

US Department of Agriculture, Forest Service. 1972. The Oregon Dunes National Recreational Area resource inventory. US Forest Service Pacific Northwest Region, Portland, OR. 294 pp.

US Department of Agriculture, Forest Service. 1993. Draft environmental impact statement for the Oregon Dunes National Recreation Area management plan.

US Department of Agriculture, Forest Service. 1982. ROS Users Guide, 37 pp.

US Department of Agriculture, NRC. 2004. The PLANTS database, Version 3.5. [Online] Available http;//plants.usda.gov. National Plant Data Center, Baton Rouge, LA.

US Department of Agriculture and US Department of Interior. 2002. Environmental assessment: predator damage management to protect the federally threatened pacific coast population of the Western snowy plover in Oregon. Prepared by USDA, APHIS, Wildlife Services Program and the Siuslaw National Forest, USDI, Fish and Wildlife Service and Bureau of Land Management, and in cooperation with the Oregon Department of Fish and Wildlife and the Oregon Parks and Recreation Department. Portland, OR.

US Department of Defense, Army Corps of Engineers. 1987. Corps of Engineers wetlands delineation manual. Wetlands Research Program Technical Report Y-87-1 (on-line edition). Waterways Experiment Station, Vicksburg, MS.

US Department of Interior, Bureau of Land Management. 1981. Bureau of Land Management Planning for Recreation Resources Policy. Manual 8320, Re1. 8-12.

US Department of Interior, Bureau of Land Management. 1982. Bureau of Land Management Off Road Vehicle General Policy. Manual 8340, Re1. 8-18.

US Department of Interior, Bureau of Land Management. 1984. Bureau of Land Management Visual Resource Management Manuals 8400, Re1. 8-24.

US Department of Interior, Bureau of Land Management. 1984. North Spit Amendment to the Master Framework Plan.

US Department of Interior, Bureau of Land Management. 1988. Bureau of Land Management Areas of Critical Environmental Concern Policy. Manual 1613, Re1. 1-1541.

US Department of Interior, Bureau of Land Management. 1989. Coos Bay Shorelands draft management plan. Coos Bay District, North Bend, OR. 38 pp.

US Department of Interior, Bureau of Land Management. 1992. North Spit ACEC Team Meeting Notes. On file, Coos Bay District, North Bend, OR.

US Department of the Interior, Bureau of Land Management. 1994. Coos Bay Shorelands draft plan and environmental assessment. Coos Bay District, North Bend, OR.

US Department of Interior, Bureau of Land Management. 1995a. Coos Bay District record of decision and resource management plan and associated environmental impact statement, Volumes I, II, & III, North Bend, OR.

US Department of Interior, Bureau of Land Management. 1995b. Coos Bay Shorelands final management plan. Coos Bay District, North Bend, OR. 26 pp.

US Department of Interior, Bureau of Land Management. 2000. Biological assessment for the management of federal lands on the North Spit of Coos Bay during the 2000-2001 Western snowy plover nesting and wintering seasons. Coos Bay District, North Bend, OR. 36 pp.

US Department of Interior, Bureau of Land Management. 2001a. Bureau 6840 special status species manual. Release 6-121 (supersedes Release 6-116).

US Department of Interior, Bureau of Land Management. 2001b. National Management Strategy for Motorized Off-Highway Vehicle Use on Public Lands, Rel. 1-01.

US Department of Interior, Bureau of Land Management. 2003a. BLM's priorities for recreation and visitor services. BLM work plan fiscal years 2003-2007. Report on file, Coos Bay District, North Bend, OR.

US Department of Interior, Bureau of Land Management. 2003b. Sale of Special Forest Products within the Coos Bay District. Categorical exclusion review CX OR120-04-05. Coos Bay District, North Bend, OR. 4 pp.

US Department of Interior, Fish and Wildlife Service. 1980. Pages 39-44 *in* Important fish and wildlife habitats of Oregon: An inventory. US Fish and Wildlife Service, Oregon-Idaho Area Office, Boise, ID.

US Department of Interior, Fish and Wildlife Service. 1984. An overview of wetland functions. US Fish and Wildlife Service, Fort Collins, CO. 68 pp.

US Department of Interior, Fish and Wildlife Service. 1993. Final Rule. Endangered and threatened wildlife and plants: determination of threatened status for the Pacific coast population of the Western snowy plover. Federal Register 58(42):12864-12874.

US Department of Interior, Fish and Wildlife Service. 1999. Final Rule. Endangered and threatened wildlife and plants: designation of critical habitat for the Pacific coast population of the Western snowy plover. Federal Register 60(234):68507-68544.

US Department of Interior, Fish and Wildlife Service. 2000. Biological opinion for the management of federal lands on the North Spit of Coos Bay during the 2000-2001 Western snowy plover nesting and wintering seasons. Portland, OR. 22 pp.

US Department of Interior, Fish and Wildlife Service. 2003. Western snowy plover (*Charadrius alexandrinus nivosus*) pacific coast population draft recovery plan. Sacramento, CA. 492 pp.

Varoujean, D. H. 1985. Abundance and distribution of shorebirds, waterfowl, wading birds, gulls, and crows in Coos Bay, Oregon. Oregon Department of Fish and Wildlife Nongame Program Technical Report No. 85-2-01. Oregon Department of Fish and Wildlife Service, Portland, OR. 36 pp.

Wagner, D. 2000. Bryophytes of the Coos Bay District, USDI Bureau of Land Management, Southwestern Oregon. Unpublished report on file at the Coos Bay District, North Bend, OR. 28 pp. + 8 Tables.

Western Regional Climate Center. 2004. North Bend FAA Airport, Oregon (356073). [Online] Available http://www.wrcc.dri.edu.

Western Snowy Plover Working Team. 2004. Draft Western snowy plover outreach plan. Internal document on file, Coos Bay District Office, North Bend, OR.

Wilson-Jacobs, Ruth. 1983. Wildlife use of Coos Bay North Spit, Oregon. A report to the US Department of Defense, US Army Corps of Engineers, Portland District. Portland, OR. 67 pp.

Zenk, H. B. 1990. Siuslawans and Coosans. Pages 572-579 *In* Handbook of North American Indians, Vol. 7, Northwest Coast. US Government Printing Office, Washington, D.C.

Zika, P. F., B. Wilson, N. Otting, B. Newhouse, D. Lytjen, K. Kuykendall, and R. Brainerd. 1998. *Carex* (sedge) inventory of Coos Bay District, Bureau of Land Management. Cooperative Challenge Cost Share Project. Unpublished report on file at the Coos Bay District, North Bend, OR.

Personal communications:

Pappajohn, S. 2002. Personal Communication at Interagency Meeting, Salem, Oregon: Principal of GeoTrends-Hampton, Incorporated. August 27, 2002.

Pullen, R. 2004. Outdoor Recreation Planner, Bureau of Land Management, Coos Bay District, North Bend, OR.

Schab, R. 2004. RE: Coos Bay Shorelands update**.** ROB@cbnbh2o.com (18 May).

Souza, S. 2004. Spit Wells. Shannon@solcoast.com (15 July).

Appendix 1. North Spit Plant List.

Preliminary nonvascular and vascular plant species list for the North Spit. Information drawn from Coos Bay District herbarium, staff survey lists, Stansell (1989), Wagner (2000), and Zika et al. (1998). Common names in parentheses, taxonomy as per USDA, NRC (2004), E = exotic or non-native, * = special status species, and # = Bureau tracking species.

NONVASCULAR PLANTS
(lichens, sac fungi, club fungi, liverworts, hornworts, and mosses)

KINGDOM FUNGI

CLASS ASCOMYCETES & DISCOMYCETES (Lichens)
**Bryoria pseudocapillaris* Brodo & D.Hawksw. (brown beard lichen)
**Bryoria spiralifera* Brodo & D.Hawksw. (horsehair)
Cavernularia hultenii Degel. (Hulten's pitted lichen)
**Erioderma sorediatum* D.J. Galloway & P.M. Jorg. (ncn)
**Heterodermia leucomelos* (L.) Poelt (shield lichen)
Hypogymnia enteromorpha (Aceh.) Nyl. (beaded bone lichen)
Hypogymnia physodes (L.) Nyl. (hooded bone lichen)
Hypotrachyna sinuosa (Sm.) Hale (ncn)
**Leioderma soridiatum* D.J. Galloway & P.M. Jorg. (ncn)
Nephroma laevigatum Ach. (seaside kidney lichen)
Nephroma resupinatum (L.) Ach. (kidney lichen)
Parmelia hygrophila Goward & Ahti (shield lichen)
Parmelia sulcata Hale (waxpaper lichen)
Parmeliopsis hyperopta (Ach.) Arnold (ncn)
Parmotrema arnoldii (Du Rietz) Hale (eyelash lichen)
Peltigera membranacea (Ach.) Nyl. (membranous felt lichen)
Plastismatia glauca (L.) Culb. & C.Culb. (ragbag)
Platismatia herrei (Imshaug) Culb.& C.Culb. (Herre's ragged lichen)
Pseudocyphellaria anomala Brodo & Ahti (specklebelly)
**#Pseudocyphellaria perpetua* McCune & Miadlikowska (ncn)
Ramalina farinacea (L.) Ach. (farinose cartilage lichen)
Ramalina menziesii Taylor (fishnet lichen)
Ramalina roesleri (Hochst. *ex* Schaerer) Hue (ncn)
Ramalina thraustai (Ach.) Nyl. (ncn)
Sphaerophorus globosus (Hudson) (globe ball lichen)
Tuckermannopsis chlorophylla (Willd.) Vainio (ncn) [=*Cetraria chlorophylla*]
Tuckermannopsis orbata (Nyl.) Fink (ncn) [=*Cetraria orbata*]

CLASS ASCOMYCOTINA (Sac Fungi)
None known at this time

CLASS HYMENOMYCETES & GASTEROMYCETES (Club Fungi)
Boletus edulis Bull. ex Fr. (king bolete, cep, steinpilz, porcini)
Clavaria purpurea (purple fairy club)
Cortinarius allutus (Secr.) Fr. (ncn)
Cortinarius brunneus (ncn)
Cortinarius californicus (ncn)

DIVISION BRYOPHYTA

CLASS HEPATICOPSIDE (Liverworts)
Calypogeia azurea Stotler & Crotz (blue pouchwort)
Cephalozia bicuspidata (L.) Dum. (two-horned pincerwort)

Cephalozia lunulifolia (Dum.) Dum. (ncn)
Cephaloziella divaricata (Sm.) Schiffn. (ncn)
**Diplophyllum plicatum* Lindb. (giant folded leaf liverwort)
Frullania nisquallensis Sull. (hanging millipede liverwort)
Geocalyx graveolens (Schrad.) Nees (ncn)
Lepidozia reptans (L.) Dum. (little hands liverwort)
Lophocolea cuspidata (Nees) Limpr. (ncn)
Lophocolea heterophylla (Schrad.)Dum. (ncn)
Porella navicularis (Lehm. & Lindenb.) Pfieff. (tree ruffle liverwort)
Radula complanata (L.) Dum. (flat-leaved liverwort)
Riccardia latifrons (Lindb.) Lindb. (ncn)
Scapania bolanderi Aust. (yellow-ladle liverwort)

CLASS ANTHOCEROTOPSIDA (Hornworts)
None known at this time.

CLASS MUSCOPSIDA (Mosses)
Aulacomnium androgynum (Hedw.) Schwaegr. (lover's moss)
Aulacomnium palustre (Hedw.) Schwaegr. (ribbed bog moss or glow moss)
Brachythecium rivulare Schimp. in B.S.G. (ncn)
Bryum capillare Hedw. (ncn)
Campylium polygamum (Schimp. in B.S.G.) C. Jens. (ncn)
Campylopus introflexus (Hedw.) Brid. (ncn)
Ceratodon purpureus (Hedw.) Brid. (red roof moss)
Claopodium crispifolium (Hook.) Ren. &Card. (rough moss)
Dichelyma falcatum (Hedw.) Myr. (ncn)
Dicranoweisia cirrata (Hedw.) Lindb. ex Milde (curly thatch moss)
Dicranum fuscescens Turn. (curly Heron's-bill moss)
Dicranum scoparium Hedw. (broom moss
Dicranum tauricum Sapeh. (broken-leaf moss)
Drepanocladus aduncus (Hedw.)Warnst. (ncn)
Drepanocladus sendtner (Schimp.)Warnst. (ncn)
Eurhynchium oreganum (Sull.) Jaeg. (Oregon beaked moss)
Eurhynchium praelongum (Hedw.) Schimp. in B.S.G. (slender beaked moss)
Homalothecium fulgescens (Mitt. ex C. Muell.) Lawt. (yellow moss)
Homalothecium pinnatifidum (Sull. & Lesq.) Lawt. (ncn)
Hylocomium splendens (Hedw.) Schimp. in B.S.G. (stair step moss)
Hypnum circinale Hook. (coiled-leaf moss)
Isothecium stoloniferum Brid. (cat-tail moss)
Neckera douglasii Hook. (Douglas' neckera)
Orthotrichum consimile Mitt. (ncn)
Orthotrichum lyellii Hook. & Tayl. (Lyell's bristle moss)
Plagiothecium undulatum (Hedw.) Schimp. in B.S.G. (wavy-leaved cotton moss)
Pohlia wahlenbergii (Web. &Mohr)Andrews (ncn)
Polytrichum juniperinum Hedw. (juniper haircap moss)
Polytrichum piliferum Hedw. (awned haircap moss)
Pseudotaxiphyllum elegans (Brid.) Iwats. (small flat moss)
Racomitrium elongatum Ehrh. ex Frisv. (roadside rock moss)
Rhizomnium glabrescens (Kindb.)T. Kop. (fan moss)
Tortula princes De Not. (ncn)
Trachybryum megaptilum (Sull.) Schof. (ncn)
Ulota phyllantha Brid. (ncn)

VASCULAR PLANTS

FERNS AND FERN ALLIES

DENNSTAEDTIACEAE — BRACKEN FERN FAMILY
Pteridium aquilinum (L.) Kuhn var. *pubescens* Underwood (northern bracken fern)

DRYOPTERIDACEAE — WOOD FERN FAMILY
Polystichum munitum (Kaulfuss) K. Presl (pineland sword fern)

POLYPODIACEAE — POLYPODY FAMILY
Polypodium scouleri Hook. & Grev. (leathery polypody)

GYMNOSPERMS

CUPRESSACEAE — CYPRESS FAMILY
Chamaecyparis lawsoniana (A. Murray) Parl (Port-Orford-cedar)

PINACEAE — PINE FAMILY
Pinus contorta Dougl. ex Loud. var. *contorta* (shore pine)
Pinus attenuata Lemmon (knob-cone pine)
Picea sitchensis (Bong.) Carr. (Sitka spruce)
Pseudotsuga menziesii (Mirbel.) Franco var. *menziesii* (Douglas-fir)

DICOTYLEDONS

APIACEAE — CARROT FAMILY
Angelica lucida L. (seacoast angelica)
Glehnia littoralis F. Schmidt ex Miq. (American silvertop)
Lilaeopsis occidentalis Coult. & Rose (western grasswort)

ARALIACEAE — GINSENG FAMILY
Hedera helix L. (English-ivy) E

ASTERACEAE — ASTER FAMILY
Achillea millefolium L. (common yarrow)
Ambrosia chamissonis (Less.) Greene (silver burr-ragweed) E
Anaphalis margaritacea (L.) Benth. (pearly-everlasting)
Artemisia pycnocephala (Less.) DC. (beach wormwood)
Baccharis pilularis DC. (coyotebrush)
Cirsium arvense (L.) Scop. (Canadian thistle) E
Corethrogyne californica var. *obovata* DC. var. *obovata* (Benth.) Kuntze (California sandaster)
Erechtites glomerata (Desf. ex Poir.) DC. (cut-leaf burnweed) [=*E. arguta*]
Erechtites minima (Poir.) DC. (coastal burnweed) E
Gamochaeta purpurea (L.) Cabrera (spoon-leaf purple everlasting) [=*Gnaphalium chilense*]
Grindelia stricta DC. (Oregon gumweed)
Hieracium albiflorum Hook. (white-flower hawkweed)
Hypochaeris radicata L. (hairy cat's-ear) E
Jaumea carnosa (Less.) Gray (marsh jaumea)
Leontodon taraxacoides (Vill.) Mérat ssp. *taraxacoides* (lesser hawkbit) [=*L. leysseri*] E
Pseudognaphalium stramineum (Kunth) A. Anderb. (cotton-batting-plant) [=*Gnaphalium purpureum*]
Sonchus L. (sow-thistle) E
Symphyotrichum chilense (Nees) Nesom (Pacific American-aster) [=*Aster chilense*]
Tanacetum camphoratum Less. (camphor tansy) E

BETULACEAE — BIRCH FAMILY
Alnus rubra Bong. (red alder)

BRASSICACEAE — MUSTARD FAMILY
Brassica rapa L. var. *rapa* (rape) E
Cakile edentula (Bigelow) Hook. (American searocket)
Cakile maritima Scop. (European searocket) E
Cardamine nuttallii Greene var. *nuttallii* (Nuttall's toothwort)
Draba verna L. (spring whitlow-grass)
Raphanus sativus L. (radish) E

CAPRIFOLIACEAE — HONEYSUCKLE FAMILY
Lonicera involucrata (Richards.) Banks ex Spreng. (four-line honeysuckle)
Sambucus nigra L. ssp. *caerulea* (Raf.) R. Bolli (black elder)

CARYOPHYLLACEAE — PINK FAMILY
Cardionema ramosissimum (Weinm.) A. Nels. & J.F. Macbr. (sandcarpet)
Cerastium arvense L. (field mouse-ear chickweed) E
Honckenya peploides (L.) Ehrh. (seaside sandplant)
Spergularia canadensis (Pers.) G. Don (Canadian sandspurry)
Spergularia macrotheca (Hornem.) Heynh. (sticky sandspurry)
Spergularia salina J. & K. Presl (saltmarsh sandspurry) [=*S. marina*]

CHENOPODIACEAE — GOOSEFOOT FAMILY
Atriplex patula L. (halberd-leaf orache)
Atriplex prostrata Bouchér ex DC. (hastate orache) [=*A. hastata*]
Salicornia depressa Standl. (woody saltwort) [=*S. virginica*]

CONVOLVULACEAE — MORNING-GLORY FAMILY
Calystegia soldanella (L.) R. Br. (seashore false bindweed)

CUSCUTACEAE — DODDER FAMILY
Cuscuta salina Engelm. var. *major* (Yuncker goldenthread)

ERICACEAE — HEATH FAMILY
Arbutus menziesii Pursh (Pacific madrone)
Arctostaphylos columbiana Piper (bristly manzanita) [includes *A. tracyi*]
Arctostaphylos uva-ursi (L.) Spreng. (red bearberry)
Gaultheria shallon Pursh (salal)
Vaccinium ovatum Pursh (evergreen blueberry)
Vaccinium oxycoccos L. (small cranberry)
Vaccinium uliginosum L. (alpine blueberry)

FABACEAE — PEA FAMILY
Cytisus scoparius (L.) Link (Scotch broom) E
Genista monspessulana (L.) L. Johnson (French broom) E
Lathyrus japonicus Willd. (sea vetchling)
Lotus corniculatus L. (garden bird's-foot-trefoil)
Lotus unifoliolatus (Hook.) Benth. (American bird's-foot-trefoil)
Lupinus littoralis Dougl. (Chinook lupine)
Medicago lupulina L. (black medick)
Melilotus officinalis (L.) Lam. (yellow sweet-clover) [=*M. alba*]
Trifolium arvense L. (rabbit-foot clover)
Trifolium pratense L. (red clover)
Trifolium repens L. (white clover) E
Trifolium wormskioldii Lehm. (cow clover)
Ulex europaeus L. (common gorse) E

Veronica scutellata L. (grass-leaf speedwell)
Vicia americana Muhl. ex Willd. (American purple vetch)
Vicia hirsuta (L.) S.F. Gray (tiny vetch)

GENTIANACEAE — GENTIAN FAMILY
Centaurium erythraea Rafn (European centaury) E
Gentiana sceptrum Griseb. (king's-scepter gentian)

GERANIACEAE — GERANIUM FAMILY
Geranium sp. L. (crane's-bill) E

GROSSULARIACEAE — CURRANT FAMILY
Ribes sanguineum Pursh (blood currant)

MYRICACEAE — BAYBERRY FAMILY
Morella californica (Cham.) Wilbur (Pacific bayberry) [=*Myrica californica*]

NYCTAGINACEAE — FOUR-O'CLOCK FAMILY
**Abronia latifolia* Eschsch. (yellow sandverbena)
***#Abronia umbellata* Lam. ssp. *breviflora* (Standl.) Munz (pink sandverbena)

ONAGRACEAE — EVENING-PRIMROSE FAMILY
Camissonia cheiranthifolia (Hornem. ex Spreng.) Raimann (beach suncup)
Epilobium ciliatum Raf. (fringed willowherb) [=*E. franciscanum*]
Ludwigia peploides (Kunth) Raven (floating primrose-willow)

PLANTAGINACEAE — PLANTAIN FAMILY
Plantago maritima L. var. *juncoides* (Lam.) Gray (goosetongue)

PLUMBAGINACEAE — LEADWORT FAMILY
**Limonium californicum* (Boiss.) Heller (western marsh-rosemary)

POLYGONACEAE — BUCKWHEAT FAMILY
Polygonum paronychia Cham. & Schlecht. (beach knotweed)
Rumex acetosella L. (common sheep sorrel) E
Rumex sp. L. (dock, sorrel)

PORTULACACEAE — PURSLANE FAMILY
Claytonia perfoliata Donn ex Willd. ssp. *perfoliata* (miner's-lettuce) [=*Montia perfoliata*]

PRIMULACEAE — PRIMROSE FAMILY
Anagallis minima (L.) Krause (chaffweed)
Glaux maritima L. (sea-milkwort)

RANUNCULACEAE — BUTTERCUP FAMILY
Ranunculus flammula L. var. *flammula* (greater creeping spearwort)

ROSACEAE — ROSE FAMILY
Argentina egedii (Wormsk.) Rydb. (Pacific silverweed) [=*Potentilla pacifica*]
Fragaria chiloensis (L.) P. Mill. (beach strawberry)
Galium aparine L. (sticky-willy)
Malus fusca (Raf.) Schneid. (Oregon crabapple)
Rubus armeniacus Focke (Himalayan blackberry) [=*R. procerus, R. discolor*] E
Rubus spectabilis Pursh (salmon raspberry)
Rubus ursinus Cham. & Schlecht. (California dewberry)

SALICACEAE — WILLOW FAMILY
Salix hookeriana Barratt ex Hook. (coastal willow)

VIOLACEAE — Violet Family
Viola spp. (ndentification pending)

SCROPHULARIACEAE — FIGWORT FAMILY
Castilleja ambigua Hook. & Arn. ssp. *ambigua* (johnnynip) [=*Orthocarpus castillejoides*]
**Cordylanthus maritimus* ssp. *palustris* (Behr) Chuang & Heckard (Point Reyes bird's-beak)
Nuttallanthus texanus (Scheele) D.A. Sutton (Texas toadflax)
Parentucellia viscosa (L.) Caruel (yellow glandweed) E

MONOCOTYLEDONS

CYPERACEAE — SEDGE FAMILY
Carex lenticularis Michx. var. *limnophila* (Holm) Cronq. (lakeshore sedge)
Carex lyngbyei Hornem. (Lyngbye's sedge)
Carex obnupta Bailey (slough sedge)
Carex pansa Bailey (sand-dune sedge)
Carex unilateralis Mackenzie (one-sided sedge)
Carex viridula Michx. ssp. *viridula* (little green sedge)
Eleocharis macrostachya Britt. (pale spike-rush)
Eleocharis obtusa (Willd.) J.A. Schultes (blunt spike-rush)
Eleocharis palustris (L.) Roemer & J.A. Schultes (common spike-rush)
Schoenoplectus americanus (Pers.) Volk. ex Schinz & R. Keller (chairmaker's club-rush)
[=*Scirpus americanus*]
Schoenoplectus maritimus (L.) Lye (saltmarsh club-rush)

IRIDACEAE — IRIS FAMILY
Sisyrinchium californicum (Ker-Gawl.) Ait. (golden blue-eyed-grass)

JUNCACEAE RUSH FAMILY
Juncus effusus L. (lamp rush)
Juncus falcatus E. Mey. (sickle-leaf rush)
Juncus gerardii Loisel. (saltmarsh rush)
Juncus lesueurii Boland. (salt rush)

JUNCAGINACEAE — ARROW-GRASS FAMILY
Triglochin concinna Burtt-Davy (slender arrow-grass)
Triglochin maritima L. (seaside arrow-grass)
Triglochin striata Ruiz & Pavón (three-rib arrow-grass)

LILIACEAE -- LILY FAMILY
Lilium columbianum hort. ex Baker (Columbian lily)

ORCHIDACEAE — Orchid Family
Goodyera oblongifolia Raf. (green-leaf rattlesnake-plantain)
Listera sp. R. Br. ex Ait. f. (twayblade)
Spiranthes romanzoffiana Cham. (hooded ladies'-tresses)

POACEAE — GRASS FAMILY
Agrostis stolonifera L. (spreading bent) E
Aira praecox L. (early silver-hair grass)
Ammophila arenaria (L.) Link (European beach grass) E
Bromus hordeaceus L. (soft brome) E
Bromus tectorum L. (cheat grass) E
Cynosurus echinatus L. (bristly dog's-tail grass) E

Dactylis glomerata L. (orchard grass) E
Distichlis spicata (L.) Greene (coastal salt grass)
Festuca idahoensis Elmer (bluebunch fescue)
Festuca rubra L. (red fescue)
Holcus lanatus L. (common velvet grass) E
Hordeum brachyantherum Nevski (meadow barley)
Hordeum jubatum L. (fox-tail barley)
Leymus mollis (Trin.) Pilger (American lyme grass)
Parapholis incurva (L.) C.E. Hubbard (curved sickle grass)
Poa confinis Vasey (coastline blue crass)
Puccinellia nuttalliana (J.A. Schultes) A.S. Hitchc. (Nuttall's alkali grass)
*#*Puccinellia pumila* (Vasey) A.S. Hitchc. (dwarf alkali grass)

Appendix 2. North Spit Wildlife List.

Wildlife inventories are incomplete for the North Spit. Information on birds was drawn from staff observations and detailed data on the birds of Coos County (Contreras 1998). Information on other wildlife species is based on habitat associations, BLM files, and documented observations. Questions marks refer to information that is speculative.

BIRDS
Legend

Status:

B- breeding species
M- migrant (usually May/June and August-October)
MS- spring migrant only (usually May-June)
MF- fall migrant only (usually August-October)
PB- post breeding migrant (typically appearing in summer/fall)
W- wintering species (normally Oct/Nov- April/May)
Y- Year-round resident
O- offshore species occasionally seen from land
S- over-summering nonbreeder (typically, a few birds seen most years into summer)

Abundance:

C- common to abundant, easily observed in appropriate habitat.
FC- fairly common, usually observed in appropriate habitat.
U- uncommon, not always observed in appropriate habitat.
R- rare, not seen every year.
V- vagrant, very rare species with few records.
I- irregular, numbers fluctuate year-to-year.
D- dead specimen found on beach.

Bolded species are probable breeders.

SWANS/GEESE/DUCKS (Family Anatidae)

Tundra Swan (*Cygnus columbianus)* **W-U**
Greater White-fronted Goose (*Anser albifrons)* **MF-U, MS-R**
Snow Goose (*Chen caerulescens*) **M-R**
Canada Goose (*Branta Canadensis)* **Y-C**
Canada Goose (Aleutian subspecies, *Branta canadensis ssp. leucopareia)* **M-U**
Emperor Goose (*Chen canagica*) **V**
Brant *(Branta bernicula*) **MS-C, W-U, MF-U, OS-R**
Wood Duck *(Aix sponsa)* **Y-U**
American Wigeon *(Anas americana)* **W-C**
Eurasian Wigeon (*Anas penelope)* **W-U**
Green-winged Teal *(Anas crecca)* **W-C, OS-R**
Mallard *(Anas platyrhynchos*) **Y-C**
Gadwall *(Anas strepera*) **W-U, OS-R**
Northern Shoveler (*Anas clypeata)* **W-FC, B-R**
Northern Pintail *(Anas acuta*) **W-C, OS-R**
Cinnamon Teal *(Anas cyanoptera)* **M-U**
Blue-winged Teal (*Anas discors)* **MS-U, MF-R**
Canvasback (*Aythya valisineria)* **W-C, OS-R**
Redhead *(Aythya Americana)* **M-U, W-I**
Ring-necked Duck (*Aythya collaris)* **Y-C, B-R**

Greater Scaup *(Aythya marila)* **W-C, OS-U**
Lesser Scaup *(Aythya affinis*) **W-U, OS-R**
Steller's Eider (*Polysticta stelleri*) **V**
Harlequin Duck (*Histrionicus histrionicus*) **W-U**
Long-tailed Duck (*Clangula hyemalis)* **W-U**
Black Scoter *(Melanitta nigra)* **W-U**
Surf Scoter *(Melanitta perspicillata)* **W-C**
White-winged Scoter *(Melanitta fusca)* **W-U**
Common Goldeneye (*Bucephala clangula*) **W-C**
Barrow's Goldeneye (*Bucephala islandica*) **W-R**
Bufflehead *(Bucephala albeola)* **W-C, OS-R**
Red-breasted Merganser *(Mergus serrator)* **W-C**
Hooded Merganser (*Lophodytes cucullatus)* **W-U**
Ruddy Duck (*Oxyura jamaicensis)* **W-C, B-R**

PHEASANT (Family Phasianidae)

Ring-necked Pheasant *(Phasianus colchicus*) **Y-U**

QUAIL (Family Odontophoridae)

California Quail *(Callipepla californica*) **Y-R?**

LOONS (Family Gaviidae)

Common Loon *(Gavia immer*) **W-C, OS-U**
Pacific Loon *(Gavia pacifica*) **W-FC**
Red-throated Loon *(Gavia stellata*) **W-FC**
Yellow-billed Loon (*Gavia adamsii)* **V**

GREBES (Family Podicipedidae)

Pied-billed Grebe (*Podilymbus podiceps)* **Y-U**
Red-necked Grebe (*Podiceps grisegena)* **W-FC**
Horned Grebe (*Podiceps auritus)***W-C**
Eared Grebe (*Podiceps nigricollis)* **W-U**
Western Grebe (*Aechmophorus occidentalis)* **W-C, OS-R**
Clark's Grebe (*Aechmophorus clarkii)* **W-U**

SHEARWATERS (Family Procellariidae)

Northern Fulmar (*Fulmarus glacialis)* **O: MF-U, W-U**
Murphy's Petrel (*Pterodroma ultima*) **D**
Sooty Shearwater (*Puffinus griseus)* **O: MF-C, W-R**

STORM-PETRELS (Family Hydrobatidae)

Fork-tailed Storm-Petrel (*Oceanodroma furcata*) **O: M-R, W-R**
Leach's Storm-Petrel (*Oceanodroma leucorhoa*) **V**

PELICANS (Family Pelecanidae)

Brown Pelican (*Pelecanus occidentalis)* **PB-C**
American White Pelican (*Pelecanus erythrorhynchos)* **V**

CORMORANTS (Family Phalacrocoracidae)

Double-crested Cormorant (*Phalacrocorax auritus)* **Y-C**
Pelagic Cormorant (*Phalacrocorax pelagicus)* **Y-C**
Brandt's Cormorant (*Phalacrocorax penicillatus)* **Y-U**

HERONS (Family Ardeidae)

American Bittern (*Botaurus lentiginosus)* **B-U, W-R**
Great Blue Heron *(Ardea herodias)* **Y-C**
Great Egret *(Casmerodius albus)* **Y-C**
Snowy Egret (*Egretta thula*) **W-R**
Cattle Egret (*Bubulcus ibis*) **V**
Green Heron (*Butorides virescens*) **B-U**
Black-crowned Night-Heron (*Nycticorax nycticorax*) **M-R**

IBIS (Family Threskiornithidae)

White-faced Ibis (*Plegadis chihi*) **V**

VULTURES (Family Cathartidae)

Turkey Vulture *(Cathartes aura)* **B-C**

KITES/HAWKS/EAGLES (Family Accipitridae)

Osprey *(Pandion haliaetus*) **B-C, W-R**
White-tailed Kite *(Elanus caeruleus)* **W-C, B-R?**
Bald Eagle *(Haliaeetus leucocephalus*) **Y-U**
Northern Harrier *(Circus cyaneus*) **W-C, B-R**
Sharp-shinned Hawk *(Accipiter striatus*) **Y-U, B-R?**
Cooper's Hawk *(Accipiter cooperii*) **Y-U, B-R?**
Red-tailed Hawk *(Buteo jamaicensis*) **Y-FC**
Rough-legged Hawk (*Buteo lagopus*) **MF-R, W-I**
Red-shouldered Hawk (*Buteo lineatus*) **W-FC, B-R?**

FALCONS (Family Falconidae)

American Kestrel (*Falco sparverius*) **M-U**
Merlin *(Falco columbarius*) **W-U**
Peregrine Falcon *(Falco peregrinus*) **Y-U**
Prairie Falcon (*Falco mexicanus*) **V**
Gyrfalcon (*Falco rusticolus*) **V**

RAILS/COOTS (Family Rallidae)

Virginia Rail *(Rallus limicola*) **Y-U**
Sora *(Porzana carolina*) **B-U, W-R**
American Coot *(Fulica americana*) **W-FC**

PLOVERS (Family Charadriidae)

Black-bellied Plover *(Pluvialis squatarola*) **W-U, M-FC**
Pacific Golden-plover (*Pluvialis fulva)* **MF-U, MS-R**
American Golden-plover (*Pluvialis dominica)* **MF-U, MS-R**
Semipalmated Plover *(Charadrius semipalmatus*) **Y-FC, B-R**
Snowy Plover (*Charadrius alexandrinus)* **Y-U**
Killdeer *(Charadrius vociferus*) **Y-C**

OYSTERCATCHER (Family Haematopodidae)

Black Oystercatcher (*Haematopus bachmani)* **W-U**

STILTS/AVOCETS (Family Recurvirostridae)

Black-necked Stilt (*Himantopus mexicanus)* **V**
American Avocet (*Recurvirostra americana)* **M-R**

SANDPIPERS (Family Scolopacidae)

Greater Yellowlegs *(Tringa melanoleuca*) **M-C, W-U**
Lesser Yellowlegs *(Tringa flavipes*) **M-U**
Wandering Tattler (*Heteroscelus incanus*) **M-U**
Spotted Sandpiper *(Actitus macularia*) **B-U, W-R**
Solitary Sandpiper (*Tringa solitaria*) **M-R**
Willet (*Catoptrophorus semipalmatus)* **M-U**
Whimbrel *(Numenius phaeopus*) **M-C**
Long-billed Curlew (*Numenius americanus)* **M-U**
Marbled Godwit (*Limosa fedoa)* **M-U, W-R**
Ruddy Turnstone (*Arenaria inter)* **M-U**
Black Turnstone *(Arenaria interpres*) **M-FC**, **W-FC**
Sanderling (*Calidris alba)* **W-C, OS-R**
Surfbird **(***Aphriza virgata***)** **W-U**
Red Knot (*Calidris canutus)* **M-U**
Semipalmated Sandpiper (*Calidris pusilla)* **MF-U, MS-R**
Red-necked Stint (*Calidris ruficollis*) **V**
Little Stint (*Calidris minuta*) **V**
Western Sandpiper *(Calidris mauri*) **M-C, W-U, OS-R**
Least Sandpiper *(Calidris minutilla*) **M-C, W-U, OS-R**
Baird's Sandpiper (*Calidris bairdii)* **MF-U, MS-R**
Pectoral Sandpiper (*Calidris melanotos)* **M-FC, MS-R**
Rock Sandpiper (*Calidris ptilocnemis*) **W-U**
Dunlin *(Calidris alpina*) **M-C, W-U**
Curlew Sandpiper (*Calidris ferruginea*) **V**
Stilt Sandpiper (*Calidris himantopus)* **MF-R**
Buff-breasted Sandpiper (*Tryngites subruficollis)* **MF-U**
Ruff (*Philomachus pugnax)* **MF-R**
Upland Sandpiper (*Bartramia longicauda)* **V**
Short-billed Dowitcher *(Limnodromus griseus*) **M-C, OS-R**
Long-billed Dowitcher *(Limnodromus scolopaceus*) **M-C, W-U, OS-R**
Wilson's Snipe *(Gallinago delicata*) **W-FC**
Wilson's Phalarope (*Phalaropus tricolor*) **M-R, B-R**
Red-necked Phalarope *(Phalaropus lobatus*) **M-U**
Red Phalarope (*Phalaropus fulicaria)* **O: M-U, W-I**

GULLS/TERNS (Family Laridae)

Pomarine Jaeger (*Stercorarius pomarinus*) **O: M-R**
Parasitic Jaeger (*Stercorarius parasiticus*) **O: M-R**
Franklin's Gull (*Larus pipixcan*) **M-R**
Bonaparte's Gull *(Larus philadelphia*) **M-U, W-I**
Little Gull (*Larus minutus*) **V**
Heermann's Gull (*Larus heermanni*) **PB-FC**
California Gull *(Larus californicus*) **W-C, PB-C, OS-U**
Western Gull *(Larus occidentalis*) **Y-C**
Glaucous-winged Gull *(Larus glaucescens*) **W-C**

Glaucous Gull (*Larus hyperboreus)* **W-R**
Herring Gull (*Larus argentatus*) **W-U**
Thayer's Gull (*Larus thayeri)* **W-U**
Mew Gull (*Larus canus)* **W-C**
Ring-billed Gull (*Larus delawarensis)* **W-C, OS-U**
Black-legged Kittiwake (*Rissa tridactyla)* **O: W-FC**
Red-legged Kittiwake (*Rissa brevirostris*) **V, D**
Sabine's Gull (*Xema sabini*) **O: M-R**
Elegant Tern (*Sterna elegans)* **PB-I**
Caspian Tern *(Sterna caspia)* **M-C, OS-U**
Common Tern (*Sterna hirundo*) **M-R**

AUKS (Family Alcidae)

Common Murre *(Uria aalge*) **Y-C**
Pigeon Guillemot (*Cepphus columba)* **B-C, W-R**
Marbled Murrelet *(Brachyramphus marmoratus*) **O: Y-U**
Rhinoceros Auklet (*Cerorhinca monocerata)* **Y-R**
Cassin's Auklet (*Ptychoramphus aleuticus*) **O: M-R**
Xantus' Murrelet (*Synthliboramphus hypoleucus*) **D**
Ancient Murrelet (*Synthliboramphus antiquus*) **O: W-R**
Tufted Puffin (*Fratercula cirrhata*) **O: M-R**
Horned Puffin (*Fratercula corniculata*) **D**

PIGEONS/DOVES (Family Columbidae)

Rock Pigeon (*Columba livia*) **Y-C**
Band-tailed Pigeon *(Columba fasciata*) **M-U, B-R?**
Mourning Dove *(Zenaida macroura*) **B-C, W-R**

OWLS (Family Strigidae)

Great-horned Owl *(Bubo virginianus*) **Y-U, B-U**
Snowy Owl (*Bubo scandiaca*) **V**
Short-eared Owl (*Asio flammeus*) **MF-R, W-R**
Western Screech-Owl (*Otus kennicottii)* **Y-R?**
Burrowing Owl (*Athene cunicularia*) **M-R**, **W-R**

NIGHTJARS (Family Caprimulgidae)

Common Nighthawk *(Chordeiles minor*) **M-U, B-R?**

SWIFTS (Family Apodidae)

Black Swift (*Cypseloides niger*) **MS-U**
Vaux's Swift (*Chaetura vauxi*) **M-FC, B-R?**

HUMMINGBIRDS (Family Trochilidae)

Anna's Hummingbird *(Calypte anna*) **Y-U**
Rufous Hummingbird *(Selasphorus rufus*) **B-C**

KINGFISHER (Family Alcedinidae)

Belted Kingfisher *(Ceryle alcyon)* **Y-C**

WOODPECKERS (Family Picidae)

Northern Flicker *(Colaptes auratus)* **Y-C**
Downy Woodpecker *(Picoides pubescens*) **Y-U**
Hairy Woodpecker *(Picoides villosus*) **Y-U**
Pileated Woodpecker *(Dryocopus pileatus)* **Y-U**
Red-breasted Sapsucker (Sphyrapicus ruber) **Y-R, B?**

FLYCATCHERS (Family Trannidae)

Olive-sided Flycatcher *(Contopus borealis*) **B-U**
Western Wood-Pewee *(Contopus sordidulus*) **M-FC**, **B-U**
Willow Flycatcher (*Empidonax traillii*) **M-U**
Hammond's Flycatcher (*Empidonax hammondii*) **M-R**
Dusky Flycatcher (*Empidonax oberholseri*) **M-R**
Pacific Slope Flycatcher *(Empidonax difficilis*) **B-C**
Black Phoebe *(Sayornis nigricans*) **W-C, B-U**
Say's Phoebe (*Sayornis saya*) **M-R**
Ash-throated Flycatcher (*Myiarchus cinerascens*) **M-R**
Tropical Kingbird (*Tyrannus melancholicus*) **PB-R**
Western Kingbird (*Tyrannus verti*) **M-R**
Scissor-tailed Flycatcher (*Tyrannus forficatus*) **V**

SHRIKES (Family Lannidae)

Northern Shrike (*Lanius excubitor)* **W-U**
Loggerhead Shrike (*Lanius ludovicianus*) **V**

VIREOS (Family Vireonidae)

Hutton's Vireo *(Vireo huttoni*) **Y-U**
Warbling Vireo *(Vireo gilvus*) **M, B-R**
Cassin's Vireo (*Vireo cassinii)* **M-R**

JAYS/CROWS/RAVENS (Family Corvidae)

Steller's Jay *(Cyanocitta stelleri*) **Y-C**
Western Scrub-Jay (*Aphelocoma californica*) **M-R**
American Crow *(Corvus brachyrhynchos*) **Y-C**
Common Raven *(Corvus corax)* **Y-C**

HORNED LARKS (Family Alaudidae)

Streaked Horned Lark (*Eremophila alpestris strigata)* **M-U, W-R**

SWALLOWS (Family Hirundinidae)

Tree Swallow *(Tachycineta bicolor*) **B-C, W-R**
Violet-green Swallow *(Tachycineta thalassina*) **B-U**
Purple Martin *(Progne subis*) **B-U**
Northern Rough-winged Swallow *(Stelgidopteryx serripennis*) **B-U**
Barn Swallow *(Hirundo rustica*) **B-FC**
Cliff Swallow *(Hirundo pyrrhonota)* **B-C**
Bank Swallow *(Riparia riparia)* **M-R**

CHICKADEES (Family Paridae)

Black-capped Chickadee *(Parus atricapillus*) **Y-C**
Chestnut-backed Chickadee *(Parus rufescens*) **Y-C**

BUSHTITS (Family Aegithalidae)

Bushtit *(Psaltriparus minimus*) **Y-U**

NUTHATCHES (Family Sittidae)

Red-breasted Nuthatch *(Sitta canadensis*) **B-U, W-I**
White-breasted Nuthatch (*Sitta carolinensis*) **V**

CREEPERS (Family Certhiidae)

Brown Creeper *(Certhia americana*) **W-U, B-R**

WRENS (Family Troglodytidae)

Marsh Wren *(Cistothorus palustris*) **Y-C**
Bewick's Wren *(Thryomanes bewickii)* **Y-FC**
Winter Wren (*Troglodytes troglodytes*) **W-C, B-U**
House Wren *(Troglodytes aedon*) **M-R**
Rock Wren (*Salpinctes obsoletus*) **V**
Sedge Wren (Cistothorus platensis) **V**

KINGLETS (Family Regulidae)

Ruby-crowned Kinglet *(Regulus calendula)* **W-C**
Golden-crowned Kinglet *(Regulus satrapa*) **Y-C**

GNATCATCHERS (Family Sylviidae)

Blue-gray Gnatcatcher (*Polioptila caerulea*) **V**

THRUSHES (Family Turdidae)

Western Bluebird (Sialia mexicana) **M-R, W-R**
Mountain Bluebird (*Sialia currucoides*) **V**
Varied Thrush *(Ixoreus naevius*) **W-C**
Swainson's Thrush (*Catharus ustulatus*) **B-C**
Hermit Thrush *(Catharus guttatus*) **W-FC**
American Robin *(Turdus migratorius*) **Y-C**

WRENTIT (Family Timaliidae)

Wrentit *(Chamaea fasciata*) **Y-C**

MIMIC THRUSHES (Family Mimidae)

Northern Mockingbird *(Mimus polyglottus*) **Y-R**
Sage Thrasher (*Oreoscoptes montanus*) **V**

STARLINGS (Family Sturnidae)

European Starling (*Sturnus vulgaris*) **Y-C**

PIPITS (Family Motacillidae)
American Pipit *(Anthus rubescens*) **M-C, W-U**

WAXWINGS (Family Bombycillidae)

Cedar Waxwing *(Bombycilla cedrorum*) **B-U**

WARBLERS (Family Parulidae)

Orange-crowned Warbler *(Vermivora celata*) **B-C, W-R**
Nashville Warbler *(Vermivora ruficapilla*) **M-R**
Virginia's Warbler (*Vermivora virginiae*) **V**
Yellow Warbler *(Dendroica petechia*) **M-C**
Yellow-rumped Warbler *(Dendroica coronata)* **Y-C**
Black-throated Gray Warbler *(Dendroica nigrescens*) **B-FC**
Black-and-white Warbler (*Mniotilta varia*) **V**
MacGillivray's Warbler *(Oporornis tolmiei*) **M-R**
Common Yellowthroat *(Geothlypis trichas*) **M-C, B-FC, W-R**
Wilson's Warbler *(Wilsonia pusilla)* **B-R**
Hermit Warbler (*Dendroica occidentalis)* **M-R**
Townsend's Warbler *(Dendroica occidentalis*) **W-U**
Palm Warbler (*Dendroica palmarum)* **M-FC, W-R**

TANAGERS (Family Thraupidae)

Western Tanager *(Piranga ludoviciana*) **B-U**

SPARROWS (Family Emberizidae)

Song Sparrow *(Melospiza melodia*) **Y-C**
Lincoln's Sparrow (*Melospiza lincolnii)* **W-U**
White-crowned Sparrow *(Zonotrichia leucophrys*) **Y-C**
Golden-crowned Sparrow *(Zonotrichia atricapilla*) **W-FC**
White-throated Sparrow (*Zonotrichia albicollis*) **W-U**
Harris's Sparrow (*Zonotrichia querula*) **V**
Fox Sparrow (*Passerella iliaca*) **W-C**
Dark-eyed Junco (*Junco hyemalis*) **Y-C**
Savannah Sparrow *(Passerculus sandwichensis*) **B-C, W-U**
Chipping Sparrow *(Spizella passerina*) **M-R**
Clay-colored Sparrow (*Spizella pallida*) **M-R, W-R**
American Tree Sparrow (*Spizella arborea*) **V**
Spotted Towhee *(Pipilo maculatus*) **B-C, W-U**
Oregon Vesper Sparrow *(Pooecetes gramineus affinis*) **M-R, W-R**
Lapland Longspur (*Calcarius lapponicus)* **MF-U, MS-R, W-R**
Chestnut-collared Longspur (*Calcarius ornatus*) **V**
Snow Bunting (*Plectrophenax nivalis*) **V**

GROSBEAKS/BUNTINGS (Family Cardinalidae)

Black-headed Grosbeak *(Pheucticus melanocephalus*) **B-U?**
Lazuli Bunting *(Passerina amoena*) **M-R**

BLACKBIRDS (Family Icteridae)

Bobolink (*Dolichonyx oryzivorus*) **V**
Red-winged Blackbird *(Agelaius phoeniceus*) **Y-C**
Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*) **M-R**
Brewer's Blackbird (*Euphagus cyanocephalus*) **Y-R, B-R?**

Brown-headed Cowbird *(Molothrus ater*) **B-FC**
Western Meadowlark (Sturnella neglecta) **W-C, B-R?**

FINCHES (Family Fringillidae)

Pine Siskin *(Carduelis pinus*) **M-I, B-U?**
American Goldfinch *(Carduelis tristis*) **B-FC, W-R**
Purple Finch *(Carpodacus purpureus*) **B-C, W-R**
House Finch *(Carpodacus mexicanus*) **Y-C**
Red Crossbill (*Loxia curvirostra)* **Y-FC**
Evening Grosbeak *(Coccothraustes vespertinus)* **M-U?**

WEAVERS (Family Passeridae)

House Sparrow *(Passer domesticus*) **Y-R**

Mammals[1]

OPOSSUMS (Family Didelphiidae)

Virginia Opossum (*Didelphis virginianus)*

SHREWS (Family Soricidae)

Vagrant Shrew (*Sorex vagrans)*
Trowbridge Shrew (*Sorex trowbridgii)*
Pacific Shrew (*Sorex pacificus*)
Pacific Water Shrew *(Sorex bendirii*)

MOLES (Talpidae)

Shrew Mole (*Neurotrichus gibbsii*)
Townsend's Mole (*Scapanus townsendii*)
Coast Mole (*Scapanus orarius*)

EVENING BATS (Family Vespertilionidae)

Little Brown Bat (*Myotis lucifugus*)
Long-eared Myotis (*Myotis evotis*)
Hoart Bay (*Lasiurus cinereus*)
Townsend's Big-eared Bat (*Corynorhinus townsendii*)
Long-legged Myotis (*Myotis volans*)
California Myotis (*Myotis californicus*)
Big Brown Bat (*Eptesicus fuscus*)
Yuma Myotis (*Myotis yumanensis*)
Silver-haired Bat (*Lasionycteris noctivagans*)

RABBITS (Family Leporidae)

Brush Rabbit (*Sylvilagus bachmani*)

SQUIRRELS (Family Sciuridae)

California Ground Squirrel (*Spermophilus beecheyi*)
Northern Flying Squirrel (*Glaucomys sabrinus*)

[1]Potential or documented occurences.

Townsend's Chipmunk (*Eutamias townsendi*)
Douglas' Squirrel (*Tamiasciurus douglasii*)

POCKET GOPHERS (Family Geomyidae)

Western Pocket Gopher (*Thomomys mazama*)

BEAVERS (Family Castoridae)

American Beaver (*Castor Canadensis*)

MICE/VOLES/MUSKRATS/RATS (Family Muridae)

Deer Mouse (*Peromyscus maniculatus*)
Long-tailed Vole (*Microtus longicaudus*)
Townsend's Vole (*Microtus townsendii*)
Creeping Vole (*Microtus oregoni*)
Western Red-backed Vole (*Clethrionomys californicus*)
Red Tree Vole (*Phenacomys longicaudus*)
Oregon or Creeping Vole (*Microtus oregoni*)
White-footed Vole (*Arborimus albipes*)
Bushy-tailed Woodrat (*Neotoma cinerea*)
Muskrat (*Ondatra zibethicus*)
Norway Rat (*Rattus norvegicus*)
Black Rat (*Rattus rattus*)
House Mouse (*Mus musculus*)

JUMPING MICE (Family Zapodidae)

Pacific Jumping Mouse (*Zapus trinotatus*)

PORCUPINES (Family Erethizontidae)

Porcupine (*Erethizon dorsatum*)

FOXES (Family Canidae)

Coyote (*Canis latrans*)
Gray Fox (*Vulpes velox*)

BEARS (Family Ursidae)

Black Bear (*Ursus americanus*)

RACCOONS (Family Procyonidae)

Raccoon (*Procyon lotor*)

WEASELS/SKUNKS/OTTER/MINK/MARTENS (Family Mustelidae)

Long-tailed Weasel (*Mustela frenata*)
Ermine (*Mustela erminea*)
Striped Skunk (*Mephitis mephitis*)
Spotted Skunk (*Spilogale gracilis*)
River Otter (*Lutra canadensis*)
Mink (*Mustela vison*)

American Marten (*Martes Americana*)
Fisher *(Martes pennanti)*

CATS (Family Felidae)

Mountain Lion (*Felis concolor*)
Bobcat (*Lynx rufus*)

DEER (Family Cervidae)

Black-tailed Deer (*Odocoileus hemionus columbians*)
Roosevelt Elk (*Cervise elaphus roosevelti*)

HAIR SEALS (Family Phocidae)

Harbor Seal (*Phoca vitulina*)

EARED SEALS (Family Otariidae)

Steller Sea Lion (*Eumetopias jubatus*)
California Sea lion (*Zalophus californianus*)

Amphibians[1]

MOLE SALAMANDERS (Family Ambystomatidae)

Northwestern Salamander (*Ambystoma gracile*)
Pacific Giant Salamander (*Dicamptodon ensatus*)

LUNGLESS SALAMANDERS (Family Plethodontidae)

Clouded Salamander (*Aneides ferreus*)
Ensatina (*Ensatina eschscholtzi*)
Dunn's Salamander (*Plethodon dunni*)
Western Redback Salamander (*Plethodon vehiculum*)
California Slender Salamander (*Batrachoseps attenuatus*)

NEWTS (Family Salamandridae)

Roughskin Newt (*Taricha granulosa*)

TREE FROGS (Family Hylidae)

Pacific Treefrog (*Ascaphus regilla*)

TRUE FROGS (Family Ranidae)

Northern Red-legged Frog (*Rana aurora*)
Bullfrog (*Rana catesbeiana*)

Reptiles[1]

SEA TURTLES (Family Dermochelyidae)

Leather-back Sea Turtle (*Dermochelys coriacea*)

[1]Potential or documented occurences.

WATER AND BOX TURTLES (Family Emydidae)

Northwestern Pond Turtle (*Clemmys marmorata*)

ALLIGATOR LIZARDS (Family Anguidae)

Northern Alligator Lizard (*Elgaria coerulea*)

IGUANIDS (Family Iguanidae)

Western Fence Lizard (*Sceloporus occidentalis*)
Northern Alligator Lizard (*Elgaria coerulea*)

BOAS (Family Bioidae)

Rubber Boa (*Charina bottae*)

COLUBRID SNAKES (Family Colubridae)

Northwestern Garter Snake (*Thamnophis ordinoides*)
Common Garter Snake (Thamnophis sirtalis)
Western Terrestrial Garter Snake (*Thamnophis elegans*)

Appendix 3. Plan Conformance

PLAN CONFORMANCE / NEPA COMPLIANCE RECORD
North Spit Management Plan

Coos Bay District Office
Development of the North Spit Plan

The North Spit Management Plan is the ten year update to the 1995 Coos Bay Shorelands Management Plan (Shorelands Plan) and addresses the lands on the North Spit of Coos Bay under Buerau of Land Management jurisdiction. The North Spit of Coos Bay is a sandy, vegetated point of land separating the waters of Coos Bay from the Pacific Ocean. It is northwest of the communities of Coos Bay, North Bend, and Charleston in Coos County in southwestern Oregon. The BLM lands on the North Spit are all public domain lands, and provide habitat for several Special Status Species (SSS). BLM intends to conserve and improve when feasible, habitat for SSS on the North Spit, while preserving the recreational opportunities available.

Plan Conformance Review

The North Spit Plan incorporated the 1989 Draft Coos Bay Shorelands Management Plan, the 1994 Coos Bay Shorelands Draft Plan and Environmental Assessment, and the Final Coos Bay Shorelands Management Plan, signed September, 1995.

The North Spit is in compliance with the Coos Bay District Resource Management Plan (RMP) which was completed and signed in 1995.

Nancy Zepf 4-19-05
Nancy Zepf, ID Team Reviewer

NEPA Review

Existing Environmental Impact Statement (EIS) Review:
This plan is in conformance with the Coos Bay District Resource Management Plan and Environmental Impact Statement /Record of Decision, 1995.

The Draft Coos Bay Shorelands Plan Environmental Assessment No. EA120-93-07* is in conformance with the following existing decisions from the Coos Bay District Resource Management Plan (RMP)/ EIS Record of Decision (ROD).

1. The District RMP designated nearly half of the BLM lands on the Spit as an ACEC for outstanding values for wildlife, scenery, wetlands, SSS and recreation.
2. The District RMP designated motorized access on the Spit as "Motorized Access is Limited to designated roads and trails." The designated roads and trails have not changed.

3. The District RMP designated all the lands on the Spit as a Special Recreation Management Area due to the known popularity of the area and the challenges of managing for both recreation and SSS habitat.
4. The direct and indirect impacts of the North Spit Plan are less than those identified in the Shorelands Plan, due to land tenure adjustments (see * below).
5. There would be no additional cumulative impacts from the implementation of the North Spit Plan.
6. Public involvement that occurred during the development of the North Spit Plan occurred the same way as if a NEPA document was produced. No new issues were identified.

*The EA number was changed from EA No. OR126-93-07 (which is in the official draft plan booklet, to EA No. OR120-93-07. The change occurred due to the re-organization of the district in the early 1990's. OR126 referred to the Tioga Resource Area, which did not exist after the re-organization. OR 120 refers to the Coos Bay District. Many of the management actions proposed in the previous planning documents for the Spit included actions on lands the BLM identified as desirable to acquire through exchange. Three of the four proposed land exchanges have occurred, however, a key parcel used by the public for access, has not been acquired. Therefore, many of the management actions proposed for that parcel have been dropped in the updated North Spit Plan because they are not on BLM lands.

The North Spit Plan was written by an interdisciplinary team of BLM staff. Natural resource information was reviewed and updated. BLM management requirements for SSS and the designations in the RMP were further explained. There are no new public restrictions proposed, nor is there any surface-distrubing activity proposed. No new issues were identified. If BLM proposes surface disturbing projects, a new Environmental Analysis will be done. The basic goals and objectives from the District RMP, through the Shorelands drafts and final documents remain virtually the same: Allow recreational activities while conserving habitat for all species, with special attention on the SSS.

Steve Morris 4-19-05
Steve Morris, NEPA Reviewer

Decision

I have reviewed this Plan Conformance and NEPA Compliance Record and have determined that the North Spit Management Plan is in conformance with the approved land use plan and that no further environmental analysis is required. It is my decision to implement the plan as described.

M. Elaine Raper
M. Elaine Raper
Umpqua Area Manager

4/21/05
Date

Appendix 4. History of Land Tenure on the North Spit.

1857 First survey of the North Spit.

1878 Beginning of numerous attempts to build a jetty on the east shore of the estuary.

1882 Cash entry patent to Sec. 24 Lot 4.

1884 Cash entry patent to Sec. 25 Lot 1.

1887 Sec. 25 Lot 2 Withdrawn to the Treasury Department for lifesaving purposes. The Life Saving Station was constructed and fully staffed by August 1891. The US later also acquired Sec. 24 Lot 4 and Sec. 25 Lot 1.

1889 The east shore was abandoned as a location of the jetty and planning began for construction on the North Spit.

1889 (June) Cash entry patent to Sec. 26 Lot 3.

1889 (November) All public domain land in T.25S., R13 & 14 W., withdrawn to the War Department for the Coos Bay Harbor.

1890 Congress appropriated money for the jetty construction. The Corps of Engineers began reclamation of the North Spit and jetty construction.

1891 The US acquired Section 26 Lot 3.

1915 Life Saving Station relocated to Coos Head because the location made it difficult to monitor the bar and quickly respond to accidents. US Navy assumed use of the old station on the North Spit. The Navy used the site as Radio Compass Station (on-shore facility for determining the direction of received radio signals)

1947 The Navy closed the Radio Compass Station on the North Spit and relocated to Coos Head.

1950 The Navy declared the old Radio Compass Station surplus. The withdrawn land (Sec. 25 Lot 2) was transferred to the Corps of Engineers. The parcels purchased in fee were disposed of by sale.

1984 The Corps of Engineers relinquished a portion of their withdrawal on the North Spit. BLM determined that it was suitable for return to the public domain and accepted jurisdiction. By accepting jurisdiction, BLM inherited numerous permits and leases issued by the COE. As these authorizations expired, they were replaced by FLPMA right of ways.

1989 A resurvey by BLM established that none of the buildings were on the land (sec. 24 Lot 4) purchased by Edward Altoffer in 1950. BLM demolished the buildings and removed the underground tanks. Attempts to purchase the land from Altoffer failed due to appraisal issues. Altoffer later sold the land to another party.

1992 BLM acquired a parcel in T.25S., R13 W., Sec. 8 for a boat ramp.

1997 BLM acquired Sec. 25 Lot 1 and a 5-acre parcel located next to the BLM Boat Ramp in a land exchange with Weyerhaeuser. In the exchange, the Weyerhaeuser Company picked up the land encumbered by their effluent pond in T.25S., R13 W. The pond had been authorized under a lease by the COE.

2000 BLM acquired Sec. 24 Lot 4 by fee purchase.

2001 The Corps of Engineers relinquished the lands remaining under their withdrawal on the North Spit. BLM determined that it was suitable for return to the public domain and accepted jurisdiction.

Appendix 5. Glossary

Area of Critical Environmental Concern: an area of BLM-administered lands where special management attention is needed to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes; or to protect life and provide safety from natural hazards (as defined in BLM Manual 8300).
Biodiversity: the full range of variety and variability within and among living organisms and the ecological complexes in which they occur.
Breach: term used in this plan to explain an opening in the foredune between Coos Bay and the Pacific Ocean, caused by floodwaters, ocean surf run-up, or by planned mechanical intervention.
Cascadia seismic event: a rupture of the interlocked North American Plate and the Juan de Fuca Plate along the subduction planes. The energy released is expected to generate an 8.8 magnitude earthquake.
Cascadia subduction zone: the generally north-south zone along the Northwest coast where the Juan de Fuca Plate is being over-ridden by the North American Plate.
Community: a group of plants and animals that occupy a given locale.
Coniferous: cone-bearing trees or shrubs; mostly evergreens such as pine, cedar, spruce, etc.
Cubic foot per second (cfs): a unit of measurement of the rate of water flow past a given point equal to one cubic foot in one second.
Deflation plain: area behind the foredune where wind has eroded the sand to the water table, forming a wet surface resistant to further erosion.
Dune: a hill of drifting sand formed by wind action.
Ecosystem: an assemblage of integrated organisms plus the local environment.
Eolian: (Aeolian) pertaining to the action or the effect of the wind, as in eolian sand dune deposits.
Estuary: the zone between the fresh water of a stream and the salt water of an ocean. An estuarine system extends upstream until ocean derived salt measures less than 0.5% during average annual flow. Estuaries are low energy systems and may include subtidal and intertidal areas with aquatic beds.
Estuarine: of, relating to, or found in an estuary.
Exotic: introduced species; not indigenous to a given area.
Globally ranked plant community: a prioritization system for determining global significance of plant communities. G1 communities are the most imperiled whereas G5 communities are widespread and secure.
Good Friday Earthquake, 1964: a tectonic event that originated in Alaska. The earthquake occurred on March 27, 1964, Good Friday and was a 9.2 magnitude, the second largest earthquake ever recorded. The earthquake triggered a tsunami that impacted Pacific coastlines including Oregon, California, Washington, and Alaska.
Herbicide: a chemical substance capable of killing or inhibiting plants.
Interpretation: a communication process that forges emotional and intellectual connections between the interests of the audience and the inherent meanings in the resource.
Introduced species: also referred to as exotic species, these are plants or animals occurring as a result of introduction or unnatural range expansion. These are species that did not occur before the arrival of European culture.
Littoral cell: segment of the shore or beach that is bound by headlands which extend sufficiently seaward to prevent along-shore transport of beach sediment, creating a relatively closed sediment system.
Native: a species indigenous to a given area; any species known to occur before the arrival of European culture or which has moved in through natural range extension.
Non-vascular: refers to the lichens, fungi, liverworts, hornworts, and mosses.
Noxious weeds: any plant designated by the Oregon State Weed Board that is injurious to public health, agriculture, recreation, wildlife, or any public or private property.
Plant community: a general term for an assemblage of plants growing together at a site which show a definite association or affinity to each other
Precipitation ridge: the leading landward edge of a dune field at the point of advancement of the dune.

Riparian: living on or adjacent to a water supply such as a riverbank, lake, or pond.
Riverine: relating to or resembling a river, in this case a coastal freshwater system.
Special Recreation Management Area: an area where a commitment has been made to provide specific recreation activity and experience opportunities. These areas usually require a high level of investment and/or management. They include recreation sites, but recreation sites alone do not constitute SRMAs (as defined in BLM Manual 8300).
Special status species: animals and plants considered being of conservation interest because of their rarity or vulnerability to extirpation or extinction, or they are under-represented in protected areas. BLM SSS are those designated by the BLM State Director, usually in cooperation with the Oregon Department of Agriculture and the Oregon Natural Heritage Information Center. The Oregon and Washington SSS policy identifies three tiers: Bureau Sensitive (BS), Bureau Assessment (BA), and Bureau Tracking (BT). BA species are those which are not presently eligible for official federal or state status but are of concern in Oregon or Washington and may at a minimum, need protection or mitigation in BLM activities. BT species are those which may become threatened or endangered in the future and are not considered SSS for management purposes. Surveys for SSS may be conducted prior to implementing proposed actions that may adversely affect special status species and their habitats.
Succession: the transition of plant species of a given area through a definite ecological stage (e.g., through succession of species composition, grasslands become tree-bearing forests).
Threatened species: plants and animals listed as threatened on the Endangered Species List that are in danger of becoming extinct.
Vascular plants: refers to vessels or ducts that conduct fluids in plants; includes the fern and fern allies, gymnosperms, dicotyledons, and monocotyledons.
Wetland: an area subjected to periodic inundation, usually with soil and vegetative characteristics that separates it from non-inundated area.

G2O U.S. GOVERNMENT PRINTING OFFICE: 2006 — 576-093 / 03040 Region No. 10



UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Coos Bay DISTRICT OFFICE
Umpqua Field Office
1300 Airport Lane
North Bend, Oregon 97459

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

PRIORITY MAIL
POSTAGE AND FEES PAID
Bureau of Land Management
Permit No. G-76

UNITED STATES
DEPARTMENT OF THE
INTERIOR
BUREAU OF LAND
MANAGEMENT
Coos Bay District Office

BLM/OR/WA/PL-06/008-1792

APPENDIX P-9

Oregon Administrative Rules Division 415: ODFW Fish and Wildlife Habitat Mitigation Policy

DIVISION 415

FISH AND WILDLIFE HABITAT MITIGATION POLICY

635-415-0000
Purpose

The purpose of these rules is to further the Wildlife Policy (ORS 496.012) and the Food Fish Management Policy (ORS 506.109) of the State of Oregon through the application of consistent goals and standards to mitigate impacts to fish and wildlife habitat caused by land and water development actions. The policy provides goals and standards for general application to individual development actions, and for the development of more detailed policies for specific classes of development actions or habitat types.

Stat. Auth.: ORS 496.012, ORS 496.138, ORS 496.171, ORS 506.109 & ORS 506.119
Stats. Implemented: ORS 496.012, ORS 496.138, ORS 496.171, ORS 506.109 & ORS 506.119
Hist.: DFW 25-2000, f. 4-26-00, cert. ef. 5-1-00

635-415-0005
Definitions

For the purposes of OAR 635-415-0000 through 635-415-0025 only:

(1) "Department" means the Oregon Department of Fish and Wildlife.

(2) "Development Action" means any activity subject to regulation by local, state, or federal agencies that could result in the loss of fish and wildlife habitat. Development actions may include, but are not limited to, the planning, construction, and operational activities of local, state, and federal agencies. Development actions also include subsequent re-permitting for activities with new impacts or continued impacts that have not been mitigated consistent with current standards.

(3) "Essential Habitat" means any habitat condition or set of habitat conditions which, if diminished in quality or quantity, would result in depletion of a fish or wildlife species.

(4) "Fish and Wildlife" means all fish, shellfish, intertidal animals, wild birds, amphibians, reptiles, and wild mammals over which the Fish and Wildlife Commission has jurisdiction.

(5) "Habitat" means the physical and biological conditions within the geographic range of occurrence of a species, extending over time, that affect the welfare of the species or any sub-population or members of the species.

(6) "Habitat Quantity" means the amount of a given habitat type.

(7) "Habitat Quality" means the relative importance of a habitat with regard to its ability to influence species presence and support the life-cycle requirements of the fish and wildlife species that use it.

(8) "Habitat Type" means the classification of a site or area based on its dominant plant, soil, and water associations or other salient features (e.g. tidal influence, salinity, substrate, alkalinity, etc.) of value to the support and use by fish and wildlife.

(9) "Home Range" means the area that a species traverses in the scope of normal life-cycle activities.

(10) "Impact" means an adverse effect of a development action upon fish and wildlife habitat.

(11) "Important Habitat" means any habitat recognized as a contributor to sustaining fish and wildlife populations on a physiographic province basis over time.

(12) "In-kind Habitat Mitigation" means habitat mitigation measures which recreate similar habitat structure and function to that existing prior to the development action.

(13) "In-proximity Habitat Mitigation" means habitat mitigation measures undertaken within or in proximity to areas affected by a development action. For the purposes of this policy, "in proximity to" means within the same home range, or watershed (depending on the species or population being considered) whichever will have the highest likelihood of benefiting fish and wildlife populations directly affected by the development.

(14) "Irreplaceable" means that successful in-kind habitat mitigation to replace lost habitat quantity and/or quality is not feasible within an acceptable period of time or location, or involves an unacceptable level of risk or uncertainty, depending on the habitat under consideration and the fish and wildlife species or populations that are

affected. "Acceptable", for the purpose of this definition, means in a reasonable time frame to benefit the affected fish and wildlife species.

(15) "Limited habitat" means an amount insufficient or barely sufficient to sustain fish and wildlife populations over time.

(16) "Mitigation" means taking one or more of the following actions listed in order of priority:

(a) Avoiding the impact altogether by not taking a certain development action or parts of that action;

(b) Minimizing impacts by limiting the degree or magnitude of the development action and its implementation;

(c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;

(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the development action and by monitoring and taking appropriate corrective measures;

(e) Compensating for the impact by replacing or providing comparable substitute resources or environments.

(17) "Mitigation Bank" means fish and/or wildlife habitat that is restored, created, or enhanced for the purpose of selling habitat credits in exchange for anticipated unavoidable future habitat loses due to development actions.

(18) "Mitigation Plan" means a written plan or statement that thoroughly describes the manner in which the impact of a development action will be reduced or eliminated over time, avoided, and/or minimized; and the affected environment, including fish and wildlife habitat, monitored, restored, rehabilitated, repaired and/or replaced or otherwise compensated for in accordance with OAR 635-415-0010 of these rules.

(19) "Native" means fish and wildlife species, subspecies or populations that occur currently or historically in Oregon through natural (i.e. nonhuman) colonization or immigration, rather than by human action or intervention.

(20) "Nonnative" means a fish or wildlife species not native to Oregon; foreign or introduced.

(21) "Net Benefit" means an increase in overall in-proximity habitat quality or quantity after a development action and any subsequent mitigation measures have been completed and monitored.

(22) "Net Loss" means a loss of habitat quantity and/or habitat quality resulting from a development action despite mitigation measures having been taken.

(23) "Off-site" means outside the boundary of the development action.

(24) "Off-proximity Habitat Mitigation" means habitat mitigation measures undertaken outside the area that would constitute "in-proximity mitigation" but within the same physiographic province as the development action.

(25) "Out-of-kind Habitat Mitigation" means habitat mitigation measures which result in different habitat structure and function that may benefit fish and wildlife species other than those existing at the site prior to the development action.

(26) "Physiographic Province" means any one of ten major geographical areas within the State of Oregon based on differences in topography, climate, and vegetation as defined in the Oregon Wildlife Diversity Plan (OAR 635-100-0001 through 0040).

(27) "Project Life" means the period of time during which a development action is subject to regulation by local, state, or federal agencies.

(28) "Project Proponent" means any individual, corporation, association or agency or their delegated representative that proposes a development action.

(29) "Reliable Method" means a mitigation method that has been tested in areas with site factors similar to those affected by a development action and the area in which the mitigation action is being proposed and that has been found (e.g., through field trials, demonstration projects or scientific studies) to produce the habitat effects required to meet the mitigation goal for that action.

(30) "Site Factors" means climate, soil series, sediments, hydrology, salinity, pH, DO, plant community, fish and wildlife use, or other characteristics of an area that determine its capacity to produce vegetation or maintain habitat features valuable to fish and wildlife.

(31) "Watershed" means a drainage basin encompassing a stream, its tributaries, and associated uplands at the USGS 4th Field Hydrologic Unit level.

Stat. Auth.: ORS 496.012, ORS 496.138, ORS 496.171, ORS 506.109 & ORS 506.119
Stats. Implemented: ORS 496.012, ORS 496.138, ORS 496.171, ORS 506.109 & ORS 506.119
Hist.: DFW 25-2000, f. 4-26-00, cert. ef. 5-1-00

635-415-0010
Fish and Wildlife Habitat Mitigation Policy

It is the fish and wildlife habitat mitigation policy of the Oregon Department of Fish and Wildlife to require or recommend, depending upon the habitat protection and mitigation opportunities provided by specific statutes, mitigation for losses of fish and wildlife habitat resulting from development actions. Priority for mitigation actions shall be given to habitat for native fish and wildlife species. Mitigation actions for nonnative fish and wildlife species may not adversely affect habitat for native fish and wildlife.

Stat. Auth.: ORS 496.012, ORS 496.138, ORS 496.171, ORS 506.109 & ORS 506.119
Stats. Implemented: ORS 496.012, ORS 496.138, ORS 496.171, ORS 506.109 & ORS 506.119
Hist.: DFW 25-2000, f. 4-26-00, cert. ef. 5-1-00

635-415-0015
Application of Fish and Wildlife Habitat Mitigation Policy

(1) The Department shall work with regulatory and planning agencies, land management agencies, private developers, operators, public interest groups, and the public to implement this Fish and Wildlife Habitat Mitigation Policy.

(2) The Department shall apply the requirements of this division when implementing its own development actions, and when developing recommendations to other state, federal, or local agencies regarding development actions for which mitigation for impacts to fish and wildlife habitat is authorized or required by federal, state, or local environmental laws or land use regulations.

(3) In applying this policy, the Department shall identify and utilize the habitat protection and mitigation opportunities provided by applicable federal, state, and local environmental laws and land use regulations, and shall participate throughout the duration of these regulatory processes to coordinate Department mitigation requirements or recommendations with those of other agencies. If the regulatory authority of an agency provides for mitigation of cumulative or historic losses, the Department shall apply the standards of OAR 635-415-0025 in making its recommendations.

(4) When making recommendations on local land use actions, the Department shall follow the provisions of its certified State Agency Coordination Program and OAR Chapter 635 Division 405.

(5) Unless required by statute, the Department may elect not to recommend or require mitigation for a development action if, in the opinion of the Department, the impacts to fish and wildlife habitat are expected to be inconsequential in either nature, extent, or duration; or if staff resources are not available.

(6) Nothing in this policy shall be construed to vest authority in the Department where no such statutory or regulatory authority has been granted.

Stat. Auth.: ORS 496.012, ORS 496.138, ORS 496.171, ORS 506.109 & ORS 506.119
Stats. Implemented: ORS 496.012, ORS 496.138, ORS 496.171, ORS 506.109 & ORS 506.119
Hist.: DFW 25-2000, f. 4-26-00, cert. ef. 5-1-00

635-415-0020
Implementation of Department Habitat Mitigation Requirements

(1) The Department shall provide mitigation consistent with the goals and standards of OAR 635-415-0025 for Department development actions that impact fish and wildlife habitat.

(2) The Department shall require mitigation consistent with the goals and standards of OAR 635-415-0025 for development actions that impact fish and wildlife habitat for which the Department has statutory authority to require mitigation as a condition of a permit or order.

(3) The Department shall recommend mitigation consistent with the goals and standards of OAR 635-415-0025 for development actions which impact fish and wildlife habitat for other than Department actions when:

(a) Federal or state environmental laws or land use regulations authorize or require mitigation for impacts to fish and wildlife; or

(b) Local environmental laws or land use regulations authorize or require mitigation for impacts to fish and wildlife habitat; or

(c) The proposed development action requires either an amendment to an acknowledged comprehensive plan or land use regulation relating to fish and wildlife habitat protection, or adoption of a new land use regulation relating to fish and wildlife habitat protection, and the Department believes that mitigation is necessary to comply with Statewide Planning Goal 5 or other applicable statewide planning goal requirements for fish and wildlife habitat protection.

(4) The Department's recommendations or requirements for mitigating the impacts of a development action shall be based on the following considerations:

(a) The location, physical and operational characteristics, and duration of the proposed development action; and

(b) The alternatives to the proposed development action; and

(c) The fish and wildlife species and habitats which will be affected by the proposed development action; and

(d) The nature, extent, and duration of impacts expected to result from the proposed development action.

(5) The Department shall require the project proponent to prepare a written mitigation plan approved by the Department if required by an ODFW implemented statute; or recommend or require a written plan approved by the Department if the impacts of the proposed development action may, in the opinion of the Department, be so significant in nature, extent, or duration that mitigation measures to achieve the goals and standards of OAR 635-415-0025 cannot be identified without the evaluation that would be provided in a written mitigation plan.

(6) The Department may recommend or require the posting of a bond, or other financial instrument acceptable to the Department, to cover the cost of mitigation actions based on the nature, extent, and duration of the impact and/or the risk of the mitigation plan not achieving mitigation goals.

(7) The Department may consider the use of mitigation banks or payment-to-provide mitigation based on the nature, extent, and duration of the impact and/or the risk of the mitigation plan not achieving mitigation goals.

(a) The Department may consider the use of mitigation banks and payment-to-provide mitigation only for habitat categories two through six and only if they are consistent with the mitigation goals and standards identified in OAR 635-415-0025.

(b) The amount of payment-to-provide mitigation, recommended or required, shall include at a minimum the cost of property acquisition, mitigation actions, maintenance, monitoring, and any other actions needed for the long-term protection and management of the mitigation site.

(8) In addition to any other information that may be required by law, a written mitigation plan prepared for the Department shall:

(a) Include the information required in OAR 635-415-0020(4)(a)–(d); and

(b) Describe the mitigation actions which shall be taken to achieve the fish and wildlife habitat mitigation goals and standards of OAR 635-415-0025; and

(c) Describe and map the location of he development action and mitigation actions including the latitude and longitude, township, range, section, quartersection and county; and

(d) Complement and not diminish mitigation provided for previous development actions; and

(e) Include protocols and methods, and a reporting schedule for monitoring the effectiveness of mitigation measures. Monitoring efforts shall continue for a duration and at a frequency needed to ensure that the goals and standards in OAR 635-415-0025 are met, unless the Department determines that no significant benefit would result from such monitoring; and

(f) Provide for future modification of mitigation measures that may be required to meet the goals and standards of OAR 635-415-0025; and

(g) Be effective throughout the project life or the duration of project impacts whichever is greater.

(h) Contain mitigation plan performance measures including:

(A) Success Criteria. The mitigation plan must clearly define the methods to meet mitigation goals and standards and list the criteria for measuring success;

(B) Criteria and a timeline for formal determination that the mitigation goals and standards have been met;

(C) Provisions for long-term protection and management of the site if appropriate;

(D) A reporting schedule for identifying progress toward achieving the mitigation goals and standards and any modification of mitigation measures. Mitigation goals and standards must be achieved within a reasonable time frame to benefit the affected fish and wildlife species.

(9) The requirement for a mitigation plan pursuant to OAR 635-415-0020(8) may, at the discretion of the Department, be partially or entirely fulfilled by incorporation of environmental assessments or environmental impact statements prepared for the proposed development action; or by local government land use regulations which implement the requirements of Statewide Planning Goals 5, 8, 15, 16, or 17 pertaining to fish and wildlife habitat protection.

(10) The project proponent is responsible for the expenses of developing, evaluating, and implementing the mitigation plan and monitoring the mitigation site; however, to the extent that available resources allow, the Department may take one or more of the following actions to assist in the development of a mitigation plan:

(a) Identify fish and wildlife species and habitats to be affected by the proposed development action;

(b) Determine the Habitat Categories that are likely to be affected by the proposed development action;

(c) Identify the nature, extent, and duration of potential impacts upon fish and wildlife habitat resulting from the proposed development action;

(d) Identify mitigation measures to achieve the goals and standards of OAR 635-415-0025.

(e) Furnish any information or counsel to further the purpose of OAR Chapter 635 Division 415

Stat. Auth.: ORS 496.012, ORS 496.138, ORS 496.171, ORS 506.109 & ORS 506.119
Stats. Implemented: ORS 496.012, ORS 496.138, ORS 496.171, ORS 506.109 & ORS 506.119
Hist: DFW 25-2000, f. 4-26-00, cert. ef. 5-1-00

635-415-0025
Implementation of Department Habitat Mitigation Recommendations

(1) "Habitat Category 1" is irreplaceable, essential habitat for a fish or wildlife species, population, or a unique assemblage of species and is limited on either a physiographic province or site-specific basis, depending on the individual species, population or unique assemblage.

(a) The mitigation goal for Category 1 habitat is no loss of either habitat quantity or quality.

(b) The Department shall act to protect Category 1 habitats described in this subsection by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) No authorization of the proposed development action if impacts cannot be avoided.

(2) "Habitat Category 2" is essential habitat for a fish or wildlife species, population, or unique assemblage of species and is limited either on a physiographic province or site-specific basis depending on the individual species, population or unique assemblage.

(a) The mitigation goal if impacts are unavoidable, is no net loss of either habitat quantity or quality and to provide a net benefit of habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 2 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through reliable in-kind, in-proximity habitat mitigation to achieve no net loss of either pre-development habitat quantity or quality. In addition, a net benefit of habitat quantity or quality must be provided. Progress towards achieving the mitigation goals and standards shall be reported on a schedule agreed to in the mitigation plan performance measures. The fish and wildlife mitigation measures shall be implemented and completed either prior to or concurrent with the development action.

(c) If neither 635-415-0025(2)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

(3) "Habitat Category 3" is essential habitat for fish and wildlife, or important habitat for fish and wildlife that is limited either on a physiographic province or site-specific basis, depending on the individual species or population.

(a) The mitigation goal is no net loss of either habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 3 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through reliable in-kind, in-proximity habitat mitigation to achieve no net loss in either pre-development habitat quantity or quality. Progress towards achieving the mitigation goals and standards shall be reported on a schedule agreed to in the mitigation plan performance measures. The fish and wildlife mitigation measures shall be implemented and completed either prior to or concurrent with the development action.

(c) If neither 635-415-0025(3)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

(4) "Habitat Category 4" is important habitat for fish and wildlife species.

(a) The mitigation goal is no net loss in either existing habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 4 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through reliable in-kind or out-of-kind, in-proximity or off-proximity habitat mitigation to achieve no net loss in either pre-development habitat quantity or quality. Progress towards achieving the mitigation goals and standards shall be reported on a schedule agreed to in the mitigation plan performance measures. The fish and wildlife mitigation measures shall be implemented and completed either prior to or concurrent with the development action.

(c) If neither 635-415-0025(4)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

(5) "Habitat Category 5" is habitat for fish and wildlife having high potential to become either essential or important habitat.

(a) The mitigation goal, if impacts are unavoidable, is to provide a net benefit in habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 5 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through actions that contribute to essential or important habitat.

(c) If neither 635-415-0025(5)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

(6) "Habitat Category 6" is habitat that has low potential to become essential or important habitat for fish and wildlife.

(a) The mitigation goal is to minimize impacts.

(b) The Department shall act to achieve the mitigation goal for Category 6 habitat by recommending or requiring actions that minimize direct habitat loss and avoid impacts to off-site habitat.

Stat. Auth.: ORS 496.012, ORS 496.138, ORS 496.171, ORS 506.109 & ORS 506.119

Stats. Implemented: ORS 496.012, ORS 496.138, ORS 496.171, ORS 506.109 & ORS 506.119

Hist.: DFW 25-2000, f. 4-26-00, cert. ef. 5-1-00

APPENDIX P-10

Oregon Conservation Strategy, Summary of Strategy Species

APPENDIX I

Statewide Summary of Strategy Species

Although Strategy species were designated by ecoregion and not statewide, we recognize that appropriate conservation actions for a Strategy species outside the ecoregion(s) that has been identified will contribute to the overall conservation for that species. Thus, conservation actions for Strategy species may be important throughout the state, and should be considered when planning or implementing conservation activities. However, the ecoregions designated have the greatest conservation need and/or opportunities for Strategy species. These areas will be considered the highest priority for Strategy implementation.

Marine species, including marine mammals, will be addressed in the Oregon Nearshore Strategy.

KEY

Federal Status:

C – Candidate

LE – Listed Endangered

LT – Listed Threatened

SOC – Species of Concern

State Status:

C – Candidate (plants only)

LE– Listed Endangered

LT – Listed Threatened

SC – Sensitive Species, Critical category

SP – Sensitive Status, Peripheral or Naturally Rare category

SU – Sensitive Species, Undetermined Status category

SV – Sensitive Species, Vulnerable Category

(note: Sensitive Species applies to vertebrates only)

Heritage List (Oregon Natural Heritage Information Center rank):

1 (List 1) – threatened with extinction or presumed to be extinct throughout their entire range

2 (List 2) – threatened with extirpation or presumed to be extirpated in Oregon

3 (List 3) – More information is needed before status can be determined, but may be imperiled in Oregon or throughout range

4 (List 4) – of conservation concern but not currently imperiled

G Rank (Global) and S Rank (State)

(NatureServe/Natural Heritage Network Ranks):

1 = Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation, typically with 5 or fewer occurrences.

2 = Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction or extirpation, typically with 6-20 occurrences.

3 = Rare, uncommon or threatened, but not immediately imperiled, typically with 21-100 occurrences.

4 = Not rare and apparently secure, but with cause for long-term concern, usually with more than 100 occurrences.

5 = Demonstrably widespread, abundant, and secure.

H = Historical Occurrence, formerly part of the native biota with the implied expectation that it may be rediscovered.

T = subspecies, variety or recognized race.

X = Presumed extirpated or extinct.

U = Unknown rank.

NR = Not yet ranked.

G and S Rank Qualifiers:

Q = Questionable taxonomy.

? = Inexact Numeric Rank. Taxa that can be ranked, but for which the rank is not certain. Ranks with a "?" indicate that the rank is probably correct, but that either documentation is lacking or there is still some uncertainty. Such ranks are always provisional.

Range Ranks = Ranks with more than one value. These can be G1G2, G1G3, etc. These indicate that the predicted final rank would be within the range, but with no indication of preference among the possibilities.

Ecoregions:

BM – Blue Mountains

CP – Columbia Plateau

CR – Coast Range

EC – East Cascades

KM – Klamath Mountains

NBR – Northern Basin and Range

WC – West Cascades

WV – Willamette Valley

X = Strategy Species within that ecoregion

ext = Extirpated from ecoregion (conservation priority is in ecoregions where populations still occur naturally, but translocation back into ecoregions of extirpation may be appropriate. For plants and invertebrates, extirpation status may reflect lack of complete survey data. Recent populations have been found for some "extirpated" plants.)

DG = Data gap (known occurrence, but unknown conservation status)

Table A-I.1

Scientific Name	Common Name	STATUS			G Rank	S Rank	BM	CP	CR	EC	KM	NBR	WC	WV
		Federal	state	Heritage										
AMPHIBIANS														
Aneides ferreus	Clouded salamander		SV	4	G3	S3			X		X		X	
Ascaphus montanus	Inland tailed frog	SOC	SV	2	G4	S2	X							
Ascaphus truei	Coastal tailed frog	SOC	SV	4	G4	S3			X		X		X	
Batrachoseps wrightorum	Oregon slender salamander	SOC	SU	1	G2G3	S2S3							X	
Bufo boreas	Western toad		SV	4	G4	S3	X		X	X	X	X	X	
Dicamptodon copei	Cope's giant salamander		SU	2	G3G4	S2			X				X	
Plethodon larselli	Larch Mountain salamander	SOC	SV	2	G3	S2							X	
Plethodon stormi	Siskiyou Mountain Salamander	SOC	SV	1	G2G3	S2					X			
Rana aurora aurora	Northern red-legged frog	SOC	SV(WV) /SU(other)	4	G4T4	S3S4					X			X
Rana boylii	Foothill yellow-legged frog	SOC	SV	2	G3	S2S3			X		X		X	X
Rana cascadea	Cascades frog	SOC	SV	4	G3G4	S3				X			X	
Rana luteiventris	Columbia spotted frog	C	SU	2	G4	S2S3	X					X		
Rana pipiens	Northern leopard frog		SC	2	G5	S1S2	ext	ext		ext		X		
Rana pretiosa	Oregon spotted frog	C	SC	1	G2	S2				X			X	ext
Rhyacotriton cascadae	Cascade torrent salamander		SV	4	G3	S3							X	
Rhyacotriton kezeri	Columbia torrent salamander		SC	4	G3	S3			X					
Rhyacotriton variegatus	Southern torrent salamander	SOC	SV	4	G3G4	S3			X		X			
BIRDS														
Accipiter gentilis	Northern goshawk	SOC	SC	4	G5	S3B				X			X	
Ammodramus savannarum	Grasshopper sparrow		SV(CB) /SP(WV)	2	G5	S2B		X			X			X
Amphispiza belli	Sage sparrow		SC(CB)	4	G5	S4B		X						
Asio flammeus	Short-eared owl			NR	NR	NR								X
Athene cunicularia hypugaea	Western burrowing owl	SOC	SC(WV, KM, CB, BM)	4	G4T4	S3B		X			ext			ext
Baeolophus ridgwayi	Juniper titmouse			NR	NR	NR						X		
Bartramia longicauda	Upland sandpiper	SOC	SC	2	G5	S1B	X							
Brachyramphus marmoratus	Marbled murrelet	LT	LT	2	G3G4	S2			X		X			
Branta bernicla nigricans	Black brant			NR	NR	NR			X					
Branta canadensis leucopareia (note: AOU name is Branta hutchinsii leucopareia)	Aleutian Canada goose (Semidi Island subpopulation) (Note: AOU name is Aleutian cackling goose).			1	G5T2T3	S2S3N			X					
Branta canadensis occidentalis	Dusky Canada goose			1	G5T2T3	S2S3N								X
Bucephala albeola	Bufflehead		SU	2	G5	S2B,S5N				X			X	

Scientific Name	Common Name	STATUS			G Rank	S Rank	BM	CP	CR	EC	KM	NBR	WC	WV
		Federal	state	Heritage										
Bucephala islandica	Barrow's goldeneye		SU	4	G5	S3B,S3N				X			X	
Buteo regalis	Ferruginous hawk	SOC	SC	4	G4	S3B	X	X				X		
Buteo swainsoni	Swainson's hawk		SV	4	G5	S3B		X				X		
Calidris ptilocnemis	Rock sandpiper			NR	NR	NR			X					
Centrocercus urophasianus	Greater sage-grouse	SOC	SV(EC, CB, BM)	4	G4	S3	X	ext		ext		X		
Charadrius alexandrinus nivosus	Western snowy plover	LT(Coastal)	LT	2	G4T3	S2			X			X		
Chordeiles minor	Common nighthawk		SC(WV)	4	G5	S5B								X
Contopus cooperi	Olive-sided flycatcher	SOC	SV	4	G4	S3B			X	X			X	
Coturnicops noveboracensis	Yellow rail	SOC	SC	2	G4	S1B				X				
Cypseloides niger	Black swift		SP	2	G4	S2B							X	
Dolichonyx oryzivorus	Bobolink		SV	2	G5	S2B	X					X		
Dryocopus pileatus	Pileated woodpecker		SV	NR	NR	NR	X							
Egretta thula	Snowy egret		SV	2	G5	S2B						X		
Empidonax traillii brewsteri	Little willow flycatcher	SOC	SU	4	G5T5	S3S4B								X
Empidonax traillii adastus	Willow flycatcher		SV	4	G5T3T4	S3S4B						X		
Eremophila alpestris strigata	Streaked horned lark	C	SC	1	G5T2	S2B					ext			X
Falco peregrinus anatum	American peregrine falcon		LE	2	G4T3	S2B			X			X		
Fratercula cirrhata	Tufted puffin			2	G5	S2B			X					
Grus canadensis tabida	Greater sandhill crane		SV	4	G5T4	S3S4B				X		X	X	
Haematopus bachmani	Black oystercatcher			4	G5	S3			X					
Haliaeetus leucocephalus	American bald eagle	LT	LT	4	G4	S4B,S4N			X					
Himantopus mexicanus	Black-necked stilt			NR	NR	NR						X		
Icteria virens	Yellow-breasted chat	SOC	SC	4	G5	S4B								X
Lanius ludovicianus	Loggerhead shrike		SV(CB, BM)	4	G4	S3B,S2N	X	X						
Larus pipixcan	Franklin's gull		SP	2	G4G5	SB2						X		
Melanerpes formicivorus	Acorn woodpecker	SOC		4	G5	S3								X
Melanerpes lewis	Lewis' woodpecker	SOC	SC(WV, KM, WC, EC, CB)	2	G4	S2S3B	X	X		X	X			ext
Numenius americanus	Long-billed curlew		SV(CB)	4	G5	S3B		X				X		
Oceanodrama furcata	Fork-tailed storm-petrel		SV	2	G5	S2B			X					
Oceanodrama leucorhoa	Leach's storm-petrel			NR	NR	NR			X					
Oreortyx pictus	Mountain quail	SOC	SU(EC, BM)	4	G5	S4						X		
Otus flammeolus	Flammulated owl		SC	4	G4	S3B	X			X				
Patagioenas fasciata	Band-tailed pigeon	SOC		4	G4	S3B			X				X	

Scientific Name	Common Name	STATUS			G Rank	S Rank	BM	CP	CR	EC	KM	NBR	WC	WV
		Federal	state	Heritage										
Scientific name	Common name	status	status	List	G Rank	S Rank	BM	CP	CR	EC	KM	NBR	WC	WV
Pelecanus erythrorhynchos	American white pelican		SV	2	G3	S2B						X		
Pelecanus occidentalis californicus	California brown pelican	LE	LE	2	G4T2	S2N			X					
Picoides albolarvatus	White-headed woodpecker	SOC	SC	2	G4	S2S3	X			X	X			
Picoides arcticus	Black-backed woodpecker		SC	4	G5	S3	X			X				
Picoides dorsalis	American three-toed woodpecker		SC	4	G5	S3	X			X				
Podiceps grisegena	Red-necked grebe		SC	2	G5	S1B,S4N				X				
Polioptila caerulea	Blue-gray gnatcatcher			NR	NR	NR					X			
Pooecetes gramineus affinins	Oregon vesper sparrow	SOC	SC	2	G5T3	S2B,S2N					X			X
Progne subis	Western purple martin	SOC	SC	2	G5	S2B				ext	X			X
Sialia mexicana	Western bluebird		SV(CR, WV, KM, WC)	4	G5	S4B,S4N								X
Sitta carolinensis aculeata	Slender-billed (white-breasted) nuthatch			4	G5T4	S3								X
Spizella passerina	Chipping sparrow													X
Sterna caspia	Caspian tern								X					
Strix nebulosa	Great gray owl		SV	4	G5	S3	X			X				
Strix occidentalis caurina	Northern spotted owl	LT	LT						X		X		X	
Sturnella neglecta	Western meadowlark		SC(WV)	4	G5	S4								X
Spizella breweri	Brewer's sparrow			NR	NR	NR		X						
FISH														
Acipenser medirostris	Green sturgeon	SOC		4	G3	S3			X					
Catostomus microps	Modoc sucker	SOC	SC	1	G1	S1				X				
Catostomus occidentalis lacusanserinus	Goose Lake sucker			1	G5T2T3Q	S2				X				
Catostomus rimiculus	Jenny Creek sucker (=Jenny Creek population of Klamath smallscale sucker)	SOC	SS	1	G5T+G1432Q	S2				X				
Catostomus warnerensis	Warner sucker	LT	LT	1	G1	S1						X		
Chasmistes brevirostris	Shortnose sucker	LE	LE	1	G1	S1				X				
Cottus bendirei	Malheur mottled sculpin	SOC	SS	4	G4Q	S4	X					X		
Cottus marginatus	Margined sculpin	SOC	SV	4	G3	S3	X	X						
Cottus tenuis	Slender sculpin	SOC		3	G3	S3				X				
Deltistes luxatus	Lost River sucker	LE	LE	1	G1	S1				X				
Gila avordensis	Alvord chub	SOC	SS	1	G2	S2						X		
Gila bicolor eutysoma	Sheldon tui chub	SOC	SS	1	G4T1	S1						X		
Siphateles sp. (cf. S. obesus)	Abert Lake tui chub (=Oregon Lakes tui chub)	SOC	SV	1	G4T2	S2						X		
Gila bicolor ssp.	Catlow tui chub	SOC	SS	1	G4T1	S1						X		

Scientific Name	Common Name	STATUS			G Rank	S Rank	BM	CP	CR	EC	KM	NBR	WC	WV
		Federal	state	Heritage										
Gila bicolor ssp.	Hutton tui chub	LT	LT	1	G4T1	S1						X		
Gila bicolor ssp.	Summer Basin tui chub	SOC	SS	1	G4T1	S1						X		
Gila bicolor ssp.	Warner Basin tui chub		SS	1	G4T2Q	S2						X		
Gila bicolor thalassina	Goose Lake tui chub		SS	1	G4T2	S2				X				
Gila boraxobius	Borax Lake chub	LE	LE	1	G1	S1						X		
Lampetra richardsoni	Western brook lamprey	SOC	SS				X	X	X	X	X		X	X
Lampetra lethophaga	Pit-Klamath brook lamprey			4	G3G4	S3				X				
Lampetra minima	Miller Lake lamprey	SOC	SS	1	G1	S1				X				
Lampetra tridentata	Pacific lamprey	SOC	SS	4	G5	S3	X	X	X	X	X		X	X
Lampetra tridentata ssp.	Goose Lake lamprey	SOC	SC	1	G5T1	S1				X				
Lampetra tridentata ssp.	Upper Klamath Lake lamprey			NR	NR	NR				X				
Oncorhnchus kisutch	Coho salmon (Lower Columbia /SW Washington Coast ESU)	C	LE	1	G4T2Q	S2		X	X	X			X	X
Oncorhnchus kisutch	Coho salmon (Oregon Coast ESU)	LT	SS	1	G4T2Q	S2			X		X		X	X
Oncorhnchus kisutch	Coho salmon (Southern Oregon/Northern California Coasts ESU)	SOC	SS	1	G4T2Q	S2			X		X		X	
oncorhychus clarki lewisi	Westslope cutthroat trout	SOC	SS	1	G4T3	S3	X							
Oncorhynchus clarki	Coastal cutthroat trout (Oregon coast ESU)	SOC	SV	4	G4T3Q	S3			X		X		X	X
Oncorhynchus clarki	Coastal cutthroat trout (Southwestern Washington/Columbia River ESU)		SC	1	G4T2Q	S2			X	X			X	X
Oncorhynchus clarki	Coastal cutthroat trout (Upper Willamette River ESU)	SOC		4	G4T?Q	S3?			X				X	X
Oncorhynchus clarki	Coastal cutthroat trout (Southern Oregon/ California Coasts ESU)	SOC	SS	4	G4T?Q	S3?			X		X		X	
Oncorhynchus clarki henshawi	Lahontan cutthroat trout	LT	LT	2	G4T3	S1						X		
Oncorhynchus keta	Chum salmon (Pacific Coast)	LT	SC	2	G5T3Q	S2			X					
Oncorhynchus keta	Chum salmon (Columbia River ESU)	LT	SS	1	G5T2Q	S2								
Oncorhynchus mykiss	Steelhead (Lower Columbia River ESU, summer run)	LT	SS	1	G5T2Q	S2			X	X			X	X
Oncorhynchus mykiss	Steelhead (Lower Columbia River ESU, winter run)			1	G5T2Q	S2			X	X			X	X
Oncorhynchus mykiss	Steelhead (Middle Columbia ESU, summer run)	LT	SS	1	G5T2Q	S2	X	X	X	X			X	X
Oncorhynchus mykiss	Steelhead (Middle Columbia River ESU, winter run)			1	G5T2Q	S2	X	X	X	X			X	X
Oncorhynchus mykiss	Steelhead (Oregon Coast ESU, summer run)	C	SS	1	G5T2T3Q	S2S3			X		X		X	X
Oncorhynchus mykiss	Steelhead (Oregon Coast ESU, winter run)	C	SS	1	G5T2T3Q	S2S3			X		X		X	X
Oncorhynchus mykiss	Steelhead (Snake River Basin ESU)	LT	SV	1	G5T2T3Q	S2S3	X	X	X	X			X	X
Oncorhynchus mykiss	Steelhead (Southwest Washington ESU, winter run)	C		2	G5T3Q	S2			X					X
Oncorhynchus mykiss	Steelhead (Upper Willamette River ESU, winter run)	LT	SS	1	G5T2Q	S2			X				X	X

Scientific Name	Common Name	STATUS			G Rank	S Rank	BM	CP	CR	EC	KM	NBR	WC	WV
		Federal	state	Heritage										
Oncorhynchus mykiss	Oregon Basins redband trout (Goose Lake SMU)	SOC	SS	1	G5T2Q	S2				X				
Oncorhynchus mykiss	Oregon Basins redband trout (Catlow Valley redband trout SMU)	SOC	SS	1	G5T1Q	S1						X		
Oncorhynchus mykiss	Oregon Basins redband trout (Foster Creek redband trout)			NR	NR	NR						X		
Oncorhynchus mykiss	Oregon Basins redband trout (Silvies River)		SV	3	G5T3Q	S3	X							
Oncorhynchus mykiss	Oregon Basins redband trout (Warner Valley redband trout SMU)	SOC	SS	1	G5T2Q	S2						X		
Oncorhynchus mykiss	Steelhead (Klamath Mountains Province ESU summer run)		SS	2	G5T3Q	S2S3			X		X		X	
Oncorhynchus mykiss	Steelhead (Klamath Mountains Province ESU, winter run		SS	2	G5T3Q	S2S3			X		X		X	
Oncorhynchus mykiss gairdneri	Inland Columbia Basin redband trout	SOC	SS	4	G5T4	S3	X	X		X		X		
Oncorhynchus tshawytscha	Chinook (Snake R ESU, spring/summer run)	LT	ST	1	G5T1Q	S1	X	X	X	X			X	X
Oncorhynchus tshawytscha	Chinook (Snake River ESU fall run)	LT	LT	1	G5T1Q	S1	X	X	X	X			X	X
Oncorhynchus tshawytscha	Chinook salmon (Lower Columbia, fall run)	LT	SC	1	G5T2Q	S2			X	X			X	X
Oncorhynchus tshawytscha	Chinook salmon (Lower Columbia, spring run)	LT	SC	1	G5T2Q	S2			X	X			X	X
Oncorhynchus tshawytscha	Chinook salmon (Upper Willamette River ESU, spring run)	LT		1	G5T2Q	S2			X				X	X
Oncorhynchus tshawytscha	Chinook salmon (Southern Oregon/Northern California Coast ESU, fall run)		SS	2	G5T3Q	S2			X		X		X	
Oregonichthys crameri	Oregon chub	C	LE	1	G2	S2							X	X
Oregonichthys kalawatseti	Umpqua chub	SOC	SS	1	G2G3	S2S3			X		X		X	
Rhinichthys cataractae ssp	Millicoma dace	SOC	SP	1	G5T2	S2			X					
Rhinichthys osculus ssp	Foskett spring speckled dace	LT	LT	1	G5T1	S1						X		
Salvelinus confluentus	Bull trout (Columbia Distinct Population Segment [DPS])	LT	SS	1	G3T2Q	S2	X	X		X			X	X
Salvelinus confluentus	Bull trout (Klamath River population)	LT	SS	1	G3T2Q	S2				X			X	
INVERTEBRATES														
Acetropis americana	American grass bug	SOC		1	G1	S1								X
Algamorda newcombiana	Newcomb's littorine snail	SOC		1	G1G2	S1			X					
Allomyia scotti	Scott's apatanian caddisfly	SOC		1	G1	S1							X	
Amerigoniscus malheurensis	Malheur isopod			1	G1	S1						X		
Anodonta wahlametensis	Willamette floater (freshwater mussel)			1	G2Q	S1								X
Apochthonius malheuri	Malheur pseudoscorpion	SOC		1	G1	S1						X		
Branchinecta lynchi	Vernal pool fairy shrimp	LT		1	G2G3	S2S3					X			
Chloealtis aspasma	Siskiyou short-horned grasshopper	SOC		1	G1	S1					X			
Cryptomastix hendersoni	Columbia Gorge oregonian (snail)			1	G1G2	S1S2		X						
Deroceras hesperium	Evening fieldslug			1	G1	S1			P	X			P	P

Scientific Name	Common Name	STATUS			G Rank	S Rank	BM	CP	CR	EC	KM	NBR	WC	WV
		Federal	state	Heritage										
Euphydryas editha taylori	Taylor's checkerspot	C		1	G5T1	S1								X
Farula constricta	"Constricted" caddisfly (no common name)	SOC		1	G1?	S1?							X	
Fisherola nuttalli	Shortface lanx (=giant Columbia River limpet)			1	G2	S1S2		X						
Fluminicola turbiniformis	Turban pebblesnail			1	G3	S1				X				
Gliabates oregonius	Salamander slug			1	G1Q	S1			X	DG			DG	
Helisoma newberryi newberryi	Great Basin ramshorn			1	G1T1	S1				X				
Helminthoglypta hertleini	Oregon shoulderband (snail)			1	G1	S1					X		X	
Hesperarion mariae	Tillamook westernslug			1	G2	S2			X					
Hochbergellus hirsutus	Sister's hesperian (snail)			1	G1	S1			X					
Icaricia icarioides fenderi	Fender's blue butterfly	LE		1	G5T1	S1								X
Incisalia polia maritima	Hoary elfin (butterfly)			1	G5T2T3	S1?			X					
Juga acutifilosa	Scalloped juga (snail)			1	G2	S1				X				
Juga bulbosa	Bulb juga (snail)			1	G1	S1	X	X						
Juga hemphilli hemphilli	Purple-lipped juga (=Deschutes juga; snail)			1	G2T1	S1	X	X						
Kenkia rhynchida	Malheur Cave flatworm	SOC		1	G1G2	S1S2						X		
Lanx alta	Highcap lanx (snail)			1	G1	S1				X				
Lanx klamathensis	Scale lanx (snail)			1	G1	S1				X				
Lanx subrotunda	Rotund lanx (snail)			1	G2	S2					X			
Mitoura johnsoni	Johnson's hairstreak			1	G2G3	S2?	DG				X		X	
Monadenia chaceana	Chace sideband (snail)			1	G1Q	S1							X	
Monadenia fidelis beryllica	Green sideband (snail)			1	G4G5T1T2	S1S2			X		X			
Monadenia fidelis celeuthia	Traveling sideband (snail)			1	G4G5T1	S1					X		X	
Monadenia fidelis minor	Oregon snail (=Dalles sideband)	SOC		1	G4G5T1	S1		X						
Neothremma andersoni	Columbia Gorge caddisfly	SOC		1	G1	S1							X	
Oncopodura mala	Malheur Cave springtail			1	G3G4	S1						X		
Oreohelix variabilis variabilis	Dalles mountainsnail			1	G1T1	S1		X						
Pisodium ultramontanum	Montane peaclam	SOC		1	G1	S1				X				
Planoorbella oregonensis	Borax Lake ramshorn (snail)			1	G1	S1						X		
Plebeius saepiolus littoralis	Insular blue butterfly	SOC		1	G5T1T3	S1			X					
Polites mardon	Mardon skipper (butterfly)	C		1	G2G3	S2					X		DG	
Pomatiopsis binneyi	Robust walker (snail)			1	G1	S1			X					
Pomatiopsis californica	Pacific walker (snail)			1	G1	S1			X					
Pristiloma arcticum crateris	Crater Lake tightcoil			1	G4T1	S1				X				
Prophysaon vanattae pardalis	Spotted tail-dropper			1	G4T2	S2			X					

Scientific Name	Common Name	STATUS			G Rank	S Rank	BM	CP	CR	EC	KM	NBR	WC	WV
		Federal	state	Heritage										
Pterostichus rothi	Roth's blind ground beetle	SOC		1	G1	S1			X					
Pygulopsis archimedis	Archimedes springsnail			1	G1Q	S1				X				
Pyrgulopsis hendersoni	Harney Lake springsnail			1	G1	S1						X		
Pyrgulopsis intermedia	Crooked Creek springsnail			1	G1	S1						X		
Rhyacophila haddocki	Haddock's rhyacophilan caddisfly	SOC		1	G1	S1			X					
Speyeria zerene hippolyta	Oregon silverspot butterfly	LT		1	G5T1	S1			X					
Stygobromus hubbsi	Malheur Cave amphipod	SOC		1	G1	S1						X		
Stygobromus oregonensis	Oregon Cave amphipod			1	G1	S1					X			
Vespericola depressus	Columbia Gorge hesperian (snail)			1	G2	S2		X						
Vespericola sierranus	Siskiyou hesperian (snail)			1	G2	S1				X	X			
Vorticifex effusus dalli	Dall's ramshorn			1	G3QT1	S1				X				
Vorticifex effusus diagonalis	Lined ramshorn			1	G3QT1	S1				X				
Vorticifex klamathensis klamathensis	Klamath ramshorn			1	G1QT1	S1				X				
Vorticifex klamathensis sinitsini	Sinitsin ramshorn			1	G1QT1	S1				X				
Zapada wahkeena	Wahkeena Falls flightless stonefly	SOC		1	G2	S2							X	
MAMMALS														
Antrozous pallidus	Pallid bat	SOC	SV	2	G5	S2	X	X		X	X	X		DG
Arborimus longicaudus	Red tree vole	SOC		1, 4	G3G4TQ	S1, S3			X		X		X	
Bassariscus astutus	Ringtail		SU	4	G5	S3			DG		X		X	
Brachylagus idahoensis	Pygmy rabbit	SOC	SV	2	G4	S2?						X		
Corynorhinus townsendii	Townsend's big-eared bat	SOC	SC	2	G4	S2	X	X	X	X	X	X	X	X
Euderma maculatum	Spotted bat	SOC		2	G4	S2	X	DG		DG		X		
Lasionycteris noctivagans	Silver-haired bat	SOC	SV	4	G5	S3S4	X		X	X	X		X	
Lasiurus cinereus	Hoary bat			4	G5	S3	X	DG	X	X	X	X	X	DG
Lepus townsendii	White-tailed jackrabbit		SU	3	G5	S4?	DG	DG		DG		X		
Martes americana	American marten		SV	4	G5	S3S4	X		X	X			X	
Martes pennanti	Fisher	C	SC	2	G5	S2	ext		DG	DG	X		X	
Myotis californicus	California myotis (bat)		SV	4	G5	S3	X		X	X	X	X	X	X
Myotis thysanodes	Fringed myotis (bat)	SOC	SV	2	G4G5	S2	X		X	X	X		X	
Myotis volans	Long-legged myotis (bat)	SOC	SV	4	G5	S3	X		X	X	X	X	X	
Odocoileus virginianus leucurus	Columbia white-tailed deer	LE (CR)	SV(CR)	1	G5T2Q	S2			X		X			ext
Sciurus griseus	Western gray squirrel		SU	4	G5	S4								X
Spermophilus washingtoni	Washington ground squirrel	C	LE	1	G2	S2		X						

Scientific Name	Common Name	STATUS			G Rank	S Rank	BM	CP	CR	EC	KM	NBR	WC	WV
		Federal	state	Heritage										
Vulpes macrotis	Kit fox		LT	2	G4	S1						X		
PLANTS														
Artemisia campestris var. wormskioldii	Northern wormwood	C	LE	1-ex	G5T1	SX		X					X	
Calochortus indecorus	Sexton Mountain mariposa-lily		LE	1-X	GX	SX					X			
Castilleja levisecta	Golden paintbrush	LT	LE	1-ex	G1	SH								X
Plagiobothrys lamprocarpus	Shiny-fruited allocarya		LE	1-X	GX	SX					X			
Abronia umbellata ssp. breviflora	Pink sand-verbena	SOC	LE	1	G4G5T2	S1			X					
Amsinckia carinata	Malheur Valley fiddleneck	SOC	LT	1	G2	S2						X		
Arabis macdonaldiana	Red Mountain rockcress		LE	1	G2	S1					X			
Aster curtus	White-topped aster	SOC	LT	1	G3	S2								X
Aster vialis	Wayside aster	SOC	LT	1	G3	S3					X		X	X
Astragalus applegatei	Applegate's milk-vetch	LE	LE	1	G1	S1				X				
Astragalus collinus var. laurentii	Laurence milk-vetch	SOC	LT	1	G5T1	S1		X						
Astragalus diaphanus var. diurnus	South Fork John Day milk-vetch		LT	1	G3G4T2Q	S2	X							
Astragalus mulfordiae	Mulford's milk-vetch	SOC	LE	1	G2	S1						X		
Astragalus peckii	Peck's milk-vetch		LT	1	G3	S3	X			X				
Astragalus sterilis	Sterile milk-vetch		LT	1	G5T2	S2						X		
Astragalus tyghensis	Tygh Valley milk-vetch		LT	1	G2	S2		X						
Botrychium pumicola	Pumice grape-fern		LT	1	G3	S3				X				
Calochortus coxii	Crinite mariposa-lily	SOC	LE	1	G1	S1					X			
Calochortus howellii	Howell's mariposa-lily	SOC	LT	1	G3	S3					X			
Calochortus umpquaensis	Umpqua mariposa-lily	SOC	LE	1	G1	S1					X		X	
Cordylanthus maritimus ssp. palustris	Saltmarsh bird's-beak	SOC	LE	1	G4?T2	S2			X					
Delphinium leucophaeum	White rock larkspur	SOC	LE	1	G2Q	S2							X	X
Delphinium pavonaceum	Peacock larkspur	SOC	LE	1	G1Q	S1								X
Erigeron decumbens	Willamette daisy	LE	LE	1	G4T1	S1								X
Eriogonum chrysops	Golden buckwheat	SOC	LT	1	G1	S1						X		
Eriogonum crosbyae	Crosby's buckwheat	SOC	LT	1	G3	S2						X		
Erythronium elegans	Coast Range fawnlily	SOC	LT	1	G1	S1			X					
Fritillaria gentneri	Gentner's fritillary	LE	LE	1	G1	S1					X			
Gratiola heterosepala	Boggs Lake hedge-hyssop	SOC	LT	1	G3	S1						X		
Hackelia cronquistii	Cronquist's stickseed	SOC	LT	1	G3	S3						X		
Hastingsia bracteosa	Large-flowered rushlily	SOC	LT	1	G2T2	S2					X			
Howellia aquatilis	Howellia	LT		1	G2	S1								X

Scientific Name	Common Name	STATUS			G Rank	S Rank	BM	CP	CR	EC	KM	NBR	WC	WV
		Federal	state	Heritage										
Ivesia rhypara var. rhypara	Grimy ivesia	SOC	LE	1	G2T1	S1						X		
Lepidium davisii	Davis' peppergrass	SOC	LT	1	G3	S1						X		
Lilium occidentale	Western lily	LE	LE	1	G1	S1			X					
Limnanthes floccosa ssp. grandiflora	Big-flowered wooly meadowfoam	LE	LE	1	G4T1	S1					X			
Limnanthes floccosa ssp. pumila	Dwarf meadowfoam	1	LT	1	G4T1	S1					X			
Lomatium bradshawii	Bradshaw's desert parsley	LE	LE	1	G2	S2								X
Lomatium cookii	Cook's desert parsley	LE	LE	1	G1	S1					X			
Lomatium erythrocarpum	Red-fruited desert parsley	SOC	LE	1	G1	S1	X							
Lomatium greenmanii	Greenman's desert parsley	SOC	LT	1	G1	S1	X							
Lupinus cusickii	Cusick's lupine	C	LE	1	G1T1	S1	X							
Lupinus sulphureus ssp. kincaidii	Kincaid's lupine	LT	LT	1	G5T2	S2					X			X
Mentzelia mollis	Smooth mentzelia	SOC	LE	1	G2	S2						X		
Mentzelia packardiae	Packard's mentzelia	SOC	LT	1	G2	S2						X		
Microseris howellii	Howell's microseris		LT	1	G3	S3					X			
Mirabilis macfarlanei	MacFarlane's four-o'clock	LT	LE	1	G2	S1	X							
Oenothera wolfii	Wolf's evening-primrose	SOC	LT	1	G1	S1			X					
Phacelia argentea	Silvery phacelia	SOC	LT	1	G2	S2			X					
Plagiobothrys hirtus	Rough allocarya	LE	LE	1	G1	S1					X			
Pleuropogon oregonus	Oregon semaphore grass	SOC	LT	1	G1	S1	X			X		X		
Pyrrocoma radiata	Snake River goldenweed	SOC	LE	1	G3	S3	X					X		
Ranunculus reconditus	Dalles Mountain buttercup	SOC	LE	1	G5T2	S1				X				
Sidalcea nelsoniana	Nelson's checker-mallow	LT	LT	1	G2	S2			X					X
Silene douglasii var. oraria	Cascade Head catchfly	SOC	LT	1	G4T1	S1			X					
Silene spaldingii	Spalding's campion	LT	LE	1	G2	S1	X							
Stephanomeria malheurensis	Malheur wire-lettuce	LE	LE	1	G1	S1						X		
Thelypodium eucosmum	Arrow-leaf thelypody	SOC	LT	1	G2	S2	X							
Thelypodium howellii ssp. spectabilis	Howell's thelypody	LT	LE	1	G2T1	S1	X							
Trifolium owyheense	Owyhee clover	SOC	LE	1	G2	S2						X		
REPTILES														
Chrysemys picta belli	Western painted turtle		SC	2	G5	S2	X	X		X			X	X
Crotalus viridis	Western rattlesnake		SV(WV)	4	G5	S5								X
Emys marmorata marmorata	Northwestern pond turtle	SOC	SC	2	G3G4T3T4	S2			X	X	X		X	X
Lampropeltis getula	Common kingsnake	SOC	SV	4	G5	S3					X			
Sceloporus graciosus graciosus	Northern sagebrush lizard	SOC	SV(CB)	4	G5T5	S5		X						

APPENDIX P-11

Oregon Forest Practices Act Guidelines for Osprey, Great Blue Heron and Bald Eagles, Relevant Excerpts

Oregon Department of Forestry
Forest Practice Administrative Rules and Forest Practices Act

CHAPTER 629
Forest Practices Administration

July 2008

"STEWARDSHIP IN FORESTRY"

This publication includes the text of the Forest Practices Act and the Forest Practice Administrative Rules as they exist on July 1, 2008.

Divisions 670 through 680 of the forest practice rules are not included in this publication, but are available as separate publications upon request. The rules in these divisions address civil penalties, appeals from orders of the State Forester, hearings procedure, stay of operations, access to notifications and written plans, regional forest practice committees, and the resource site inventory and protection process.

The Secretary of State publishes the official administrative rules.

The rules and statutes are also available on the Oregon Department of Forestry's website at: http://egov.oregon.gov/ODF/ as well as the Oregon Secretary of State's website at http://arcweb.sos.state.or.us/rules/alpha_index.html. See Department of Forestry, Chapter 629, Division 600-680, and the Oregon State Legislature at http://www.leg.state.or.us/ors/home.htm. See Chapter 527.

Rule and statutory language changes made since the January 2006 publication are indicated by underlined text and are listed below.

Changes:

The following rules were amended or adopted with effective dates in 2007. They remain underlined for this edition of the rules:

OAR 629-600-0100(39) Effective January 8, 2007.

OAR 629-635-0200 Effective October 1, 2007.

OAR 629-640-0110 Effective January 8, 2007.

OAR 629-640-0105 Effective January 8, 2007.

OAR 629-623-0400 was amended and 629-623-0500 was suspended through the temporary rule process. The changes are effective July 18, 2008 through January 13, 2008, or until rescinded by permanent rule, whichever comes first.

OAR 629-635-0100 and 629-635-0110 were amended and became effective October 31, 2006, but the changes were inadvertently omitted in the January 2007 publication.

OAR 629-640-0210 Effective October 1, 2007. Applicable July 1, 2008.

The following statutes were amended during the 2007 regular and 2008 special legislative sessions:

ORS 527.670, 527.687, and 527.755 Effective January 1, 2008.

ORS 527.736 Effective March 3, 2008.

The index for the administrative rules is on the inside cover page. The index for the Forest Practices Act is on page 65.

Index

Division 600, Definitions....1
Division 605, Planning Forest Operations....5
Division 610, Forest Practices Reforestation Rules....13
Division 611, Forest Practice Afforestation Incentive Rules....18
Division 615, Treatment of Slash....19
Division 620, Chemical and Other Petroleum Product Rules....20
Division 623, Shallow, Rapidly Moving Landslides and Public Safety....24
Division 625, Forest Roads; Road Construction and Maintenance....27
Division 630, Harvesting....31
Division 635, Water Protection Rules: Purpose, Goals, Classification and Riparian Management Areas....35
Division 640, Water Protection Rules: Vegetation Retention Along Streams....40
Figure 1 and Tables 1 - 7....48-52
Division 645, Water Protection Rules: Riparian Management Areas and Protection Measures for Significant Wetlands 53
Division 650, Water Protection Rules: Riparian Management Areas and Protection Measures for Lakes....55
Division 655, Water Protection Rules: Protection Measures for "Other Wetlands", Seeps and Springs....56
Division 660, Water Protection Rules: Specific Rules for Operations Near Waters of the State....57
Division 665, Specified Resource Site Protection Rules....57
Oregon Forest Practices Act....65
Department of Forestry Office Addresses and Phone Numbers....Back Cover

Notes

DIVISION 660
WATER PROTECTION RULES: SPECIFIC RULES FOR OPERATIONS NEAR WATERS OF THE STATE

629-660-0040
Stream Channel Changes

(1) Operators shall not channelize, relocate, or divert water from any stream, except as allowed in the forest practice rules for construction of roads, stream improvement projects or temporary stream crossings.

(2) Operators shall not add to or remove soil or rock from any streams, except as allowed in the forest practice rules for construction of roads, stream improvement projects or temporary stream crossings.

629-660-0050
Beaver Dams or Other Natural Obstructions

(1) Except as needed for road maintenance, operators must submit a written plan to the State Forester prior to the removal of beaver dams and other natural obstructions from waters of the state during forest operations. Removal of any beaver dam that is within 25 feet of a culvert shall be considered to be needed for road maintenance.

(2) A written plan for removal of a beaver dam or obstruction must demonstrate:
  (a) A beaver dam or obstruction threatens existing forests or plantations; or
  (b) Beaver dam removal is part of a beaver population control program approved by the Oregon Department of Fish and Wildlife; or
  (c) Retaining the beaver dam or obstruction would result in greater environmental harm than benefit.

(3) Sediment releases and downstream channel scouring can occur when beaver dams are removed. Operators are encouraged to use techniques that result in a gradual release of water when a dam is removed.

629-660-0060
Headwater Amphibian Species

Amphibians that are sensitive to temperature and moisture fluctuations may live in small Type N streams. Operators are encouraged to retain portions of in-unit green live trees and snags as blocks of intact vegetation along small Type N streams.

DIVISION 665
SPECIFIED RESOURCE SITE PROTECTION RULES

629-665-0000
Purpose

(1) OAR 629-665-0000 to 0300 shall be known as the specified resource site protection rules.

(2) These rules provide a protection goal, describe the duties of the State Forester, landowner, timber owner and operator, and outline protection for:
  (a) Sensitive Bird Nesting, Roosting and Watering Resource Sites (OAR 629-665-0100);
  (b) Threatened and Endangered Fish and Wildlife Species that use Resource Sites on Forestlands (OAR 629-665-0200);
  (c) Biological Sites that are Ecologically and Scientifically Significant (OAR 629-665-0300); and
  (d) Significant Wetlands on Forestlands (OAR Chapter 629, Division 645).

629-665-0010
Protection Goal for a Resource Site

(1) The goal of resource site protection is to ensure that forest practices do not lead to resource site destruction, abandonment or reduced productivity.

(2) A resource site shall receive protection when the State Forester determines:
  (a) It is an active resource site; and
  (b) Proposed forest practices conflict with the resource site.

(3) The State Forester may grant an exception from either structural or temporal protection as determined by the Board for each species or resource site.

629-665-0020

Application of Protection and Exception Rules; State Forester Duties; Landowner, Timber Owner and Operator Duties

(1) When a landowner, timber owner or operator proposes an operation near a resource site that requires special protection, the State Forester shall inspect the resource site with the landowner or landowner's representative, the operator and when available, the appropriate representative of the Department of Fish and Wildlife. The State Forester shall:
  (a) Identify the resource site.
  (b) Apply the protection goal in OAR 629-665-0010.
    (A) If the proposed forest practices do not conflict with the resource site, the operation will not be subject to the protection requirements for the resource site. The operation shall be conducted in compliance with all other existing forest practice rules;
    (B) If the proposed forest practices conflict with the resource site, the structural and temporal protection requirements for the resource site shall be required to eliminate the conflict;
    (C) When the proposed forest practices conflict with a resource site, the landowner or operator may request a structural or temporal exception through a plan for an alternate practice, if the applicable administrative rule provides for such an exception.
    (D) The State Forester shall document and maintain on file the reasons for granting or denying all exceptions.

(2) If the proposed operation conflicts with the resource site, the operator shall submit a written plan to the State Forester before starting operations. The written plan shall comply with the requirements of OAR 629-605-0170, Written Plans.

(3) When the written plan in subsection (2) of this rule does not follow the written recommendations of the Department of Fish and Wildlife or other responsible coordinating state agency, the State Forester shall maintain on file a written explanation of the reasons for:
  (a) Differences in the identification of the resource site; and
  (b) Different protection levels required for the resource site.

(4) When a resource site is discovered by the operator, timber owner or landowner during a forest operation, the party making the discovery shall:
  (a) Immediately protect all remaining trees within 300 feet of the resource site and submit to the State Forester a written plan for the resource site; and
  (b) Immediately notify the State Forester.

629-665-0100

Species Using Sensitive Bird Nesting, Roosting and Watering Sites

The following species use sensitive bird nesting, roosting and watering resource sites:

(1) Osprey use sensitive bird nesting sites.

(2) Great blue herons use sensitive bird nesting sites.

629-665-0110

Osprey Resource Sites; Key Components; Protection Requirements; and Exceptions

(1) For osprey, the resource site is the active nest tree and any identified key components.
  (a) An active nest tree is one that has been used by osprey within the past five (5) nesting seasons. No protection is required for abandoned resource sites.
  (b) The key components associated with an osprey resource site are perching and fledging trees and replacement trees. Factors to consider when identifying key components:
    (A) Actual observation data if available;
    (B) Perching trees should provide for maximum visibility of the surrounding terrain and structure that allows the osprey easy access, such as large, tall snags or trees that have broken or dead tops, forks, or lateral branches high in the crown;
    (C) Replacement trees should provide maximum visibility of the surrounding terrain, and be large enough to support an osprey nest;
    (D) Perching and fledging trees and replacement trees should be located within 600 feet of the active nest tree;
    (E) Areas of high winds may require that additional trees be retained to protect the resource site from damage.

(2) When the State Forester identifies the resource site as per OAR 629-665-0020, the operator shall provide the following protection measures:
  (a) Retain the active nest tree; and
  (b) Retain no fewer than eight additional trees as key components (i.e.: perching, fledging and replacement trees).
  (c) During forest operations, the resource site shall be protected from damage. The operation shall be designed to protect these trees from windthrow;
  (d) During the critical period of use, the active nest tree and any perch tree identified as a key component shall be protected from disturbance. From March 1st through September 15th, forest operations shall not be permitted within 600 feet of the active nest tree or perch tree unless the State Forester determines that the operations will not cause the birds to flush from these trees. The critical period of use may be modified in writing by the State Forester as the resource site is evaluated as per OAR 629-665-0020.

(3) The State Forester shall not permit structural exceptions for the resource site: Removal of a resource site may be permitted if replacement nest trees, artificial structures, or replacement key components are provided by the operator or landowner. Replacement is not considered an exception, since the productivity of the nesting territory is maintained. When addressed in a plan for an alternate practice, replacement may be considered by the State Forester when:
  (a) Alternate forest practices which retain and protect the resource site are not economically feasible; and
  (b) The productivity of the nesting territory is not reduced.

(4) Temporal exceptions for the resource site may be approved by the State Forester when addressed in a plan for an alternate practice that demonstrates:
  (a) Nest disruption or failure for a season does not affect the local population; and
  (b) There are no economically feasible forest practices that avoid disturbance to the resource site during the critical period of use.

(5) Factors considered by the State Forester before approving a plan for an alternate practice under section (4) of this rule shall include, but are not limited to:
  (a) The size of the local population;
  (b) The contribution of the resource site in question to the local population; and
  (c) The feasibility of alternate forest practices that do not cause disturbance.

(6) The State Forester shall document all requests and decisions concerning structural or temporal exceptions. All approved structural replacements shall be documented.

629-665-0120
Great Blue Heron Resource Sites; Key Components; Protection Requirements; and Exceptions

(1) For the great blue heron, the resource site is the active nest tree(s) and any identified key components.
  (a) An active nest tree is one that has been used by one or more pair of great blue heron within the past three nesting seasons. No protection is required for an abandoned resource site.
  (b) The key components associated with a great blue heron resource site are the nest tree(s), a vegetative buffer around the nest tree(s) including perching and fledging trees, and replacement tree(s). Factors to consider when identifying key components:
    (A) Actual observation data when available;
    (B) Perching, fledging, and replacement tree(s) should be tall with plenty of space for these large birds to fly into and out. Older trees with open branching should be retained;
    (C) Areas of high winds may require that additional trees be retained to protect the active nest tree and identified key components from damage.

(2) The operator shall provide the following protection measures when operating within or near a great blue heron resource site:
  (a) Retain the active nest tree;
  (b) Retain a vegetative buffer not less than 300 feet around the outermost nest trees as key components that includes perching and fledging trees, and replacement trees.
  (c) The vegetative buffer around a rookery may be actively managed if the key components in subsection (1) are protected. When conducting forest management activities within this buffer, operators shall consider heron protection as the highest priority. The vegetative buffer needs to provide a visual screen from disturbing influences around the rookery, and must be designed to protect the nest tree(s), perching, fledging, and replacement tree(s) from windthrow. Examples of

forest management activities that may occur within the vegetative buffer include tree topping, and/or other methods of "feathering" the outer edges of the buffer to reduce windthrow potential, or remove individual trees (especially along the edge of the buffer) if the integrity of the buffer is maintained and all the key components are adequately protected. Input from the ODFW wildlife biologist and ODF's fish and wildlife specialist is important when marking trees to be removed from this buffer.

(d) During and after forest operations, the resource site shall be protected from damage. The operation shall be designed to protect the key components from windthrow;

(e) During the critical period of use, operations shall be designed and conducted so as not to disturb great blue herons using the key components. From February 15 through July 31, forest operations shall not be permitted within one-quarter (1/4) mile of the active nest tree(s) unless the State Forester determines that the operations will not cause the birds to flush from these trees. The critical period of use may be modified by the State Forester after the resource site is evaluated following OAR 629-665-0020.

(3) Structural exceptions for the resource site may be approved by the State Forester when addressed in a plan for an alternate practice. The State Forester may approve such a plan when these criteria are met:

(a) The site contains five nests or fewer;

(b) The State Forester determines that the loss of the site will not adversely affect the local population; and

(c) There are no economically feasible alternatives that maintain the key components.

(4) Factors considered by the State Forester before approving a structural exception to protection of a great blue heron resource site shall include, but are not limited to:

(a) The size of the site (number of nests);

(b) The size of the breeding population in the local area;

(c) The productivity of great blue herons in the local area;

(d) The contribution of the site to local productivity;

(e) The probability that protection measures will be successful;

(f) Available alternate nesting sites; and

(g) Whether alternatives that protect the site are economically feasible.

(5) Temporal exceptions to protection of a great blue heron resource site may be approved by the State Forester when addressed in a plan for an alternate practice. The State Forester may approve such a plan when:

(a) The State Forester determines that nest disruption or failure for a season or site abandonment will not adversely affect the local population; and

(b) There are no economically feasible alternatives that will not disturb the birds during the critical period of use.

(6) Factors considered by the State Forester before approving a temporal exception shall include, but are not limited to:

(a) The size of the site (number of nests);

(b) The size of the breeding population in the local area;

(c) The productivity of great blue herons in the local area;

(d) The contribution of the site to local productivity; and

(e) Whether alternatives that protect the site are economically feasible.

629-665-0200

Resource Sites Used By Threatened and Endangered Species

The following resource sites used by threatened or endangered species are sensitive to forest practices:

(1) Northern spotted owl nesting sites.

(2) Bald eagle nesting sites.

(3) Bald eagle roosting sites.

(4) Bald eagle foraging perches.

629-665-0210

Interim Requirements for Northern Spotted Owl Nesting Sites

(1) Whenever the State Forester determines that an operation will conflict with protection of a nesting site of the northern spotted owl (Strix occidentalis caurina), the operator must submit to the State Forester a written plan

before commencing the operation. The written plan, at a minimum, must address how the operation will be conducted to provide for the following:

(a) A 70 acre area of suitable spotted owl habitat encompassing the nest site, to be maintained as suitable spotted owl habitat;

(b) Prevention of disturbances resulting from operation activities which cause owls to flush from the nesting site. Such disturbances must be prevented during the critical period of use for nesting. The critical period of use is the time period between March 1 and September 30, each year.

(2) For the purposes of this rule, nesting site means and includes the tree, when known, containing a spotted owl nest; or when not specifically known, includes an activity center of a pair of adult spotted owls. An activity center is a location determined by the State Forester to have been reliably identified as being occupied by an adult pair of spotted owls, capable of breeding. Such determination must be supported by repeated observation of the owls in close proximity or observation of nesting behavior.

(3) (a) For the purposes of this rule, suitable spotted owl habitat means and includes:

(A) A stand of trees with moderate to high canopy closure (60 to 80%); a multi-layered, multi-species canopy dominated by large overstory trees (greater than 30 inches in diameter at breast height); a high incidence of large trees with various deformities (e.g., large cavities, broken tops, and other evidence of decadence); numerous large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for owls to fly; or

(B) In the absence of habitat which exhibits all the characteristics listed above, the available forested habitat which comes closest to approximating the listed conditions.

(b) Stands which do not exhibit at least two of the characteristics listed in paragraph (a)(A) of this section are not suitable habitat.

(4) (For information only) Federal law prohibits a person from taking northern spotted owls. Taking under the federal law may include significant alteration of owl habitat on any class of land ownership. Compliance with subsection (1) of this rule is not in lieu of compliance with any federal requirements related to the federal Endangered Species Act.

(5) Exceptions to the requirements for protecting northern spotted owl nesting sites are allowed if the operator is in compliance with, and has on file with the State Forester, an applicable incidental take permit issued by federal authorities under the Endangered Species Act.

629-665-0220

Bald Eagle Nesting Sites; Key Components; Protection Requirements; and Exceptions

(1) For bald eagle nesting sites, the resource site is the active nest tree and all identified key components:

(a) An active nest tree is one in which a bald eagle has nested in the past, and that the State Forester determines to be structurally capable of successful future use, whether or not the tree still contains a nest.

(b) An active nest tree may fall down or may become structurally incapable of supporting a bald eagle nest site. When this happens the nest resource site shall be considered active and shall be protected for an additional five (5) years only if the site contains suitable nesting sites. In this case, if a nesting resource site is not used during this five-year period, the site shall be considered abandoned and no protection will be required.

(c) The key components associated with a bald eagle nesting site are perching and fledging trees, replacement nest trees, and a forested buffer around the nest tree. Factors to consider when identifying key components:

(A) Actual observation data when available.

(B) Perching and fledging trees should be tall enough to provide maximum visibility of the surrounding area. Perching and fledging trees are often snags or decadent live trees with exposed, strong, lateral branches high in the crown.

(C) Replacement nest trees should provide maximum visibility of the surrounding terrain, and be large enough to support a bald eagle nest. Bald eagles prefer to nest in large, tall trees that are alive, with large limbs, broken tops, or irregular growth patterns with open structure.

(D) Areas of high winds may require that additional trees be retained to protect the active nest tree(s) and identified key components from damage.

before commencing the operation. The written plan, at a minimum, must address how the operation will be conducted to provide for the following:

(a) A 70 acre area of suitable spotted owl habitat encompassing the nest site, to be maintained as suitable spotted owl habitat;

(b) Prevention of disturbances resulting from operation activities which cause owls to flush from the nesting site. Such disturbances must be prevented during the critical period of use for nesting. The critical period of use is the time period between March 1 and September 30, each year.

(2) For the purposes of this rule, nesting site means and includes the tree, when known, containing a spotted owl nest; or when not specifically known, includes an activity center of a pair of adult spotted owls. An activity center is a location determined by the State Forester to have been reliably identified as being occupied by an adult pair of spotted owls, capable of breeding. Such determination must be supported by repeated observation of the owls in close proximity or observation of nesting behavior.

(3) (a) For the purposes of this rule, suitable spotted owl habitat means and includes:

(A) A stand of trees with moderate to high canopy closure (60 to 80%); a multi-layered, multi-species canopy dominated by large overstory trees (greater than 30 inches in diameter at breast height); a high incidence of large trees with various deformities (e.g., large cavities, broken tops, and other evidence of decadence); numerous large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for owls to fly; or

(B) In the absence of habitat which exhibits all the characteristics listed above, the available forested habitat which comes closest to approximating the listed conditions.

(b) Stands which do not exhibit at least two of the characteristics listed in paragraph (a)(A) of this section are not suitable habitat.

(4) (For information only) Federal law prohibits a person from taking northern spotted owls. Taking under the federal law may include significant alteration of owl habitat on any class of land ownership. Compliance with subsection (1) of this rule is not in lieu of compliance with any federal requirements related to the federal Endangered Species Act.

(5) Exceptions to the requirements for protecting northern spotted owl nesting sites are allowed if the operator is in compliance with, and has on file with the State Forester, an applicable incidental take permit issued by federal authorities under the Endangered Species Act.

629-665-0220

Bald Eagle Nesting Sites; Key Components; Protection Requirements; and Exceptions

(1) For bald eagle nesting sites, the resource site is the active nest tree and all identified key components:

(a) An active nest tree is one in which a bald eagle has nested in the past, and that the State Forester determines to be structurally capable of successful future use, whether or not the tree still contains a nest.

(b) An active nest tree may fall down or may become structurally incapable of supporting a bald eagle nest site. When this happens the nest resource site shall be considered active and shall be protected for an additional five (5) years only if the site contains suitable nesting sites. In this case, if a nesting resource site is not used during this five-year period, the site shall be considered abandoned and no protection will be required.

(c) The key components associated with a bald eagle nesting site are perching and fledging trees, replacement nest trees, and a forested buffer around the nest tree. Factors to consider when identifying key components:

(A) Actual observation data when available.

(B) Perching and fledging trees should be tall enough to provide maximum visibility of the surrounding area. Perching and fledging trees are often snags or decadent live trees with exposed, strong, lateral branches high in the crown.

(C) Replacement nest trees should provide maximum visibility of the surrounding terrain, and be large enough to support a bald eagle nest. Bald eagles prefer to nest in large, tall trees that are alive, with large limbs, broken tops, or irregular growth patterns with open structure.

(D) Areas of high winds may require that additional trees be retained to protect the active nest tree(s) and identified key components from damage.

(2) The operator shall provide the following protection measures when operating within or near a bald eagle nesting site:
  (a) During and after forest operations, the resource site shall be protected from damage. The operation shall be designed to protect the trees from windthrow;
  (b) Retain the active nest tree.
  (c) Retain a forested buffer not less than 330 feet around the active nest tree as a key component that includes perching, fledging, and replacement tree(s).
  (d) During the critical period of use, operations shall be designed and conducted to not disturb bald eagles using the resource site:
    (A) Except as provided in paragraph (B) of this subsection, during the critical period of use, operations shall not be permitted within one-quarter (1/4) mile of the active nest tree or perch trees. If the eagles have line-of-sight vision from these trees to the operation, the distance is one-half (1/2) mile.
    (B) If the State Forester determines through review of the written plan that the operations will not cause the birds to flush from the trees identified in paragraph (A) of this section, then there is no conflict and the distance restrictions in paragraph (A) of this section may be modified.
    (C) The critical period of use is January 1 through August 31. The specific critical period of use for individual nesting resource sites may be modified in writing by the State Forester depending upon the actual dates that bald eagles are present at the resource site and are susceptible to disturbance.
(3) Structural or temporal exceptions for the resource site are allowed if the operator is in compliance with, and has on file with the State Forester, an applicable incidental take permit issued by federal authorities under the Endangered Species Act.

629-665-0230
Bald Eagle Roosting Sites; Key Components; Protection Requirements; and Exceptions
(1) For bald eagle roosting sites, the resource site is the active roost trees, probable roost trees as identified by the State Forester, and all identified key components:
  (a) An active roosting site is one that has been used within the past 5 years for roosting by bald eagles. No protection is required for an abandoned bald eagle roosting site.
  (b) The key components associated with a bald eagle roosting site are staging trees, probable roost trees as identified by the State Forester, and a forested buffer around the roost trees. Factors to consider when identifying key components:
    (A) Actual observation data when available.
    (B) Roost sites frequently occur in mature forests. Roost trees are often significantly larger than the rest of the stand.
    (C) Staging trees are often large, dead-top or dominant trees or snags where one or more eagles can perch and have direct access to the roosting site.
    (D) The surrounding forested buffer must be adequate to maintain a suitable microclimate around the roost trees.
    (E) Areas of high winds may require that additional trees be retained to protect the active roost tree(s) and identified key components from damage.
(2) The operator shall provide the following protection measures when operating within or near a bald eagle roosting site:
  (a) During and after forest operations, the resource site shall be retained and protected from damage. The operation shall be designed to protect the trees from windthrow.
  (b) Retain the active roost tree(s).
  (c) Retain a forested buffer not less than 300 feet around the outermost active roost trees as a key component that includes probable roost trees.
  (d) Retain staging trees.
  (e) During the critical period of use, operations shall be designed and conducted to not disturb bald eagles using the resource site:
    (A) Except as provided in paragraph (B) of this subsection, during the critical period of use, operations shall not be permitted within one-quarter (1/4) mile of the active roost trees. If the eagles have line-of-sight vision from these trees to the operation, the distance is one-half (1/2) mile.

(B) If the State Forester determines through review of the written plan that the operations will not cause the birds to flush from trees identified in paragraph (A) of this subsection, then there is no conflict and the distance restrictions in paragraph (A) of this subsection may be modified.

(C) The critical period of use for bald eagle roosting sites in the Klamath Basin is October 31 through March 31. In other areas of Oregon the critical period of use is November 15 through March 15. The specific critical period of use for individual roosting resource sites may be modified in writing by the State Forester depending upon the actual dates that bald eagles are present at the resource site and are susceptible to disturbance.

(3) Structural or temporal exceptions for the resource site are allowed if the operator is in compliance with, and has on file with the State Forester, an applicable incidental take permit issued by federal authorities under the Endangered Species Act.

629-665-0240

Bald Eagle Foraging Perches; Key Components; Protection Requirements; and Exceptions

(1) For bald eagle foraging perches, the resource site is the active foraging perch. An active foraging perch is one that is habitually used by eagles as a vantage point while hunting. No protection is required for abandoned bald eagle foraging perches. The presence or absence of foraging perches within or near a foraging area shall be determined by the State Forester when the forester conducts an operation inspection. Factors to consider when identifying key components:

(a) Actual observation data when available.

(b) Bald eagles usually perch in the tallest trees on the edge of forest stands overlooking the hunting area. Snags and dead-top trees are often used.

(c) Areas of high winds may require that additional trees be retained to protect the active foraging perch from damage.

(2) The operator shall provide the following protection measures when operating near a bald eagle foraging perch:

(a) During and after forest operations, the foraging perch shall be retained and protected from damage. The operation shall be designed to protect the foraging perch from windthrow.

(b) During the critical period of use, operations shall be designed and conducted so they do not cause excessive disturbance to bald eagles using the foraging area. The critical period of use shall be determined on a site specific basis. The critical period of use varies for each bald eagle foraging area, depending on whether the foraging area is used by nesting, wintering, or migrating bald eagles.

(3) Temporal exceptions for the entire foraging areas shall not be permitted by the State Forester. Temporal protection is determined by evaluating the potential disturbance to the entire foraging area used by a breeding pair or wintering population of bald eagles. Disturbance at a single foraging perch in a foraging area may be determined by the State Forester to not cause a conflict. This evaluation shall be based on the number of alternative foraging perches in the bald eagle foraging area.

(4) Structural exceptions for an active foraging perch may be permitted if the State Forester determines that adequate replacement foraging perches will remain in the vicinity after completion of the forest operation.

APPENDIX P-12

Washington Department of Fish and Wildlife Compiled White Papers for Hydraulic Project Approval Habitat Conservation Plan, Relevant Excerpts

WDFW Publications

Search WDFW Publications

Search

Compiled White Papers For Hydraulic Project Approval Habitat Conservation Plan (HCP)

Category: Habitat - Habitat Conservation Plans

Date Published: March 2009

Number of Pages: 904

DESCRIPTION:

In 2006 and 2007, WDFW contracted with Anchor Environmental, Herrera Environmental Consultants, Jones & Stokes Associates, and R2 Resource Consultants to develop a series of “white papers” documenting the state of the science on a range of topics related to HPAs. Each of the original white papers was prepared as a stand-alone document. Therefore, many of the white papers contained information specific to a particular activity as well as more general information pertinent to more than one kind of HPA-permitted activity.

In order to reduce redundancy and allow for a more efficient review of the extensive body material, WDFW has re-organized and consolidated the information contained in ten of the eleven original white papers to minimize repeated text. In addition, WDFW organized the information from “most general” to “most specific” within each document.

The original white papers were peer reviewed by a panel of experts outside of WDFW. In addition to consolidating the original white papers,WDFW has edited the content to incorporate technical changes based on the peer review.

The eleventh original white paper, on mineral prospecting, was not included in this consolidation because comprehensive updates to the Washington Administrative Code (WAC) sections covering mineral prospecting were adopted by the Washingtington Fish and Wildlife Commission in 2008 through a separate process. Those updates will be incoporated into the HCP as the HCP document is finalized.

EXECUTIVE SUMMARY:

The Revised Code of Washington (RCW) directs the Washington Department of Fish and Wildlife (WDFW) to "preserve, protect, perpetuate, and manage" the fish and wildlife species of the state as its paramount responsibility (RCW 77.04.012). Under RCW 77.55, any construction or work that uses, diverts, obstructs, or changes the natural bed or flow of state waters requires a Hydraulic Project Approval (HPA) issued by WDFW. The purpose of the HPA program is to ensure that hydraulic projects are completed in a manner that prevents damage to public fish and shellfish resources and their habitats. To ensure that the HPA program complies with the Endangered Species Act (ESA), WDFW is developing a programmatic multispecies Habitat Conservation Plan (HCP) to obtain Incidental Take Permits from the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service (also known as NOAA Fisheries), in accordance with Section 10 of the ESA. For WDFW, the objective is to avoid and/or minimize the incidental take of those aquatic species potentially considered for coverage under the HCP (referred to in this white paper as "HCP species") resulting from activities conducted under an HPA.

The HCP will address the impacts, potential for take, and mitigation measures for effects on HCP species from hydraulic projects that require HPAs. WDFW's intent is to build the scientific foundation for the effort to prepare an HCP for hydraulic projects that receive HPAs. To accomplish this, WDFW is compiling the best available scientific information related to the impacts, potential for incidental "take" of species that may be covered in the HCP (as defined in the ESA), adequacy of existing rules (Washington Administrative Code [WAC] 220-110), and possible management directives and mitigation measures to avoid and/or minimize potential take to the maximum extent practicable. As the HPA authority covers all waters of the state, this white paper considers hydraulic project impacts in both freshwater and marine environments.

The objectives of this white paper are:

- To compile and synthesize the best available scientific information related to the potential human impacts on HCP species, their habitats, and associated ecological processes resulting from the construction, maintenance, repair, replacement, modification, and removal of HPA-permitted projects.
- To use this scientific information to estimate the circumstances, mechanisms, and risks of incidental take potentially or likely to result from the construction and repair of HPA-permitted projects.
- To assess the extent to which current HPA rules address the potential impacts on covered species, their habitats, and ecological processes.
- To identify appropriate and practicable measures, including policy directives, conservation measures, and best management practices (BMPs), to avoid, minimize, or mitigate the risk of incidental take of HCP species.

This white paper is a consolidation of a suite of white papers prepared to establish the scientific basis for the HCP and assist WDFW decision-making on what specific HPA activities should be covered by the HCP. The original white papers covered the following activities:

- Water crossings (bridges, culverts, conduits)
- Fish passage (fish ladders, culverts, weirs, roughened channels, trap and haul)
- Flow control structures (dams, weirs, dikes, levees, tide gates, intakes, outfalls)
- Bank protection/stabilization (bulkheads, retaining walls, revetments, toe protection, beach nourishment, subsurface drainage, biotechnical bank protection, bank reshaping or regrading, soil reinforcement, coir and straw logs, integrated approaches)
- Shoreline modifications (groins, jetties, breakwaters)
- Channel modifications (dredging, gravel mining and bar scalping, sediment capping, channel creation and alignment.)
- Habitat modification (beaver dam removal, large woody debris manipulations, spawning substrate augmentation, riparian planting, wetland creation/restoration, enhancement, beach nourishment/contouring, reef creation, eelgrass planting/restoration/enhancement, in-channel and off-channel habitat modifications
- Overwater structures (docks, floats, piers, ramps, wharfs, pilings and non-structural pilings)
- Marinas and Terminals
- Fish screens (in-channel, off channel).

The literature review conducted for the original white papers identified seven mechanisms of impact that could potentially affect the HCP species. These mechanisms of impact have direct and indirect effects that can be temporary, short-term effects or permanent, long-term effects. The mechanisms of impact are:

- Construction and maintenance activities
- Facility operation and vessel activity
- Hydraulic and geomorphic modifications
- Water quality modifications
- Riparian vegetation modifications
- Aquatic vegetation modifications
- Ecosystem fragmentation.

Key elements of the white paper are to:

- Specify objectives. (Section 2).
- Identify methods used to find the pertinent literature. (Section 3).
- Describe the potentially covered activities in detail (Section 4).
- Identify the distribution of the 52 HCP species (i.e., whether they use fresh water, marine water, or both) and their habitat requirements (Section 5).
- Present a conceptual framework for assessing impacts (Section 6).
- Discuss the potential direct and indirect impacts on the HCP species and their habitats due to exposure to the mechanisms of impact (Section 7).
- Identify cumulative impacts (Section 8).
- Based on the distribution information, identify the risk of "take" associated with each of these impacts mechanisms (Section 9).
- Identify data gaps (Section 10).
- Identify habitat protection, conservation, and mitigation strategies that could avoid or minimize the identified potential impacts (Section 11).

DOCUMENT SECTION(s):

- Table of Contents, List of Abbreviations and Acronyms, and List of Units of Measure
- Executive Summary
- 1 Introduction, 2 Objectives, and 3 Methods
- 4 Hydraulic Project Descriptions
- 5 Species Habitat Use and 6 Conceptual Framework
- 7 Direct and Indirect Effects: Aquatic Vegetation
- 7 Direct and Indirect Effects: Construction and Maintenance
- 7 Direct and Indirect Effects: Ecosystem Fragmentation
- 7 Direct and Indirect Effects: Hydraulic and Geomorphic Modifications
- 7 Direct and Indirect Effects: Riparian Vegetation and LWD Modifications
- 7 Direct and Indirect Effects: Water Quality Modifications
- 8 Cumulative Impacts
- 9 Potential Risk of Take
- 10 Data Gaps
- 11 Habitat Protection, Conservation, and Mitigation Strategies
- 12 References

Most publications can be made available in alternative formats, such as, Braille, large print, audiotape, or computer disk.
Requests can be made by calling (360) 902-2349 or (360) 902-2207 (TDD) Or online at: http://wdfw.wa.gov/accessibility/reasonable_request.html
Please allow 72 hours for your request to be processed.

10. Creation of discrete habitat that is as functional as physical structure.

Alterations to aquatic vegetation by HPA-permitted projects may result in altered habitat complexity. This includes changes or reduction in three dimensional habitat structure, refuge and edge habitat, foraging opportunities, and altered autochthonous inputs (alteration of primary productivity, nutrient cycling, and conversion of dissolved organic material into biomass available for grazers, affecting food web productivity). However, HPA-permitted projects are not the only factor that affects the distribution of aquatic vegetation; it is also limited by the ecological conditions of the water body and the requirements of aquatic plant species (Chambers et al. 1999). For example, substrate type can play a role in the survivability of aquatic plants (Koch 2001).

7.1.2 Aquatic Vegetation and Altered Habitat Complexity

Changes to aquatic vegetation may cause alterations to habitat complexity through altered autochthonous (primary productivity and other in-water) inputs, changes in the food web, and changes in habitat structure. In some case, alterations have been linked to specific types of HPA-permitted projects. For both fish and invertebrates, altered habitat could reduce foraging opportunity as well as the availability of nutrients, resulting in decreased survival, growth, and fitness.

7.1.2.1 General Effects: All Environments

HPA-permitted activities may uproot or permanently displace aquatic vegetation during construction, maintenance, and operation of structures. Short-term construction-related impacts may temporarily modify vegetation. In-water ground disturbance has been used as a measure of habitat take in ESA biological opinions (NMFS 2006e). Vessels used during installation, operation, and/or maintenance of HPA-permitted structures may physically disturb submerged vegetation through increased velocity from propeller wash. Lagler et al. (1950, in Carrasquero 2001) reported that outboard motor use has been shown to clear a swath when used within 1 foot (30 centimeters [cm]) of aquatic vegetation. In addition, propeller use may entrain air bubbles and cause sediment suspension that result in a temporary reduction in light availability (Haas et al. 2002).

HPA-permitted structures can cause losses of aquatic vegetation by several pathways in addition to direct disturbance.

- Hydrologic and geomorphic alterations may induce changes in substrate composition and stability and alter habitat suitability for aquatic vegetation. HPA-permitted activities may increase wave reflection, causing unsuitable energy conditions for vegetation, and may flush out small substrate that supports plant growth. Increased flow velocities and substrate characteristics caused by hydraulic and geomorphic modifications can scour algae and damage macrophytes. Conversely, changes in substrate composition with an increase in fine sediment transport can bury aquatic vegetation. Dewatered channels may experience loss of aquatic vegetation, depending on the duration of dewatering and the vulnerability of the affected plants to desiccation and drought stress.

- Increased turbidity is known to compromise the survivability of submerged aquatic vegetation (Parkhill and Gulliver 2002; Terrados et al. 1998) such as eelgrass (Erftemeijer and Lewis 2006) because it limits the amount of sunlight the plants receive. Increased turbidity can also bury the plants if sediment in suspension settles out (Mills and Fonseca 2003). In a study of the impact of sedimentation on seagrass in southeast Asia, Terrados et al. (1998) noted an approximate 50 percent decline in the number of seagrass species and a precipitous decline in seagrass biomass with a 15 percent increase in the clay content of the sediments.

- Numerous studies have shown that macrophytes and algae in both marine and freshwater environments reduce ambient concentrations of suspended sediment (Abdelrhman 2003; Moore 2004), nutrients (Moore 2004), and metals (Fritioff and Greger 2003). The processing and retention of sediment, nutrients, and pollutants in aquatic systems is accelerated by the presence of aquatic vegetation (Clarke 2002). Moore (2004) noted decreased nutrient concentrations and turbidity levels in seagrass beds relative to areas outside the beds along the littoral zone of the Chesapeake Bay National Estuarine Research Reserve. Aquatic vegetation does more than reduce nutrient and sediment concentrations; the plants themselves can sequester harmful trace metal pollutants and are frequently planted in wetland treatment systems with that intended function. In a comparative study of heavy metal uptake in terrestrial, emergent, and submerged vegetation, Fritioff and Greger (2003) noted that submerged vegetation was efficient at removing zinc, copper, cadmium, and lead from influent stormwater.

- HPA-permitted activities may affect aquatic vegetation through changes to ambient light. The growth and survival of submerged aquatic plants (benthic and planktonic) are dependent on identified light levels, known as photosynthetically active radiation (PAR). Light levels falling below PAR are known to limit the photosynthesis for a suite of aquatic photosynthesizers, such as diatoms, epiphytes, eelgrass, and other autotrophs important to HCP species. On average in Puget Sound, instantaneous mid-day PAR greater than approximately 150 $\mu M/m^2/sec$ is required to maintain eelgrass growth. Instantaneous PAR of approximately 325 $\mu M/m^2/sec$ is required to support maximum densities (Thom et al. 1998). The light requirements of different species vary, but reduced light in the littoral zone of freshwater environments can potentially limit aquatic vegetation (Chambers et al. 1999). The availability of light is also a crucial parameter for seagrasses and other marine aquatic vegetation (Hall et al. 1999). The loss of vegetation from shade could pose an indirect effect on the HCP species that rely on the species supported by that vegetation. Light limitations can lead to a local reduction in autochthonous primary production (i.e., organic matter produced by aquatic plants within a water body) and a reduction in the other functions of aquatic vegetation, including cover, substrate for invertebrate species, and food for herbivores (Hruby et al. 1999).

Structures can limit ambient light availability. Many types of HPA-permitted structures, including overwater structures, marinas, terminals, bridges, and culverts have been shown to shade the area underneath, within, and adjacent to the structures. The orientation of the structures, density of the structure (solid or open), culvert height, height above water (for bridges, overwater structures, marinas and terminals), length and width of the structure, size and spacing of supports (piers or piles), water depth, and tidal range all affect the extent and degree of shading (Nightingale and Simenstad 2001b).

Effects on fish associated with decreased light penetration and decreased vegetation include reduced foraging success and altered migration timing due to a reduction in primary productivity and associated reductions in prey species. Decreased light penetration and shading impacts on vegetation could also result in fish expending increased energy or being increasingly exposed to predation because of loss of suitable habitat and cover.

- HPA-permitted activities may introduce noxious aquatic weeds, or may alter ecosystems in ways that sustain their growth.

7.1.2.2 Ecosystem-Specific Effects: Marine and Estuarine

Marine aquatic vegetation is a fundamental structural and ecological component of the nearshore ecosystem and substantially influences the physical and chemical properties of the nearshore environment (Nightingale and Simenstad 2001b).

The Washington State Hydraulic Code Rules (WAC 220-110-250) designate eelgrass, kelp, and intertidal vascular plants as saltwater habitats of special concern and require that hydraulic projects result in no net loss of these habitats. The hydraulic code rules require that overwater structures be designed or located to avoid shading or other impacts that could result in the loss of eelgrass and kelp habitat (WAC 220-110-240 through 330).

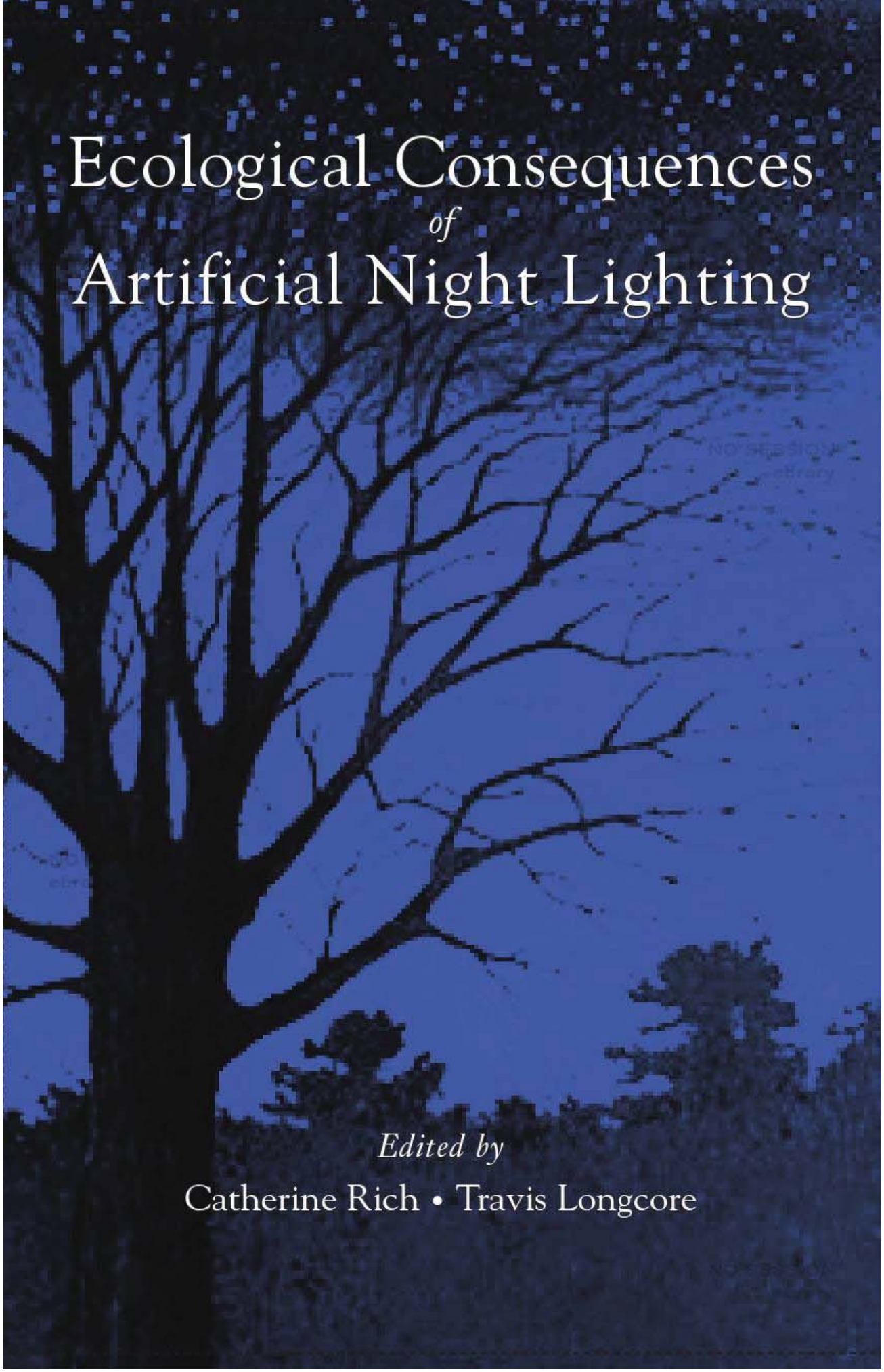
Eelgrass is associated with important rearing habitats for a suite of marine fishes, such as Pacific cod, Pacific salmon, rockfish, Pacific herring, walleye pollock, and rockfish (Gustafson et al. 2000; Murphy et al. 2000; Nightingale and Simenstad 2001a; Simenstad et al. 1999).

7.1.2.2.1 Vegetation and primary productivity

The basis for nearly all life in the sea is the photosynthetic activity of aquatic autotrophs such as algae, cyanobacteria, benthic microalgae, benthic macroalgae (kelps and seaweeds), and seed plants (such as seagrasses, mangroves, and salt-marsh plants) (Nybakken and Bertness 2005). These photosynthesizers rely on the availability of light for photosynthesis (Govindjee 1975). Marine aquatic vegetation forms an important component of the base of the aquatic (and terrestrial) food web (Seliskar and Gallagher 1983).

APPENDIX P-13

Literature Review Sources



Rich, Catherine, and Longcore, Travis, eds. Ecological Consequences of Artificial Night Lighting. Washington, DC, USA: Island Press, 2005. ProQuest ebrary. Web. 30 September 2014.
Copyright © 2005. Island Press. All rights reserved.

NO SESSION
ebrary

migrants to artificial lights at lodges and to automobile headlights has been used to enhance ecotourism (Backhurst and Pearson 1977, Nikolaus 1980, Nikolaus and Pearson 1983).

As human populations expand geographically, artificial lighting also expands, and it is now almost impossible to find areas that are free from its influence. Verheijen (1981b) was first to apply the term *photopollution* to situations in which artificial light has adverse effects on wildlife. His 1985 review elaborates on the concept of photopollution and highlights incidents involving birds and sea turtles, natural and artificial light fields, orientation issues, and remedies (Verheijen 1985). All evidence indicates that the increasing use of artificial light at night is having an adverse effect on populations of birds, particularly those that typically migrate at night.

NO SESSION
ebrary

In this chapter we provide a review of the literature on the attraction of birds to light at night. We first examine how and why birds are attracted to light and the mechanisms of avian vision. We then review examples of this attraction, organized by the type of lighting: lighthouses and lightships, floodlights and ceilometers, city lights and horizon glows, fires and flares, and broadcast and communication towers. We then report our observations of the response of migratory birds to lights on communication towers. We conclude with some specific recommendations to minimize light attraction of migrating birds and reduce the associated mortality.

Mechanisms of Bird Attraction to Artificial Light

NO SESSION
ebrary

Little is known about how birds are attracted to light at night (Verheijen 1985). It has been suggested that when a bird flies into lights at night it loses its visual cues to the horizon, and the bird uses the lights as a visual reference, resulting in spatial disorientation (Herbert 1970). According to Herbert (1970), birds using a light on a tower as a horizon cue would circle the tower, which may be a factor in bird attraction to lights on tall communication towers. Exposure to a light field at night causes alteration of a straight flight path (e.g., hovering, slowing down, shifting direction, or circling), and the change in flight path would keep the bird near the light source longer than if the flight path remained straight (Gauthreaux and Belser 1999, unpublished data). Under such circumstances *attraction* may not be as appropriate a term for the behavioral response as *capture* (Verheijen 1958). It is also likely in some cases that the intensity of the light bleaches visual pigments so that the birds are in effect blinded and can no longer see visual details that they could detect when dark adapted (Verheijen 1985).

NO SESSION
ebrary

Rich, Catherine, and Longcore, Travis, eds. Ecological Consequences of Artificial Night Lighting. Washington, DC, USA: Island Press, 2005. ProQuest ebrary. Web. 30 September 2014.
Copyright © 2005. Island Press. All rights reserved.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arcata Fish and Wildlife Office
1655 Heindon Road
Arcata, CA 95521-5582
Phone: (707) 822-7201 Fax: (707) 822-8411

In Reply Refer To:
8-14-2006-2887

JUL 31 2006

Memorandum

To: All Interested Parties

From: Field Supervisor, Arcata Fish and Wildlife Office
Arcata, California

Subject: Transmittal of Guidance: Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California

This memorandum transmits guidance prepared by the Arcata Fish and Wildlife Office (AFWO) that addresses the potential effects of disturbance on the federally listed northern spotted owl (*Strix occidentalis caurina*) (owl) and marbled murrelet (*Brachyramphus marmoratus*) (murrelet). This guidance promotes consistent and reasonable determinations of effects for activities that occur in or near owl or murrelet suitable habitat and result in elevated human-generated sounds or human activities in close proximity to nest trees. This guidance applies to activities occurring within the jurisdictional area of AFWO; generally, that area including Humboldt, Del Norte, and Trinity Counties, western Siskiyou County, and Mendocino County exclusive of the Russian River watershed.

This guidance applies to activities which have the potential to harass the owl or the murrelet as a result of substantially elevated sound levels or human presence near nests during the breeding season. This guidance was developed as a local adaptation of more general recommendations provided in 2005 by Region 1 of the Fish and Wildlife Service; those general recommendations are included as appendices to our guidance. This local adaptation resulted from extensive discussions among AFWO staff, consideration of local data, and comments provided by biologists from other Service offices and other agencies in California.

Through this memorandum, I am making this new guidance available for use by AFWO staff and the agencies and partners with whom we interact in project design, analysis, and consultation. This guidance will become fully effective as of the 2007 breeding seasons for the affected species. We are releasing it now to facilitate your project planning processes. However, as special case-by-case circumstances may warrant, and as our staff resources permit, we may

TAKE PRIDE IN AMERICA

consider implementation of this guidance this year for certain projects. If you have such projects, we will work with you to apply it on a site-specific basis. While this guidance is the result of lengthy and detailed discussion and development, and should be implemented substantially as written, it is to be viewed as a living document subject to continued, ongoing revision and improvement as additional data and experience are acquired.

Questions regarding implementation and interpretation of this guidance should be directed to Amedee Brickey, Endangered Species Program Lead, at (707) 822-7201.

Attachments

Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California, July 26, 2006

Marbled Murrelet Sound and Visual Harassment Decision Support Tool Draft User Guide, October 2003

Northern Spotted Owl Sound and Visual Harassment Decision Support Tool Draft User Guide, March 2004

Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California

July 26, 2006

Executive Summary

The issue of project-induced noise disturbance to northern spotted owls and marbled murrelets has drawn increasing attention in recent years, yet remains a complex, controversial, and poorly understood subject. The data available to assess impacts to terrestrial wildlife from these effects are limited, and fewer data yet are specific to these listed species. This guidance document builds upon and consolidates prior efforts (see Appendices) to interpret the limited available data to draw objective conclusions about the potential for these effects to rise to the level of take.

Through this guidance, the US Fish and Wildlife Service (Service) describes behaviors of these two forest species that reasonably characterize when disturbance effects rise to the level of take (i.e., harass), as defined in the implementing regulations of the Endangered Species Act of 1973, as amended (the Act). These behaviors include:

- Flushing an adult or juvenile from an active nest during the reproductive period.
- Precluding adult feeding of the young for a daily feeding cycle.
- Precluding feeding attempts of the young during part of multiple feeding cycles.

We have attempted to provide objective metrics based on a substantial review of the existing literature, as it pertains to these species and appropriate surrogate species. Our recommended methodology relies on a comparison of sound levels generated by the proposed action to pre-project ambient conditions. Disturbance may reach the level of take when at least one of the following conditions is met:

- Project-generated sound exceeds ambient nesting conditions by 20-25 decibels (dB).
- Project-generated sound, when added to existing ambient conditions, exceeds 90 dB.
- Human activities occur within a visual line-of-sight distance of 40 m or less from a nest.

To simplify the analysis of these potential effects, and to promote consistency in interpretation of the analytical results, we established sound level categories of 10-dB increments. The analysis relies on a simple comparison of project-generated sound levels against ambient conditions. Our recommended analysis includes a simple comparison of project and pre-project sound levels within a matrix of estimated distances for which available data support a conclusion of harassment. We provide a real-world example to assist the reader in understanding the correct application of the methodology.

Finally, we provide additional information the analyst should consider in conducting the analysis, as well as guidance on interpretation the final numbers derived from the analysis. We describe site-specific information that is important to include in project analyses, caution against inappropriate inclusion of information and circumstances not relevant to the results, and provide context to the final interpretation.

Introduction

The issue of elevated sound and visual disturbance of forest wildlife species, especially as it affects the northern spotted owl (owl) and the marbled murrelet (murrelet), has received increased attention in recent years, yet remains a complex, controversial, and poorly understood subject. In an effort to provide objective criteria for determining when disturbance of these species might rise to the level of "take", and to promote consistency in the interpretation of analytical results, the Arcata Fish and Wildlife Office (AFWO) developed the following guidance. The purposes of this guidance are (a) to describe the scientific basis for considering the effects of auditory and visual disturbance to owls and murrelets, and (b) to provide a methodology to simplify the analysis of these effects for the large majority of project circumstances typically encountered in or near owl and/or murrelet habitat.

This guidance attempts to quantify the effects of elevated sound levels and visual proximity of human activities to owls and murrelets, and primarily applies to these species within their suitable forest habitats in northwestern California. It may have some applicability to other forest nesting avian species, but was not developed with other species specifically in mind. Future updates of this guidance may address other forest birds.

This guidance has been developed through an extensive consideration of the available literature, incorporating species-specific information as available, but relying substantially on data from a variety of other surrogate avian species and local applications, as appropriate. This guidance is adapted from information compiled and distributed by the Service's Pacific Region, Office of Technical Support, while allowing for local conditions. Appendices A and B of this document include that information. The reader is referred to those documents for important and extensive background information regarding this issue, methods used to estimate the physical attenuation of sound in the forested landscape, and a complete list of cited material supporting our analysis. However, this guidance is intended to stand alone; the user need not read and digest the extensive appended material to fully implement this guidance.

Behaviors Indicating Harassment

The definition of "take" prescribed by the Act includes "harass". The Act's implementing regulations further define harass as "… an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering" [50 CFR §17.3]. Activities that create elevated sound levels or result in close visual proximity of human activities at sensitive locations (e.g., nest trees), have the potential to significantly disrupt normal behavior patterns.

While owls and murrelets may be disturbed by many human activities, we anticipate that such disturbance rises to the level of harassment under a limited range of conditions. For purposes of this guidance, we assume harassment may occur when owls or murrelets demonstrate behavior suggesting that the safety or survival of the individual is at significant risk, or that a reproductive effort is potentially lost or compromised. Examples of this behavior include, but are not limited to:

- An adult or juvenile is flushed from a nest during the incubation, brooding, or fledging period, that potentially results in egg failure or reduced juvenile survival.
- An adult abandons a feeding attempt of a dependent juvenile for an entire daily feeding period, that potentially results in malnutrition or starvation of the young.
- An adult delays feeding attempts of dependent birds on multiple occasions during the breeding season, potentially reducing the growth or likelihood of survival of young.

Other essential behaviors, if disrupted, may also indicate harassment.

We conclude, based on our interpretation of the available literature, that these behaviors may occur when owls or murrelets are subject to elevated sound levels or visual detection of human activities near their active nests or dependent offspring. We interpret the available published data on owls, murrelets and appropriate surrogate species as indicating that the above behaviors may manifest when: (a) the action-generated sound level substantially exceeds (i.e., by 20-25 dB or more as experienced by the animal) ambient conditions existing prior to the project; (b) when the total sound level, including the combined existing ambient and action-generated sound, is very high (i.e., exceeds 90 dB, as experienced by the animal); or (c) when visual proximity of human activities occurs close to (i.e., within 40 m of) an active nest site. Sound levels of lesser amplitude or human presence at farther distances from active nests have the potential to disturb these species, but have not been clearly shown to cause behaviors that meet the definition of harassment. We estimate distances at which conditions (a) and (b) occur by calculating attenuation rates of sound across habitat conditions representative of the forest habitats occupied by owls and murrelets. We describe this calculation in detail in a later section.

These behaviors are difficult to witness or quantify under field conditions. The difficulty associated with documentation of these behaviors, especially in species such as the marbled murrelet that rely on cryptic coloration and behavior to avoid detection, warrants a conservative interpretation of the limited data available on this subject. However, at this time, we have identified only those behaviors associated with active nest sites during the nesting season as potentially indicating harassment.

Sound Level Categories

The analysis of auditory and visual disturbance provided herein relies substantially on a simple comparison of the sound level generated by sources (e.g., chainsaws, dozers, trucks, power tools, etc.) anticipated for use in a proposed action against ambient sound conditions prevalent in the action area prior to implementing the project. The analysis compares the sound level that a nesting owl or murrelet is likely to be subject to as a result of implementing a proposed action against the sound levels to which the species may be exposed under existing, pre-project conditions.

Note that in this guidance we define the “ambient” sound level as that sound environment in existence prior to the implementation of the proposed action, and may include any and all human-generated sound sources when they constitute a long-term presence in the habitat being analyzed. Temporary, short-term sources, even if in effect during or immediately prior to the

proposed action, would generally not be considered as part of the ambient but would instead be considered as a separate effect, or considered in combination with the sources from the proposed action. A special case of ambient is the "natural ambient", which includes sound sources native to the forested habitat being considered, such as wind in trees, bird calls, and distant water flow. Human-generated, "white noise" sources, such as a distant highway, may also be part of the natural ambient if (a) distant to the area being considered, (b) relatively low in volume (i.e., <50 dB), and (c) relatively uniform in sound level over the area of consideration. Ambient sound should be estimated based on typical sources experienced on a daily or more frequent basis. For other than "natural ambient", sources are generally located within or near the footprint of the proposed action.

The analytical comparison is provided graphically in Table 1. However, before discussing the methodology incorporated into this table, and the interpretation of numeric values derived from its use, we define and describe the sound level categories used in this analysis. We created sound level categories of 10-dB increments as a means to simplify the analysis. Each sound level category is described in terms of the conditions, equipment, tools, and other sound sources common to the particular level.

The following subsections provide concise descriptions of sound levels typically encountered under pre-project ambient conditions or during project implementation (including post-project use, if future use of the project area results in a long-term alteration of the sound/visual environment). Each description includes the decibel range, a general description, and examples of equipment or tools that typify that sound environment. Measurements and estimates from a broad range of tools and equipment are provided for reference purposes in Table 2.

It should be noted that many tools and equipment demonstrate a range of sound production substantially wider than the 10-dB sound level categories provided here. That range of sound production represents the inherent variability among similar sources, and the variation that typically occurs among measurements of even identical sources. This can easily be seen in a cursory examination of Table 2. When the range of sound measures for a source exceed the 10-dB range of a single sound level category, the analyst should consider the sound source in the context of other sources typical to the proposed activity. For example, chain saws used in timber harvest operations would include those in the higher sound measures, and would not include lower sound levels more representative of homeowner applications. In a related issue, the sound of small trees being felled is not anticipated to be substantially higher than the sound of the saws and other activities. However, the felling of larger trees may exceed the sound of the equipment used to fall and yard them; we have addressed this situation in the sound level descriptions.

We have attempted to create categories here that include similar sound sources, and have generally applied more median values (that is, we have discounted outliers) where multiple values for similar sound sources are encountered. While there may be exceptions within and among these categories, we have attempted to address this variability through an otherwise conservative approach to estimating distances at which harassment behaviors may manifest.

Natural Ambient: Refers to ambient sound levels (generally < 50 dB) typically experienced in owl or murrelet habitat not substantially influenced by human activities, and includes sources native to forest habitats. Human-generated "white noise", such as from a *distant* highway, may apply when < 50 dB and relatively uniform across the action area.

Very Low: Typically 50-60 dB, and generally limited to circumstances where human-generated sound would never include amplified or motorized sources. Includes forest habitats close to less-frequently encountered natural sources, such as rapids along large streams, or wind-exposure, and may include quiet human activities such as nature trails and walk-in picnic areas.

Low: Typically 61-70 dB, and generally limited to sound from small power tools, light vehicular traffic at slow speeds on paved surfaces, non-gas-powered recreational activities, and residential activities, such as those associated with small parks, visitor centers, bike paths, and residences. Includes most hand tools and battery operated, hand-held tools.

Moderate: Typically 71-80 dB, generally characterized by the presence of passenger vehicles and street-legal motorcycles, small trail cycles (not racing), small gas-powered engines (e.g., lawn mowers, *small* chain saws, portable generators), and high-tension power lines. Includes electric hand tools (except circular saws, impact wrenches and similar).

High: Typically 81-90 dB, and would include medium- and large-sized construction equipment, such as backhoes, front end loaders, large pumps and generators, road graders, dozers, dump trucks, drill rigs, and other moderate to large diesel engines. Would include high speed highway traffic including RVs, large trucks and buses, large street legal and trail (not racing) motorcycles. Also includes power saws, large chainsaws, pneumatic drills and impact wrenches, and large gasoline-powered tools.

Very High: Typically 91-100 dB, and is generally characterized by impacting devices, jackhammers, racing or Enduro-type motorcycles, compression ("jake") brakes on large trucks, and trains. This category includes both vibratory and impact pile drivers (smaller steel or wood piles) such as used to install piles and guard rails, and large pneumatic tools such as chipping machines. It may also include largest diesel and gasoline engines, especially if in concert with other impacting devices. Felling of large trees (defined as dominant or subdominant trees in mature forests), truck horns, yarding tower whistles, and muffled or underground explosives are also included.

Extreme: Typically 101-110 dB. Generally includes use of ground-level, unmuffled explosives, pile driving of large steel piles, low-level over flights or hovering of helicopters, and heavily amplified music.

Sound Levels Exceeding 110 dB: These sound levels, typified by sources such as jet engines and military over flights, large sirens, open air (e.g., treetop) explosives, and double rotor logging helicopters, are special situations requiring site- and situation-specific analysis, and are not covered by the analytical methods provided herein.

Derivation of Harassment Distances

As indicated earlier, available data suggest that harassment occurs when sound levels resulting from project-based sound sources exceed ambient conditions by relatively substantial levels, or when those sound sources exceed a high absolute threshold. Since sound attenuates as a function of the distance from the source (within typical forest habitat, at a rate of approximately 6 dB per doubling of distance from a point source), the analyst can estimate the distance at which various sound sources exceed ambient conditions by anticipated threshold values. We estimated these distances using a spreadsheet model that simulates sound attenuation in typical forest habitats, reasonably accounting for ambient environmental conditions and sound source characteristics. As a means of simplifying the analysis process, we used reasonable median sound values within the above-described categories for both source and ambient sound conditions. Table 1 reports the distances within which elevated, project-generated sound is reasonably expected to exceed ambient conditions to such a degree as to result in harassment of murrelets or owls. The reader is referred to Appendices 1 and 2 and their references for additional, detailed discussion of sound metrics and the model used to derive these distances.

Time of Day Adjustment for the Marbled Murrelet

The disturbance take threshold distances provided in Table 1 are based on a comparison of project generated sound levels with existing (ambient) sound levels, which themselves represent average daytime sound conditions. We recognize, however, that ambient sound level often has a substantial time-of-day component, with nighttime, dawn and dusk ambient sound levels generally 5-10 dB lower than typical midday levels (see Appendix A *in* EPA 1974). It is also known that murrelet flights into nests to feed nestlings and for nest-tending exchanges are concentrated around dawn and dusk (Nelson and Hamer 1995), during the period when ambient noise levels tend to be lower than average daytime levels (EPA 1974).

Therefore, for marbled murrelets, the harassment threshold distances provided in Table 1 apply to noise-generating activities occurring during the midday period, when the risk of harassment is lower. Specifically, for murrelets, the harassment distances in Table 1 apply to noise-generating activities that are not within 2 hours of sunrise or sunset. If proposed activities will occur within 2 hours of sunrise or sunset, and if the ambient sound environment during the dawn and dusk period can reasonably be expected to be 5 dB or more quieter than the midday sound environment, then the estimated harassment distance threshold should be calculated based on an ambient level 10 dB lower (i.e., one row up in the table) compared to the normal ambient rating in Table 1. In some cases, this will result in a larger harassment threshold distance. This time-of-day measure provides a more consistent application of the threshold criteria to the known biology of the murrelet and the anticipated sound environment during dawn and dusk periods.

Similar time-of-day considerations and adjustments are not required for the northern spotted owl.

Application of Harassment Distances to Project Conditions

The following methodology may be used to estimate the approximate distance at which project-generated sound exceeds ambient conditions to such an extent that northern spotted owls or marbled murrelets may be subject to harassment due to sound or visual disturbance.

Step 1: The analyst reviews the environment in the action area to determine the existing ambient sound level. The analyst should include any sound sources occurring in the action area, prior to and not part of the proposed action, that create ambient sound levels higher than the "natural" background. For example, if the proposed action would add a passing lane to a high-use major highway, the ambient condition should include the existing traffic and maintenance on the highway itself, in addition to other sounds native to the adjacent forest environment. As a second example, a proposed action to maintain a remote hiking trail would not include sound sources other than the "natural background" and infrequent human use as part of the existing ambient. Based on this review, the analyst assigns a sound level category to the ambient condition (equivalent to a row of Table 1).

Step 2: The analyst reviews the proposed action to determine the types of equipment, tools, etc., anticipated to be used during the project. Based on the descriptions of sound level categories, above, the analyst assigns a sound level category to the action-generated sound sources (corresponding to the columns in Table 1). Action-generated sound sources should include all major sources necessary to complete the proposed action. When project-specific sound measures are not available, the reader should refer to Table 2 for typical values for equipment, tools, and other sound sources. For projects where distinctly different sound environments (for either ambient or action-generated) may occur within the overall action area, the analyst may complete separate analyses for each distinct sound environment.

Step 3: From Table 1, the analyst finds the cell corresponding to the appropriate row and column for existing ambient sound and action-generated sound, respectively. This cell provides an estimate of the distance within which increased sound level may harass an owl or murrelet. The cell values are generally reported as a distance from the outer edge of the project footprint into occupied or presumed occupied suitable habitat, unless site-specific information indicates sound sources may be more localized within the project footprint (see also "Other Considerations", below).

Step 4: When significant topographic features occur within the sound environment, appropriate consideration may be given to their sound attenuating capabilities. However, the analyst should have a full understanding of the effects of topography on sound attenuation, especially when the species involved typically nests at a substantial distance above the ground. That is, topography may substantially attenuate sound between the source and the receiver (i.e., owl or murrelet nest site) when that topographic barrier is sufficiently high to block line-of-sight transmission between the source and receiver. For species such as owls and murrelets that normally nest high in tall trees, topography or other barriers provide little attenuation unless very close to the sound source, or very high.

Step 5: Consider the potential for human activities within 40 m of nest branches of owls or murrelets. If no known or likely nest tree, or flight path to the nest itself, occurs this close to the visual disturbance sources, there would be no visual disturbance of owls or murrelets anticipated. Otherwise, assume visual harassment for up to 40 m from human activities.

Table 1. Estimated harassment distance due to elevated action-generated sound levels for proposed actions affecting the northern spotted owl and marbled murrelet, by sound level.

Existing (Ambient) Pre-Project Sound Level (dB) [1, 2]	Anticipated Action-Generated Sound Level (dB) [2, 3]			
	Moderate (71-80)	High (81-90)	Very High (91-100)	Extreme (101-110)
"Natural Ambient" [4] (<=50)	50 (165) [5,6]	150 (500)	400 (1,320)	400 (1,320)
Very Low (51-60)	0 (0)	100 (330)	250 (825)	400 (1,320)
Low (61-70)	0 (0)	50 (165)	250 (825)	400 (1,320)
Moderate (71-80)	0 (0)	50 (165)	100 (330)	400 (1,320)
High (81-90)	0 (0)	50 (165)	50 (165)	150 (500)

[1] Existing (ambient) sound level includes all natural and human-induced sounds occurring at the project site prior to the proposed action, and are not causally related to the proposed action.
[2] See text for full description of sound levels.
[3] Action-generated sound levels are given in decibels (dB) experienced by a receiver, when measured or estimated at 15.2 m (50 ft) from the sound source.
[4] "Natural Ambient" refers to sound levels generally experienced in habitats not substantially influenced by human activities.
[5] All distances are given in meters, with rounded equivalent feet in parentheses.
[6] For murrelets, activities conducted during the dawn and dusk periods have special considerations for ambient sound level. Refer to text for details.

Example Analysis

The following example is provided to assist the reader in understanding the application of this recommended methodology to a hypothetical yet typical project circumstance.

Proposed Project: An agency proposes to construct an informational kiosk, restroom, and six graveled parking slots at an existing, undeveloped, trailhead parking area along a low-speed (<45 mph), paved road closed to large trucks and buses. The footprint of the proposed project is a roughly circular area of approximately 75-foot diameter (about 1/10 acre). The surrounding

forest is suitable nesting habitat for marbled murrelets, and the agency proposes to do construction during the nest season. Topography in the action area is low rolling ridges less than 50 feet high. No other sound sources of significance are located nearby. The construction project will not remove any large trees, but requires the use of several pieces of equipment (e.g., backhoe, dump truck), as well as smaller power equipment (e.g., saws, cement mixer, portable generator, small chain saw) and hand tools. No jackhammering, pile driving, or larger diesel equipment is needed. The agency agrees to conduct all on-site activities during the midday time period between 2 hours after sunrise to 2 hours before sunset.

Analysis: The ambient sound level at the proposed kiosk includes the existing passenger vehicle/light truck traffic on a paved surface immediately adjacent to the work area, and existing human presence of hikers. Using the above-described sound level categories, this ambient sound level classifies as "low" (61-70 dB). The large construction equipment (i.e., the backhoe and truck) are the greatest sources of increased sound to be considered here, as they exceed the level of the other tools. From the above-described sound levels, we anticipate that action-generated sound levels will fit into the "high" category (81-90 dB). Choosing the appropriate row (Ambient = Low) and column (Action-generated = High) in Table 1, we estimate that disturbance may rise to the level of harassment over an area within 50 m (165 ft) from the footprint of the project. Since all activities will be conducted during the mid-day period, no further adjustment of the tabled value to account for murrelet activity periods is necessary. This 50-m distance, when used as a buffer around the project footprint, results in an estimate of 2.9 acres (1.2 ha) subject to harassment from auditory disturbance. Large potential nest trees exist immediately adjacent to the work area, so visual harassment may also be a consideration. However, human presence already occurs at the trailhead on a daily basis, and the proposed project will not substantially alter that effect. The topographic features in the action area are unlikely to further attenuate any sound experienced by murrelets, which commonly nest more than 50 feet above ground level. Since construction of the kiosk and restroom would not appreciably change the effects of the existing roadway or parking area, the duration of effects would be for a single breeding season, and would not alter effects already at the site in future years.

Interpretation and Application of the Results

The estimated harassment distance resulting from the analysis of any particular project conditions requires careful interpretation. Although seemingly precise, the reported distance represents a reasonable *approximation* of the distance wherein "the likelihood of injury" occurs, as supported by currently available data. That is, the resultant number estimates the distance within which available disturbance data on owls or murrelets (or surrogate species, as appropriate) show that at least some individuals would demonstrate one or more behaviors indicating harassment as a result of anticipated sound levels or visual detection of human activities near nest sites. Given the many sources of variability in such an analysis, such as differences in individual bird response, variation in actual sound level produced by similar sources, variability in sound transmission during daily weather patterns, and non-standardization in sound metrics reported in the published literature, exact estimates of harassment distances are currently infeasible, and likely will remain so.

It is reasonable to assume that owls or murrelets closer to sources of disturbance have a higher likelihood of suffering significant disruption of normal behavior patterns than those at the outer limits of the estimated harassment distance, due to louder sound levels or a visually closer perceived threat to the nest. Further, not all owls or murrelets, except those in the very closest proximity to the disturbance source, may respond to a degree indicating harassment. Thus, the likelihood of injury for any particular individual would range from some low proportion to a higher value depending on its actual proximity to a particular sound/visual source. It is neither reasonable nor necessary for purposes of analysis and estimation of take to predict that all (or even a high proportion of) owls or murrelets within this distance show harassment behaviors. Conversely, it is also unreasonable to conclude that owls or murrelets beyond this distance would never be harassed. A more supportable interpretation is that currently available information does not support a conclusion that owls or murrelets more distant to the anticipated sound/visual disturbances are likely to suffer a significant disruption of normal behavior patterns.

The reporting of take associated with auditory and visual disturbances is necessary, even if somewhat imprecise. It is appropriate to consider all reasonable means to minimize take including, but not limited to, seasonal restrictions and substitution of equipment type to reduce the likelihood of injury, so long as those means are consistent with the "minor change rule" [50 CFR §402.14 (i)(2)]. When considering measures to reduce the effects of harassment, the analyst should bear in mind not only the spatial extent of the disturbance, but also the timing and duration of the disturbance.

Finally, activities which result in estimated distances of zero meters would be expected to have no effect on either owls or murrelets. Activities resulting in estimates of 50 m or less may, under some circumstances, be considered not likely to adversely affect, due in part to the species preference of nesting high up in large trees. However, the analyst should be prepared to describe and justify reasons for these findings.

Other Considerations

This guidance does not consider the direct effects of predation by corvids (ravens, crows and jays) and other predators as a result of human activities in murrelet and owl habitat. That is, while corvids may increase in number in murrelet and owl habitat in response to human activities, the resulting increased take due to predation (injury) is not addressed here. Distance estimates reported in this guidance reflect only the effects of sound attenuation and visual detection on behaviors appropriately interpreted as harassment. We have considered predation only in the sense that detection of the nest as a result of owl or murrelet harassment behavior (e.g., flushing from the nest) may increase the risk of predation, regardless of density of predators, and thus represents a "likelihood of injury."

This analytical method addresses most forest habitat conditions that affect the attenuation rate of sound (and thus the level of sound detected by the owl or murrelet at its location). These conditions include dampening effects of forest vegetation, variability in natural ambient sound typically encountered under forest conditions, use of multiple pieces of identical equipment, and the effect of elevated nest sites on sound attenuation. Departure from the tabled values in this guidance to account for special forest conditions is generally inappropriate except under highly

unusual circumstances. A factor *not* considered in this methodology is the effect of topography on sound attenuation. Therefore, a site-specific assessment of topography should be considered. Steep slopes, ridges, and designed sound barriers may increase sound attenuation when they form complete barriers to the direct line of sound transmission between source and the location of the receiver (here, the actual location of the potentially harassed animal). In general, small ridges or walls not clearly blocking the sources from a highly elevated nest would provide little or no attenuation. When clearly supported by site-specific information regarding topography, action-generated sound may be reduced by one or two levels in the analysis, when compared to existing ambient sound levels.

For some projects, elevated sound levels may cease following completion of the project. For example, sound level following the completion of timber harvest is likely to return to pre-harvest levels, and so would not result in long-term or permanent sound and visual disturbance to owls and murrelets. On the other hand, actions such as the creation of a new road may result in elevated sound levels both during construction and during future use and maintenance of the road. The analyst should carefully consider both spatial and temporal aspects of noise and visual disturbance for each project.

Activities producing sound levels of 70 dB or less (estimated at 15.2 m from the sources), such as use of hand tools, small hand-held electric tools, or non-motorized recreation, would not generally rise to the level of harassment, except in certain circumstances, such as when used in very close proximity (i.e., <25 m) to an active nest. However, under these circumstances, visual detection of human activities by the species near its nest is assumed to be of more consequence than auditory disturbance, and take should be described in such terms.

Activities producing sound levels greater than 110 dB (estimated at 15.2 m from the sources), such as open-air blasting, aircraft, or impact pile-driving, are not addressed in this analysis, and should be evaluated through a more detailed site-specific analysis.

Table 2. Some Common Sound Levels for Equipment/Activities

	Range of Reported dB Values @ Distance Measure *(Distance measured @ 50 ft (15.2 m) unless otherwise indicated)*		
Measured Sound Source	**Reported Decibel Value**	**"Standardized" Value @ 50 ft [/1]**	**Relative Sound Level [/2]**
Quiet Whisper	30 @ 3 ft	6	Ambient
Ambient Sound Level - Forest Habitats (low end[/3])	25	25	Ambient
Library (ambient sound level)	30 @ ambient	30	Ambient
Conversation (low end)	55 @ 1 m	31	Ambient
Conversation (high end[/4])	62 @ 2 ft	34	Ambient
Conversataion	60 @ 3 ft	36	Ambient
Speech (normal)	65 @ 1 m	41	Ambient
Ambient Sound Level - Forest Habitats (high end)	43.8	44	Ambient
Home Vacuum Cleaner	70 @ 1 m	46	Very Low
Loud Singing	75 @ 3 ft	51	Very Low
Generator (light home/recreational, 900-2,800 W)	59 @ 7 m	52	Very Low
Air Conditioner Window Unit	60 @ 25 ft	54	Very Low
Generator (light commercial, 4,000-5,000 W) (low end)	61 @ 7 m	54	Very Low
Pickup Truck (idle) (low end)	55	55	Very Low
Garbage Disposal (low end)	80 @ 1 m	56	Very Low
Garbage Disposal (high end)	80 @ 3 ft	57	Very Low
Generator (light commercial, 4,000-5,000 W) (high end)	65 @ 7 m	58	Very Low
Conversation (indoor)	60	60	Very Low
Chain Saw Running (rain) (low end)	61	61	Low
Food Blender (low end)	85 @ 1 m	61	Low
Generator (heavy home, 3,300-5,500 W) (low end)	68 @ 7 m	61	Low
Generator (light industrial, 2,600-9,500 W) (low end)	68 @ 7 m	61	Low
Milling Machine	83 @ 4 ft	61	Low
Pickup Truck (idle) (high end)	77 @ 8 ft	61	Low
Motorcycle on Trail (620 cc street legal, meter at ground level)	61.9	62	Low
Powerline	50 @ 200 ft	62	Low
Chainsaw (Stihl 025)	46 @ 105 m	63	Low
Generator (economic home, 2,300-4,500 W) (low end)	70 @ 7 m	63	Low
Street Motorcycles < 100 cc (low end)	65	65	Low
Motorcycle on Trail (100 cc, 2-stroke, meter at ground level)	65.7	66	Low
Chainsaw (McCulloch Promac 260, low end)	46.1 @ 150 m	66	Low
Chainsaw (Stihl 025, low end)	53.8 @ 60 m	66	Low
Food Blender (high end)	90 @ 3 ft	66	Low
Motorcycle on Trail (620 cc street legal, meter elevated 15 m)	66.6	67	Low
Generator (welding, 4,000 W)	74 @ 7 m	67	Low
Passenger Car (50 mph)	67	67	Low
Passenger Car (60 kph)	65 @ 20 m	67	Low
Generator (heavy home, 3,300-5,500 W) (high end)	75 @ 7 m	68	Low
Generator (medium commercial, 6,000 W)	75 @ 7 m	68	Low
Power Lawn Mower	92 @ 1 m	68	Low
Motorcycle on Trail (100 cc, 2-stroke, meter elevated 15 m)	68.1	68	Low
Generator (economic home, 2,300-4,500 W) (high end)	76 @ 7 m	69	Low
Chainsaw (McCulloch Promac 260)	59.9 @ 50 m	70	Low
Generator (25 KVA or less)	70	70	Low
Yelling	92 @ 4 ft	70	Low
Pickup Truck (driving)	87 @ 8 ft	71	Moderate
Motorcycle on Trail (300 cc, 2-stroke, meter at ground level)	71.3	71	Moderate
Chainsaw (McCulloch Promac 260)	61.3 @ 50 m	72	Moderate
Gas Lawn Mower	96 @ 1 m	72	Moderate
Mowers, leaf blowers (low end)	72	72	Moderate
Chainsaw (Stihl 025, high end)	60.5 @ 60 m	73	Moderate

Measured Sound Source	Reported Decibel Value	"Standardized" Value @ 50 ft [1]	Relative Sound Level [2]
Generator (light industrial, 2,600-9,500 W) (high end)	80 @ 7 m	73	Moderate
Street Motorcycles 350-749 cc (low end)	73	73	Moderate
Welder	73	73	Moderate
Automobile	80 @ 25 ft	74	Moderate
Jackhammer (muffled)	74	74	Moderate
Pile Driving (1999 ODOT Study, low end)	74	74	Moderate
Roller (low end)	74	74	Moderate
Street Motorcycles >= 750 cc (low end)	74	74	Moderate
Chain saws (low end)	75	75	Moderate
Off-Road Motorcycles < 100 cc (low end)	75	75	Moderate
RVs (small) (low end)	75	75	Moderate
Concrete Vibrator	76	76	Moderate
Passenger Cars/Light Trucks (65 mph) (low end)	76	76	Moderate
Flatbed Pickup Truck	93 @ 8 ft	77	Moderate
Log Truck	67 @ 46 m	77	Moderate
Pump (low end)	77	77	Moderate
Street Motorcycles 170-349 cc (low end)	77	77	Moderate
BPA Powerline	66 @ 200 ft	78	Moderate
Generator (low end)	78	78	Moderate
Off-Road Motorcycles 100-169 cc (low end)	78	78	Moderate
Street Motorcycles 100-169 cc (low end)	78	78	Moderate
Backhoe	69 @ 46 m	79	Moderate
Off-Road Motorcycles 170-349 cc (low end)	79	79	Moderate
Motorcycle on Trail (300 cc, 2-stroke, meter elevated 15 m)	79.6	80	Moderate
Backhoe (low end)	80	80	Moderate
Boat motors (low end)	80	80	Moderate
Cat Skidder	70 @ 46 m	80	Moderate
Chainsaw (McCulloch Promac 260, high end)	59.5 @ 150 m	80	Moderate
Compressor (low end)	80	80	Moderate
Concrete Mixer (low end)	80	80	Moderate
Front-end Loader (low end)	80	80	Moderate
Ground Compactor (low end)	80	80	Moderate
Horizontal Boring Hydraulic Jack	80	80	Moderate
Medium Construction (low end)	80	80	Moderate
Medium Trucks & Sport Vehicles (65 mph) (low end)	80	80	Moderate
Paver (low end)	80	80	Moderate
Rock Drill and Diesel Generator (low end)	58 @ 200 m	80	Moderate
Roller (high end)	80	80	Moderate
Vacuum Street Sweeper	80	80	Moderate
Cat Skidder	59 @ 200 m	81	High
Concrete Truck (low end)	81	81	High
Off-Road Motorcycles < 100 cc (high end)	81	81	High
Pumps, generators, compressors (low end)	81	81	High
Concrete Pump	82	82	High
Dump Truck Dumping Rock	72 @ 46 m	82	High
Ground Compactor (high end)	82	82	High
Rock Drills and Jackhammers (low end)	82	82	High
Slurry Machine (low end)	82	82	High
Street Motorcycles < 100 cc (high end)	82	82	High
Train	90 @ 20 ft	82	High
Chainsaw, large	73 @ 46 m	83	High
Chainsaw, large	61 @ 200 m	83	High
Concrete Batch Plant	83	83	High
Dump Truck Dumping Rock	54 @ 400 m	83	High
General construction (low end)	83	83	High

Measured Sound Source	Reported Decibel Value	"Standardized" Value @ 50 ft [/1]	Relative Sound Level [/2]
Highway Traffic (uphill, discontinuous traffic, wet)	61 @ 200 m	83	High
Log Loader	73 @ 46 m	83	High
Power Mower	107 @ 3 ft	83	High
Road Grader (low end)	83	83	High
Backhoe (high end)	84	84	High
Dozer (low end)	84	84	High
Dump Truck	84	84	High
Flat Bed Truck	84	84	High
Generator (high end)	84	84	High
Heavy Construction (low end)	84	84	High
Large Truck (low end)	84	84	High
Motorcycle	88 @ 30 ft	84	High
Motorcycle Enduro Event	62.3 @ 180 m	84	High
Pile Driving (1987 WDOT Study, low end)	84	84	High
Rock Drill and Diesel Generator (low end)	55 @ 400 m	84	High
Motorcycle on Trail (200 cc, 2-stroke, meter at ground level)	84.5	85	High
5 Motorcycles	67 @ 120 m	85	High
Auger Drill Rig	85	85	High
Concrete Mixer (high end)	85	85	High
Concrete Truck (high end)	85	85	High
Crane (low end)	85	85	High
Diesel Truck (40 mph)	85	85	High
Drill Rig (low end)	85	85	High
Dump Truck	63 @ 200 m	85	High
Equipment > 5 horsepower	85	85	High
Gradall (low end)	85	85	High
Highway Traffic (uphill, discontinuous traffic, wet)	75 @ 46 m	85	High
Impact Wrench	85	85	High
Large Tree Falling	63 @ 200 m	85	High
Log Loader	63 @ 200 m	85	High
Mounted Impact Hammer Hoe-Ram (low end)	85	85	High
Mowers, leaf blowers (high end)	85	85	High
Passenger Cars/Light Trucks (65 mph) (high end)	85	85	High
Pump (high end)	85	85	High
Road Grader (high end)	85	85	High
Rock Drill (low end)	85	85	High
RVs (large) (low end)	85	85	High
RVs (small) (high end)	85	85	High
Scraper (low end)	85	85	High
23 ft Detonation Cord, on surface (low end)	80 @ 100 ft	86	High
Chain saws (high end)	86	86	High
Chainsaw (Cantor, one chainsaw running)	86	86	High
Dump Truck Dumping Rock	64 @ 200 m	86	High
Gradall (high end)	86	86	High
Large Diesel Engine	100 @ 10 ft	86	High
Motorcycle Enduro Event	68.4 @ 120 m	86	High
Pneumatic wrenches, rock drills (low end)	86	86	High
Rock Drill and Diesel Generator (high end)	64 @ 200 m	86	High
12 ft Detonation Cord, buried (low end)	66 @ 580 ft	87	High
Diesel Truck (50 kph)	85 @ 20 m	87	High
Front-end Loader (high end)	87	87	High
Hydromulcher (low end)	71 @ 300 ft	87	High
Pumps, generators, compressors (high end)	87	87	High
Crane (high end)	88	88	High
Dozer (high end)	88	88	High

Measured Sound Source	Reported Decibel Value	"Standardized" Value @ 50 ft [1]	Relative Sound Level [2]
Drill Rig (high end)	88	88	High
Off-Road Motorcycles 350-750 cc (low end)	88	88	High
Street Motorcycles 100-169 cc (high end)	88	88	High
Motorcycle on Trail (200 cc, 2-stroke, meter elevated 15 m)	88.2	88	High
5 Motorcycles	55 @ 760 m	89	High
Chainsaw (Cantor, two chainsaws running)	89	89	High
General construction (high end)	89	89	High
Jackhammer	89	89	High
Large Truck (high end)	89	89	High
Medium Construction (high end)	89	89	High
Medium Trucks & Sport Vehicles (65 mph) (high end)	89	89	High
Motorcycle Enduro Event	73.3 @ 90 m	89	High
Paver (high end)	89	89	High
Scraper (high end)	89	89	High
Street Motorcycles 350-749 cc (high end)	89	89	High
Chain Saw Running (rain) (high end)	80 @ 150 ft	90	High
Compressor (high end)	90	90	High
Concrete Saw	90	90	High
Heavy Trucks and Buses (low end)	90	90	High
Hydra Break Ram	90	90	High
Mounted Impact Hammer Hoe-Ram (high end)	90	90	High
Circular Saw (hand held)	115 @ 1 meter	91	Very High
Highway Traffic (downhill, discontinuous traffic, wet)	81 @ 46 m	91	Very High
Motorcycle Enduro Event	78.8 @ 60 m	91	Very High
Pneumatic Chipper (low end)	115 @ 1 m	91	Very High
Pneumatic Riveter	115 @ 3 ft	91	Very High
Slurry Machine (high end)	91	91	Very High
Track Hoe (low end)	75 @ 300 ft	91	Very High
Highway Traffic (downhill, discontinuous traffic, wet)	70 @ 200 m	92	Very High
Large Tree Falling	82 @ 46 m	92	Very High
Motorcycle Enduro Event	85.8 @ 30 m	92	Very High
Chainsaw	117 @ 3 ft	93	Very High
Clam Shovel	93	93	Very High
Railroad (low end)	93	93	Very High
Street Motorcycles >= 750 cc (high end)	93	93	Very High
Explosives (low end)	94	94	Very High
Hydromulcher (high end)	88 @ 100 ft	94	Very High
Jake Brake on Truck	110 @ 8 ft	94	Very High
Boat motors (high end)	95	95	Very High
Guardrail Installation and Pile Driving (low end)	95	95	Very High
Heavy Trucks and Buses (high end)	95	95	Very High
Impact Pile Driver (low end)	95	95	Very High
Off-Road Motorcycles 350-750 cc (high end)	95	95	Very High
Pneumatic Chipper (high end)	115 @ 5 ft	95	Very High
RVs (large) (high end)	95	95	Very High
Vibratory (Sonic) Pile Driver (low end)	95	95	Very High
Diesel Truck	100 @ 30 ft	96	Very High
Heavy Construction (high end)	96	96	Very High
Jet Overflight (low end)	80 @ 300 ft	96	Very High
Vibratory (Sonic) Pile Driver (high end)	96	96	Very High
Logging Truck	97	97	Very High
Pneumatic wrenches, rock drills (high end)	97	97	Very High
Rock Drills and Jackhammers (high end)	97	97	Very High
Street Motorcycles 170-349 cc (high end)	97	97	Very High
Door Slamming	98	98	Very High

Measured Sound Source	Reported Decibel Value	"Standardized" Value @ 50 ft [/1]	Relative Sound Level [/2]
Dump Truck	88 @ 46 m	98	Very High
Pile Driving (1999 ODOT Study, low end)	98	98	Very High
Railroad (high end)	98	98	Very High
Rock Drill (high end)	98	98	Very High
Helicopter S-61 (large, single rotor, loaded) (low end)	79 @ 500 ft	99	Very High
Rock Drill and Diesel Generator (high end)	70 @ 400 m	99	Very High
Off-Road Motorcycles 100-169 cc (high end)	100	100	Very High
Off-Road Motorcycles 170-349 cc (high end)	100	100	Very High
Rock Drill and Diesel Generator	90 @ 46 m	100	Very High
Exterior Cone Blast w/ sand bags (low end)	72 @ 0.25 mi	101	Extreme
Helicopter S-61 (low end)	77 @ 800 ft	101	Extreme
Impact Pile Driver (high end)	101	101	Extreme
Pneumatic tools, jackhammers & pile driver (low end)	101	101	Extreme
Amplified Rock and Roll	120 @ 6 ft	102	Extreme
Helicopter S-61 (large, single rotor, loaded) (high end)	82 @ 500 ft	102	Extreme
Pile Driving (1987 WDOT Study, high end)	103	103	Extreme
Truck Horn	120 @ 8 ft	104	Extreme
Guardrail Installation and Pile Driving (high end)	105	105	Extreme
23 ft Detonation Cord, on surface (high end)	85 @ 580 ft	106	Extreme
Impact Pile Driving	106	106	Extreme
Track Hoe (high end)	96 @ 150 ft	106	Extreme
Columbia double rotor logging helicopter (reading from road)	79 @ 400 m	108	Extreme
Pave Hawk Military Helicopter	92 @ 105 m	109	Extreme
Columbia double rotor logging helicopter (read in forest)	100 @ 46 m	110	Extreme
Pneumatic tools, jackhammers & pile driver (high end)	110	110	Extreme
12 ft Detonation Cord, buried (high end)	92 @ 500 ft	112	Extreme
Helicopter S-61 (high end)	106 @ 100 ft	112	Extreme
Rock Blast	91 @ 575 ft	112	Extreme
Columbia double rotor logging helicopter (reading from road)	84 @ 400 m	113	Extreme
Engine Exhaust (no muffler)	140 @ 3 ft	116	Extreme
Military Flight (low end)	98 @ 500 ft	118	Extreme
Exterior Cone Blast w/ sand bags (high end)	100 @ 500 ft	120	Extreme
Treetop Blast (low end)	110 @ 200 ft	122	Extreme
Columbia double rotor logging helicopter (read at clearing)	101 @ 200 m	123	Extreme
Jet Overflight (high end)	86 @ 4,000 ft	124	Extreme
Exterior Cone Blast (obstructed)	107 @ 500 ft	127	Extreme
Jet takeoff	120 @ 200 ft	132	Extreme
50 HP Siren	130 @ 100 ft	136	Extreme
Jet Plane	130 @ 100 ft	136	Extreme
Treetop Blast (high end)	116 @ 0.1 mi	137	Extreme
Military Flight (high end)	120 @ 600 ft	142	Extreme
Explosives (high end)	145 @ 330 ft	162	Extreme

[/1] "Standardized" values are sound levels converted to 50-foot equivalents (i.e., as though measured at 50 feet distance from source). For comparison purposes.

[/2] Relative Sound Level: a general, subjective ranking of relative noise levels created by the sources considered here,when used for analysis of relative noise effects on species.

[/3] "Low end" indicates the lower value when a range of values is reported for a sound source.

[/4] "High end" indicates the higher value when a range of values is reported for a sound source.

Literature Cited

EPA. 1974. Information on levels of environmental noise requisite to protect public health and welfare with an adequate margin of safety. Prepared by the U.S. Environmental Protection Agency Office of Noise Abatement and Control. EPA/ONAC 550/9-74-004.

Nelson, S.K. and T.E. Hamer. 1995. Nesting biology and behavior of the marbled murrelet. *In*: Ralph, C.J., G.L. Hunt, M.G. Raphael, J.F. Priatt, eds. Ecology and conservation of the marbled murrelet. Gen. Tech. Rep. PSW-512. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. pp. 57-67.

American Society of Mammalogists

Status of American Martens in Coastal Forests of the Pacific States
Author(s): William J. Zielinski, Keith M. Slauson, Carlos R. Carroll, Christopher J. Kent, Donald G. Kudrna
Source: *Journal of Mammalogy*, Vol. 82, No. 2 (May, 2001), pp. 478-490
Published by: American Society of Mammalogists
Stable URL: http://www.jstor.org/stable/1383728
Accessed: 15/07/2009 19:50

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at http://www.jstor.org/page/info/about/policies/terms.jsp. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at http://www.jstor.org/action/showPublisher?publisherCode=asm.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

JSTOR is a not-for-profit organization founded in 1995 to build trusted digital archives for scholarship. We work with the scholarly community to preserve their work and the materials they rely upon, and to build a common research platform that promotes the discovery and use of these resources. For more information about JSTOR, please contact support@jstor.org.



American Society of Mammalogists is collaborating with JSTOR to digitize, preserve and extend access to *Journal of Mammalogy*.

http://www.jstor.org

Journal of Mammalogy, 82(2):478–490, 2001

STATUS OF AMERICAN MARTENS IN COASTAL FORESTS OF THE PACIFIC STATES

WILLIAM J. ZIELINSKI,* KEITH M. SLAUSON, CARLOS R. CARROLL, CHRISTOPHER J. KENT, AND DONALD G. KUDRNA

Redwood Sciences Laboratory, Pacific Southwest Research Station, United States Forest Service, 1700 Bayview Drive, Arcata, CA 95521 (WJZ, KMS)
Conservation Biology Institute, 800 NW Starker Avenue, Suite 31C, Corvallis, OR 97330 (CRC)
Six Rivers National Forest, United States Forest Service, 1330 Bayshore Way, Eureka, CA 95501 (CJK, DGK)
Present Address of CRC: Klamath Center for Conservation Research, P.O. Box 104, Orleans, CA 95556

American martens (*Martes americana*) are associated strongly with mature conifer forests and once occurred throughout the mountains of the coastal Pacific states. We sought to document the distribution of martens in this region using historical records and to understand recent change in their distribution. We described the distribution of martens from 1900 to 1949 using museum and trapping records and compared it to recent (1989–1998) detections at camera and track-plate stations. Martens were detected at only 12 of the 237 (5.1%) survey sample units in coastal California, Oregon, and Washington. Martens are absent from most of the historical range of the Humboldt marten (*M. a. humboldtensis*) in California and also may have declined on the Olympic Peninsula of Washington. Few data exist from northwestern Oregon and southwestern Washington, but the limited amount of protected public land and absence of reported road kills are reasons for concern for populations in this region. Martens still occur in the central and southern coastal mountains of Oregon. Our results suggest that conservation of martens in coastal forests will require new initiatives to protect existing populations and new efforts to document all populations of martens in this region. Conservation measures should include a reevaluation of timber harvest plans that affect habitat in coastal forests, interagency cooperation on a coastal marten conservation assessment, and the collection of new survey information, especially on private lands in southwestern Washington and northwestern Oregon.

Key words: conservation, distribution, marten, *Martes americana*, Pacific states

---

American martens (*Martes americana*) once occurred throughout the coastal forests of northern California, Oregon, Washington, British Columbia, and Alaska (Hall 1981). The species is typically associated with late-seral coniferous forests characterized by closed canopies, large trees, and abundant standing and down woody material (Buskirk and Powell 1994; Thompson and Harestad 1994). Coastal Pacific forests are extremely productive and include some of the most valuable trees in the world. The relatively easy access by ocean to this resource resulted in heavy exploitation of the region early in the period of European settlement (United States Department of Agriculture 1992). Because much of the coastal forest region is in private ownership, the focus on timber production continues. Although the status of American martens was

* *Correspondent: bzielinski@fs.fed.us*

considered during the planning process for restoring late-successional habitat within the range of the northern spotted owl (*Strix occidentalis caurina*) on federal lands (Northwest Forest Plan—United States Department of Agriculture 1993), this was largely a summary of professional opinion and did not include significant review of existing data or collection of new data. However, the marten was judged the 2nd-least likely mammal species to remain well distributed within the range of the northern spotted owl in Washington, Oregon, and California under the preferred alternative (United States Department of Agriculture 1993).

Three subspecies of *M. americana* occur in the coastal or near-coastal regions of the Pacific Northwest. In California, the range of *M. a. humboldtensis* includes the northwestern coast from the Oregon–California boundary south to Sonoma County (Grinnell and Dixon 1926; Grinnell et al. 1937; Fig. 1A). The Humboldt subspecies is replaced at the northern boundary of the range of coast redwoods (*Sequoia sempervirens*) by *M. a. caurina,* which continues along the coast north to British Columbia (Merriam 1890; Miller 1912; Wright 1953; Fig. 1A). *M. a. sierrae* (Grinnell et al. 1937) occurs nearest the coast in the Trinity Mountains in northwestern California and then east to the Cascades and south throughout the Sierra Nevada.

Of the coastal subspecies, *M. a. humboldtensis* has attracted the greatest conservation concern (Kucera et al. 1995; Zielinski and Golightly 1996). Originally, the Humboldt marten occurred from sea level to about 3,000 feet in the "narrow northwest humid coast strip, chiefly within the redwood belt" (Grinnell et al. 1937:209). Grinnell et al. (1937) related accounts of individual trappers taking 35 and 50 martens in 1 winter within a few miles of the coast. Declining harvests led to the closure of the season in extreme northwestern California in 1946. Zielinski and Golightly (1996) could not document a single verified location within the historical range of *M. a. humboldtensis* in the 50 years prior to 1995. The subspecies was assumed to be either very rare or extinct.

Martes a. sierrae, which occurs in the Sierra Nevada of California, and *M. a. caurina,* which occurs in coastal Oregon, Washington, and British Columbia and the Cascades, have apparently never become as uncommon as the Humboldt marten. Although trapping of the Sierran subspecies was prohibited in 1954, it has remained well distributed over most of its historical range (Grinnell et al. 1937; Kucera et al. 1995; Schmepf and White 1977). At the time of European settlement, *M. a. caurina* occurred throughout coastal forests of Oregon and Washington, including locations at sea level (Bailey 1936; Hagmeier 1956). However, previous reviews indicate that martens appear to be absent from the coastal forests of northern Oregon and southern Washington and rare on the Olympic Peninsula (Dalquest 1948; Gibilisco 1994; R. E. Johnson and K. M. Cassidy, in litt.; D. B. Marshall, in litt.; Sheets 1993; Verts and Carraway 1998). Martens are still legally trapped in coastal Oregon and Washington, although the season has been closed intermittently for various periods since the 1930s (L. Cooper, pers. comm.; Martinsen 1971; Rhymon 1969).

Comparing the historical distribution of a species to its current distribution is the 1st step toward determining its status. We conducted an assessment of martens in the coastal mountains of the Pacific states. We summarized the current status of the coastal subspecies and report new survey results. We build on reviews of other western subspecies of martens (Kucera et al. 1995; D. B. Marshall, in litt.; Sheets 1993; Verts and Carraway 1998; Zielinski and Golightly 1996) and consider together the status of *M. a. humboldtensis* and *M. a. caurina* across their ranges in California, Oregon, and Washington.

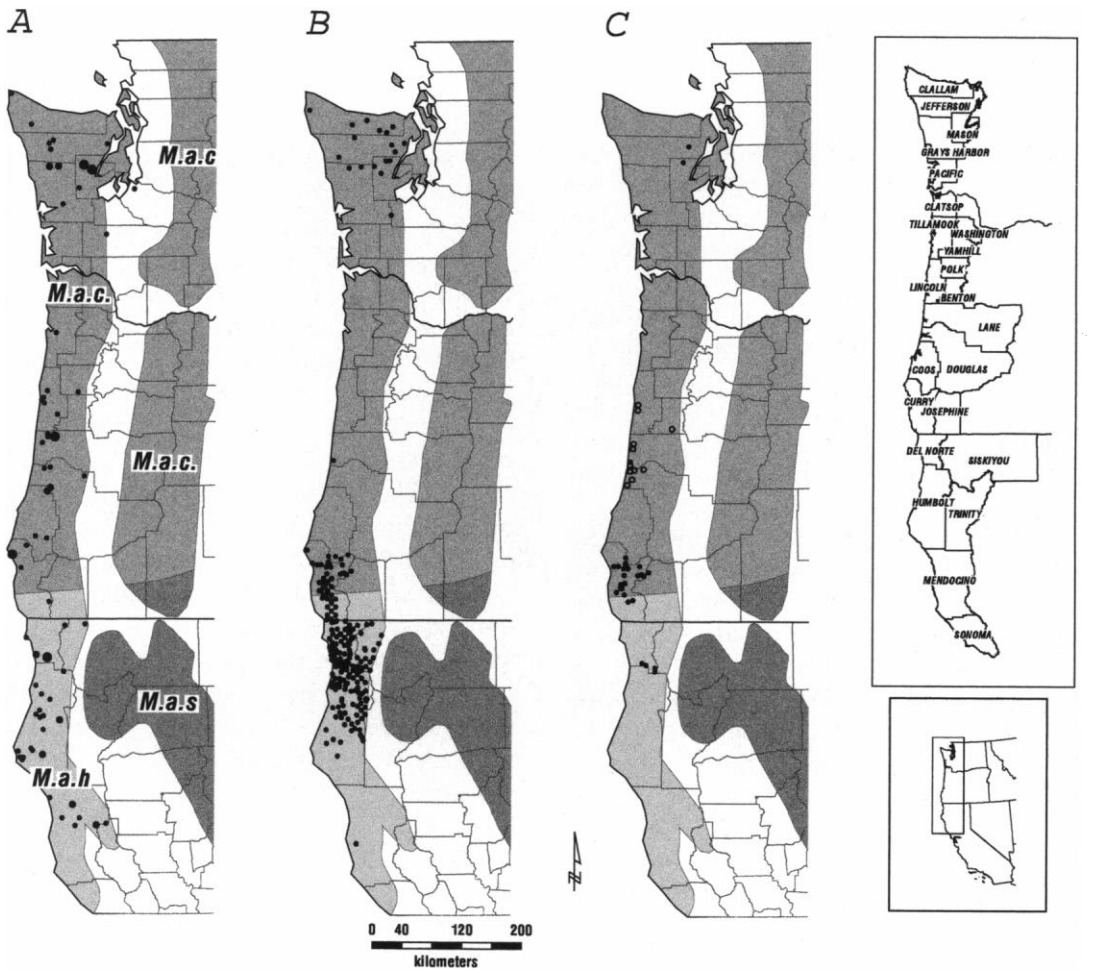


FIG. 1.—A) Historical distribution of *Martes americana humboldtensis* and *M. a. caurina* in California, Oregon, and Washington based on records collected during the early and mid-20th century. Size of circles is proportional to the number of records from the location; smallest = 1 and largest = 5–10. B) Centers of track-plate and camera sample units (see text for definition) from 1989 to 1998. C) Contemporary distribution of martens from track-plate, camera, and snow-tracking surveys (solid circles) and road kills or trapped animals (open circles) from 1989 to 1998. Subspecific boundaries are adapted from the integration of ranges presented in Dalquest (1948), Hagmeier (1956), and Hall (1981).

METHODS

Historical Information

We reviewed all available published and unpublished information on *M. a. humboldtensis* and *M. a. caurina,* which included previous reviews (Bailey 1936; Dalquest 1948; Gibilisco 1994; Grinnell et al. 1937; Kucera et al. 1995; D. B. Marshall, in litt.; Maser et al. 1981; Olterman and Verts 1972; Schempf and White 1977; Sheets 1993; Verts and Carraway 1998; Yocum 1974; Zielinski and Golightly 1996), selected files of sightings records from state and federal resource management agencies, and unpublished field notes of agency biologists and fur trappers. We also interviewed individuals who could provide special perspective on the history and current status of martens, including biologists employed by agencies or timber companies, representatives of Native American

tribes, outdoorsmen, and trappers. Information that could not be verified was not included in our database of geographic locations but provided important background information. Most of the historical data used for this analysis came from requests sent to 23 museums in North America for information about *M. a. humboldtensis* or *M. a. caurina* in their collections.

Contemporary Information

Field surveys.—We summarized 4 types of surveys, conducted from 1989 to 1998, using sooted track plates and remotely operated cameras, which are effective in detecting many forest carnivores, including American martens (Raphael 1994; Zielinski and Kucera 1995). We did not use reported sightings because we doubted the ability of many observers to distinguish martens from other species. Administrative surveys are often recommended as part of biologic evaluations preceding land management activities (e.g., timber harvest). Surveys conducted by research organizations were of 2 types: road based and systematic. In the former, track plates or cameras were placed at regular intervals along roads (K. M. Beyer and R. T. Golightly, in litt.; L. L. C. Jones and M. G. Raphael, in litt.; Sheets 1993). In the latter, track plates or cameras were placed at regular intervals throughout the forest in the Klamath region of California and Oregon (Carroll et al. 1999). Follow-up surveys were established at the locations of highly reliable sightings or at locations where a single track or photograph detection had occurred. All surveys used either chicken, fish, deer, or elk as bait. The only stations that used commercial trapping lure (Mountain Marten® and Skunk-it®, M&M Fur Company, Bridgewater, South Dakota, or Gusto®, Minnesota Trapline Products, Pennock) as an attractant were systematic research surveys in the Klamath region (only at stations that did not receive either a marten or fisher detection by the 4th visit) and the few follow-up surveys near the Klamath sample units in California.

We summarized the data represented by the 4 types of surveys by adopting the use of a standard sample unit. A sample unit is a collection of ≥4 track-plate stations or line-triggered camera stations or ≥2 35-mm camera stations deployed simultaneously. Those methods were viewed as equivalent because the track-plate and line-triggered stations tend to be run for one-half the duration of the 35-mm cameras. Sample units had multiple stations, and the number of stations differed among sample units. However, each sample unit was recorded as detecting presence when a marten was detected at any 1 of the stations. A minimum of 6.4 km was required between the closest stations of each unit. Similarly, if >1 survey occurred in the same general location, they were considered independent only if the intersurvey interval exceeded 1 year.

Administrative surveys used either track plates, line-triggered cameras, or 35-mm camera (usually Trailmaster Model 1500 or 500; Goodson and Assoc., Inc., Lenexa, Kansas) stations (4–50 stations/sample unit) that were distributed at about 0.8-km intervals along forest roads in a project area (Zielinski 1992; Zielinski and Kucera 1995). Those surveys were conducted for a minimum of 8 days, except for the 35-mm cameras, which were run for ≥30 days. All administrative surveys were conducted in California and Oregon in 1989–1995.

The road-based research surveys included surveys exclusively within the redwood region in California (K. M. Beyer and R. T. Golightly, in litt.) and the predominately line-triggered camera surveys in Washington conducted by L. L. C. Jones and M. G. Raphael (in litt.) and Sheets (1993). Surveys in the redwood region were conducted in 1994 and included 48 sample units, each composed of 6 track-plate stations set at 1-km intervals along roads. Each station was checked every other day for 22 days. The road-based research surveys in Washington included 18 sample units and were conducted in 1990–1992; each sample unit was composed of multiple line-triggered camera stations (and a few track plates in 1990) placed about 1.0 km apart along roadsides and checked every other day for ≥8 days (L. L. C. Jones and M. G. Raphael, in litt.).

The systematic research surveys in the Klamath region were conducted during the summers of 1996 and 1997 and included 78 sample units. A sample unit was a circle of 5 track-plate stations, each 0.5 km from a 6th station in the center, which was 7–10 km from the center of adjacent sample units (n = 468 stations). Nineteen of the units (114 stations) were in Oregon and 59 units (354 stations) in California. Track plates were checked every 2 days for 16 days. Follow-up surveys used 35-mm cameras (n = 13 sample units; 26 stations) or track plates (n = 5 sample units; 38 stations) and were near the locations in

California where the Klamath research surveys detected martens. Those surveys used 10.4-km^2 blocks with either 2 35-mm camera stations or 6 track-plate stations checked for a minimum of 28 and 16 days, respectively.

A few snow-tracking surveys were conducted on the Siskiyou National Forest in Oregon. Where these detected *Martes* tracks outside the known geographic range of fishers, they were included as part of the contemporary record. We were unable to obtain information about the effort or locations of snow surveys in which no tracks were discovered.

Habitat information at detection locations.—We collected vegetation information at all the sample units in the Klamath research surveys and for the follow-up surveys in California at those locations where martens were detected. We used the California Wildlife Habitat Relations (CWHR) system (Mayer and Laudenslayer 1988) to describe the cover type near each location as 1 of 5 tree size classes (class 2 = 2.5–15.2 cm dbh [diameter breast height], 3 = 15.3–27.9 cm dbh, 4 = 28.0–61.0 cm dbh, 5 = >61.1 cm dbh, 6 = class 5 + multiple layers) and 1 of 3 canopy closure classes (sparse–open = 10–39%, moderate = 40–59%, dense = 60–100%). Each track plate also was the center of a variable-radius plot where we used prism sampling (Wenger 1984) to estimate basal area of all trees and snags. We recorded the species, dbh (1.4 m), height, and condition class of each tree in the sample and estimated the number of logs and the canopy closure using 2 perpendicular, 25-m transects centered on the track plate. Logs that intersected the transect were tallied into 4 maximum-diameter categories (15–30, 31–60, 61–90, and >90 cm). At the track plate and at the 4 cardinal directions at the 4 transect termini, we measured total canopy closure using a densitometer. We estimated the percentage cover of the dominant tree and shrub species by eye calibration.

RESULTS

Historical Information

Twenty-three museums (100%) responded, and 4 reported a total of 22 specimens of *M. a. humboldtensis,* all dated before 1928. Five reported a total of 90 specimens of *M. a. caurina,* with various dates from 1886 to 1983. The historical summary (Fig. 1A) included records from primary museum specimens (62%) and secondary records (38%). The latter include locations published in early accounts (Bailey 1936; Grinnell et al. 1937; Olterman and Verts 1972) and derived from trapper interviews (e.g., Grinnell et al. 1937; Hemphill 1952; Twining and Hensley 1947). All historical records from Washington were primary records, and two-thirds of the records from Oregon and about one-third of the historical locations for California were primary records.

California.—Few records of Humboldt martens are reported from California in the last 60 years. In 1942, 8 trappers in coastal Humboldt and Del Norte counties caught an average of 2 martens, and Twining and Hensley (1947) concluded that the range in northwestern California had contracted. In the late 1940s, Hemphill (1952) estimated >100 martens on the Mendocino National Forest, although no data were provided. Yocum (1974) reported 7 incidental observations by biologists from 1961 to 1972. Wildlife files of government agencies included 9 observations of Humboldt martens from 1960 to 1975 (Schempf and White 1977). Raphael and Barrett (1981) collected tracks at 135 sooted track-plate stations on the eastern margin of the range of the Humboldt marten, but martens could not be confirmed among them (Raphael 1988). Three tanned skins trapped in the 1940s near Smith River, California (J. Hight, pers. comm.), represented the most recent historical record of martens within the range of *M. a. humboldtensis.* Interviews of biologists, foresters, and trappers in northwestern California did not result in any evidence of verifiable sightings or road kills.

Oregon.—The number of martens harvested in coastal Oregon counties has declined since the 1940s (Fig. 2), most notably in Coos and Curry counties. Caution must be exercised in interpreting trapping data because of annual variation in trapper effort and pelt prices; however, a large increase in the price paid for pelts occurred

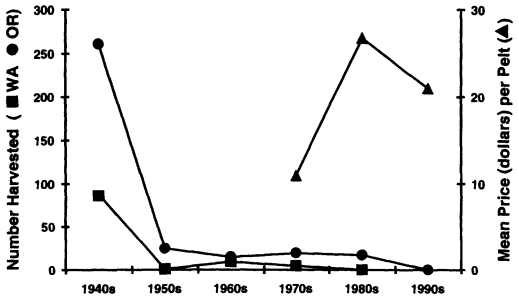


FIG. 2.—Number of martens trapped, by decade, in the predominantly coastal counties of Washington (Clallam, Grays Harbor, Jefferson, Kitsap, Mason, Pacific) and Oregon (Benton, Clatsop, Columbia, Coos, Curry, Josephine, Lincoln, Polk, Tillamook, Washington, Yamhill) and the mean price paid for each pelt.

in the late 1980s with no corresponding increase in harvest for any of the coastal counties (Fig. 2; Verts and Carraway 1998). Sherrell (1970) interviewed trappers in Curry County in the early 1900s and reported several localities where martens were once common but were now rare. By the 1970s martens were considered very rare along the Oregon coast (Mace 1970; Maser et al. 1981). Although historical records are sparse in the northern coastal Oregon counties (Fig. 1A), early trapping records, reported only at the county level, verify occurrence of martens in the northern Oregon counties of Clatsop, Tillamook, Washington, and Yamhill (Anonymous 1914; C. Bruce, pers. comm.; L. Cooper, pers. comm.; D. B. Marshall, in litt.; Verts and Carraway 1998).

Washington.—The historical range of martens in Washington includes all coastal counties (D. B. Marshall, in litt.; Sheets 1993). The harvest of martens in coastal Washington has never been consistent (Fig. 2). Notable was the largest harvest for any decade from the Olympic Mountains in the 1940s, 83 animals from Clallam, Jefferson, and Mason counties. Martens once occurred along the Washington coast to sea level, and Dalquest (1948) suspected that the species still might have occurred in the Willapa Hills in the 1940s. Only a few records exist of martens harvested from the southwestern counties (including martens trapped in the early 1900s in Pacific County; B. Adamire, pers. comm.), and martens are presumed to have been extirpated from this area of Washington (Gibilisco 1994; D. B. Marshall, in litt.; Sheets 1993). In addition to trapping, martens in the Olympic Mountains also were killed by poisons intended for large carnivores (B. Adamire, pers. comm.).

Contemporary Surveys

Survey effort.—Since 1989, a total of 237 sample units, using about 2,360 track-plate or camera stations comprising about 34,800 survey days, were sampled in the coastal mountains of California, Oregon, and Washington (Table 1; Fig. 1B). The density and distribution of surveys were much greater in California than in the other states, but surveys in California favored the northern portion of the historical range of the Humboldt marten over the southern portion (Mendocino and Sonoma counties). Surveys in California included a much larger sample of private land than in Oregon and Washington, where surveys occurred almost exclusively on federal land (Fig. 3). All 35 surveys in Oregon were conducted in either the Siskiyou (34) or Siuslaw (1) National Forests. Surveys in Oregon and Washington were road-based research surveys or administrative surveys (except for a minority of the sample units in Oregon from the Klamath research survey), whereas all 4 types of surveys were conducted in California. We are unaware of any survey that met our minimum requirements for inclusion that was conducted in northwestern Oregon or the southwestern Washington coastal mountains.

Detections.—Martens were detected at 12 of the 237 (5.1%) sample units across all 3 states. Martens were detected at 4 of 184 (2.2%) sample units in California. All 16 detections at these 4 units were clustered in an area <200 km^2 in southern Del Norte

TABLE 1.—Number and type of sample units and stations to survey martens (see Methods) by state, 1985–1998.

	Administrative	Research, road based	Research, systematic	Follow-up	Total
California					
Sample units	69	48	59	8	184
Stations	768	500	354	65	1,687
Oregon					
Sample units	13		19	3	35
Stations	98		114	18	230
Washington					
Sample units		18			18
Stations		443			443
Total					
Sample units	82	66	78	11	237
Stations	866	1,443	468	83	2,360
Survey days	17,196	8,544	7,488	1,560	34,792

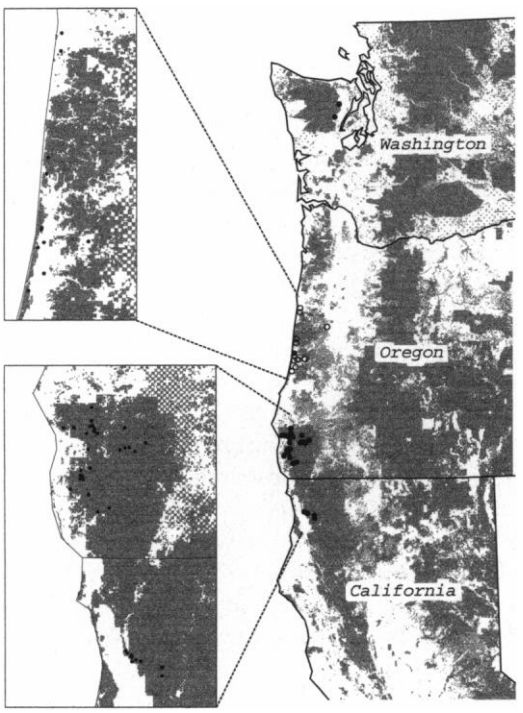


FIG. 3.—Contemporary (1989–1998) detections of martens on federal and state public land (shaded) and private land. Detailed views depict actual locations where martens were detected rather than centers of sample units.

County on the Six Rivers National Forest near the southern end of the Siskiyou Wilderness (Fig. 1C). The 1st (1996) and 2nd (1997) detections occurred during the Klamath systematic research surveys. The remainder were from follow-up surveys in 1998 and 1999 conducted within a 15-km radius of the initial detections. No road kills have been reported in coastal California. The 16 detections near the Siskiyou Wilderness, which probably reflected fewer individuals, represented the only known population of martens in the Coast Range of California.

Surveys in Oregon detected martens at 6 of 35 (17.1%) sample units (Fig. 1C) that excluded detections by snow-track survey. Much of the contemporary location information in central Oregon (1980–1998) was derived from road kills, 9 on the Highway 101 corridor in the Siuslaw National Forest and Oregon Dune National Recreation Area and 1 on a national forest road. Most detections of martens in Oregon were on public lands in the central and southern portions of the Oregon Coast Range (Fig. 1C).

In Washington, martens were detected in only 2 of 18 sample units (11.1%) and only at a single station within each unit. All but 1 sample unit were in the Olympic National

TABLE 2.—Distribution detection locations of martens among the California Wildlife Habitat Relationships (CWHR) system cover types, tree size classes, and canopy closure classes (percentages of detections in parentheses); all assessments are visual estimates.

Cover type		Tree size class[a]		Canopy closure class[b]	
Class	No. marten detections	Class	No. marten detections	Class	No. marten detections
Douglas fir	9 (33.3)	Class 2	4 (14.8)	Sparse–open	2 (7.4)
Mixed hardwood and conifer	7 (25.9)	Class 3	7 (25.9)	Moderate	4 (14.8)
Lodgepole pine	4 (14.8)	Class 4	7 (25.9)	Dense	21 (77.8)
Montane chaparral	1 (3.7)	Class 5	8 (29.6)		
Jeffrey pine	1 (3.7)	Class 6	1 (3.7)		
Montane hardwood	1 (3.7)				
Klamath mixed conifer	1 (3.7)				
Unknown	3 (11.1)				

[a] Class 2 = 2.5–15.2 cm dbh (diameter breast height); class 3 = 15.3–27.9 cm dbh; class 4 = 28.0–61.0 cm dbh; class 5 = >61.1 cm dbh; class 6 = class 5 + multiple layers.

[b] Sparse–open = 0–39%; moderate = 40–59%; dense = 60–100%.

Park or Olympic National Forest. No surveys occurred in the central or southern portions of the coastal mountains. No road kills have been reported for coastal areas in Washington. The few summary data from Washington suggest that martens still occur on the eastern Olympic Peninsula.

The contrast between historical and contemporary distributions of martens is especially clear in California, where surveys have been numerous but detections few. Data are too few elsewhere to make similar statements, but absence of detections of martens in the western Olympic Peninsula suggests that their range in northwestern Washington also may have contracted. Martens currently occupy west-central and extreme southwestern Oregon. Unfortunately, the northern Oregon and southern Washington coastal mountains were not well represented in either historical records or the recent survey effort, making it difficult to assess the status of martens there.

Habitat at detection locations.—The stations in California and southern Oregon where martens were detected (n = 27) were represented by 7 different CWHR cover types (Table 2). Douglas fir (*Pseudotsuga menziesii*) was the most common type, but detections also occurred in a montane hardwood and a montane chaparral type. The detection locations were distributed evenly across 3 of 5 tree size classes but were most often in the dense (60–100%) overhead canopy closure class (Table 3). One of the most distinguishing characteristics of the detection locations was the density of shrubs, such as salal (*Gaultheria shallon*), Pacific rhododendron (*Rhododendron macrophyllum*), and huckleberry oak (*Quercus vaccinifolia*). Mean shrub cover was 70.5% ± 16.5 *SD*, with a paucity of logs >15 cm diameter ($\bar{X}$ = 1.7/site) and large logs >90 cm (0.03/site) and a wide range (0–97.8%; $\bar{X}$ = 69.6%) of average canopy closure readings (Table 3). Nine of 29 detections occurred on serpentine soils on ridges where the basal area of trees was very low (minimum = 9.24 m^2/ha) but where shrub density was high. The southernmost locations, on the Six Rivers National Forest, tended to have the higher values for total basal area and overstory canopy closure.

DISCUSSION

Martens are considered the most abundant of the 4 forest carnivores, which include the fisher (*Martes pennanti*), wolverine (*Gulo gulo*), and lynx (*Lynx canadensis*). Although their continental range may have declined (Gibilisco 1994), populations of martens have not suffered the magnitude

TABLE 3.—Vegetation and topographic characteristics at locations in California and Oregon where martens were detected (n = 29 except for shrub and herb cover, for which n = 12).

Character	Range	$\bar{X}$	*SD*	95% *CI*
Basal area (BA)	9.24–78.54	40.94	19.47	33.54–48.35
BA, conifer	0–69.30	30.75	19.84	23.20–38.29
BA, hardwood	0–69.30	10.20	17.13	3.68–16.71
Mean diameter breast height (dbh)	7.80–119.50	39.82	26.28	29.82–49.81
Quadratic mean dbh	8.30–122.00	43.38	27.64	32.87–53.90
Mean height	4.00–44.90	19.79	11.76	15.32–24.26
Mean dbh, conifer	0–119.50	42.39	30.18	30.91–53.87
Mean dbh, hardwood	0–48.00	13.21	15.93	7.15–19.26
Mean, canopy closure (%)	0–97.80	69.64	29.72	58.34–80.94
Percent shrub cover (%)	28.60–90.60	70.52	16.53	60.02–81.03
Mean herb cover (%)	0–51.00	13.83	20.56	0.77–26.90
Number of logs	0–10.00	1.69	2.24	0.84–2.54
Number of large logs	0–1.00	0.03	0.19	0–0.11
Slope (%)	0–65.00	30.38	18.34	23.40–37.35

of decrease in the 20th century that has characterized the other species (Ruggiero et al. 1994). Martens are still legally trapped for their fur in most of the western states. Although individuals are affected by habitat loss, habitat fragmentation, and direct mortality via trapping (Bissonette et al. 1997; Hargis et al. 1999), most of the 14 subspecies appear to be well distributed within their geographic ranges. Exceptions include *M. a. atrata* on Newfoundland (Burnett et al. 1989), *M. a. americana* in portions of eastern Canada (Thompson 1991), and, based on our data, *M. a. humboldtensis*. Our survey results should be cause for concern about the persistence of *M. a. humboldtensis*. Data do not support a similar level of concern for *M. a. caurina* on the Olympic Peninsula, but our results support the conclusions of others (D. B. Marshall, in litt.; Sheets 1993) that martens have declined there. Our documentation of the loss of martens from significant portions of their historical range in the coastal forests contrasts with their status in the interior forests of the Cascades, Sierra Nevada, and Rocky Mountains (Gibilisco 1994; Kucera et al. 1995).

We did not uncover sufficient historical or contemporary data to allow us to evaluate the status of martens in the coastal mountain ranges of central and northern Oregon and southern Washington. The routes taken by early (1800s) museum expeditions bypassed most of this region (Verts and Carraway 1998), and we found few museum records from this era. However, martens are included in the earliest records of commercial fur harvest in the central and northern coastal counties of Oregon (Anonymous 1914; C. Bruce, pers. comm.; L. Cooper, pers. comm.). Because much of the unsurveyed area between central Oregon and southern Washington is privately owned commercial forest or managed state forest (Fig. 3) on which very little mature or old-growth forest remains, we are not optimistic about the abundance of martens there. Martens are sensitive to forest fragmentation in both the Rocky Mountains (Bissonette et al. 1997; Hargis et al. 1999) and the northeastern United States (Bissonette et al. 1997; Chapin et al. 1998) and may respond similarly to fragmentation of mature forest habitat in coastal Oregon and Washington.

The absence of reported road kills along coastal Highway 101 in northern Oregon and southern Washington, in contrast to the dozen or so on the same highway in central

Oregon, also suggests low numbers of martens. Because this highway runs the entire length of the range of coastal martens in the Pacific states, densities of road kills should reflect the abundance of martens. Although not all evidence is as convincing as the results of detection surveys, the data suggest that of the 3 states, martens are most common in coastal Oregon.

In early 1996, the prognosis for the discovery and recovery of populations of martens in coastal California was bleak. The existence of martens within the historical range of the Humboldt subspecies was in doubt (Zielinski and Golightly 1996). Then, in 1996 and 1997, the detection of martens at 2 locations within the historical range of the Humboldt subspecies represented the 1st verified presence of martens in this region in 50 years. However, their location alone is insufficient evidence to conclude that they are members of *M. a. humboldtensis*. None of the animals we detected have been captured and examined, nor have we collected hair or other tissue for analysis. Furthermore, all detections occurred <100 km from the western boundary of *M. a. sierrae* (Grinnell et al. 1937). Also, none of the recent detections in California occurred in redwoods, the forest type with which the Humboldt marten was originally associated (Grinnell and Dixon 1926; Grinnell et al. 1937).

The ambiguity of the original subspecific boundaries and absence of genetic data make it difficult to assign the martens we detected in California to subspecies. Yet, from a conservation perspective, the subspecific affinity of the individual animals is academic; our results document the 1st martens detected within the California Coast Range since the trapping season was closed in 1946. It appears that a population of martens exists within the California coastal mountains, and with sufficient potential for growth to warrant conservation measures. Martens appear to occupy a region of about 150–200 km^2.

The demise of the Humboldt marten was first attributed to overtrapping (Twining and Hensley 1947). However, it has been >50 years since martens have been protected from trapping in northwestern California. We believe that the effect of timber harvest in the redwood region is the most plausible reason for the continued absence of martens from most of the coastal range. The north coast was 1 of the 1st regions subjected to commercial harvest in California. Less than 5% of the original forest cover in the redwood region remains unharvested (Fox 1996). Because martens typically are associated with old forests with a diversity of large structural features (Buskirk and Powell 1994), it is likely that the intensity of timber harvest, especially on private land, has reduced the habitat value over much of the region and may affect immigration of martens to California from populations on public forest land in southwestern Oregon.

Tree basal area and canopy closure at detection locations varied considerably, but martens were almost always detected in dense shrub layer. In this respect, the habitat at marten detection locations resembles that described for the sable (*M. zibellina*) in China (Buskirk et al. 1996). Martens were detected at some locations with very few mature trees, where our previous understanding of the ecology of martens would have suggested that we would be unlikely to detect them. Many of those locations were on ridgetops where serpentine parent material limited density of trees but not shrubs. Detections were distributed quite evenly among size classes of CWHR trees, indicating that size class alone is not sufficient to predict presence of martens. In fact, the average basal area reported here (40.9 m^2/ha) is lower than that reported at track-plate detection locations in the northern (Spencer 1981) and southern (W. J. Zielinski, in litt.) Sierra Nevada in California. However, most detection locations were in the CWHR dense class, consistent with the general description of the habitat of martens (Buskirk and Powell 1994). Canopy closure readings measured directly with a densi-

tometer also support the CWHR visual density estimates.

Our study draws attention to potential problems associated with managing a species associated with mature forest conditions in the coastal regions of the Pacific states. All martens detected were on or near public lands (Fig. 3). Detections are clumped in 4 locations, separated by significant distances. Although surveys on private lands in Oregon and Washington have not been conducted, based on the negative results of surveys on private lands in California, we suspect that martens are faring worse on private than public lands. Federal lands in the coastal mountains of the Pacific states are few and fragmented compared with the nearly continuous distribution of national forest and national park land in the Cascades and the Sierra Nevada (Fig. 3).

Our summary of historical information and results of recent detection surveys have emphasized *M. a. humboldtensis,* largely because of the concern about its continued existence (Zielinski and Golightly 1996). More historical and contemporary data exist on the distribution of *M. a. humboldtensis* in California than *M. a. caurina* in Oregon and Washington. However, conservation efforts should focus on all martens in coastal forests throughout the Pacific Northwest. Coastal forest habitats are poorly connected compared with inland habitats (e.g., Cascades, Sierra Nevada) that constitute most of the range of the species in the Pacific states. Our surveys have demonstrated a serious conservation problem that appears to affect populations and subspecies and that requires prompt attention if martens are to persist in forest communities of the Pacific coast.

Acknowledgments

Many people helped collect the field data we synthesized, especially the employees of the United States Forest Service in Oregon and California. In particular we acknowledge the field assistance of T. Kirk, J. Lowe, D. Barrett, R. Brening, J. Shamansky, S. Paghlulgi, and A. Hill. C. Ogan, B. Devlin, T. Hacking, D. Austin, K. Schmidt, and S. Sniado, all of the Forest Service, provided essential administrative support and coordination for surveys. We thank D. Macfarlane of the Pacific Southwest Region of the United States Forest Service and A. Brickey of the United States Fish and Wildlife Service for providing funding. The Pacific Southwest Research Station of the Forest Service also provided financial support. We are indebted to L. Cooper and C. Bruce of the Oregon Department of Fish and Wildlife and J. Lewis of the Washington Department of Fish and Wildlife for providing information regarding the history of marten distribution. R. Truex assisted with analyses and review, and A. Wright created the maps. K. Aubry provided information about martens in Oregon and Washington and reviewed the manuscript. M. Raphael and S. Buskirk also provided helpful editorial comments, and A. Albert provided editorial assistance.

Literature Cited

Anonymous. 1914. Report of fur-bearing animals. The Oregon Sportsman 2:20.

Bailey, V. 1936. The mammals and life zones of Oregon. North America Fauna 55:281–285.

Bissonette, J. A., D. J. Harrison, C. D. Hargis, and T. G. Chapin. 1997. The influence of spatial scale and scale-sensitive properties on habitat selection by American marten. Pp. 368–385 in Wildlife and landscape ecology (J. A. Bissonette, ed.). Springer-Verlag, New York.

Burnett, J. A., C. T. Dauphine, S. H. McCrindle, and T. Mosquin. 1989. On the brink: endangered species in Canada. Western Producer Prairie Books, Saskatoon, Saskatchewan, Canada.

Buskirk, S. W., Y. Ma, L. Xu, and Z. Jiang. 1996. Diets of, and prey selection by sables (*Martes zibellina*) in northern China. Journal of Mammalogy 77:725–730.

Buskirk, S. W., and R. A. Powell. 1994. Habitat ecology of fishers and American martens. Pp. 283–296 in Martens, sables, and fishers (S. W. Buskirk, A. Harestad, M. Raphael, and R. A. Powell, eds.). Comstock Publishing Associates, Cornell University Press, Ithaca, New York.

Carroll, C., W. J. Zielinski, and R. F. Noss. 1999. Using presence-absence data to build and test spatial habitat models for the fisher in the Klamath Region, U.S.A. Conservation Biology 13:1344–1359.

Chapin, T. G., D. J. Harrison, and D. D. Katnik. 1998. Influence of landscape pattern on habitat use by American marten in an industrial forest. Conservation Biology 12:1327–1337.

Dalquest, W. W. 1948. Mammals of Washington. University of Kansas Publications, Museum of Natural History 2:1–444.

Fox, L., III. 1996. Current status and distribution of coast redwood. Pp. 18–20 in Proceedings of the

Conference on Coast Redwood Forest Ecology and Management, June 18–20 (J. LeBlanc, ed.). Humboldt State University, Arcata, California.

GIBILISCO, C. J. 1994. Distributional dynamics of modern Martes in North America. Pp. 59–71 in Martens, sables, and fishers (S. W. Buskirk, A. Harestad, M. Raphael, and R. A. Powell, eds.). Comstock Publishing Associates, Cornell University Press, Ithaca, New York.

GRINNELL, J., AND J. DIXON. 1926. Two new races of the pine marten from the Pacific Coast of North America. Zoology 21:411–417.

GRINNELL, J., J. S. DIXON, AND J. M. LINSDALE. 1937. Fur-bearing mammals of California. Vol. 1. University of California Press, Berkeley.

HAGMEIER, E. M. 1956. Distribution of marten and fisher in North America. The Canadian Field-Naturalist 70:148–168.

HALL, E. R. 1981. The mammals of North America. 2nd ed. John Wiley & Sons, New York 2:981–985.

HARGIS, C. D., J. A. BISSONETTE, AND D. L. TURNER. 1999. The influence of forest fragmentation and landscape pattern on American martens. The Journal of Applied Ecology 36:157–172.

HEMPHILL, D. V. 1952. The vertebrate fauna of the boreal areas of the southern Yolla Bolly mountains, California. Ph.D. dissertation, Oregon State College, Corvallis.

KUCERA, T. E., W. J. ZIELINSKI, AND R. BARRETT. 1995. The current distribution of American martens (*Martes americana*) in California. California Fish and Game 81:96–103.

MACE, R. U. 1970. Oregon's furbearing animals. Oregon State Game Commission, Wildlife Bulletin 6:1–82.

MARTINSEN, C. F. 1971. History and management of Washington's furbearers. Washington Wildlife 23: 10–17.

MASER, C., B. R. MATE, J. F. FRANKLIN, AND C. T. DARNES. 1981. Natural history of Oregon coast mammals. United States Department of Agriculture, Forest Service, Pacific Northwest Research Station, General Technical Report PNW-133:288–299.

MAYER, K. E., AND W. F. LAUDENSLAYER. 1988. A guide to wildlife habitats of California. California Department of Forestry and Fire Protection, Sacramento.

MERRIAM, C. H. 1890. Descriptions of twenty-six new species of North American mammals. North America Fauna 4:1–56.

MILLER, G. S. 1912. List of North American land mammals in the United States National Museum, 1911. Bulletin of the United States National Museum 79:1–455.

OLTERMAN, J. H., AND B. J. VERTS. 1972. Endangered plants and animals of Oregon IV: mammals. Agricultural Experiment Station, Oregon State University, Corvallis, Special Report 364:1–47.

RAPHAEL, M. G. 1988. Long-term trends in abundance of amphibians, reptiles, and mammals in Douglas-fir forests of northwestern California. Pp. 23–31 in Management of amphibians, reptiles, and small mammals in North America. United States Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-166.

RAPHAEL, M. G. 1994. Techniques for monitoring populations of fishers and American martens. Pp. 224–240 in Martens, sables, and fishers: biology and conservation (S. W. Buskirk, A, Harestad, M. Raphael, and R. A. Powell, eds.). Comstock Publishing Associates, Cornell University Press, Ithaca, New York.

RAPHAEL, M. G., AND R. H. BARRETT. 1981. Methodologies for a comprehensive wildlife survey and habitat analysis on old-growth Douglas-fir forests. Pp. 106–121 in Cal-Neva Wildlife Transactions, The Western Section of The Wildlife Society, Sacramento, California.

RHYMON, L. M. 1969. A critical analysis of wildlife conservation in Oregon. M.S. thesis, Oregon State University, Corvallis.

RUGGIERO, L. F., W. J. ZIELINSKI, K. B. AUBRY, S. W. BUSKIRK, AND L. J. LYON. 1994. A conservation assessment framework for forest carnivores. Pp. 1–6 in American marten, fisher, lynx, and wolverine in the western United States (L. F. Ruggiero, K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski, eds.). United States Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-254:1–184.

SCHMEPF, P. F., AND M. WHITE. 1977. Status of six furbearer populations in the mountains of northern California. United States Department of Agriculture, Forest Service, Pacific Southwest Region, San Francisco, California.

SHEETS, T. J. 1993. Washington state pine marten distribution. Washington Department of Wildlife, Olympia.

SHERRELL, P. E. 1970. An annotated checklist of the land mammals of Curry County, Oregon. M.S. thesis, Central Washington State College, Ellensburg.

SPENCER, W. D. 1981. Pine marten habitat preferences at Sagehen Creek, California. M.S. thesis, University of California, Berkeley.

THOMPSON, I. D. 1991. Will marten become the spotted owl of the east? Forestry Chronicle 67:136–140.

THOMPSON, I. D., AND A. S. HARESTAD. 1994. Effects of logging on American martens with models for habitat management. Pp. 355–367 in Martens, sables, and fishers: biology and conservation (S. W. Buskirk, A. Harestad, M. Raphael, and R. A. Powell, eds.). Comstock Publishing Associates, Cornell University Press, Ithaca, New York.

TWINING, H., AND A. HENSLEY. 1947. The status of pine martens in California. California Fish and Game 33: 133–137.

UNITED STATES DEPARTMENT OF AGRICULTURE, FOREST SERVICE. 1992. Final Environmental Impact Statement (FEIS) on management for the northern spotted owl in the national forests. States of Washington, Oregon, and California. Portland, Oregon.

UNITED STATES DEPARTMENT OF AGRICULTURE, FOREST SERVICE. 1993. Forest ecosystem management: an ecological, economic and social assessment report of the Forest Ecosystem Management Assessment Team (FEMAT). United States Government Printing Office, 1993-793-071.

VERTS, B. J., AND L. N. CARRAWAY. 1998. Land mammals of Oregon. University of California Press, Berkeley.

WENGER, K. F. 1984. Forestry handbook. 2nd ed. John Wiley & Sons, New York.

WRIGHT, P. L. 1953. Intergradation between *Martes americana* and *Martes caurina* in western Montana. Journal of Mammalogy 34:74–86.

YOCUM, C. F. 1974. Status of marten in northern California, Oregon and Washington. California Fish and Game 60:54–57.

ZIELINSKI, W. J. 1992. A survey protocol to monitor forest carnivores in proposed management activity areas. United States Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, California.

ZIELINSKI, W. J., AND R. T. GOLIGHTLY. 1996. The status of marten in redwoods: is the Humboldt marten extinct? Pp. 115–119 in Conference on Coast Redwood Forest Ecology and Management (J. LeBlanc, ed.). Humboldt State University, Arcata, California.

ZIELINSKI, W. J., AND T. E. KUCERA. 1995. American marten, fisher, lynx, and wolverine: survey methods for their detection. United States Department of Agriculture, Forest Service, Pacific Southwest Research Station, General Technical Report PSW-GTR-157: 1–163.

Submitted 17 December 1999. Accepted 10 August 2000.

Associate Editor was Ronald E. Barry.