Seward Highway MP 75-90

Road and Bridge Rehabilitation Project

Final

Wetlands Functional Assessment

Project Number : BR-BH-NH-OA3-1(35)/58105/41858

May 23, 2008

Alaska Department of Transportation and Public Facilities

Seward Highway
Milepost 75-90
Road & Bridge Rehabilitation

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Seward Highway, MP 75-90, Ingram Creek to Girdwood

BR-BH-NH-OA3 1(35) / 58105

Wetland Functional Assessment

May 2008

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1.0 Introduction and Purpose

The purpose of this report is to describe the primary hydrologic and ecological functions of wetlands along a 15-mile section of the Seward Highway. The proposed project area begins at milepost (MP) 75 (near Ingram Creek) and continues north for 15 miles, paralleling the shoreline of Turnagain Arm to the intersection of the Seward and Alyeska Highways near Girdwood at MP 90 (Figure 1). Wetland mapping, descriptions of wetland types, and field data are included in the Seward Highway MP 75-90 Preliminary Jurisdictional Determination (PJD) (HDR 2008a).

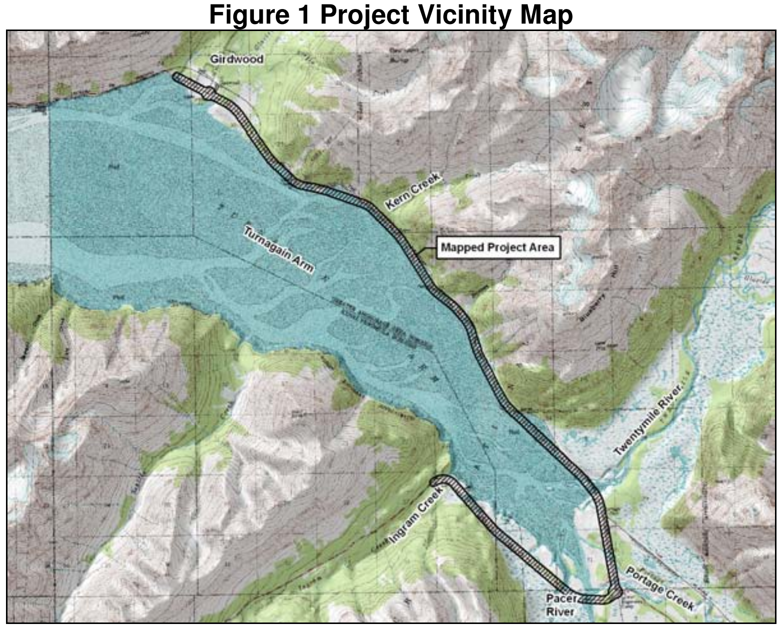
The Alaska Department of Transportation and Public Facilities, in cooperation with the Federal Highway Administration, seeks to make improvements along this 15-mile segment as part of the Seward Highway MP 75-90 Project. The MP 75-90 segment is one of the few remaining segments in a series of planned improvements along the length of the Seward Highway between Potter Marsh in south Anchorage and Turnagain Pass (MP 68.5). The project purpose is to extend the service life of the highway and improve safety.

This report is intended to support the PJD by providing information regarding physical and ecological processes that occur in the project area wetland types. Wetland functions are defined as the chemical, physical, and biological processes or attributes that contribute to the self-maintenance of a wetland and relate to the ecological significance of wetland properties without regard to subjective human values (American Society for Testing and Materials 1999). Not all wetlands perform all functions, nor do they perform all functions to the same extent. For example, a wetland's geographic location may determine its habitat functions, and the location of a wetland within a watershed may determine its hydrologic or water quality functions. The principal factors that determine how a wetland performs these functions are climatic conditions, quantity and quality of water entering and leaving the wetland, and disturbances or alteration within the wetland or the surrounding ecosystem (Novitzki et al. 1997).

1.1 Project Environment

The proposed project is located within the Municipality of Anchorage, approximately 35 miles southeast of the Anchorage Bowl. The highway is heavily used by automobile, truck, bus, recreational vehicle, and trailer traffic, and is the only road connection between the Kenai Peninsula and the rest of the state. The Seward Highway also provides the sole surface connection from Anchorage to Girdwood and Whittier.

Figure 1 Project Vicinity Map



The region is bounded by the Chugach Mountains to the north, Prince William Sound to the east, Turnagain Arm to the west, and the Kenai Mountains to the south. The physical landscape consists of high relief coastal and mountainous terrain rising from sea level to nearly 4,000 feet elevation. Glaciers have carved wide, flat valleys in the area, and large glaciers still exist in the upper portions of those watersheds (U.S. Forest Service (USFS) 2004). The mapped area includes portions of several large drainage basins including the Glacier Creek, Twentymile River, Portage Creek, and Placer River watersheds.

Wetlands were mapped for an area extending 250 feet from either side (500 feet total corridor width) of the existing highway centerline (Figure 1). The mapped area encompasses approximately 973 acres. Most of the mapped wetlands are situated along coastline of Turnagain Arm. Coastal wetlands are among the world's most dynamic habitats, serving as productive transition areas between terrestrial and aquatic environments which maintain water quality and provide rearing habitat for many fish and wildlife species (Ritchie et al. 1981, Carstensen 2004). A breakdown of mapped wetlands, other "waters of the U.S.", and uplands from the PJD (HDR 2008a) is included in Table 1.

Many of the coastal environments located along project corridor were significantly altered by the 1964 earthquake which caused 6 to 7 feet of subsidence at the head of Turnagain Arm, resulting in tidal inundation of the Twenty-Mile, Portage, and Placer Valleys. In addition, the construction of the Seward Highway and the Alaska Railroad has impeded water from freely flowing into Turnagain Arm from these valleys, resulting in increased wetland abundance upstream of the highway and railroad (USFS 2004).

Table 1 Wetland, Waterbody, and Upland Area Summary

NWI Code	Description of Type	Area (acres)
PEM1B	Palustrine/Emergent/Persistent/Saturated	6.7
PEM1C	Palustrine/Emergent/Persistent/Seasonally Flooded	14.3
PEM1F	Palustrine/Emergent/Persistent/Semi-permanently Flooded	22.6
PEM1R	Palustrine/Emergent/Persistent/Seasonally Flooded –Tidal	1.2
E2EM1M	Estuarine/Intertidal/Emergent/Persistent/Irregularly Exposed	7.5
E2EM1N	Estuarine/Intertidal/Emergent/Persistent/Regularly Exposed	9.9
E2EM1P	Estuarine/Intertidal/Emergent/Persistent/Irregularly Flooded	105.0
	Total Emergent Wetlands	*167.2*
PSS1B	Palustrine/Scrub-Shrub/Broad-Leaved Deciduous/Saturated	11.3
PSS1C	Palustrine/Scrub-Shrub/Broad-Leaved Deciduous/Seasonally Flooded	7.1
PSS1/EM1B	Palustrine/Scrub-Shrub/Broad-Leaved Deciduous/Emergent/Persistent/Saturated	0.4
PSS1/EM1C	Palustrine/Scrub-Shrub/Broad-Leaved Deciduous/Emergent/Persistent/Seasonally Flooded	13.4
PSS1/EM1F	Palustrine/Scrub-Shrub/Broad-Leaved Deciduous/Emergent/Persistent/Semi-permanently Flooded	1.0
E2SS1/EM1P	Estuarine/Intertidal/Scrub-Shrub/Broad-Leaved Deciduous/Emergent/Persistent/Irregularly Flooded	49.1
E2SS1P	Estuarine/Intertidal/ Scrub-Shrub/Broad-Leaved Deciduous/Irregularly Flooded	52.3
	Total Scrub-Shrub Wetlands	*134.6*
E2FO5/EM1P	Estuarine/Intertidal/Forested/Dead/Emergent/Persistent/Irregularly Flooded	2.3
	Total Forested Wetlands	*2.3*
PABH	Palustrine/Aquatic Bed/Permanently Flooded	4.0
PUBH	Palustrine/Unconsolidated Bottom/Permanently Flooded	11.6
PUBJ	Palustrine/Unconsolidated Bottom/Intermittently Flooded	0.5
L1UBH	Lacustrine/Limnetic/Unconsolidated Bottom/Permanently Flooded	18.2
L2ABH	Lacustrine/Littoral/Aquatic Bed/Permanently Flooded	24.6
E2ABM	Estuarine/Intertidal/Aquatic Bed/Irregularly Exposed	6.9

NWI Code	Description of Type	Area (acres)
	Total Aquatic Beds, Ponds, and Lakes	*65.8*
R1UBV	Riverine/Tidal/Unconsolidated Bottom/Permanently Flooded -Tidal	0.1
R2UBH	Riverine/Lower Perennial/Unconsolidated Bottom/Permanently Flooded	0.2
	Total Streams	*0.3*
E1UBL	Estuarine/Subtidal/Unconsolidated Bottom/Subtidal	44.2
E2US1N	Estuarine/Intertidal/Unconsolidated Shore/Cobble-Gravel/Regularly Exposed	8.9
E2US1P	Estuarine/Intertidal/Unconsolidated Shore/Cobble-Gravel/ Irregularly Flooded	30.4
E2US3N	Estuarine/Intertidal/Unconsolidated Shore/Mud/Regularly Exposed	141.6
	Total Estuarine Shorelines and Waters	*225.1*
	Total Regulated Waters	**595.3**
	Total Upland	377.7

2.0 Methods

The purpose of this document is to describe wetland functions that the proposed project area wetlands may perform. Several existing methods were reviewed to extract useful concepts that could help identify functions pertinent to the project area's wetlands and describe field and GIS-based indicators of each. Coinciding with this assessment, other project-related studies have evaluated fish and wildlife habitat (HDR 2007 and 2008b, Pentec 2006), documented hydrology characteristics (HDR 2008c), and have engaged in agency and public scoping related to project area resources. Through the development of this wetland function assessment document, wetland scientists have been actively assembling and reviewing available reference material for the Upper Turnagain Arm region. This effort is limited to reference material that is judged appropriate to developing an understanding of area wetlands, their landform position, and any information that can be related to an area's potential to perform wetland functions.

Initially, a PJD was prepared for the project based on the summer 2006 HDR field investigation (HDR 2008a). The purpose of the PJD was to describe the wetland identification process and delineate and describe the extent and types of wetlands and other jurisdictional waters found within the project corridor. The focus of the PJD was on delineation of wetlands. Project design, alternatives, wetland functions, and impacts were not discussed in the PJD. Wetlands were delineated using the 1987 wetland delineation manual's three-parameter method of determining an area's wetland status and methods described in the Alaska Interim Regional Supplement to the 1987 Wetland Delineation Manual (USACOE 1987, USACOE 2006). Standard U.S. Army Corps of Engineers (USACOE) data sheets were completed at 42 sites and were included in the PJD. Mapped wetlands were attributed with National Wetland Inventory (NWI) mapping codes based on the U.S. Fish and Wildlife Service Classification of Wetlands and Waterbodies (Cowardin et al. 1979).

Wetland scientists then identified physical features that contribute to or prevent certain functions from occurring. Examples of such indicators include the wetland's location relative to streams, the wetland's vegetation type, the amount of open water present, and the wetland's topographic position and location in the watershed. For each wetland type, scientists then subjectively considered these indicators and observations in specific wetlands to define what functions the proposed project area wetlands may perform. Wetland data sheets, site photographs, GIS data layers, and other resource study reports for the project were used to identify indicators of wetland function. The following eight functions were evaluated:

- Groundwater Recharge
- Groundwater Discharge
- Stream Flow Moderation
- Shoreline, Stream Bank and Soil Stabilization
- Water Quality Improvement
- Nutrient Cycling and Export
- Wildlife Habitat
- Fish Habitat

3.0 Summary of Wetland Functions

Vegetation type, hydrological input and output, wildlife information, and topographic setting were used to identify wetland functions of mapped wetlands. Project area wetlands may have some of the following functions.

3.1 Hydrologic and Water Quality Functions

Groundwater Interchange. Wetlands are often located near groundwater recharge or discharge areas (Adamus Resource Assessment 1987). Groundwater recharge is the infiltration of groundwater from a wetland into the underlying aquifer. Groundwater discharge is the net upward vertical movement of water from an aquifer to the surface (Mitsch and Gosselink 1993). In general, seasonally flooded wetlands, wetlands with vegetation tolerant of low nutrient status, wetlands with permeable soils, wetlands higher in a watershed, and wetlands with inlets but no outlets are more likely to recharge aquifers. Wetlands typically recharge less to groundwater and base flows than do most undeveloped upland areas (National Wetland Technical Council (NWTC) 1978). Wetlands near toes of slopes that are perennially wet, with vegetation known to thrive in nutrient-rich areas, and with an outlet but no inlet are often ground water discharge sites, as are sites where springs and seeps are observed directly.

Photo 1. Surface water impounded by the highway may have the capacity to recharge groundwater.

Photo 2. At low tides, temporarily stored groundwater is slowly discharged as soils aerate.

All project area wetlands are located within the lowest limits of their respective watersheds. This proximity to Turnagain Arm may ultimately reduce both the capacity at which wetlands recharge groundwater and the importance of doing so. Even so, impounded waters, often those located along the upslope side of the Seward Highway or Alaska Railroad may have the ability to contribute to shallow aquifers (Photo 1). A total of 23 of the 61 mapped wetland complexes were identified as potential groundwater recharge areas (Table 2).

Coastal wetlands are typically discharge rather than recharge areas. As the tides rise, water is temporarily stored in the upper intertidal zones; as the tides fall, the upper layers of soil are aerated, and water moves back into the marine system

(Photo 2) (NWTC 1978). These temporary, tidal induced discharge events likely occur across many of the project area wetlands located on the Turnagain Arm side of the Seward Highway. Simultaneously, many of these same wetlands may also discharge freshwater through seeps and springs directly into Turnagain Arm. Twenty-seven of the 61 mapped wetland complexes were identified as likely discharge areas (Table 2).

Stream Flow Moderation. By holding water within its soils or on its surface, a wetland may delay the release of water downslope and downstream during and after rain storms. This delayed release may reduce the magnitude of peak stream flows and associated flood stages and reduce bank erosion and channel bed scour. Slow release of water from wetlands may sustain stream flows during dry seasons and in coastal areas may help provide a continuous source of outflow for exported freshwater and organic matter into Turnagain Arm (Adamus Resource Assessment, Inc. 1987). Overall, this function may add to the stability of the aquatic environment within Turnagain Arm. Wetlands with a surface outlet and wetlands along streams are presumed to moderate surface flows to varying degrees. Wetlands without continually saturated soils are presumed to perform this function more effectively as their capacity to store water during storm events is higher. Additionally, wetlands with dense vegetation and those situated across flatter slopes can slow water more than other wetland types (Sather et al. 1984, Thompson 1998).

It is possible for an individual wetland to be singularly effective in flood control, but more often moderation of stream flow is the result of the interrelated functioning of a series of wetlands and water bodies within a watershed (NWTC 1978). Floodplain wetlands along project area streams often serve as temporary storage areas for overbank flows. The temporary storage of surface water, combined with the retardation of floodwater velocities by floodplain vegetation, serves to reduce flood peaks and increase duration of flow (Novitzki 1978). However, due to the coastal position of most of the project area wetlands and streams, flooding in the tidal portions of rivers and estuaries is complicated by the action of wind and tide combined with storm flows generated higher in the basin. Temporary storage of floodwater is a primary function of wetlands adjacent to estuaries and tidal rivers, but their effect may be either minimized or maximized by the tidal stage during which flooding occurs (NWTC 1978). Few wetlands in the project area were identified as performing this function (Table 2). This low number is a result of the project areas proximity to Turnagain Arm and many wetlands frequent exposure to tidal inundation.

Photo 3. An emergent wetland stabilizing soils along a streambank near Girdwood.

Photo 4. A frequently flooded estuarine wetland situated along the Turnagain Arm shoreline.

Shoreline, Stream Bank, and Soil Stabilization. Wetland vegetation can stabilize stream banks (Photo 3), pond and lake fringes, and the shores of Turnagain Arm against erosion in various ways. Vegetation can bind and stabilize substrates, it can dissipate wave and current action, and it can trap sediments during periods of inundation. The effectiveness of shoreline vegetation in controlling erosion depends on the plant types present, the width of the vegetated bank, the efficiency of the vegetation in trapping sediments, the soil composition of the bank or shore, the height and slope of the bank or shore, and the elevation of the toe of the bank relative to mean high water (Sather et al. 1984). In some streams, erosion and collapse of stream banks can reduce the availability of cover, degrade water quality, and reduce the suitability of coarse sediment important for salmon spawning, at least temporarily (Adamus Resource Assessment 1987). The vegetation in wetlands also stabilizes the wetland soils against erosion by water that may pass through the wetland by sheetflow and shallow flow through the soils. Where plant cover exists along shorelines (Photo 4), the principal factors determining the degree of shoreline protection are the ability of the plants to survive prolonged flooding and their resistance to underminings (NWTC 1978).

Twenty-three of the 61 mapped wetland complexes in the project area were identified as performing shoreline, stream bank, or soil stabilization functions (Table 2).

Water Quality Improvement. The slow movement of sediment-laden water through wetland vegetation and across uneven ground surfaces results in retention of the sediments. This process can provide water quality functions to downstream aquatic systems. Project area wetlands may receive pollutants such as sand, metals, and petroleum products in runoff from the highway and immobilize them in their soils. Wetlands may perform contaminant removal functions by receiving and storing other toxins and immobilizing them by accumulation in organic soil layers. Where nutrient concentrations are high in aquatic systems, the nutrient uptake function can remove a pollutant from the system. While retention of pollutants may degrade the wetland itself, that retention would protect the quality of downstream waterways for organisms such as salmon.


Photo 5. A typical vegetated road embankment along the Seward Highway abutting a flooded wetland.

Most of the surrounding areas along Upper Turnagain Arm have few chemical pollutants because of limited development and access. Areas within the project area that have a higher potential to be exposed to pollutants include Girdwood and Portage Valleys where upslope development has occurred and along areas immediately adjacent to the Seward Highway (Photo 5) and Alaska Railroad. As a result of this, nearly all of the mapped wetland complexes have the capacity to improve water quality due to their proximity to the Seward Highway (Table 2).


Photo 6. A large avalanche brings water, organic debris, and sediment to a flooded wetland along the Seward Highway.

Turnagain Arm itself is subject to large tidal ranges, powerful currents, and large inputs of glacial and coastal sediment. Despite these extreme conditions, studies done by Pentec Environmental showed a surprising level of biological activity (Pentec 2006). The stability of that aquatic environment may be related in some part to water quality improvement functions of project area wetlands. In addition to human induced chemical pollutants, natural pollutants such as sediment loads and suspended silt particles from glacially fed streams may reduce water quality. Winter avalanches are common occurrences along the steep slopes bordering Upper Turnagain Arm. Debris from these avalanches is often released directly into wetland areas (Photo 6). Wetlands located in those avalanche run-out zones may retain much of that debris and reduce its output into Turnagain Arm. Wetlands with flatter gradients have a higher potential for sediment retention than ones with steep gradients because flows are slower and retention time is longer (Magee and Hollands 1998).

3.2 Ecological Functions

Photo 7. Woody material is exported to downstream aquatic environments by project area streams.

Photo 8. Plant biomass in project area marshes can be high.

Nutrient Cycling and Food Chain Support. Wetlands may retain nutrients from water entering a site, incorporating them into plant tissue and sometimes into the peat soil. Nutrients can enter wetlands in one form and leave in another. Wetland productivity depends heavily on inputs of organic matter and nutrients; wetland systems in turn export organic matter and nutrients to the marine environment (National Wetlands Technical Council (NWTC) 1978). Most wetlands seem to act as nutrient traps, at least during the growing season. Periodic tidal inundation or overbank flooding into wetlands allow decaying plant material to be washed downstream to other aquatic ecosystems, where it would support the food web with energy and nutrients. These flooding events also give a wetland the opportunity to temporarily store water, thus reducing flood flows, and to slow water flow so particulates may settle out.

Wetlands have varying levels of primary productivity; that is, capture of the sun's energy and conversion to plant material. This plant material may be consumed directly by vertebrates and invertebrates or chemically and physically altered through decomposition before use by other consumers. Decomposition and the rate at which nutrients are transformed to forms usable by plants influence plant productivity and, ultimately, food chain dynamics. The rate of decomposition and the degree to which nutrients and organic carbon are transported out of the wetland affect the wetland's role in the aquatic food chain. Within estuarine wetlands, most of the primary production takes place in marshes. A large share of the decomposition takes place on and in the mudflats (NWTC 1978).

Wetlands with surface flow outlets, wetlands that flood, and wetlands used by highly mobile fish and wildlife species have mechanisms for exporting organic matter and nutrients (Photo 7). Wetlands with a high proportion of palatable plant species are presumed to support food webs to a higher degree (Photo 8). Wetland systems that have lower levels of nutrients, lower pH, peat soils, and evergreen vegetation are presumed to have lower plant productivity that is less able to support food webs.

Photo 9. A moose browses in a project area wetland.

Photo 10. Several species of salmon utilize project area wetlands for spawning and rearing.

Photo 11. Large numbers of eulachon spawn in Twentymile River.

Food chain value depends not only on the amount and type of organic material produced by wetland plants, but also on the availability of this plant material to detrital and herbivore-based food webs. Alaskan coastal wetlands, whose primary productivity appears to be relatively low, may have relatively high food chain value to estuarine and marine fish because they export proportionally large amounts of palatable organic material to nearby waters (NWTC 1978).

Within the project area, 39 of the 61 mapped wetland complexes were identified as performing nutrient cycling and food chain support functions (Table 2).

Fish and Wildlife Habitat. Fish and wildlife species are likely dependent on wetland habitat factors such as the availability of cover, freedom from disturbance, availability of food, availability of specialized habitat features, water regime (especially fluctuations in water level), and interspersion of different vegetation forms and water. The fish and wildlife habitat function considers the effectiveness of the wetland in providing habitat for various types of resident and migratory species typically associated with wetlands and the wetland edge (USACOE 1995).

Relatively few mammals are truly wetland-dependent. However, some mammal species are highly wetland-dependent in some areas at certain times of the year (Photo 9). In Upper Turnagain Arm, coastal shrub wetlands dominated by willow may support winter moose habitat because of abundant snow-free areas of willow. Many birds depend on wetland habitats during all or parts of their life histories. In addition, several anadromous fish streams intersect the project area and provide important spawning and rearing habitat to fish. Ponds in marshes and tidal wetlands during high tidal stages may also support fish. Functions directly related to wildlife use could include fish passage, fish rearing habitat, avian nesting and resting, and animal movement corridors.

Ecological succession in wetlands is not unidirectional, but is cyclical in response to water level periodicity (NWTC 1978). Wetland habitat values are not constant over time. Habitat conditions change daily (e.g., with tides), with the seasons, over periods of several years, and with long-term succession (NWTC 1978). For instance, during extreme high waters, fish can move into high marsh areas to feed or find cover, and detritus can be carried out of the marsh into deeper water, to be utilized by organisms later eaten by fish. More importantly, high marsh areas may also be indirectly valuable to fish by trapping nutrients and releasing them slowly to lower marshes and water areas (NWTC 1978).

The level of interspersion of different vegetation types in a wetland can influence the quality of wildlife habitat. When vegetation types are highly interspersed, more edge between communities exists. Edge communities are important to many wildlife species, and generally the more edge within a wetland, the greater diversity of wildlife (Thompson 1998). Interspersion of vegetation types indicates a more diverse canopy structure, and typically the greater structure in canopy results in a greater diversity of wildlife. Similar to the level of interspersion among vegetation, interspersion of open water habitat and vegetation communities can directly influence the quality of wildlife habitat. Typically, the greater interspersion of open water and plant communities, the greater the diversity of wildlife. Seasonally flooded wetlands interspersed with surface water are often important to pre-breeding waterfowl, which depend on the rich invertebrate resources found there to obtain the protein essential to egg laying (Krapu 1974).

Much of the open water along the project area provides waterbird habitat. The results of the HDR fall migration survey indicate that the wetlands and ponds at the head of Turnagain Arm and within Placer and Twentymile valleys provide important staging and resting areas for waterfowl, cranes, and geese (HDR 2007). Nearly all of the bird species that may use ponds along the highway are migratory and present only from April to November. Open water often provides habitat for waterfowl, possible spawning and/or rearing habitat for fish, and habitat for wetland-dependent mammals (beaver, mink, otter, and muskrat) and amphibians. Streams and their adjacent riparian communities can support a variety of wildlife. Many different food sources including fish, aquatic insects, and plants are available within the streams themselves. Stream banks often provide protected sites for dens and nests, easy access to drinking water, and are often used as travel corridors by larger mammals (Thompson 1998).

The Alaska Department of Fish and Game (ADF&G) Anadromous Fish Catalog lists several known anadromous water bodies in the project area (ADF&G 2007). Listed water bodies include: Ingram Creek, Placer River, Portage Creek, Twentymile River, Peterson Creek, Kern Creek, Virgin Creek, Glacier Creek, and three unnamed water bodies. According to the list, anadromous species present within the project area include: Chinook salmon, coho salmon, chum salmon (Photo 10), pink salmon, sockeye salmon, eulachon (Photo 11), and Dolly Varden. Aquatic habitat in the project area ranges from productive estuarine channels located near the mouths of the larger streams to less productive higher gradient upper valley channels found in the smaller tributaries (USFS 2004). During the summers of 2006 and 2007, HDR conducted a study to assess fish species presence, distribution and relative abundance in fresh water habitats within the project area. The study recorded seven fish species and found that 16 of 21 water bodies sampled contained anadromous fish consisting of coho and Chinook salmon. In general, wetlands and ponds had greater abundance of fish than streams, with populations dominated by stickleback. Stream site populations were dominated by coho and Dolly Varden (HDR 2008b).

In the project area, 32 of the 61 mapped wetland complexes were identified as having indicators of wildlife habitat, 27 complexes have characteristics which indicate they may provide habitat for fish (Table 2).

Table 2 Wetland Functions in the Project Area

Wetland Number (See PJD Maps)	Size (acres)	Wetland Functions							
		Hydrology				Water Quality	Ecology		
		Ground Water Recharge	Ground Water Discharge	Stream Flow Moderation	Shoreline, Streambank, & Soil Stabilization	Water Quality Improvement	Nutrient Cycling & Export	Wildlife Habitat	Fish Habitat
1	27.8		X		X	X	X		
2	7.2					X	X	X	
3	2.3					X	X	X	
4	0.7		X	X	X		X		X
5	13.4		X		X	X	X	X	X
6	12.8		X	X	X	X	X	X	
7	7.5		X	X	X	X	X	X	
8	10.4		X		X	X	X	X	X
9	0.9	X				X	X	X	
10	0.3	X				X	X	X	
11	0.4	X				X	X	X	
12	32.1		X		X				X
13	2.3		X			X	X	X	X
14	2.1					X	X	X	X
15	2.8		X			X	X	X	X
16	2.0					X	X	X	X
17	0.2	X				X			
18	7.0		X			X	X	X	X
19	0.2	X				X			
20	0.1					X	X		
21	0.9					X	X		
22	11.6		X			X	X	X	X
23	0.1					X	X	X	X
24	0.2					X	X	X	X
25	5.3		X			X	X	X	X
26	12.3		X	X		X	X	X	X
27	1.3	X				X	X	X	X
28	21.9		X		X	X	X	X	
29	1.6	X				X			
30	22.3		X		X	X	X	X	
31	0.5	X				X			
32	3.1	X				X			
33	1.1	X				X			
34	0.7	X				X			
35	0.7	X				X			
36	2.4	X		X	X	X	X	X	X
37	3.3	X				X			
38	0.9		X		X				X
39	4.0		X		X	X	X	X	
40	2.4	X				X			
41	1.7					X	X	X	
42	0.5		X		X	X			
43	0.6		X		X	X			
44	1.2	X				X			
45	0.6	X				X			
46	0.5	X				X			
47	0.5	X				X			
48	4.6		X	X	X	X	X	X	X
49	4.5		X	X	X	X	X	X	X
50	5.5				X	X	X	X	X
51	6.2				X	X		X	
52	23.0	X				X	X	X	X
53	56.0	X				X	X	X	X
54	2.7		X		X	X	X	X	X
55	1.0	X				X			
56	0.5		X		X	X	X		X
57	0.2		X		X	X	X		X
58	0.1		X		X	X	X		X
59	0.3		X		X	X	X		X
60	0.3	X				X			
61	0.3		X			X			
	Total	**23**	**27**	**7**	**23**	**58**	**39**	**32**	**27**

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