ALASKA
PipelineProject

Draft Resource Report 3 – Rev 0
Fish, Vegetation, and Wildlife Resources

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TransCanada ExxonMobil

DRAFT

Notes:

Yellow highlighting is used throughout this draft Resource Report to highlight selected information that is pending or subject to change in the final report.

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
§	Section
ACEC	Areas of Critical Environmental Concern
ADFG	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AMP	Alaska Mainline milepost
APP	Alaska Pipeline Project
APSC	Alyeska Pipeline Service Company
AS	Alaska Statute
BCB	Bering-Chukchi-Beaufort Sea
BGEPA	Bald and Golden Eagle Protection Act
BLM	U.S. Bureau of Land Management
CBD	Center for Biological Diversity
C.F.R.	Code of Federal Regulations
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FERC	U.S. Federal Energy Regulatory Commission
FMP	Fishery Management Plan
Fed. Reg.	Federal Register
FWS	U.S. Fish and Wildlife Service
GMU	Game Management Unit
GTP	Gas Treatment Plant
HDD	horizontal directional drill
MMPA	Marine Mammal Protection Act
MP	milepost
NAS	nuisance aquatic species
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf
PMP	Point Thomson Gas Transmission Pipeline milepost
PT Pipeline	Point Thomson Gas Transmission Pipeline
SPCC	Spill Prevention, Control, and Countermeasures Plan
TAPS	Trans-Alaska Pipeline System
URS	URS Corporation
U.S.C.	United States Code
USGS	U.S. Geological Survey

3.0 RESOURCE REPORT 3 – FISH, WILDLIFE, AND VEGETATION

The location information, facility descriptions, resource data, construction methods, and mitigation measures presented in this report are preliminary and subject to change. APP is conducting engineering studies, environmental resource surveys, agency consultations, and stakeholder outreach efforts to further refine and define the details of the Project.

The Project described in this resource report is being designed and developed based on estimated volumes of natural gas from projected shipper commitments. If final shipper commitments are significantly different from those estimated, the Project may be adjusted accordingly.

3.1 PROJECT OVERVIEW

TransCanada Alaska Company, LLC and Foothills Pipe Lines Ltd., working with ExxonMobil Alaska Midstream Gas Investments LLC, are developing a joint project to treat, transport, and deliver natural gas from the Alaska North Slope (ANS) to pipeline facilities in Alberta, Canada for markets in the contiguous United States and North America. This joint project is referred to as the Alaska Pipeline Project (APP or Project)[1].

As required by Title 18 Code of Federal Regulations (C.F.R.) Section (§) 380.12 and consistent with the Alaska Natural Gas Pipeline Act of 2004 (ANGPA), APP has prepared this draft resource report in support of its application to the U.S. Federal Energy Regulatory Commission (FERC) for a Certificate of Public Convenience and Necessity (CPCN) under Section 7(c) of the Natural Gas Act (NGA) to construct, own, and operate the portion of the Project in Alaska. This draft resource report pertains only to that portion of the Project in Alaska, and unless the context otherwise requires, references in this draft resource report to APP refer only to the Alaska portion of the Project[2].

As shown in Figure 1.1-1 of Resource Report 1, APP will comprise the following major components[3,4]:

- The Point Thomson Gas Transmission Pipeline (PT Pipeline)[5], consisting of approximately 58.4 miles of buried 32-inch-diameter pipeline from the Point Thomson Unit (PTU) to an APP Gas Treatment Plant (GTP) and associated facilities near Prudhoe Bay;
- The GTP, which will have the capacity to process gas received from the Point Thomson Unit and the existing Central Gas Facility (CGF) on the Prudhoe Bay Unit (PBU) in order

[1] Depending on the context, the term APP refers to the joint project or, collectively, to the sponsoring entities.

[2] The Canadian Section refers to the portion of the Project from the Yukon border to the pipeline facilities in Alberta, Canada.

[3] In previous FERC filings, the Point Thomson Gas Transmission Pipeline was referred to as Zone 1, the Gas Treatment Plant was referred to as Zone 2, and the Alaska Mainline was referred to as Zone 3 of the Alaska-Canada Pipeline.

[4] As part of the Project, APP proposes to construct compressor stations, meter stations, various mainline block valves (MLBVs), pig launcher and receiver facilities, as well as associated ancillary and auxiliary infrastructure, including additional temporary workspace, access roads, helipads, construction camps, pipe storage areas, contractor yards, borrow sites, and dock modifications at Prudhoe Bay.

[5] The origin of the PT Pipeline is assumed to be located at an outlet from the PTU. The final length may vary depending on the final gas development plan for the PTU.

to deliver an annual average capacity up to 4.5 billion standard cubic feet per day (bscfd) (standard conditions: 14.73 pounds per square inch absolute and 60º Fahrenheit) of sales quality gas; and

- The Alaska Mainline, consisting of approximately 745.1 miles of 48-inch-diameter pipeline, all of which is buried except as otherwise described in this Resource Report. The Alaska Mainline extends from the GTP to the Alaska-Yukon border east of Tok, Alaska, and includes provisions for intermediate gas delivery points within Alaska.

Table 3.1-1 lists the FERC's filing requirements and additional information applicable to Resource Report 3 taken from FERC's Guidance Manual for Environmental Report Preparation:

TABLE 3.1-1

Alaska Pipeline Project
Resource Report 3 Filing Requirements Checklist

Requirement	Where Found in Document
FERC REQUIREMENTS FROM 18 C.F.R. § 380.12	
1. Classify the fishery type of each surface waterbody that would be crossed, including fisheries of special concern. (§ 380.12[e][1]) • This includes commercial and sport fisheries as well as coldwater and warmwater fishery designations and associated significant habitat.	Section 3.2
2. Describe terrestrial and wetland wildlife and habitats that will be affected by the Project. (§ 380.12[e][2]) • Describe typical species with commercial, recreational, or aesthetic value.	Section 3.4.1
3. Describe the major vegetative cover types that will be crossed and provide the acreage of each vegetative cover type that will be affected by construction. (§ 380.12(e)(3)) • Include unique species or individuals and species of special concern. • Include nearshore habitats of concern.	Section 3.3 Appendix 3C
4. Describe the effects of construction and operation procedures on the fishery resources and proposed mitigation measures. (§ 380.12(e)(4)) • Be sure to include offshore effects, as needed.	Section 3.2.4
5. Evaluate the potential for short-term, long-term, and permanent impact on the wildlife resources and state-listed endangered or threatened species caused by construction and operation of the Project and proposed mitigation measures. (§ 380.12(c)(4))	Section 3.4.7
6. Identify all federally listed or proposed endangered or threatened species that potentially occur in the vicinity of the Project and discuss the results of the consultations with other agencies. Include survey reports as specified in § 380.12(e)(5). • See § 380.13(b) for consultation requirements. Any surveys required through § 380.13(b)(5)(I) must have been conducted and the results included in the application.	Section 3.5
7. Identify all federally listed Essential Fish Habitat (EFH) that potentially occurs in the vicinity of the Project and the results of abbreviated consultations with the National Marine Fisheries Service, and any resulting EFH assessment. (§ 380.12(e)(6))	Section 3.2.3
8. Describe any significant biological resources that will be affected. Describe impact and any mitigation proposed to avoid or minimize that impact. • For offshore species be sure to include effects of sedimentation, changes to substrate, effects of blasting, etc. This information is needed on a mile-by-mile basis and will require completion of geophysical and other surveys before filing. (§ 380.12(e)(4&7))	Sections 3.2 and 3.4.7
OTHER INFORMATION OFTEN MISSING AND RESULTING IN DATA REQUESTS PER FERC'S GUIDANCE MANUAL FOR ENVIRONMENTAL REPORT PREPARATION	
• Provide copies of correspondence from federal and state fish and wildlife agencies along with responses to their recommendations to avoid or limit impact on wildlife, fisheries, and vegetation.	Appendix 1L
• Provide a list of significant wildlife habitats crossed by the Project. Specify locations by milepost, and include length and width of crossing at each significant wildlife habitat.	Section 3.4.6

Mileposts (MPs) are commonly used markers along linear projects, such as APP. Where necessary to distinguish the PT Pipeline from the Alaska Mainline, APP has prefixed its MP identifier with a PT Pipeline MP (PMP) or an Alaska Mainline MP (AMP). This convention is used in APP's application and supporting maps and alignment sheets (refer to Appendix 1O of Resource Report 1) to identify resources and features along the respective pipeline routes.

This resource report evaluates the biological resource issues associated with the Project. In particular, this report describes the fish, wildlife, and vegetation resources in the Project area[6] and how APP's facilities will be designed, constructed, operated, and maintained to reduce potential impacts to those resources.

3.2 AQUATIC RESOURCES

3.2.1 INLAND FRESHWATER FISHERIES

The Project crosses 7 major drainage basins and 19 sub-basins as described in Section 2.3.2 of Resource Report 2, however, of the 7 major drainage basins, no streams in the Eastern Arctic Basin are affected by the Project and only 1 minor stream is crossed in the Colville River drainage basin (Figure 3.2-1).

There are two categories of inland freshwater fisheries within these major drainage basins: Coldwater anadromous and coldwater resident fisheries. A discussion of anadromous and resident fishes distributed within these sub-basins crossed by the Project is provided in the following sections.

3.2.1.1 Coldwater Anadromous Fisheries

Alaska Statute (AS) 16.05.870 requires the Alaska Department of Fish and Game (ADFG) to specify the various streams, rivers, and lakes that are important for spawning, rearing, or migration of anadromous fishes. These waterbodies are identified in the "Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes" (Catalog) (ADFG 2011a) and the "Atlas to the Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes" (Atlas) (ADFG 2011b). The Catalog lists waterbodies documented to be used by anadromous fish. ADFG has cataloged over 17,000 streams, rivers, or lakes around the state which have been specified as being important for the spawning, rearing, or migration of anadromous fish. The Catalog and its accompanying Atlas are important because they specify which streams, rivers, and lakes are important to anadromous fish species at particular life-stages and therefore afforded protection under AS 16.05.871. Waterbodies that are not "specified" within the Catalog and Atlas are not afforded that protection. According to data from the current Catalog and Atlas, the PT Pipeline and the Alaska Mainline will cross a total of 50 documented anadromous fish rivers and streams (ADFG 2011a and 2011b). Two additional anadromous streams were identified during the 2010 APP field survey and have been nominated for inclusion into the Catalog and Atlas.

6 The terms "Project area" and "Project footprint" are defined to include the project facilities and land requirements for construction and operation. The term "Project vicinity" is used to mean the area or region near or surrounding the Project area, and is subject to the context in which the term is used.

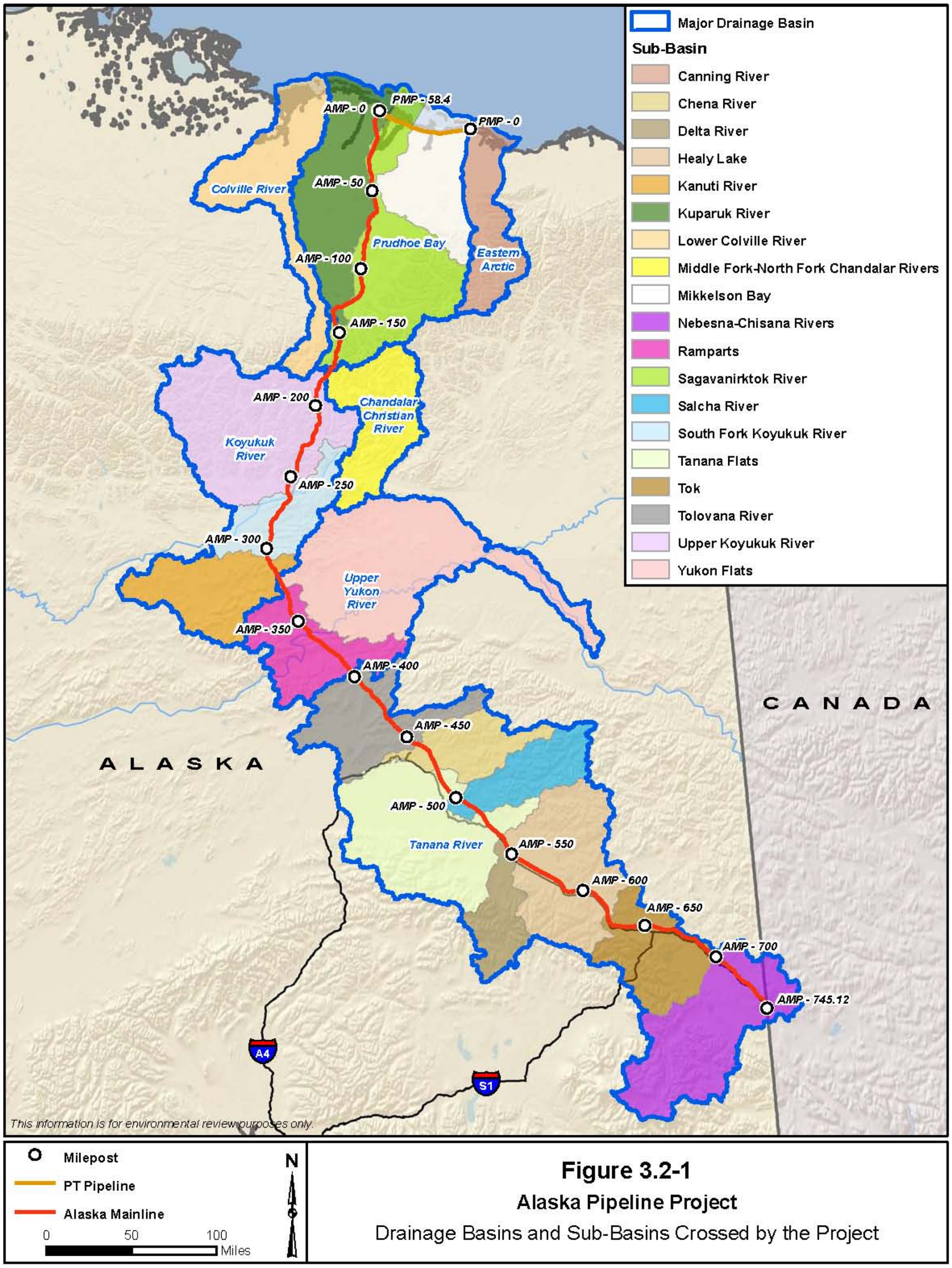

Figure 3.2-1
Alaska Pipeline Project
Drainage Basins and Sub-Basins Crossed by the Project

Anadromous fish spawn in freshwater rivers and streams. The young out-migrate to sea where they reach sexual maturity, then return to freshwater to spawn. According to distribution information, 13 anadromous fish species occur in the Project area as identified in Table 3.2.1-1 (ADFG 2011a and 2011b).

A description of each coldwater anadromous species found in the Project area is provided below.

TABLE 3.2.1-1
Alaska Pipeline Project
Coldwater Anadromous Fish Species Occurring in the Project Area

Coldwater Anadromous Fish	Major Drainage Basins[b]					
	Prudhoe Bay	Colville River	Chandalar-Christian Rivers	Koyukuk River	Upper Yukon River	Tanana River
Arctic cisco	X	X				
Least cisco	X	X				
Bering cisco	X	X			X	
Dolly Varden[a]	X	X	X	X	X	X
Pink salmon	X				X	
Chum salmon	X	X	X	X	X	X
Chinook salmon			X	X	X	X
Coho salmon				X	X	X
Sockeye salmon					X	
Broad whitefish[a]	X	X				
Humpback whitefish	X	X			X	
Rainbow smelt	X	X				
Arctic lamprey	X	X	X		X	X

[a] May occur as anadromous and resident populations within the same drainage system.
[b] No streams in the Eastern Arctic Basin are affected by the Project.
Source: ADFG 2011a and 2011b.

Arctic Cisco

Alaska's Arctic cisco (*Coregonus autumnalis*) occurs exclusively in the Beaufort Sea and is occasionally present in Arctic Slope waterbodies of the Prudhoe Bay and Colville River basins near the Project area. After emergence, the young fish are carried downstream and transported west along the Beaufort Sea coast by prevailing nearshore ocean currents. The meteorological-driven recruitment process plays a major role in determining the age structure of Arctic cisco populations in Alaska. During years when easterly winds prevail, juvenile Arctic cisco passively migrate westward into the Colville River system, west of the Project area, where they remain until they reach sexual maturity at around age seven (Gallaway and Fechhelm 2000). Within the Project area, the Sagavanirktok River supports some fish, but generally only until around age three (Mecklenburg et al. 2002). At the onset of sexual maturity, Arctic cisco migrate back to their spawning grounds in the Mackenzie River system of Canada (Gallaway and Fechhelm 2000).

Least Cisco

Least cisco (*Coregonus ardinella*) is the most abundant diadromous species (e.g., utilizing both marine and freshwater during life cycle) in the coastal waters of the Beaufort Sea (Jarvela and Thorsteinson 1999). Within the Project area, the anadromous form occurs in the Prudhoe Bay and Colville River basins. Migratory populations have a discontinuous distribution in the Beaufort sea. Western populations are associated with the Colville River and smaller rivers to the west, while eastern populations are associated with the Mackenzie River system in Canada. The large distance between these freshwater systems apparently isolates the migratory populations from each other (Fechhelm et al. 2000).

The eastward dispersal of juvenile least cisco during summer appears to be a function of wind-driven coastal currents (Fechhelm et al. 2000). West winds in early summer create easterly flowing currents in Simpson Lagoon of Prudhoe Bay, which enhance the eastward dispersal of small fish. In summers with substantial west winds, which occur about one out of every two years, substantial numbers of juvenile least cisco congregate in the Prudhoe Bay/Sagavanirktok Delta region. In years lacking substantial July west-wind events, fewer small least ciscos reach the eastern end of Simpson Lagoon (Fechhelm et al. 1999).

Least cisco return to freshwater streams in the late fall and spawn over a two-week period between late November and early December (Fechhelm et al. 2000).

Bering Cisco

The Bering cisco (*Coregonus laurettae)* is an important commercial fish in Alaska. Within the Project area, the anadromous form occurs in the Prudhoe Bay and Colville River basins. They are primarily a freshwater and coastal marine species, but anadromous populations have been documented (Mecklenburg et al. 2002). Spawning migrations extend into the upper reaches of larger rivers that drain into the Beaufort Sea. They are typically found in the Bering Sea drainages of the Seward Peninsula, Norton Sound, and Yukon and Kuskokwim rivers in nearshore habitats of low salinity, preferring river estuaries and brackish water lagoons along the coast (Committee on the Staus of Endangered Wildlife in Canada 2004).

Spawning occurs over loosely compacted gravel beds in swiftly flowing water. Eggs are typically broadcast and abandoned by their parents. After spawning, adults move downstream to the sea. Eggs hatch in the spring and young out-migrate downstream. Bering cisco reach sexual maturity at four to nine years of age (Committee on the Staus of Endangered Wildlife in Canada 2004).

Dolly Varden

Dolly Varden (*Salvelinus malma*) is widely distributed in Alaska ranging from southeastern Alaska to the Beaufort Sea. They occurs in all major drainage basins within the Project area. Habitats range from clear and glacial rivers and lakes, brackish estuaries, to nearshore marine environments. These fish can be either anadromous or resident species (ADFG 1978a). The resident form is described in Section 3.2.1.2.

Spawning occurs between early July and December, with peak spawning in September and October. Spawning occurs about every second year for individuals in the Arctic population; although they may spawn in consecutive years in more southern drainages. After hatching, juvenile fish remain in the rivers for their first few years. Studies along the Trans-Alaska Pipeline System (TAPS) have indicated that juvenile fish prefer shallow pools with medium-to-coarse rock substrates. In-stream and bank vegetation, shade, and rock cover also play an important role in providing cover features for juvenile char in streams along the TAPS. Between the ages of four and five years, they complete their transformation to smolt and begin their out-migration to preferred summer habitat in nearshore coastal waters. Dolly Varden can remain in the nearshore coastal waters from a period of a few weeks to several months feeding and may travel up to 300 kilometers along the Beaufort Sea coast (ADFG 1978a).

Dolly Varden maintain a strong fidelity to overwintering and spawning areas in the rivers they return to in late August through September. Overwintering areas are in deep freshwater habitats including lakes, river pools, and groundwater spring areas. In the smaller drainages located within the North Slope where overwintering habitat is limited, one spring-fed overwintering site could be inhabited by all members of a Dolly Varden population. As a result, limited winter habitat is a large contributor to the natural mortality of Dolly Varden. Water removal or excessive sedimentation due to gravel extraction can have population-level effects on Dolly Varden within a drainage due to the limited overwintering habitat on the North Slope (ADFG 1978a).

Juvenile Dolly Varden feed on a variety of insects and larvae, small invertebrates, and fish eggs. Adults feed on small fish, such as juvenile salmon, smelt, herring, sandlance, greenling, sculpins, flounder larvae, and cod. Factors that may limit food availability include excessive sedimentation that would inhibit aquatic plant and invertebrate fauna production (ADFG 1978a).

Dolly Varden provide excellent sport fishing opportunities and are becoming increasingly popular with anglers (Hubartt 2008).

Pink Salmon

Pink salmon (*Oncorhynchus gorbuscha*) is native to Pacific and Arctic coastal waters (Kingsbury 1994). In the Project area, their distribution is limited to the Prudhoe Bay and Upper Yukon River basins with only small numbers occurring in the Sagavanirktok River.

Pink salmon return to their natal rivers between late June and mid-October, generally traveling less than 40 miles upriver to spawn. Their preferred spawning habitat is in gravel substrate at the downstream-end of pools or shallow riffles. Spawning beds primarily consist of coarse gravel with minimal amounts of silt and sand. The eggs hatch sometime in early to mid-winter (Kingsbury 1994). For optimal survival, eggs and alevins require adequate dissolved oxygen, relatively little sediment and a stable streambed. Fry emerge from the gravel in late winter or early spring and out-migrate to the sea, usually during darkness. Pink salmon live in coastal waters until they reach sexual maturity after approximately two years. This two-year cycle has created two genetically distinct lines, odd-year and even-year populations, which are reproductively isolated from each other (Kingsbury 1994).

Pink salmon is an important subsistence and commercial fish and popular among sport anglers (Kingsbury 1994).

Chum Salmon

Chum salmon (*Oncorhynchus keta*) occur in all major drainages within the Project area, but numbers are limited in Arctic Slope streams. They spawn in rivers from northern California to the Arctic Ocean, and occasionally as far east as the Mackenzie River in Canada (Buklis 2011).

Chum salmon spawn in gravel of streams, side channels, and intertidal portions of streams (Buklis 2011). Upwelling groundwater is a requirement of all spawning areas. The upwelling water helps keep silt suspended in spawning areas prone to high silt loads such as side-channel sloughs. Upwelling water also assists in preventing spawning areas from freezing in winter months (Durst 2000). Chum salmon fry out-migrate in spring after emerging from the gravel and feed on small insects in streams and estuaries. In the fall, chum fry form schools and move out into the Bering Sea and Gulf of Alaska (Buklis 2011).

Chum salmon are the most abundantly commercially harvested Pacific salmon species in the Arctic and Interior Alaska. In the Interior, chum salmon remain an important year-round source of fresh and dried fish for subsistence and personal use (Buklis 2011). For more information on subsistence activities within the project area, refer to Appendix 5E of Resource Report 5.

Sport anglers incidentally harvest chum salmon while fishing for other Pacific salmon species in freshwater. The statewide sport harvest is usually less than 25,000 chum salmon (Buklis 2011).

Chinook Salmon

Of the Pacific salmon, the Chinook salmon (*Oncorhynchus tshawytscha*) is one of the most highly prized and important subsistence, sport, and commercial fish native to Alaska's Pacific coast, and the most abundant salmon in the Upper Yukon and Tanana River basins near the Project area. The majority of the commercial fishery for this species occurs in the coastal areas in southeast Alaska, Bristol Bay, and Arctic-Yukon-Kuskokwim areas (Delaney 2008). For more information on subsistence activities within the project area, refer to Appendix 5E of Resource Report 5.

Chinook salmon spawn in a broad range of freshwater habitats, ranging from small streams to large rivers. Yukon River Chinook salmon may travel up to 1,840 miles to reach traditional spawning grounds in the headwaters. Chinook salmon typically begin their upstream migration in the Yukon River from mid- to late-May through early July, reaching their spawning grounds in the tributaries or headwaters of the Yukon River by September. Spawning occurs immediately after the spawning grounds are reached (Yukon River Panel 2011).

Fry begin to out-migrate during spring and early summer and some leave their natal streams shortly after emergence. Young-of-the-year fish enter non-natal streams in late June. In the Yukon, juveniles are often found in small pools, along margins, and in mixing zones between the Yukon and its tributaries. Chinook salmon are most often found overwintering in streams and small rivers in areas associated with heavy glacial-fluvial material (Yukon River Panel 2011).

Coho Salmon

Coho salmon (*Oncorhynchus kisutch*) occur in the Upper Yukon River, Koyukuk, and Tanana river basins within the Project area. This species is highly migratory, extremely adaptable, and can utilize most accessible bodies of freshwater from large watersheds to small tributaries. Coho salmon school at the mouths of rivers and enter freshwater from early July through December, depending on the river system and the particular population of fish. Coho salmon migrate up the Yukon River as far as the U.S.-Canada border to spawn (Elliott 2007).

Coho salmon spawn between July to November, however timing of spawning is dependent upon water flow and water temperature at spawning grounds (Elliott 2007). Spawning occurs in streams with a constant circulation of cool, high-quality water. Similar to chum salmon, upwelling groundwater is an important spawning habitat feature. The redds require sufficient interstitial space in the substrate to allow for growth and movement through the gravel to accommodate emergence of the fry (Durst 2000). Coho salmon will usually spend one to three years in fresh or estuarine waters before migrating to sea (Elliott 2007).

Sockeye Salmon

Within the Project area, sockeye salmon have been documented in the Upper Yukon River basin, however, there presence has not been documented in any waterbodies crossed by the Project.

Broad Whitefish

Broad whitefish (*Coregonus nasus*) occupy a variety of habitats and are present in relatively small numbers in waterbodies on the Eastern Arctic Slope. Within the Project area, the anadromous form of this species occurs in the Prudhoe Bay and Colville River basins. Broad whitefish have two population centers in the Beaufort Sea Region: The Colville River and westward, and the Mackenzie River drainage (Bureau of Land Management [BLM] 2002).

Mature broad whitefish migrate upstream to spawn and overwinter. On the Arctic Slope, where spawning occurs in waters that are too shallow to support the fish over winter, whitefish will move to larger, deeper rivers such as the Sagavanirktok River or into lakes after spawning has been completed (BLM 2002).

In the spring and summer, broad whitefish move from deep overwintering areas of lakes or streams into warmer brackish water to feed. Due to suspected low tolerance for salinity, young fish (age two and younger) tend to remain near the delta of the Sagavanirktok River for much of the open-water season while whitefish age three and older tend disperse farther from their natal rivers moving between the Sagavanirktok and Colville rivers through Simpson Lagoon (BLM 2002).

Humpback Whitefish

In the Project area, the humpback whitefish (*Coregonus pidschian*) occurs in the Prudhoe Bay and Colville River basins. They are found in nearshore coastal waters and overwinter near river mouths (Mecklenberg et al. 2002). This species first spawns at four or five years of age. Upstream migration starts during the summer and fall, and spawning occurs in the upper reaches of rivers in October, usually over a gravel bottom. As with other whitefish, the humpback does not dig a nest but broadcasts its eggs which lodge between the gravel (Alt 1994a).

Humpback whitefish are important in the subsistence economy of Alaska Natives, and have commercial value as well as provide sport fishing opportunities (Alt 1994a). For more information on subsistence activities within the project area, refer to Appendix 5E of Resource Report 5.

Humpback whitefish, lake whitefish and Alaska whitefish are members of the humpback whitefish complex of species as described by McPhail and Lindsey (1970). These three species are distinguishable only by differences in population level modal gill raker counts on the first gill arch (Brown 2006).

Rainbow Smelt

Rainbow smelt (*Osmerus mordax*) are a widely distributed and abundant forage fish in Alaska. In the Project area, they occur in the Prudhoe Bay and Colville River basins. Smelt are pelagic, and are typically associated with nearshore shallow waters and estuaries. Spawning starts in mid-spring; the timing is believed to be associated with photoperiods rather than water temperatures. Larvae and juveniles feed on zooplankton, particularly microscopic crustaceans.

Adult smelt feed on small crustaceans, including shrimp and gammarid amphipods, squid (National Oceanic and Atmospheric Administration [NOAA] Fisheries 2007).

Arctic Lamprey

The Arctic lamprey (*Lampetra camtschatica*) is the most commonly occurring and widely distributed lamprey in Alaska. This species inhabits freshwater environments from the Kenai Peninsula north to Bering Sea drainages and east along Arctic Ocean drainages as far as the Anderson River. Within the Project area, this species is common in the Prudhoe Bay, Colville River, Upper Yukon, and Tanana river basins (Mansfield 2004a).

The lifecycle of the Arctic lamprey is complex. The fish spawns in late May through early July when the water temperature reaches 54 to 59 degrees °F. Up to 100,000 eggs laid by the female hatch within a few weeks. The species has a long-lived larval (ammocoete) stage, which lasts from one to four years. Ammocoetes are primarily active at night, and burrow into sediments during the day. Metamorphosis, when eyes and teeth develop, occurs in fall (McClory and Gotthardt 2005).

After metamorphosis, Arctic lamprey migrate downstream to the sea to feed by attaching parasitically to various fish species. Host species include salmon, rainbow trout, pygmy whitefish, ciscos, and three-spined stickleback. Adult Arctic lamprey return to freshwater streams to spawn, and die shortly afterward (McClory and Gotthardt 2005).

Lamprey are also an important forage species for various freshwater and marine predators. Eggs, larvae, and adults are preyed upon by various fishes including burbot (*Lota lota*), Northern pike (*Esox lucius*), and sheefish (*Stenodus leucichthys*), locally known as inconnu Mansfield 2004a).

Alaska Natives on the Yukon and Kuskokwim rivers harvest Arctic lamprey for subsistence and for use as bait. A small trial commercial fishery has occurred on the Yukon River (Mansfield 2004a). For more information on subsistence activities within the project area, refer to Appendix 5E of Resource Report 5.

3.2.1.2 Coldwater Resident Fisheries

According to distribution information, there are an 18 coldwater resident fish species inhabiting waterbodies that are crossed by the Project, identified in Table 3.2.1-2 (Mecklenburg et al. 2002). Other less abundant fish species may also inhabit some of the streams crossed by the Project, but limited or no data exists on their abundance or distribution. Two of the resident species also occur as anadromous species (broad whitefish and Dolly Varden) as described in Section 3.2.1.1.

TABLE 3.2.1-2

Alaska Pipeline Project
Coldwater Resident Fish Species Occurrence in the Project Area

Resident Species	Major Drainage Basins[b]					
	Prudhoe Bay	Colville River	Chandalar-Christian Rivers	Koyukuk River	Upper Yukon River	Tanana River
Arctic grayling	X	X	X	X	X	X
Alaskan brook lamprey						X
Longnose sucker	X	X	X	X	X	X
Ninespine stickleback	X	X				
Dolly Varden [a]	X	X	X	X	X	X
Arctic char	X	X	X			
Slimy sculpin	X	X	X	X	X	X
Burbot	X		X	X	X	X
Pond smelt	X	X				
Round whitefish	X	X	X	X	X	X
Broad whitefish	X	X	X	X	X	X
Alaska whitefish				X	X	X
Least cisco						X
Lake trout	X	X	X	X	X	X
Alaska blackfish		X			X	X
Northern pike	X	X	X	X	X	X
Lake chub			X	X	X	X
Sheefish/Inconnu				X	X	X
Fourhorn sculpin	X	X				

[a] May occur as anadromous and resident populations within the same drainage system.
[b] No streams in the Eastern Arctic Basin are affected by the Project.
Source: Mecklenburg et al. 2002

Arctic Grayling

The Arctic grayling (*Thymallus arcticus*) is a common resident fish in Arctic Slope region waterbodies. In the Project area, it is widely distributed, occurring in all major drainage basins. Grayling can be either highly mobile, utilizing different streams for spawning, juvenile rearing, summer feeding, and overwintering, or complete their lifecycles within a lake or short reach of a river. In the spring, Arctic grayling begin an upstream migration to traditional spawning areas up to 100 miles away. After spawning, Arctic grayling disperse to summer feeding habitats. By mid-summer, grayling will segregate within a stream according to age, with older adults occupying the upper reaches of river system and juveniles at the lower sections. Arctic grayling fry will forage in pools near where they hatched, and in the early fall the fish migrate downstream to overwintering areas. This species overwinters in deep lakes, lower reaches and deeper pools of medium-sized rivers, or large glacial rivers. Arctic grayling have a tolerance for low dissolved oxygen levels that are common during winter months (Holmes 1994a).

Alaskan Brook Lamprey

Often mistaken for Arctic lamprey, the Alaskan brook lamprey (*Lampetra alaskensis*) resides exclusively in freshwater. Within the Project area, their distribution is limited to the Tanana River basin. They spawn in the spring and summer in shallow areas of streams and sometimes lakes. Their life history is similar to that of the Arctic lamprey (refer to Section 3.2.1.1), however, the Alaskan brook lamprey spends four years as an ammocoete before metamorphosing into an adult. Also in contrast to the Arctic lamprey, the Alaskan brook lamprey adults are non-parasitic and survive on stored energy from their ammocoetes phase (Mansfield 2004a).

The Alaskan Brook Lamprey is considered a sensitive species by the BLM on BLM-managed lands. Refer to Section 3.5.2.

Longnose Sucker

The longnose sucker (*Catostomus catostomus*) is the only member of the sucker family (Catistomidae) in Alaska. They are widely distributed in the Project area, occurring in all major drainage basins. The longnose sucker is a freshwater fish with a ventral mouth and thick papillose lips, creating a suction action to ingest invertebrates from stream and lake bottoms (Mecklenberg et al. 2002). They spawn between May and July, depending on their geographic location. They are known to spawn in cold-water streams with gravel bottoms, lakes, or ponds. Rather than build a nest for egg fertilization, the longnose sucker allows eggs to fall into crevices in the gravel. Spawning generally occurs in the daylight and females can produce up to 60,000 eggs. The eggs take up to two weeks to hatch, then remain as sac fry in the gravel for another one to two weeks before they begin to move around and feed. By October they leave the spawning area and move downstream to lakes to overwinter (Mansfield 2004b).

Ninespine Stickleback

The ninespine stickleback's (*Pungitius pungitius*) range is widespread and abundant in coastal areas. The species is seldom found in full saltwater and is generally considered a freshwater species although coastal populations may occur in brackish water. They are widely distributed in the Project area, occurring in all major drainage basins. These fish spawn between May and July. It is believed the females in most populations produce multiple clutches of eggs during a spawning season with promiscuous spawning observed in both sexes. Males fan the eggs and guard the young. Juvenile ninespine stickleback reach sexual maturity around age one to two, and few live more than three years (Gotthardt and Booz 2005).

This species has both anadromous and freshwater forms, however, anadromous populations are not encountered within the Project area. Ninespine stickleback are a frequently studied species because of their reproduction behavior, response to environmental factors, and genetic diversity (Gotthardt and Booz 2005).

Dolly Varden

The anadromous form of this species is described in Section 3.2.1.1. Resident Dolly Varden can consist of three groups of fish: Residuals, isolated, and lake-resident. Residual stream-resident Dolly Varden are predominantly males which mature without a migration to sea; these fish co-exist with anadromous char. Isolated stream-resident Dolly Varden are separate populations isolated from downstream char by impassable barriers to upstream migrations (e.g., waterfalls). Lake resident char inhabit lakes with no outlet to the sea (ADFG 1978a). The resident Dolly Varden occurs in all major drainage basins found within the Project area.

Arctic Char

Arctic char (*Salvelinus alpines*) are found in lakes in the Brooks Range, the Kigluaik Mountains, the Kuskokwim Mountains, the Alaska Peninsula, Kenai Peninsula, Kodiak Island, and in a small area of the Interior near Denali Park (DeCicco 1994). Within the Project area, they occur in the Prudhoe Bay, Colville River, and Chandalar-Christian River basins.

Information is limited on the life history of Arctic char in Alaska lakes, however, in other areas, char often exist in two different forms in the same lake characterized by different growth rates, size at maturity, and average size. These distinct forms are believed to reflect different habitat and food selections. Growth is slow for Arctic char in Alaska's cold, often nutrient-poor lakes; although char some Arctic char have been known to live for over 20 years. Maximum size varies greatly, depending on the productivity of the particular lake and the presence of other fish species (DeCicco 1994).

Spawning takes place in lakes between August and October. Most char are ready to spawn between six to nine years of age, and individuals usually spawn only every other year. Eggs are fertilized and deposited over non-uniform substrate or gravel shoals. Spawning sites are also chosen based on water depth, as thick ice can freeze to the bottom in shallower portions of lakes. In some lakes, pre-spawning char congregate near inlet streams or waterways connecting lakes, but they move back into the lake to spawn. The fertilized eggs will hatch after two months, usually before spring. Young Arctic char begin to feed after emerging from the gravel (DeCicco 1994).

Slimy Sculpin

The slimy sculpin (*Cottus cognatus*) occurs in all major drainage basins within the Project area. During the spring spawning season, slimy sculpin move to shallower waters, usually after breakup. Males establish a nest under a rock or log and court females until eggs are deposited in these prepared nests. Females leave after egg deposition and the male guards the nest until the young fish are ready to leave. Eggs hatch about 30 days after fertilization and after about one week, the yolk-sac is absorbed and the sculpin leave the nest as fry. Slimy sculpin reach sexual maturity at around two years of age and have a life expectancy of about five years (Mansfield 2011).

Because of its' poor swimming ability, slimy sculpin is prey for other fish species. It is a nocturnal fish that generally prefers the safety of more complex stream bed habitat, such as rocks and logs. Studies indicate that, due to their potential low tolerance for acidic environments, slimy sculpin is a good indicator species in lakes, ponds, and potentially streams (Mansfield 2011).

Burbot

The burbot (*Lota lota*) are widely distributed in large clear and glacial rivers and lakes throughout Alaska and occur in all major drainage basins within the Project area. They are locally abundant in waterbodies of the Yukon River Region. A long-lived species, burbot over 20 years old have commonly been found in Alaska. This species typically begins to spawn between five and seven years. They spawn in late winter, typically under ice cover and can produce over a million eggs (Holmes 1994b).

Burbot are voracious nocturnal predators, feeding primarily on whitefish, sculpins, and other burbot. They are considered a valuable subsistence and recreational fish (Holmes 1994b). For more information on subsistence activities within the project area, refer to Appendix 5E of Resource Report 5.

Pond Smelt

In the Project area, pond smelt (*Hypomesus olidus)* occur in the Colville River and Prudhoe Bay basins. They are a freshwater species occurring in lakes, rivers and streams and only occasionally enter brackish water. Spawning takes place in early summer in shallow water areas of streams and rivers over pebble substrate and littoral areas of ponds with an organic debris substrate (Morrow 1980).

Round Whitefish

Round whitefish (*Prosopium cylindraceum*) occur throughout the mainland of Alaska and are found in all major drainage basins within the Project area. They prefer shallow areas of lakes and clear rivers and streams and are rarely found in brackish water. The round whitefish has a rounded body with a tiny, pointed snout, single nasal flaps and seldom exceeds 16 inches in length. This species is an important major prey item for many predatory fish species and an important subsistence food for Alaska Natives (Alt 1994a). For more information on subsistence activities within the project area, refer to Appendix 5E of Resource Report 5.

Broad Whitefish

The resident form if the broad whitefish occurs within all drainage basins in the Project area. This life history of this species is similar to the description of the anadromous form in Section 3.2.1.1, except that the resident form is not found in saltwaters (Morrow 1980).

Alaska Whitefish

Within the Project area, the Alaska whitefish (*Coregonus nelsonii*) occurs in the Upper Yukon, Koyukuk, and Tanana river basins. They are primarily found in rivers and streams and there is some evidence that suggest anadromous populations occur in the Yukon River (Mecklenberg et al. 2002). Spawning occurs from late September through October in clear, moderately swift streams with a gravel substrate. They generally return to the same spawning grounds year after year and undertake extensive upstream and downstream spawning migrations (Morrow 1980).

Least Cisco

Within the Project area, the resident form of the least cisco (*Coregonus ardinella*) occurs in the Tanana River basin. They are found in a wide variety of freshwater habitats including lakes, sloughs, large rivers and shallow tributaries. Upstream migrations begin shortly after breakup, moving ito lakes and sloughs to feed. In late summer, mature fish move further upstream to spawn. Spawning habitats include clear streams with gravel bottoms, sand and gravel substrate, such as braided reaches of glacial rivers. Diet consists primarily of terrestrial and aquatic insects. Least cisco move down river to overwinter; however, overwintering habitats are largely unknown.

Lake Trout

Lake trout (*Salvelinus namaycush*) are widely distributed in the Project area, occurring in all major drainage basins, however, they are limited to clear, mountain lakes and only occasionally are found in rivers and streams (Mecklenburg et al. 2002). The average maximum age of Alaska lake trout is around 20 years, although they have been known to live longer than 50 years. Eight- to ten-pound fish are typical of Alaska fisheries, although the maximum size attainable may exceed 50 pounds (Bendock 1994).

Lake trout begin to spawn between ages five and eight, and typically spawn only every other year, or less frequently in northern Alaska. Spawning occurs at night between September and October over clean, rocky lake bottoms (Bendock 1994). This species broadcast spawns over the spawning bed, and spawning may involve several males and females (Morrow 1980). Eggs hatch early the following spring, and in the first few years of life, lake trout are believed to feed on plankton (Bendock 1994).

The diet of adult lake trout varies, but commonly includes zooplankton, insect larvae, small crustaceans, clams, snails, leeches, several kinds of fish, mice, shrews, and even occasional young birds. When available, lake trout may feed extensively on other fish species, including whitefish, grayling, sticklebacks, and sculpins (Bendock 1994).

Alaska Blackfish

Alaska blackfish (*Dallia pectoralis*) inhabit waters only in Alaska and eastern Siberia. In the Project area, Alaska blackfish are found in the Colville, Upper Yukon and Tanana river basins. Their uniquely modified esophagus allows for atmospheric gas absorption giving it the ability to survive in small stagnant tundra or muskeg pools, and to survive in moist tundra mosses during extended dry periods. These fish are typically found along the bottom in densely vegetated areas of lowland swamps, ponds, rivers, and lakes (Armstrong 1994).

Alaska blackfish spawn between May to August. Females may release a total of 40 to 300 eggs during spawning, which can occur during several intervals, releasing only a portion of their eggs each time. Eggs adhere to the heavy vegetation and hatch in nine days. The young live off their yolk sacs for about 10 days, depending on water temperature (Armstrong 1994).

Aquatic insects and other small invertebrates are the principal foods of most blackfish. This species is an important subsistence fish for Alaska Natives; because of its high tolerance for low oxygen levels, this fish can be kept alive for long periods with minimal effort and used as needed (Armstrong 1994). For more information on subsistence activities within the project area, refer to Appendix 5E of Resource Report 5.

Northern Pike

The northern pike (*Esox lucius*) is widely distributed in the Project area, occurring in all major drainage basins. They are a top-level predator in aquatic food chains and are highly piscivorous (fish eating). These fish prefer highly vegetated, shallow habitats where they can hide and ambush prey (Morrow 1980). Where northern pike naturally occur in Alaska, they are highly valued as a subsistence and sport fish (Alt 1994b). For more information on subsistence activities within the project area, refer to Appendix 5E of Resource Report 5.

Spawning occurs in the spring soon after the ice goes out. Females are capable of producing up to 500,000 eggs, which are deposited in grassy margins of a lake shore, slow-moving stream, or slough. Eggs hatch after approximately 30 days (Alt 1994b).

Ice-covered, shallow lakes often become depleted of oxygen, causing most Northern pike to overwinter in the deep, slow waters of large rivers. In the spring, northern pike migrate from overwintering areas to spawning grounds, and then to summer feeding grounds, which are generally separated by short distances. Movement during the summer is localized between warm and shallow feeding areas (Alt 1994b).

Northern pike fry feed on small crustaceans and insects. By the time they reach two inches, their diet includes smaller fish. Adult northern pike prey heavily on other fish species and small mammals, including mice, shrews, and muskrats. Young ducklings are also preyed on in some areas (Alt 1994b).

Lake Chub

The lake chub (*Couesius plumbeus*) is the only member of the minnow family (*Cyprinidae*) represented in Alaska. In the Project area, it occurs in the Upper Yukon, Koyukuk, Chandalar-Christian, and Tanana river basins. The lake chub is found in all types of freshwater bodies (lakes and streams), but in Alaska they have been found more often in silty waters. They prefer shallow water, but will move into deeper water during hot weather (Mansfield 2004c).

Once reaching sexual maturity at age three or four, lake chub spawn between spring and early summer. They move to the shallower water of rivers and streams with rocky or gravelly bottom substrates, where the eggs are deposited into crevices in gravel crevices. Eggs are not guarded after fertilization and hatch approximately 10 days later (Mansfield 2004c).

Young-of-the-year and juvenile lake chubs feed primarily on zooplankton. Adult lake chubs feed on terrestrial and aquatic insects, but also feed on algae, occasionally on small fishes, and have been known to scavenge decaying fish. The lake chub is a principle prey item for larger fish and some bird species (Mansfield 2004c).

Sheefish/Inconnu

The sheefish (*Stenodus leucichthys*), or inconnu, is the largest member of the whitefish sub-family (family *Salmonidae*; subfamily *Coregoninae*). In the Project area, sheefish occur in the Upper Yukon, Koyukuk, and Tanana river basins. Sheefish inhabit large rivers and streams with some populations occurring in brackish lakes and delta waters (Mecklenburg et al. 2002).

Sheefish begin spawning generally around spring breakup, migrating to waters between 4 and 8 feet deep with fast current and a differently-sized gravel substrate to ensure that eggs lodge in the gravel crevices and are not carried away by the current (Morrow 1980). Spawning occurs between late-September and early October, generally occurring in the late afternoon and evenings. Sheefish may live to spawn several times and move to migrate to overwintering areas after spawning.

Eggs hatch in early spring before the winter ice breaks up, and rapidly flowing spring meltwater carries juvenile sheefish downstream. The young fish find backwater eddies along the river, off-channel lakes, and estuary regions at river mouths. Juvenile fish feed mainly on insects and other small prey. As they mature, sheefish will feed almost exclusively on other fish (Alt 1994c).

Sheefish are a valuable subsistence resource to rural Alaskans and are also a popular sport fish (Alt 1994c). For more information on subsistence activities within the project area, refer to Appendix 5E of Resource Report 5.

Fourhorn sculpin

Fourhorn sculpin (*Myoxocephalus quadricornis*) occupy cold brackish and moderately saline water near the Arctic coast. In the Project area, they are limited to the Prudhoe Bay and Colville river basins. Movements are typically limited to short onshore-offshore seasonal movements and mass movements of fry into shallow water in autumn. They do not migrate together in large numbers, as movement into freshwater and long distances up rivers are apparently undertaken by relatively few individuals at a time. The species is diurnal from November to April, but is largely nocturnal the rest of the year. Fourhorn sculpin feed on small crustaceans, fishes, and mollusks. Spawning takes place in shallow waters; the male digs a groove in the gravel where pairing and egg laying occur. Adults move to deeper water in the spring, where they stay in summer (Morrow 1980).

3.2.1.3 Seasonal Fish Distribution

The Project area has been well characterized for fishery resources. Since the early 1970s, several fish investigations have been conducted within the Project area in response to construction and operation of TAPS and several other proposed gas pipelines between Prudhoe Bay and the U.S.-Canada border. These studies have documented fish presence, distribution, seasonal abundance, and sensitive in-water periods for fish assemblages in or adjacent to the TAPS alignment area (BLM 2003 and 2010a; DenBeste and McCart 1984; Gnath et al. 2002; Mitchell et all. 1970).

Similar fisheries information was collected along the proposed alignments for other projects envisioned in the 1970s and 1980s, including The Alaska Highway Gas Pipeline (Foothills Pipeline Company), Alcan Gas Pipeline (Alcan Pipeline Company), Northwest Pipeline Company (Chihuly et al. 1980a,b, and 1979a,b, c), Arctic Gas, Trans-Alaska Gas System (Yukon Pacific Corporation), Alaska Natural Gas Transportation System and Alaskan Arctic Gas Study Company (Craig and McCart 1974; Craig and Mann 1974; Van Hyning 1976a and 1976b).

There have been more recent studies of the freshwater fish in Arctic coastal streams east of Prudhoe Bay. These include surveys documenting summer fish distribution in the Badami development area (Winters and Morris 2004), stream crossing surveys for proposed pipeline routes from Point Thomson (ExxonMobil Corporation 2009), and overwintering patterns of Dolly Varden in the Sagavanirktok River (Crane et al. 2005; Hemming 1996; Woodward-Clyde Consultants and Alaska Biological Research 1983).

Federal and state agencies have also conducted studies on fish passage, gravel pit reclamation, pipeline replacement, and other activities associated with TAPS and the oil and gas industry (Winters and Morris 2004; Ott and Morris 1999; U.S. Fish and Wildlife Service [FWS] 1990). Several other pertinent studies unrelated to the oil and gas industry have been conducted within the vicinity of the Project area and are applicable (Brown 2006; Viavant 2005; Ott et al. 1998).

In addition to the studies and data collected above, APP conducted stream surveys from June 17 through September 7, 2010, to document resident and anadromous fish presence or absence in wadeable streams where existing information is incomplete or currently not available. The stream surveys were also conducted to:

- Identify specific stream crossing sites with critical fish habitat (fish spawning and high-value rearing habitat);
- Document general fish habitat characteristics at APP water crossing sites;
- Collect representative water quality parameters important to fish; and

- Describe streambed substrate, riparian vegetation, and stream channel morphology at each crossing site.

Data from the 2010 surveys and the relevant historical data identified above are provided in the following sections and are compiled by the hydrologic basins crossed by the Project. Appendix 3A summarizes the life-stage and distribution of fishes within the major waterbodies crossed by the Project, along with the construction timeframe and preliminary crossing method for the streams. Critical summer and winter habitats have also been noted where present, according to the recommendations of the BLM (2010a) based on their review of inventories and investigations within the vicinity of the Project area. Refer to Section 1.6.4 of Resource Report 1 for a more detailed discussion of waterbody crossing techniques.

Prudhoe Bay Basin

Within the Prudhoe Bay Basin, 121 streams and drainages are crossed by the PT Pipeline and 81 streams and drainages are crossed by the Alaska Mainline. The PT Pipeline runs in an east-west alignment along the Arctic coast between Point Thomson and the GTP. Larger rivers crossed by the PT Pipeline in the Prudhoe Bay Basin include the Shaviovik, Kadleroshilik, Sagavanirktok, and Putuligayuk rivers. At least 11 species of resident and anadromous fish have been documented along the PT Pipeline including ninespine stickleback, rainbow smelt, Dolly Varden, Arctic grayling, broad whitefish, slimy sculpin, least cisco, humpback whitefish and other unknown whitefish species, and pink and chum salmon (Craig and McCart 1974; Hemming 1993 and 1996; Johnson and Kloehn 2009; Winters and Morris 2004; Woodward-Clyde Consultants and Alaska Biological Research 1983; Vivant 2005). The Sagavanirktok River is the only documented waterbody known to support pink and chum salmon for this segment of the pipeline (Johnson and Kloehn 2009). The Project will cross all waterbodies in the Prudhoe Bay Basin during the winter.

The PT Pipeline will also affect lakes and ponds along the Beaufort Coastal Plain, although it avoids most of the deeper and larger ponds and lakes. The distribution of fish in Beaufort Coastal Plain lakes and ponds is relatively widespread. Elliot (1990) noted that lake depth was thought to restrict the presence of fish in Arctic lakes, however, studies indicated that lakes shallower than 7 feet can also be considered potential fish habitat, as 7 feet is considered the maximum depth of ice formation in a winter season. Some species found in lakes included broad whitefish, round whitefish, Arctic grayling, Arctic char, and Alaska blackfish, and ninespine stickleback. The presence of fish in lakes with a depth of less than 7 feet is thought to be due to spring sources at the lake bottom, presence of a deep hole, or tolerance to high salinity and a depressed freezing point resulting from the accumulation of salts during ice formation (Elliot 1990). Elliot (1990) suggested that deepwater habitat suitable for wintering fish was a limiting factor that controls fish species richness and relative abundance in North Slope coastal waterbodies. Arctic grayling and other fish species were present in tributaries to larger rivers (e.g., Sagavanirktok River) that have deepwater overwintering fish habitat and in similar small streams that drain into the Beaufort Sea, where the stream mouth shares a common delta or is in proximity to a large river system.

A water reservoir will be constructed 5 miles south of the GTP to provide water for GTP construction and operation. Pumps will be employed at the edge of the Putuligayuk River to withdraw water from the river and fill the reservoir. The suction to these pumps will be designed to ensure that debris and fish are excluded from the reservoir feed water to the extent practicable. The Alaska Mainline runs south through the Prudhoe Bay Basin from the AMP 0.0

to 172.7, and also enters the Colville River Basin for approximately 1 mile as discussed in the Colville River Basin section below. Extensive freshwater fish investigations have been conducted between Prudhoe Bay and Atigun Pass in association with the construction and operations of TAPS (Alyeska Pipeline Service Company [APSC] 2002; BLM 2002 and 2010). Major waterbodies crossed by the Alaska Mainline in the Prudhoe Bay Basin include the Putuligayuk and Kuparuk rivers. Only side channels and tributaries to the Sagavanirktok River are crossed. At least 15 species of fish have been documented in these systems including burbot, lake trout, Arctic char, round whitefish, Arctic cisco, ninespine stickleback, rainbow smelt, Dolly Varden, Arctic grayling, broad whitefish, slimy sculpin, least cisco, humpback whitefish, and pink and chum salmon (APSC 2002; BLM 2002; Gnath et al. 2002; Hemming 1993; Johnson and Kloehn 2009; Winters and Morris 2004; Ott and Morris 1999). The most common species include Dolly Varden, broad whitefish, Arctic cisco, and Arctic grayling. Least cisco and humpback whitefish are less common and do not represent large spawning stocks (Craig 1984). From AMPs 0.0 to 165.0, waterbody crossing construction will occur in winter.

Viable overwintering fish habitat in rivers and streams in the North Slope region includes deep pools with low velocities, areas of groundwater upwelling, coarse rock substrates, side channels, backwater sloughs, and beaver ponds (Reynolds 1997). Typically, larger streams and river systems possess many of these habitats, and are known to support fish populations year-round. Therefore, APP has assumed overwintering habitat exists in the larger streams and rivers crossed by the Project. Smaller streams, those that typically freeze solid during the winter months, do not provide overwintering habitat. However, many streams crossed by APP fall between these two categories, and limited data exists on the presence of overwintering fish and potential overwintering fish habitat in these streams. APP conservatively assumes that overwintering habitat exists within the Putuligayuk, Sagavanirktok, and Kuparuk rivers. Due to weather constraints, Dan Creek was not surveyed in 2010.

Small coastal streams are thought to provide only summer rearing habitat for grayling because winter ice depth eliminates all under-ice water that might be used by overwintering fish. Larger river systems with perennial groundwater sources such as the Shaviovik River provide overwintering habitat. Adult and young-of-the year Arctic grayling were captured in August 2010 in the Shaviovik River. Juvenile grayling found in West Shaviovik Creek and an unnamed creek are thought to be part of the Shaviovik population that disperses to other areas during the summer rearing season.

The Sagavanirktok River is a large river system with spawning, rearing, and overwintering habitat. The Sagavanirktok River and several of the side channels are considered critically sensitive from May through June because of Arctic grayling spawning and from August through October because of anadromous Dolly Varden migration and spawning. The main channel of the Sagavanirktok River is also considered sensitive year-round because it provides spawning, rearing, and overwintering areas for all fish species present. The portion of the Alaska Mainline from approximate AMPs 22.8 to 100.1 primarily runs along the Sagavanirktok River and crosses several of the side channels and tributaries. Side channels of the Sagavanirktok River also provide spawning habitat for chum salmon, and may also support Arctic grayling, Arctic char, round whitefish, ninespine stickleback, and slimy sculpin. These waterbodies are considered sensitive during the May-to-October open-water season (BLM 2010); however, these waterbodies will be crossed in the winter months (BLM 2010).

Between AMPs 148.1 and 165.7, the pipeline crosses the Atigun River and several streams that enter Tea Lake. These waters contain Arctic char, Arctic grayling, burbot, lake trout, slimy sculpin, and round whitefish, and are considered critically sensitive from May to October (i.e., the time when fish present are in the early larval development stage). These waterbodies also provide overwintering habitat for some species and are considered sensitive in November and December (i.e., the time when fish present are in the juvenile stage or older). Streams in this segment are considered sensitive from May to October because these waterbodies provide summer foraging habitat for a number of species, including Arctic grayling and Arctic char. Because of spawning habitat for Arctic grayling, Arctic Char, and Dolly Varden, these tributaries are considered critically sensitive in spring and fall (BLM 2010). Other fish species that inhabit these waterbodies may include slimy sculpin, ninespine stickleback, broad whitefish, and burbot (BLM 2002 and 2005).

Colville River Basin

One minor waterbody, Jill Creek (AMP 140.9), is crossed within the upper reaches of the Colville River Basin. Jill Creek is approximately 3 feet in width at the Alaska Mainline crossing location. Due to its size, it is anticipated the creek will completely freeze during the winter months; therefore, overwintering habitat would not be present. APP sampled the stream for fish species in 2010 and no fish were found.

Chandalar-Christian Rivers Basin

The Chandalar-Christian Rivers Basin is located along the Alaska Mainline between AMPs 172.7 and 180.3. Within this Basin, three intermediate and five minor waterbodies are crossed by the Alaska Mainline. Extensive information on freshwater fish spatial and temporal distribution is available for many stream and river crossings between Atigun Pass and Fairbanks (APSC 2002; BLM 2010, 2005, 2003, and 2002; Gnath et al. 2002; Johnson and Kloehn 2009). Most of this information was collected to support TAPS operation and maintenance activities. At least 19 species of fish have been documented in this basin. APP's 2010 fish survey documented the presence of young-of-the-year, juvenile, and adult Arctic grayling in West Fork of the North Fork Chandalar River. Round whitefish have been documented. BLM (2010) indicates the West Fork Chandalar River downstream from the Project crossing has critical overwintering habitat during the summer from May through October, and critically sensitive in spring and fall because of spawning by Arctic grayling and possibly Dolly Varden.

The Project will cross these waterbodies in the summer using either an open-cut or isolated crossing method. The 2011 overwintering survey did not identify overwintering fish habitat at the Alaska Mainline crossing of the Chandalar River.

Koyukuk River Basin

Within the Koyukuk River Basin, 97 streams are crossed by the Alaska Mainline. Larger rivers crossed by the Alaska Mainline in the Koyukuk River Basin include the Middle Fork Koyukuk River, Slate Creek 1, South Fork Koyukuk River, Jim River, an unnamed creek at AMP 276.3, and Prospect Creek. Fish species within these waterbodies would be similar to those described for the Chandalar-Christian Rivers Basin.

The Dietrich River (AMP 211.6) and the Middle Fork of the Koyukuk River (AMPs 214.0, 228.3, and 230.8) support a fish assemblage consisting of resident Dolly Varden, Arctic grayling, burbot, round whitefish, longnose sucker, and slimy sculpin. Known overwintering areas occur in the Dietrich River and the river is considered critically sensitive year-round. The river's perennial tributaries, located between AMPs 181.5 and 212.1 are considered sensitive habitat during periods of open water, typically May through October (BLM 2010). Waterbodies within the Dietrich River system are not considered anadromous streams.

The Middle Fork and South Fork of the Koyukuk River and several of its tributaries from AMP 212.1 to AMP 263.9 support stocks of anadromous Dolly Varden, chum and Chinook salmon, Arctic grayling, and other species. The Middle Fork of the Koyukuk River is considered critically sensitive rearing habitat year-round, and many of the tributaries and backwaters associated with the system are considered sensitive from April through October (BLM 2010). The pipeline crosses two important anadromous tributaries: Hammond River is crossed at AMP 228.7 and Slate Creek at AMP 244.0. These two waterbodies are considered sensitive during the open-water period.

South of AMP 244.0, the pipeline crosses several streams that provide habitat for chum and/or Chinook salmon, including Minnie Creek (AMP 232.1), Marion Creek (AMP 239.5), the South Fork of the Koyukuk River (AMP 263.9), Jim River (AMP 275.9), Douglas Creek (AMP 277.8), Prospect Creek (AMP 284.7), and the Yukon River (AMP 360.1). These streams are considered critically sensitive throughout the year (BLM, 2010). Non-anadromous streams that support Arctic grayling and numerous minor species are considered sensitive from April through October.

Both winter and summer construction will occur within this basin. Overwintering habitat may be present in the larger rivers described above. At the time of the 2011 overwintering survey, no overwintering habitat was identified where the Project crosses Mary Angle Creek and Rosie Creek, however, the survey did confirm the presence of overwintering habitat in Prospect Creek and the South Fork Bonanza Creek. The 2011 overwintering survey documented unidentified sculpin and unidentified juvenile fish species at Prospect Creek and unidentified juvenile and/or sub-adult fish were observed at South Fork Bonanza Creek.

Upper Yukon River Basin

Within the Upper Yukon River Basin, 41 streams are crossed by the Alaska Mainline; few of these streams are anadromous streams. Larger rivers crossed by the Alaska Mainline in the Upper Yukon River Basin include the Yukon River and Hess Creek. The Yukon River supports runs of Chinook and coho salmon and also provides habitat for the Arctic lamprey. Chum salmon have been reported in Hess Creek (AMP 385.3). Fish species within these waterbodies would be similar to those described for the Chandalar-Christian Rivers Basin. Overwintering habitat is present in each of these waterbodies. The crossing method for Hess Creek is an isolated crossing method, and APP plans to cross the Yukon using an aerial span as the primary method.

Tanana River Basin

Major waterbodies in Tanana River Basin include the Salcha, Gerstle, Little Gerstle, Robertson, and Tanana rivers; and the Sears, Chief, Yerrick, Bitters, Beaver, Gardiner, and Scottie creeks. Fourteen species of fish have been documented within this basin along the Alaska Mainline including the Arctic lamprey, longnose sucker, northern pike, burbot, lake chub, Dolly Varden, Arctic grayling, slimy sculpin, innconnu, and round and Alaska, whitefish species, and Chinook, coho, and chum salmon (APSC 2002; BLM 2010, 2005, 2003, and 2002; Gnath et al. 2002; Johnson and Kloehn 2009). The Alaska Mainline does not cross the Goodpaster River and

Clearwater Creek drainages, but both drainages are recognized as providing high-value coho rearing habitat (Johnson and Kloehn 2009). Both winter and summer construction will occur within this basin.

Chum salmon have been reported in the Tolovana River (AMP 405.7). Most streams in this area support Arctic grayling and numerous other species, including whitefishes, slimy sculpin, longnose sucker, northern pike, and burbot. These waterbodies are considered sensitive from May through October. The Tolovana River supports anadromous fish approximately 25 miles downstream of the Alaska Mainline crossing site (ADFG 1999). The Chatanika River (AMP 445.1) provides critically sensitive year-round habitat for Chinook and chum salmon and whitefish (BLM 2010).

The Tanana River (AMPs 538.1 and 666.1) is a major tributary to the Yukon River and supports a diverse fish population. Chinook, coho, and chum salmon are found in the Tanana River and considered to be Yukon River stocks. Arctic grayling, Dolly Varden, round whitefish, humpback whitefish, least cisco, northern pike, burbot, longnose suckers, slimy sculpins, lake chubs, Arctic lamprey, and sheefish are also found in the river and several tributary streams. Arctic grayling is the most popular species for sport fishing in this area.

Chinook salmon from the Tanana River drainages comprise about 20 percent of the Yukon River Chinook salmon run. Chinook salmon arrive in the Tanana River as far as Fairbanks and areas upstream in early July, and are known to spawn in the Salcha River (AMP 502.0). Coho salmon spawn in several clear water tributaries of the Tanana River (Johnson and Weiss 2007).

Little Salcha River (AMP 497.0), Salcha River (AMP 502.0), Redmond Creek (AMP 506.1), and Shaw Creek (AMP 526.2) contain some of the most productive salmon spawning and rearing grounds in Interior Alaska and support extensive commercial, sport, and subsistence fisheries. The Little Salcha River and the Salcha River support Chinook salmon and a summer run of chum salmon. Salcha River salmon travel about 950 miles from the Bering Sea to the mouth of the Salcha River. A major chum salmon spawning area is located just downstream of the Tanana River (AMP 538.1) crossing at the confluence of the Tanana and Delta rivers (ADFG 2008). The Salcha and Tanana rivers and Shaw Creek provide critically sensitive year-round habitat for salmon and whitefish. The Little Salcha River provides critically sensitive overwintering habitat from November through April, and sensitive habitat the rest of the year (BLM 2010). Most of the creeks crossed by the pipeline empty into the Delta River, which supports anadromous fish near its confluence with the Tanana River. Resident fish in these waterbodies include Arctic grayling, Dolly Varden, round whitefish, humpback whitefish, northern pike, burbot, longnose suckers, slimy sculpins, and Arctic lamprey (ADFG 2008).

The Tok River (AMP 660.0) is an anadromous waterbody that supports a small run of chum salmon and also has resident and overwintering populations of Arctic grayling, Dolly Varden, whitefish, burbot, northern pike, and sculpins. From the second Tanana River crossing at AMP 666.1 to Beaver Creek (AMP 700.1) several small tributary streams are crossed. Small populations of Arctic grayling, whitefish, burbot, and slimy sculpins are found in Bitters Creek (AMP 688.6) and Bear Tree Creek (AMP 690.5).

The streams between Beaver Creek (AMP 700.1) and Little Scottie Creek (AMP 742.7) discharge into the Chisana River, a large tributary stream of the Tanana River. The Chisana River derives flow from glaciated valleys of the Wrangell Mountains. Flow in the river is highly turbid during the summer months and clear during the winter. The predominate fish species in the streams crossed in this area is the humpback whitefish (Brown 2006). Northern pike and Arctic grayling also inhabit streams in this section of the Project area.

Additionally, the 2010 overwintering survey indicated Barry Creek has suitable overwintering fish habitat, although no fish were observed during the survey.

3.2.1.4 Sensitive Fish Species

BLM-Sensitive and "Watch" List Species

The BLM has established procedures for the management of species and associated habitats that are designated as sensitive. These procedures were developed to initiate conservation actions for such species before listing pursuant to the Endangered Species Act (ESA) is warranted and to improve the status of such species so that their BLM-sensitive recognition is no longer warranted.

In implementing its obligations under the Federal Land Policy Management Act, the BLM also designates sensitive species and implements measures to conserve certain species and their habitats on BLM land. All federally designated candidate species, proposed species, and delisted species in the five years following their delisting are conserved as BLM-sensitive species.

In accordance with the Federal Land Policy Management Act, BLM State Directors designate species within their respective holdings as BLM-sensitive by using the following criteria. Species designated as BLM-sensitive must be native species found on BLM-administered lands for which the BLM has the capability to significantly affect the conservation status of the species through management, and either:

- Information that a species has recently undergone, is undergoing, or is predicted to undergo a downward trend such that the viability of the species or a distinct population segment of the species is at risk across all or a significant portion of the species range; or
- The species depends on ecological refuge or specialized or unique habitats on BLM-administered lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk.

Table 3.5.2-1 identifies the fish species the BLM has listed as sensitive on BLM-managed land or are on the "watch" list, which may occur on BLM-Managed lands, but have not been documented. The Kigluaik Mountain Arctic char, Beaver Creek Chinook salmon, and Clear Creek chum salmon occur outside the Project area and will not be impacted by the Project; however, the Alaskan Brook lamprey is found within the Project area and is described in Section 3.2.1.2. [Note: APP will consult with the BLM to determine the potential these species have to inhabit waterbodies crossed by the Project on BLM-managed land and this information will be updated accordingly in the final report.]

TABLE 3.2.1-3

Alaska Pipeline Project
BLM Sensitive and "Watch" List Fish Species on BLM-Managed Lands

Common Name	Species Range	Presence in Project Area
Kigluaik Mountain Arctic char[1]	Brooks Range	Not Present: Kigluaik Mountain Arctic char occur in isolated lakes in the Kigluaik Mountains and does not occur within any of the major drainage basins crossed by the Project.
Alaskan Brook lamprey[1]	Tanana River Basin	Present: This species is present in the Tanana River Basin. Refer to Section 3.2.1.2 for species description.
Beaver Creek Chinook salmon[2]	Yukon River Basin	Not Present: Beaver Creek is a tributary to the Yukon River in the Upper Yukon River drainage basin; however, the Project does not cross the Beaver Creek watershed.
Clear Creek chum salmon[2]	Yukon River Basin	Not Present: Clear Creek is in the Tanana River drainage basin; however the Project does not cross the Clear Creek watershed..

1 BLM-listed sensitive species known to occur on BLM managed lands in Alaska.

2 BLM "watch" species, which might occur on BLM-managed lands in Alaska, but not documented.

3.2.2 MARINE FISHERIES

Prudhoe Bay and the Beaufort Sea are home to many marine fishes, cetaceans (i.e., whales), pinnipeds (i.e., fin-footed animals such as seals, sea lions, and walrus), and mammals. Marine mammals found within the Project area are described under Section 3.4.2; marine mammals that occur in the Project area and are afforded protection under Section 7 of the ESA are described in Section 3.5.1 of this resource report. The following sections describe the existing marine environment and the fish species that inhabit the Project area.

3.2.2.1 Existing Marine Environment

The Arctic coastline is irregular, containing many small bays, lagoons, spits, beaches, and barrier islands. Mud flats or depositional deltas extend from river deltas of the rivers. Most of the coastline is low lying, and some areas are directly exposed to the open ocean, while other areas are protected by the barrier islands (NOAA 2010).

The Beaufort Sea is covered with ice for about nine months each year. By mid-July, the Beaufort is usually ice-free from the shore to the edge of the pack ice, which by late summer, retreats from 6 to 60 miles offshore (NOAA 2010). Both the dredge and disposal areas as described in Section 1.3.3.1 of Resource Report 1 are in the shore-fast ice zone where ice cover is relatively stable and continuous from shortly after freeze-up (October) to just before breakup (late-May/early June).

At the beginning of the open-water season, during and following breakup in coastal rivers and melting of sea ice, there is a stratified water column with a less saline surface water layer that can be as deep as 13 feet, and which overlays a marine water layer. As the winds from the east increase and temperatures rise following breakup each year, the water column mixes along the Project area coastline, creating a brackish water environment. As river flow drops in mid- to late summer, water column salinity increases to a more marine condition (URS 1999).

Nearshore coastal environments in the Project area are strongly influenced by water circulation patterns and are complex and highly variable during the open-water period (Tekmarine 1983; URS 1999). On the inner-shelf in water depths of less than 130 feet (40 meters), currents are predominantly wind-driven and undergo dramatic seasonal changes due mainly to buildup of land-fast ice. Hydrographic conditions (salinity and temperature) of nearshore waters are strongly influenced by proximity to rivers and by meteorological conditions. The dominant factor driving circulation of nearshore waters is wind-stress, with water level variations and water density gradients having lesser influence. Nearshore currents generally run in an east-west direction, parallel to the local bathymetry and in the same direction as the prevailing wind stress on the water surface.

Although gravel makes up the substrate around the bases of several of the barrier islands, the overlying sediment covering most of Prudhoe Bay and nearby coastal waters consists primarily of fine silt (21 percent), silt (16 percent), very fine sand (20 percent), and fine sand (28 percent) (Busdosh et al. 1985). Existing sediment data near West Dock indicate that material within the dredge area consists of a 0.5- to 6-foot-thick layer of sandy and clayey silt at the seafloor, underlain by gravelly to silty sand (McClelland-EBA 1985; McDougall et al. 1986; Osterkamp and Harrison 1976). Sediment chemical data collected for past maintenance dredging operations along West Dock (Kuhle 2010; Oasis 2006) do not indicate the presence of contamination from petroleum hydrocarbons. Observed metals concentrations are mostly within the natural variability of background values reported for Beaufort Sea coastal sediment (Neff 2010; Trefry et al. 2003).

Low densities of kelp (0.03 to 0.23 plants per square meter) are present within the Prudhoe Bay area. Kelp is typically 30 to 120 centimeters in length. Nearly half of the kelp within the Prudhoe Bay area is attached to substrate such as rock, pebbles, or shells (Busdosh et al. 1985).

[Note: This section will be updated with the information from the APP sediment sampling survey in final report.]

3.2.2.2 Marine Fishes

Anadromous fish species in the Beaufort Sea in the vicinity of the Project area are discussed in Section 3.2.1.1. Other major fish species include Arctic cod, Arctic flounder, saffron cod, and snailfish, which are described below.

Arctic cod

Arctic cod (*Arctogadus glacialis*) is widely distributed in the western part of the Arctic basin, as well as off the northwest and northeast coasts of Greenland, ranging between 85°N and 72°N latitude. Arctic cod can be found at depths of up to 1,000 meters, and are frequently found under ice. The fish prefers living close to the seafloor at depths of 15 to 40 meters, but it sometimes enters estuaries (Mecklenburg et al. 2002).

Arctic cod are a primary food source for narwhals, belugas, ringed seals, and seabirds. It is also preyed upon by other fishes such as Arctic char. The species is of minor commercial value (Mecklenburg et al. 2002).

Arctic flounder

Arctic flounder (*Liopsetta glacialis*) is a nearshore species that favors shallow depths on mud bottoms. It is often found in brackish water, and frequently enters freshwater. Arctic flounders feed on small fishes and benthic invertebrates. The fish typically moves inshore in the evenings, especially on a rising tide, and appear to move offshore in the fall and inshore in the spring (Fruge et al. 1989). Spawning occurs every two years and usually takes place in coastal areas from January to March, but can be as late as May in some regions (Morrow 1980).

Saffron cod

The saffron cod (*Eleginus gracilis)* is typically found in shallow coastal waters less than 200 feet deep in the Arctic, and less than 165 foot deep in the northeastern Bering Sea and western Alaska (Mecklenburg et al. 2002). The fish also enters brackish and freshwater habitats, and have been observed considerable distances up rivers and streams, but remaining within regions of tidal influence. Migrations are not extensive. The juveniles are not migratory and remain in shallow water throughout the year whereas adults undertake restricted seasonal migrations associated with spawning, feeding, and changes in water temperature.

In early winter, the fish move from the coast or estuaries into adjacent sand-pebble areas for spawning. After spawning, they return to silty bottoms or estuarine areas where they feed. They spend the winter under the ice cover and in early spring when the water warms, they move offshore to the cold and highly saline waters of the open sea. Adults are opportunistic epibenthic feeders; juveniles feed on fish, mysids, decapods, and amphipods. Feeding starts in summer and continues until the winter spawning. Feeding is then reduced and resumes in mid-winter after reproduction.

Snailfish

Snailfish have elongate, tadpole-like bodies. Their heads are large with small eyes and their bodies are slender to deep, tapering to a very small tail. The extensive dorsal and anal fins may merge or nearly merge with the tail fin. Snailfish are scaleless with a thin, loose gelatinous skin; some species, such as the spiny snailfish (*Acantholiparis opercularis*) have prickly spines as well. Their teeth are small and simple with blunt cusps.

Snailfish larvae captured in the Prudhoe Bay area during summer may have originated from spawning at the "Boulder Patch" in Stefansson Sound, where during late winter divers have observed snailfish adhesive eggs on adult kelp fronds and hard substrates, and planktonic larvae that appeared to be snailfish (Jarvela and Thorsteinson 1999).

3.2.3 ESSENTIAL FISH HABITAT

The Magnuson Fishery Conservation and Management Act of 1976, which has been renamed the Magnuson-Stevens Fishery Conservation and Management Act (MSA), was enacted, along with other goals, to promote the protection of Essential Fish Habitat (EFH) in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. As defined by the Magnuson-Stevens Fishery Conservation and Management Act EFH are those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of EFH, "waters" include aquatic areas that are used by fish and their associated physical, chemical, and biological properties, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and a healthy ecosystem; and, "spawning, breeding, feeding, or growth to maturity" covers a species' entire lifecycle.

Fishery management plans (FMPs), prepared by Fishery Management Councils, identify and describe the habitat areas of particular concern within the EFH. The North Pacific Fishery Management Council has prepared and implemented five FMPs for fisheries off Alaska. The Arctic FMP is the only federally administered FMP in the Project area.

[Note: An applicant-prepared EFH Assessment will be provided in the final report as Appendix 3B, filed under separate cover marked: **"CONTAINS PRIVILEGED INFORMATION – DO NOT RELEASE."**]

3.2.3.1 Marine Essential Fish Habitat

The Arctic FMP governs commercial fisheries or commercial harvests of fish resources in U.S. waters of the Chukchi Sea and Beaufort Sea, which is referred to as the Arctic Management Area. The geographic extent of the Arctic Management Area covers all marine waters in the U.S. Exclusive Economic Zone (EEZ) of the Chukchi and Beaufort Seas from 3 nautical miles offshore the coast of Alaska or its baseline to 200 nautical miles offshore, north of the Bering Strait. Implementation of the Arctic FMP on August 20, 2009, closed the Arctic Management Area to commercial fishing until such time in the future that sufficient information is available with which to initiate a planning process for commercial fishery development (NOAA Fisheries 2011).

Another FMP for Salmon was developed to prohibit fishing for salmon in the EEZ. A revision to the Salmon FMP in 1990 deferred all regulation of the sport and commercial fisheries in the EEZ to the State of Alaska. Therefore, the ADFG now regulates EFH for salmonid fisheries within the State of Alaska (NOAA Fisheries 2011).

Within the Project area, which includes the West Dock dredging area and dredge disposal area, EFH has been designated for Arctic cod and salmon (Figure 3.2-2). No Habitat Areas of Particular Concern or EFH Areas Protected from Fishing are located in the Project area.

3.2.3.2 Freshwater Essential Fish Habitat

In Alaska, EFH encompass all streams, lakes, ponds, wetlands, and other waterbodies currently or historically accessible to fish. The locations of freshwater waterbodies used by anadromous fish are described in the Catalog and Atlas as described in Section 3.2.1.1. APP reviewed the Catalog and Atlas (ADFG 2011a and 2011b) to determine the location of EFH-species, and the life-stages of fish, shellfish, and mollusks known to populate designated EFH in the Project area. Designated EFH stream reaches crossed by the PT Pipeline and Alaska Mainline are provided in Table 3.2.3-1, along with the fish species and their associated life-stages, and preliminary crossing method.

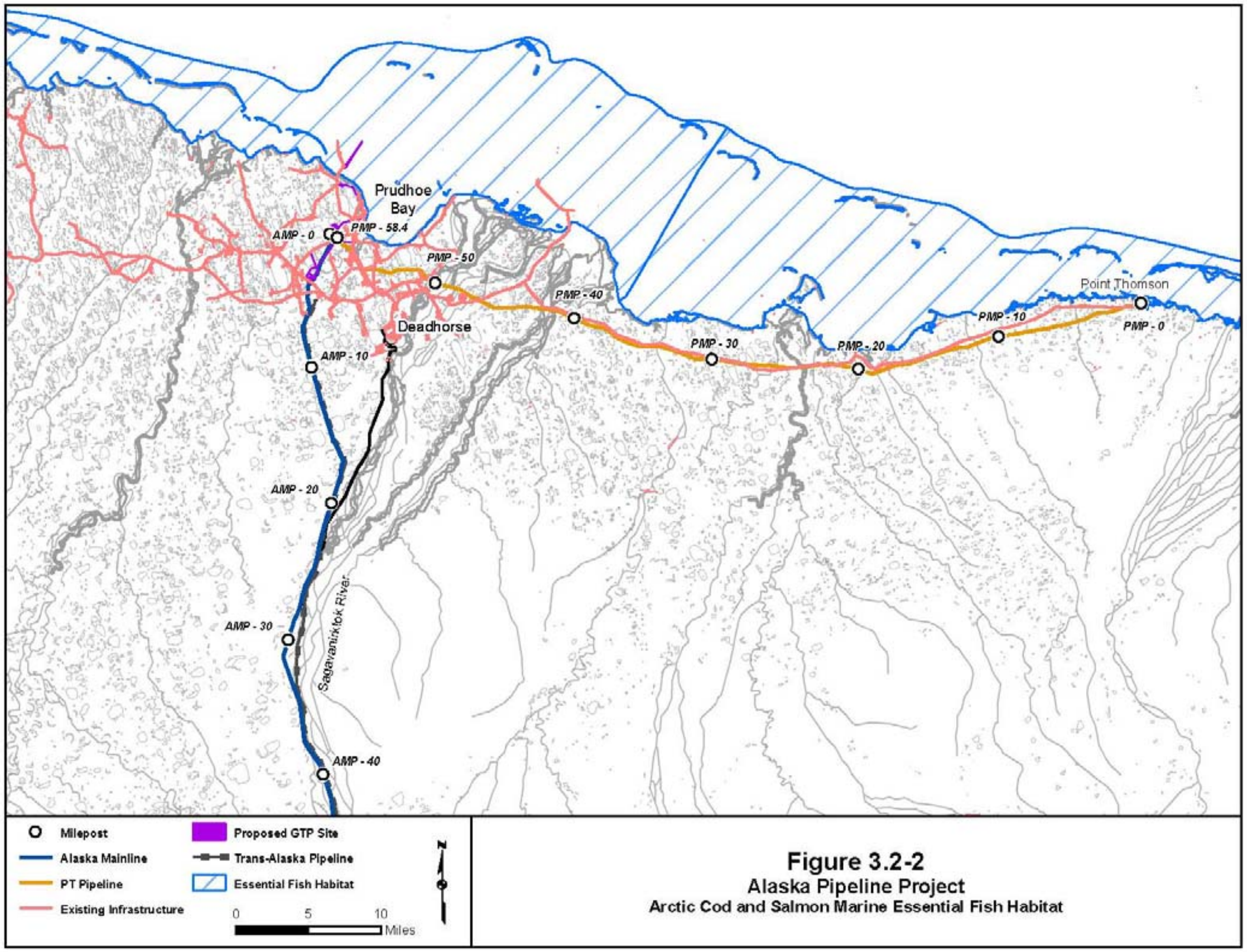

Figure 3.2-2
Alaska Pipeline Project
Arctic Cod and Salmon Marine Essential Fish Habitat

TABLE 3.2.3-1

Alaska Pipeline Project
Freshwater Essential Fish Habitat Crossed by the Project

Milepost	Water Body Name	Anadromous Catalog and Atlas Number	Species	Preliminary Crossing Season/Method
PT Pipeline				
17.7	East Badami Creek	330-00-10290	DVr2	Winter/OC
22.9	No Name River	330-00-10300	DVr2	Winter/OC
23.7	Shaviovik River – Main Channel	330-00-10310-2006	DVp2, PSs2	Winter/OC
25.3	Unnamed tributary to Shaviovik River	330-00-10330-2006	DVr2	Winter/OC
25.6	Unnamed tributary to Shaviovik River	330-00-10330-2006	DVr2	Winter/OC
25.8	Unnamed tributary to Shaviovik River	330-00-10360-2006	DVr2	Winter/OC
33.5	Kadleroshilik River	330-00-10320	DVr2	Winter/OC
40.1	East Sagavanirktok Creek	330-00-10330	BW1, DVr2	Winter/OC
41.8	Sagavanirktok River - Main Channel	330-00-10360	BCp2, DSp2, DVr2, PSs2,	Winter/OC
50.1	Sagavanirktok River - West Channel	330-00-10361	BCp2, CSp2, DSp2, DVr2, PSp2, WFp2	Winter/OC
56.4	Little Putuligayuk River	330-00-10415-2001	BCp2, DVp2, WFp2	Winter/OC
57.4	Putuligayuk River	330-00-10415	BCr2, CAr2, CSr2, DVr2, OMp2, WFp2	Winter/OC
Alaska Mainline				
4.2	Putuligayuk River	330-00-10415	BCr2, DVr2	Winter/OC
86.7	Unnamed tributary to Sagavanirktok River – Side Channel	330-00-10360-2380-3006	DVp2	Winter/OC
87.3	Unnamed tributary to Sagavanirktok River – Side Channel	330-00-10360-2380	DVp2	Winter/OC
91.2	Dan Creek	330-00-10360-2390	DVp2	Winter/OC
151.4	Vanish Creek/Holder Creek	Documented in APP field studies	DVp2	Winter/OC
214.0	Middle Fork Koyukuk River	334-40-11000-2125-3912	DSp2, INp2, KSp2, WFp2	Summer/OC
214.3	Middle Fork Koyukuk River	334-40-11000-2125-3912	DSp2, INp2, KSp2, WFp2	Summer/OC
228.3	Middle Fork Koyukuk River	334-40-11000-2125-3912	DSp2, INp2, KSp2, WFp2	Summer/OC
228.7	Hammond River	334-40-11000-2125-3912-4135	DSr2, KSp2,	Summer/OC
230.8	Middle Fork Koyukuk River	334-40-11000-2125-3912	DSp2, INp2, KSp2, WFp2	Summer/OC
232.1	Minnie Creek	334-40-11000-2125-3912-4128	KSr2	Winter/OC
239.5	Marion Creek	334-40-11000-2125-3912-4112	DSs2, KSr2, KS1	Winter/OC
244.0	Slate Creek	334-40-11000-212503912-4100	DSp2, KSp2	Winter/OC
263.9	South Fork Koyukuk River	334-40-11000-2125-3740	DSs2, KS1, KSp2, KSr2, WFp2	Winter/Isolated
275.9	Jim River	334-40-11000-2125-3740-4080	DSs2, KSs2	Winter/Isolated
276.0	Unnamed tributary to Jim River	334-40-11000-2125-3740-4080	DSs2, KS1, KSs2	Winter/OC

TABLE 3.2.3-1

Alaska Pipeline Project
Freshwater Essential Fish Habitat Crossed by the Project

Milepost	Water Body Name	Anadromous Catalog and Atlas Number	Species	Preliminary Crossing Season/Method
276.3	Unnamed tributary to Jim River	Documented in APP field studies	KS1	Winter/OC
277.8	Douglas Creek	334-00-11000-2125-3740-4080-5062	KS1, KSr2	Winter/OC
284.7	Prospect Creek	334-40-11000-2125-3740-4080-5030	KS1, KSr2	Winter/Isolated
360.1	Yukon River	334-45-11000	DSp2, INp2, KSp2, SSp2, WFp2	Winter/Aerial/Horizontal Directional Drilling (HDD)
385.3	Fish Creek	Documented in APP field studies	DS1	Winter/OC
385.3	Hess Creek	Document in APP field studies	DS1	Winter/Isolated
445.1	Chatanika River	334-40-11000-2490-3151-4020	DSp2, KSpr2, SSp2	Winter/Isolated
474.8	Chena River	334-40-11000-2490-3301	DSs2, KSp2, KSr2	Winter/HDD/OC
497.0	Little Salcha River	334-40-11000-2490-3325	DSp2	Winter/Isolated
502.0	Salcha River	334-40-11000-2490-3329	DSs2, KSsr2	Winter/HDD/OC
506.1	Redmond Creek	334-40-11000-2490-3329-4050	KSr2	Winter/OC
526.2	Shaw Creek	334-40-11000-2490-3375	DSp2, KSp2, SSp2	Winter/Aerial
538.1	Tanana River	334-40-11000-2490	DSp2, KS2, SSp2	Winter/HDD/Aerial
666.0	Tok River	334-40-11000-2490-3660	SSp2	Winter/OC
666.1	Tanana River	334-40-11000-2490	DSp2, KSp2, SSp2	Summer/HDD/OC

Notes: Several waterbodies are identified by a proper name and others that share a proper name with a different waterbody; therefore, the Alaska anadromous Catalog and Atlas number have been included in the table.

Species Codes:

DV – Dolly Varden	CA – Arctic cisco	CS – Least cisco
BC – Bering cisco	PS – Pink salmon	DS – Chum salmon
KS – Chinook salmon	SS – Coho salmon	RS – Sockeye salmon
BW – Broad whitefish	OM – Rainbow smelt	AL – Arctic lamprey
IN – Inconno (sheefish)	WF – whitefish	
Life-stage Codes:	m-migration	p-present
r-rearing	s-spawning	
Source Codes:		
1 – 2010 & 2011 APP survey data	2 – ADFG Anadromous Waters Catalog	

OC - Open-cut conventional method; HDD - Horizontal directional drill; ISOLATED - Isolated open-cut method; AERIAL - Aerial crossing method

Several waterbodies in Table 3.2.3-1 are identified by a proper name and others that share a proper name with a different waterbody; therefore, the Alaska anadromous Catalog and Atlas number have been included in the table[7].

3.2.4 CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

3.2.4.1 Inland Freshwater Fisheries Impacts and Mitigation

The construction and operation of the Project has the potential to directly and indirectly impact fisheries resources. These impacts could result from the installation of the pipeline across waterbodies, blasting, water withdrawal, development of access roads, and inadvertent releases.

The construction schedule is presented in Figure 1.5-1 of Resource Report 1. Construction will occur over multiple winter and summer seasons. In most cases, this approach will allow flexibility to install the pipeline using the most practical and efficient construction method during the least sensitive fishery timeframe. The following crossing methods are proposed and are described in more detail in Section 1.6.3.2 of Resource Report 1 and in APP's Wetland and Waterbody Construction and Mitigation Procedures (Procedures) in Appendix 1K:

- Standard open-cut crossing method;
- Isolated crossing methods (e.g., flume, dam and pump, channel diversion);
- Horizontal Direction Drill (HDD) method; and
- Aerial-span method.

Appendix 2B of Resource Report 2 provides a list of waterbody crossings, including the preliminary associated crossing method and construction timing. The majority of the waterbodies are planned to be crossed utilizing the standard open-cut method. Lakes and ponds capable of supporting resident fishes along the Arctic Slope are planned to be crossed using a standard open-cut crossing method during winter conditions. [Note: APP will provide an update of the lakes/ponds expected to have fish in the final report.]

Installation of the pipeline using the methods listed above, and construction of access roads across waterbodies, in addition to the operation of the pipeline could result in fisheries impacts. The following sections provide an evaluation of the Project activities described in Resource Report 1 with the respect to the following effects:

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7 All streams, rivers, and lakes specified in the Catalog and Atlas have a unique identifying number. The first six digits consist of a three-digit number and a two digit number separated by a hyphen. The number set is derived from the 1982 ADFG statistical fishing district number identifying the body of saltwater to which the system drains. Although fishing district numbers used by the ADFG Commercial Fisheries Division have changed periodically since 1982, the numbering system in the Atlas and Catalog remains based on the 1982 statistical area boundaries in order to maintain a unique number for each specified waterbody over time. First-order streams, which flow directly into saltwater, are identified by a five-digit suffix added to the two-part fish district number into which the stream flows. For each first order stream, this five digit suffix begins with the number "1." For example, Canning River is "330-00-10210," where "330-00" identifies the statistical fishing district in the Beaufort Sea and "10210" is the first order stream in that district. A stream branching from a first-order stream (i.e., a second-order stream) carries the same base number plus a four-digit number indicating a specific tributary. For example, Tamayariak River has the four-digit number "2015," indicating that the tributary branches to the left as viewed upstream on the Canning River. The last digit of a number sequence will be even if it branches to the right and odd if it branches to the left (Johnson and MaClean 2004).

- Fish mortality;
- Change in spatial/geographic distribution; and
- Habitat suitability.

These effects are described in terms of construction and operation phases of the Project.

APP will consult with the BLM and ADFG to determine which streams have a summer, early fall, or winter sensitivity at Pipeline Facilities crossing locations. If critical or sensitive habitat is present at or near the crossing, APP will work with these agencies as appropriate to jointly develop waterbody construction and mitigation plans for identified sensitive waterbodies.

Based on the existing baseline conditions, construction schedule, and mitigation measures that will be implemented during construction, the overall effect of the Project on inland freshwater fishery resources is anticipated to be negligible[8] to minor.

[Note: APP will update this information with an evaluation of Associated Infrastructure in the final report.]

Fish Mortality

Construction Impacts and Mitigation

The open-cut and isolated crossing methods have the potential to affect fishery resources. Equipment moving through a stream and the trenching of a waterbody could physically injure fish, disperse fish, damage fish eggs and substrate in spawning areas, and affect fish forage species.

The open-cut method can be executed in the shortest duration, usually requiring 24 to 48 hours to complete. Based on these considerations, the impacts of the open-cut method, which is the primary method to be used for the majority of water crossings, are expected to have a minor contribution to fish mortality.

Some small fish, larvae, and fish eggs could be entrained by water pumps during isolated crossings, such as the dam-and-pump process, water withdrawals for hydrostatic testing and development of ice pads and ice roads, and during diversions of water from the Putuligayuk River into the reservoir at the GTP. APP will reduce these potential effects by performing in accordance with its Procedures, for example, where fish are known to be present or suspected to be present, hoses used for withdrawal will be fitted with intake screening devices to prevent the entrainment of fish. Removal of water from fish-bearing streams will be conducted in accordance with applicable agency consultations and approvals. Impacts will further be reduced by adhering to temporal and spatial restrictions. With the effective implementation of mitigation measures, the potential effects of entrainment and entrapment on fish mortality are expected to be minor.

[8] Impact thresholds are defined as follows:

None: Resource is not within the Project area at the time the activities are occurring and there is no loss of habitat.

Negligible: Resource may be present in the Project area at time of the activity; however the resulting impact on the resource and/or their habitat, if it occurs, would be unmeasurable and insignificant.

Minor: There is a measurable impact to the resource on an individual level (i.e., direct loss of habitat, mortality, disturbance response), but not a population level.

Blasting Impacts

Blasting may be required along segments of the Pipeline Facilities where bedrock is located at or within 7 feet of the ground surface or where standard mechanical excavation within permafrost is not feasible and for development of the GTP water reservoir. Appendix 6B in Resource Report 6 discusses the locations where blasting may be required. In-stream blasting, if required to excavate the pipeline trench, could have acoustic impacts on fisheries resources. Sound pressure waves can change fish behavior, and intense sound pressure waves can injure fish or cause mortality (Hastings and Popper 2005). APP will develop a preliminary blasting plan (refer to the outline in Appendix 6A of Resource Report 6) that outlines the procedures that will be implemented during blasting activities. Necessary permits for in-water blasting will be obtained prior to conducting blasting activities near waterbodies. The construction contractor(s) will incorporate the measures in accordance with the APP's blasting plan. With the implementation of the appropriate mitigation, impacts from blasting are expected to be localized and have a minor effect on fish.

Operations Impacts and Mitigation

None of the proposed operation activities are anticipated to result in fish mortality.

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

In-stream construction, whether by isolated crossing methods (i.e., flume, dam-and-pump) or the open-cut method, could temporarily restrict migrating fish from reaching upstream spawning areas or could potentially delay downstream movement of juveniles. However, the burial of the pipeline itself will not result in a barrier to fish movements at the crossing.

Restrictions to fish movement may also occur when culverts associated with access road and bridges are not properly sized, designed, or maintained. The inability of fish to access spawning habitat could reduce spawning success and recruitment.

As a precaution, APP will design waterbody crossing methods to allow appropriate fish passage in waterbodies and design ice roads and bridges to allow fish passage by using adequately designed culverts per ADFG Permit requirements. APP will consult with the ADFG regarding fish passage under Title 16 to ensure agreeable fish passage measures are implemented during construction and operation of the Project. APP will design culvert crossings of anadromous streams in accordance with NOAA Fisheries document "Anadromous Salmonid Passage Facility Design" and ADFG's Title 16 requirements to ensure agreeable fish passage measures are implemented during construction of the Project. Impacts of implementation of waterbody crossings on the fish movement are anticipated to be localized, temporary, and minor.

Operations Impacts and Mitigation

Operation of the Project has the potential to result in minor, short-term impacts on fish movement. Unfrozen conditions (taliks) are typically encountered in the channel beds of wider Arctic rivers and streams, which could potentially cause frost bulbs to form around the pipeline at stream crossings as described in Resource Report 2. This potential only exists for those river crossings not using the HDD or aerial-span crossing methods. When formed, these frost bulbs have the potential to partially or completely block streams under certain conditions and impede or completely block fish movement between preferred habitats. Other potential impacts from frost bulbs include lowering water temperature that might affect juvenile growth and/or modify migration timing, and impeding inter-gravel flow for egg survival.

APP has identified 15 water crossings in Table 3.2.4-1 that have overwintering fish or fish habitat with the potential to restrict fish passage if frost bulbs are formed.

TABLE 3.2.4-1

Alaska Pipeline Project
Preliminary List of Waterbodies with Fish and Fish Habitat that Could be Affected by Frost Bulb Formation

Name	Location (milepost)	Fish Species Present
Jim River	276.2	BB2, CN1, CN2, CN3, DSs2, GR2, GR3, HW2, KSs2, LS2, NP2, RW2
Prospect Creek	285.0	BB3, CN2, CN3, GR2, GR3, KS2, KSr2, LS2, NP2, RW2
Tolovana River	405.8	AB?2, BB2, CI?2, CN?2, CS?2, DSp2, GR1, GR2, GR3, HW2, IN2, KS2, LW?2, NP2, SS?2
Chatanika River	445.1	AB2, AL2, BB2, BW2, CA?2, CN2, CS?2, DSs2, GR2, GR3, HW2, IN2, KSr2, KSs2, LS2, NP2, RW2, SSp2
Moose Creek	481.5	BB2, CN?2, DSp2, GR2, HW2, LS2, NP2, RW2
Little Salcha River	497.2	BB?2, CN1, CN2, CN3, DSp2, GR1, GR2, KS2, LS?2, NP?2, WF2
Fifty-Three A Creek No. 2	503.5	CN2, DS2
Gerstle River	576.2	GR2
Johnson River	588.4	CN2, GR2, LC2, RW2
Bear Creek	611.7	BB2, CN2, GR2, LS2
Robertson River	621.3	GR2, LC2, RW2
Beaver Creek	699.5	GR2, IN2, WF2
Lethe Creek	701.3	BB2, GR2, LC2, LS2, NP2
Desper Creek	739.2	BB2, GR2, HW2, NP2
Scottie Creek	740.9	BB2, DS2, GR2, HW2, LS2, NP2

Species Codes:

AB Alaska blackfish	AL Arctic lamprey	BB Burbot
BW Broad whitefish	CA Arctic cisco	CI Cisco
CN Slimy sculpin	CS Least cisco	DS Chum (dog) salmon
GR Arctic grayling	HW Humpback whitefish	IN Inconnu (sheefish)
KS Chinook (king) salmon	LC Lake chub	LS Longnose sucker
LW Lake whitefish	NP Northern pike	RW Round whitefish
SS Coho (silver) salmon	WF Whitefish (various species)	

Life-stage Codes:

m Migration	p Present	r Rearing
s Spawning	? Unconfirmed	

Source Codes:

1 2010 & 2011 APP survey data	2 BLM Open File Report 105	3 ADFG Anadromous Waters Catalog
4 2001 Alaska Gas Producers Pipeline Team data	5 Alyeska Environmental Atlas	

Through field surveys, APP has and continues to identify streams that have overwintering fish habitat. For those streams that have the potential for frost bulb development, APP will develop and implement engineering designs based on geothermal modeling to mitigate the potential effects of frost bulb formation on fish migration. Some of the mitigation measures that could be implemented include deeper burial of the pipeline at water crossings, thermal insulation measures, or a combination of both.

Habitat Suitability

Section 3.2.1.3 describes the fish habitat distributed within the Project area, including overwintering fish habitat as identified by the BLM and APP 2010 surveys. The following section describes potential impacts of the Project on this habitat.

Winter is the preferred season for construction along several segments of APP, and is a measure that will reduce impacts on fishery resources. As described in Section 3.2.1.3, most streams crossed by the Alaska Mainline that originate on the north side of the Brooks Range and eventually discharge into either the Sagavanirktok River or Kuparuk River are not considered sensitive or critical during the late fall and winter period, typically from September or October through April. Therefore, winter construction is one measure that will be implemented to reduce impacts on the fishery resources.

The exceptions include the main branch and several side channels of the Sagavanirktok River. For those waterbodies, the critical and sensitive periods are year-round as the waterbodies are specified as being important for the spawning, rearing, or migration of anadromous species (BLM 2010a). These streams in this area will be crossed in winter, as described in Section 3.2.1.3, when the fish are expected to have vacated to overwintering habitats.

In the higher elevations of the Brooks Range on either side of Atigun Pass, these streams will be crossed in the summer. Summer construction is necessary in this area due to the severity of the winter season and winter construction safety issues. Potential construction methods in this segment include the open-cut and isolated crossing methods. The method proposed is based on environmental considerations, constructability constraints (including topographic conditions), and the presence of bedrock.

Most smaller rivers and streams south and west of the Middle Fork Koyukuk River (AMP 230.8) to the U.S.-Canada border (AMP 745.1) are also considered less sensitive to in-stream disturbances during the winter months. The majority of these streams are listed as sensitive for the period of May through October (BLM 2010).

Other than the Atigun Pass area, summer construction is proposed for five other segments as indicated in Table 1.5.1-2 in Resource Report 1.

Construction Impacts and Mitigation

Impacts on fish habitat suitability as a result of streambed alterations will be short-term and minor. Limited amounts of in-stream habitat and shoreline cover will be disturbed as a result of installation of the proposed stream crossings. Streambank vegetation, in-stream woody debris, boulders, and undercut banks may be removed during construction. Fish that utilize these features for cover, rearing, resting, and feeding could be temporarily displaced or will avoid these areas during and immediately after construction. Native material will be backfilled in the streambed and naturally occurring stream scour will remove fine sand and silt particles from the crossing area that were generated during construction. Stream and river crossings will retain a substrate composition similar to upstream and downstream reaches. After the spring runoff period, substrates remaining in the main stem channels will be redistributed to a more natural distribution according to size and material composition (e.g., gravel, cobble, and boulder). Invertebrates will colonize these areas over the following summer.

Sediment and Turbidity

Elevated sediment loads associated with high turbidity can affect fish behavior and physiological processes of fish, but the impacts are short-term and generally minor. Sediment suspended in the water column can be re-deposited on downstream substrates and could potentially bury aquatic macroinvertebrates and other fish food sources. Additionally, downstream sedimentation could affect spawning habitat, spawning activities, eggs, larvae, and juvenile fish survival, as well as benthic community diversity and health. The duration of these effects are temporary and minor as the effects of increased sedimentation and turbidity are typically limited to the period of in-stream work. However, specific-site characteristics including flow velocity, substrate composition, relative disturbance, and other factors could prolong the duration of construction effects.

Deposition of sediment will not decrease the depth or number of pools available for use by fish. In Alaska, the natural stream scour that occurs seasonally in high gradient streams during spring runoff or following heavy rainfall events will remove fine and coarse sediment from riffles and pools. Sediment released as a result of pipeline construction will be removed from the main channel, and deposited in low-gradient side channels and at deltas.

For waterbodies that have no flow or are completely frozen during construction, in-stream construction will not result in substantial suspension of sediments or downstream turbidity or sedimentation. However, as spring runoff increases, frozen backfill material may release small amounts of sediment into the water column, and under initial low-flow conditions, could result in small and localized downstream sedimentation along with naturally occurring turbidity of suspended solids. As springtime flows increase however, sediment deposits will be flushed downstream. Temporary sediment deposits of fine silts may cause localized impacts on fish eggs or larvae residing in redds consisting of course gravel substrates. This impact will be temporary due to eventual high-flow scour caused by spring runoff that will remove fine sediment from the redds. For the majority of the rivers and streams crossed, natural turbidity levels during the spring runoff period are the highest of the year. Sediment discharge during the spring runoff period from winter pipeline construction should not increase suspended solids above natural springtime background turbidity and bedload concentrations.

APP will reduce sedimentation and turbidity impacts on surface waters and aquatic resources by implementing the waterbody crossing and erosion and sediment control measures in its Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) found in Appendix 1K in Resource Report 1. Construction across waterbodies will be completed as quickly as practicable to shorten the duration of sedimentation and turbidity.

The amount of sediment produced by the open-cut method depends on hydrogeomorphic characteristics at the site, including depth and width of the waterbody, current velocity and local turbulence at the site, concentrations of suspended sediment initially at the site and at some distance downstream, particle diameter, specific weight, and settling velocity of the excavated and backfilled materials (Reid et al. 2004). However, an open-cut crossing typically requires the shortest duration of in-stream work and reduces the time of disturbance, which can reduce construction-related sedimentation, turbidity, and overall in-water impacts.

Generally, most streams and rivers are either dry or completely frozen to levels below substrate during the winter. Winter construction through medium and large rivers where flows provide sufficient water to maintain fish over the winter period can have an adverse effect if the overwintering habitat is located in immediate proximity to the crossing. Where overwintering fish habitat is present and construction is scheduled for winter months, APP will implement the timing and construction measures outlined in APP's Wetland and Waterbody Construction and Mitigation Procedures (Procedures) in Appendix 1K in Resource Report 1 and state and federal permits. With open-cut crossings during summer conditions, a temporary, short-term increase in downstream turbidity may occur during in-stream trenching, backfilling, and streambank grading and reclamation. A temporary increase of sediment bedload, and subsequent sedimentation, during the summer waterbody construction may occur in smaller, low-gradient streams, but is not anticipated to result in permanent alteration to existing habitat. Other aquatic organisms, including macroinvertebrates, may be dislodged during instream construction, but re-colonization from natural stream drift will begin to occur soon after reclamation of the streambed. Based on these considerations, the impacts of the open-cut method, which is the primary method to be used for the majority of water crossings, on fish habitat suitability are expected to be minor and temporary. APP will complete in-stream, open-cut construction activities in accordance with the timing and construction measures outlined in APP's Procedures in Appendix 1K in Resource Report 1 and state and federal permits.

Isolated crossings, such as the dam-and-pump or flume methods, will also be constructed at stream crossings. Sedimentation and turbidity impacts associated with isolated methods are generally limited to: 1) Installation and removal of the upstream and downstream dams used to isolate the construction area; 2) water leaking through the upstream dam and collecting sediment as it flows across the work area and continues through the downstream dam; 3) movement of in-stream rocks and boulders to allow proper alignment and installation of the flume and dams; and 4) when streamflow is returned to the construction work area after the crossing is complete and the dams and flume are removed, or when streams thaw in the springtime. Both isolated crossing methods produce less sediment in the water than the open-cut method during summer construction timeframes (Reid and Anderson 1999; Reid et al. 2004).

In general, the HDD crossing methods will not affect aquatic habitat at the crossing sites; however, additional land area is required for this crossing method. Erosion control measures will be implemented as appropriate to reduce sediment discharge into the waterbody from work areas. If wooded areas are present between the drill entrance and exit points, a line-of-sight path will be cleared to establish an unobstructed view between the drill rig and the river and to lay down HDD guidance system wires. HDD guidance system wires are required for drill control and drill head monitoring. Clearing will be limited to the area required for the HDD operations including the width needed. In most cases, water for drill mud production will be acquired from the river being crossed. Although water will be pumped from the river to the drill rig and mixed with dry bentonite to form the drilling mud, the amount of water used during drilling will be inconsequential compared to anticipated flow volumes of the rivers crossed.

Although the HDD method avoids most in-stream impacts because it eliminates the need for in-stream excavation, it does not completely eliminate the possibility of impacts on aquatic resources due to the possibility of an inadvertent release of drilling mud or fluid into the waterbody. Drilling mud primarily consists of water mixed with bentonite, which is a naturally occurring clay material. Other possible additives may include solid materials (e.g., sawdust, nut shells, bentonite pellets, or other commercially available products) that could serve to plug an inadvertent release.

Drilling mud, such as bentonite is non-toxic (Breteler et al. 1985; Sprague and Logan 1979); however, bentonite, as with fine particulate material, can interfere with oxygen exchange by the gills of aquatic organisms (U.S. Environmental Protection Agency [EPA] 1986). The degree of interference generally increases with water temperature (Horkel and Pearson 1976). Impacts are expected to be limited to individual fish in the immediate vicinity of the inadvertent release.

The effects of an inadvertent in-stream drilling mud release on spawning habitat, egg development, and juvenile survival depend on the timing, duration, and extent of the release. During establishment of the spawning bed, a minor addition of sediment will likely be cleaned out by the female as part of the normal preparation behavior. However, a heavy sediment load dispersing downstream could settle into spawning beds and clog interstitial spaces, reducing the amount of available spawning habitat, which could have a greater impact in areas where spawning success is space limited.

Fertilized eggs could potentially be buried by a heavy sediment load, disrupting the normal exchange of gases and metabolic wastes between the eggs and water (Anderson 1996). The impacts of sediment intrusion into the redd on larval survival are more severe during the earlier embryonic stages than following development of the circulatory system of larvae, possibly because of a higher efficiency in oxygen uptake by the older fish (Shaw and Maga 1943; Wickett 1954). Clogging of interstitial spaces also reduces cover and food availability for juvenile salmonids (Cordone and Kelley 1961).

Prior to the start of construction, APP will develop and submit a final Inadvertent Release of Drilling Mud Plan to address the inadvertent release of drilling mud (refer to Appendix 2D of Resource Report 2), which describes how the drilling operations will be conducted and monitored to reduce the potential for releases. The plan will also include procedures for cleanup of drilling mud releases and for sealing the hole if a drill is not completed. If an HDD crossing fails during construction, it is possible that an alternative crossing method, will be used. Impact evaluations and decisions associated with an inadvertent release of drilling mud will be made in consultation with the applicable agencies.

Water Depletions

Water withdrawal for the Project (includes activities such as the development of ice pads and ice roads, hydrostatic testing, dust suppression, and human consumption) could affect fish and other aquatic organisms if not properly mitigated. The diversion of large volumes of water from waterbodies could result in stranding fish, loss of habitat and warming or cooling of the water, temporarily displacing fish, and temporarily impairing water quality. Water withdrawal and use could also result in entrainment of fish eggs and larvae, depending on the time of year. All water withdrawals will be conducted at a controlled rate that will reduce downstream impacts. Where fish are known to be present or suspected to be present, hoses used for withdrawal will be fitted with intake screening devices to prevent the entrainment of fish. Removal of water from fish-bearing streams will be conducted in accordance with agency consultations and approvals prior written approval by ADNR, ADFG, or the North Slope Borough, as applicable. Impacts on fish habitat suitability as a result of water withdrawals are anticipated to be short-term and minor. APP will appropriate water in a manner that maintains sufficient volumes to sustain aquatic life.

Vegetation Removal and Streambank Erosion

Removal of vegetation at the waterbody crossings has the potential to temporarily affect aquatic resources by reducing cover and nutrient input, and impacting streambank stability and sediment filtration. Clearing of vegetation during construction could temporarily increase streambank erosion and turbidity levels in the waterbodies. Alteration of the natural drainage ways or compaction of soils by heavy equipment near streambanks during construction may accelerate erosion of the banks, increase runoff, and transport sediments into waterbodies. The degree of impact on aquatic resources due to erosion will depend on sediment loads, stream velocity, turbulence, streambank slope and composition, soil stability (i.e., thaw-stable versus thaw-sensitive soils) and sediment particle size. However, implementation of APP's Plan and Procedures will reduce the potential for streambank erosion and subsequent sedimentation in the waterbody. With the effective implementation of mitigation measures, the impacts of vegetation removal and streambank erosion are anticipated to be short-term and minor.

Fishery Habitat Contamination

Refueling and maintenance activities will be conducted in accordance with the Spill Prevention, Control, and Countermeasures Plan (SPCC Plan) as outlined in Appendix 2A of Resource Report 2, thereby reducing the potential for spills from storage containers, fuel transfers, and equipment working near streams. In the unlikely event that a spill occurs, spill response will be implemented per the SPCC Plan; therefore, impacts are expected to be localized and minor.

Nuisance Aquatic Species

The Alaska Aquatic Nuisance Species Management Plan was created in 2002 by the ADFG to coordinate with the public and federal, state, local, and Alaska Native Groups and Organizations for the prevention and monitoring of invasive species and the development of an effective public information program (Fay 2002). The U.S. Geologic Survey (USGS) Nonindigenous Aquatic Species Database identifies 52 species present in Alaska (USGS 2009). The plan identifies nuisance aquatic species (NAS) as non-indigenous aquatic species that degrade ecosystem function and benefits, and provides objectives and actions to reduce the impacts of NAS. There are no species listed in the Alaska Aquatic Nuisance Species Management Plan that occur near the Project area.

Operations Impacts and Mitigation

Operation of APP is expected to result in minor impacts on fish habitat suitability. Long-term alterations of habitat could potentially occur if the stream contours are modified in the area of the crossing, the flow patterns are changed, or if erosion of the bed, banks, or adjacent localized upland areas introduces sediment into the waterbody. APP's Procedures require that flow patterns be returned to similar pre-construction conditions, and the banks be stabilized following construction; therefore, minor impacts on habitat quality are anticipated.

3.2.4.2 Marine Fisheries Impacts and Mitigation

As stated in Section 1.3.3.1 of Resource Report 1, a channel will be dredged from West Dock Head 2 to deeper water north of West Dock to achieve adequate depth for sealift barge traffic. APP has sampled and analyzed sediment from within and around the dredge channel prism as described in Resource Report 2. In addition, APP will conduct dock modifications at West Dock, which may have noise-related disturbance impacts to fish and impacts to fish habitat. [Note: An update of the results of the dredging sampling study and additional noise analyses will be provided in the final report.]

The dredging and dredged material disposal site will both occur in relatively shallow waters (less than 25 feet) in Stefansson Sound, immediately west and offshore of Prudhoe Bay. The degree of impact to fisheries from dredging and dredge disposal activities is contingent on several factors, including the timing and duration of the activities; the methods used to dredge the sealift channel, convey the dredge material to the disposal site, and dispose of the dredge material; the oceanographic currents that are present at the time of the activities; and the physical characteristics of the dredge material.

[Note: APP will provide an update of marine fisheries impacts and mitigation in the final report in the EFH Assessment to be provided in Appendix 3B.]

3.3 VEGETATION

The Project will cross a number of ecological systems that support diverse vegetation communities. Section 3.3.1 describes the general ecological provinces crossed by the Project and identifies typical species of the dominant communities. Section 3.3.2 describes the vegetation communities that are crossed by the Project. Section 3.3.3 discusses unique, sensitive, or protected vegetation communities identified through agency consultations, topographic maps, aerial photographs, or field surveys. Section 3.3.4 identifies the impacts on the vegetation resources that will be crossed and the measures APP proposes to mitigate these impacts.

3.3.1 GENERAL DESCRIPTION OF VEGETATION RESOURCES

The description of vegetation communities within the Project area follows ecoregions based on an unified interagency effort to delineate ecoregion boundaries in Alaska (Nowacki et al., 2001) (Figure 3.3-1). The Project will cross two primary Level 2 ecoregions: Arctic Tundra and Intermountain Boreal. The Arctic Tundra Ecoregion includes the following Level 3 ecoregions: Beaufort Coastal Plain (Arctic Coastal Plain), the Brooks Foothills, and the Brooks Range ecoregions. The Intermountain Boreal Ecoregion includes four Level 3 ecoregions: Kobuk Ridges and Valleys, Ray Mountains, Yukon-Tanana Uplands, and Tanana-Kuskokwim Lowlands. The EPA Level III Ecoregions for Alaska (EPA, 2010) have generally similar boundaries and are based on Gallant, et al. (1995).

3.3.1.1 Arctic Tundra Ecoregion

Beaufort Coastal Plain

Beaufort Coastal Plain sub region occurs west of the U.S-Canada border along the coast of the Beaufort Sea. The PT Pipeline (PMP 0-58.4), the northern portion of Alaska Mainline (AMP 0-63), and the GTP are within this subregion. This wind-swept plain gradually ascends from the Beaufort Sea coast southward to the foothills of the Brooks Range. The terrain is flat to undulating and is underlain by unconsolidated deposits of marine, fluvial, glaciofluvial, and eolian origin and lacks bedrock (Nowacki et al. 2001). A dry, polar climate dominates throughout the year, with short, cool summers and long, cold winters. Proximity to the Beaufort Sea and abundant sea ice contribute to the cool, frequently foggy, summers (EPA 2010).

Due to low temperatures, permafrost is continuous across the region, except in localized areas below naturally occurring thaw bulbs under large rivers and thaw lakes (Nowacki et al. 2001).

Permafrost and other frost processes result in a large variety of surface features such as pingos, ice-wedge polygons, and oriented thaw lakes. The presence of permafrost prevents the drainage of water, therefore the soils are typically saturated and have thick organic horizons. Thaw lakes make up approximately 50 percent of the surface area and with the prevalence of saturated organic soil; most all of the region is considered wetland. Vegetation is dominated by wet sedge tundra in drained lake basins, swales, and floodplains, and by sedge-tussock tundra and sedge-Dryas tundra on elevated ridges. Low shrub willow thickets grow on well-drained riverbanks (Nowacki et al. 2001).

Brooks Foothills

The Brooks Foothills ecoregion occurs between the Beaufort Coastal Plain and the Brooks Range west of the U.S.-Canada border. The Alaska Mainline (AMP 63-146) extends south through this region. This ecoregion consists of gently rolling hills and broad exposed ridges form the northern flank of the Brooks Range (Nowacki et al. 2001). Narrow alluvial valleys and glacial moraines and outwash are interspersed among long linear ridges, buttes, and mesas comprised of tightly-folded sedimentary rocks. Surfaces are mantled by colluvial and eolian material deposits. This region is underlain by thick continuous permafrost and slope-related features, such as solifluction lobes and stone stripes. Because the permafrost prevents surface drainage, surface soils are usually saturated and have fairly thick organic horizons, similar to the Beaufort Coastal Plain (Nowacki et al. 2001). Lakes are much less abundant.

The Brooks Foothills ecoregion has a mostly dry, polar tundra climate and is somewhat warmer and wetter than the Beaufort Coastal Plain to the north. This ecoregion has cool to cold summers and very cold winters (Wiken et al. 2011).

Vegetation is primarily mesic graminoid herbaceous dominated by vast expanses of shrub-sedge tussock tundra. Willow thickets occur along rivers and small drainages and *Dryas* tundra on ridges. Calcareous areas support sedge-*Dryas* tundra (Nowacki et al. 2001).

Brooks Range

The Brooks Range subregion extends from the Richardson Mountains in the northern Yukon and traverses east/west through much of northern Alaska. The Alaska Mainline in the Brooks Range extends from AMP 146 to 255. Accreted terranes originating from the Arctic Ocean underlie most of the Books Range with the high central portion having steep angular summits of sedimentary and metamorphic rock draped with rubble and scree (Nowacki et al. 2001).

The dry, polar climate along this range has short, cool summers and long, cold winters. Air temperatures decrease rapidly with rising elevation, but climate is variable due to aspect, winds, and other factors. Major mountain passes can be subject to strong outflow winds, causing severe wind chill conditions (Wiken et al. 2011).

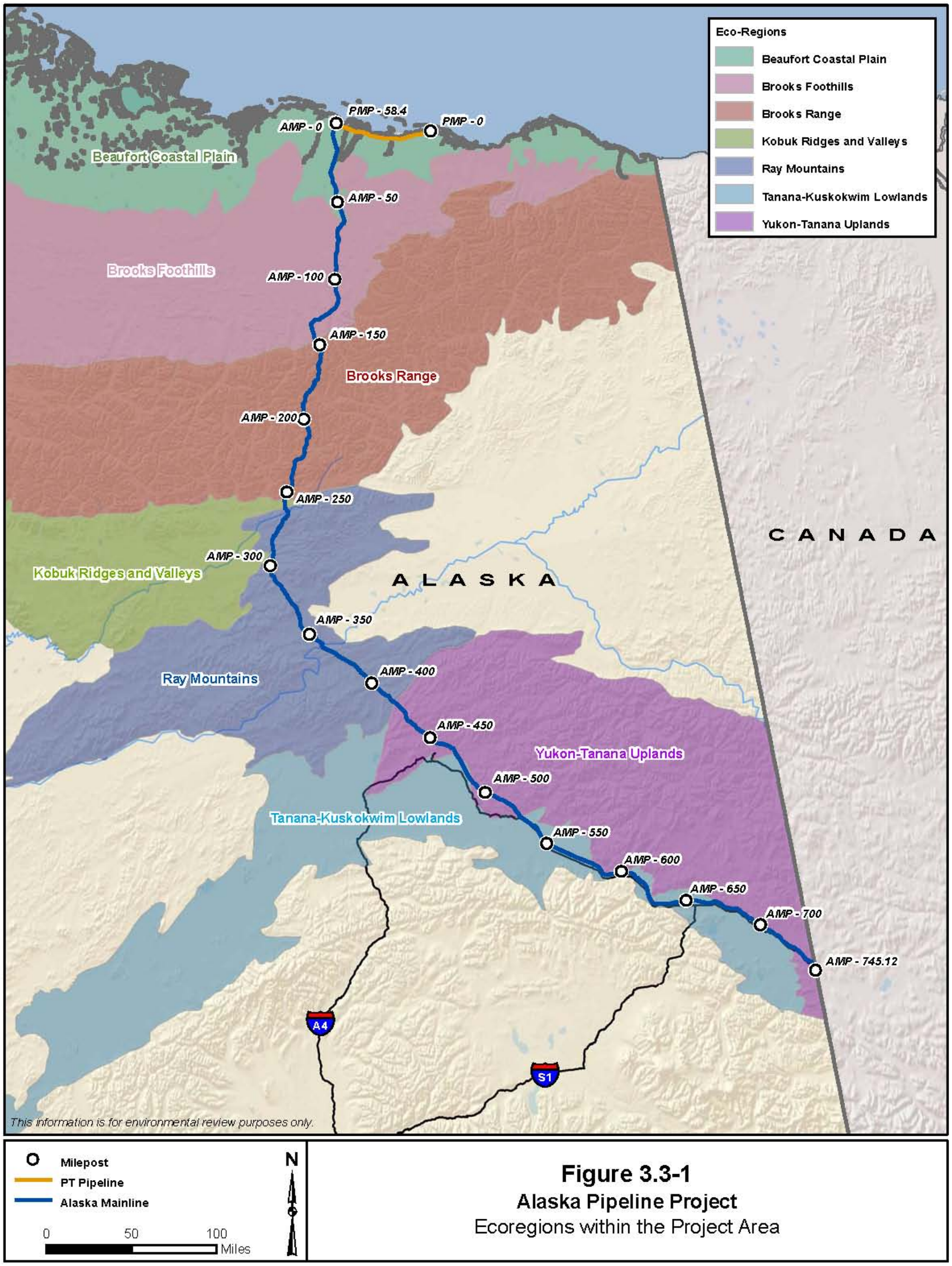

Figure 3.3-1
Alaska Pipeline Project
Ecoregions within the Project Area

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Valleys and lower mountain slopes on the north side of the range are covered by mesic shrub and herbaceous communities of shrub-sedge tussock tundra with willow thickets along rivers and streams (Nowacki et al. 2001). Alpine tundra and barrens dominate at higher elevations along the entire crest of the range (Wiken et al. 2011). Alpine tundra vegetation consists of lichens, mountain avens (*Dryas* spp), and intermediate to dwarf ericaceous shrubs, sedge (*Carex* spp), mosses, and cottongrass (*Eriophorium angustifolia*) in wetter sites. Subalpine vegetation on the southern portion of the ecoregion consists of discontinuous open stands of dwarf white spruce (*Picea glauca*) in a matrix of willow (*Salix* spp), dwarf birch (*Betula nana*), and Labrador tea (*Ledum decumbens*) (Nowacki et al. 2001).

3.3.1.2 Intermontane Boreal Ecoregion

The vegetation of the Intermontane boreal forest is a complex array of plant communities shaped by fire, soil temperature, drainage, aspect and exposure (ADNR 2011). Throughout this region, expanses of boreal forests of both needleleaf and deciduous species of are dissected by broad, flat river floodplains and a diversity of wetlands. The Intermontane Boreal Forest ecoregions (AMP 255 to 717) includes the Ray Mountains, Kobuk Ridges and Valleys AMP 255-418 (only 5 miles [AMP 255-260] of the Kobuk Ridges and Valleys), Yukon Tanana Uplands and Tanana-Kuskokwim Lowlands (AMP 418 to 745). The Project area meanders in and out of the Yukon-Tanana uplands and Tanana Kuskokwim Lowlands between the Ray Mountains and the southern end at U.S.-Canada border. These ecoregions span most of the central portions of the state east to the U.S.-Canada border (Nowacki et al. 2001).

A continental sub-Arctic climate prevails there, marked by short, warm summers and long, cold winters (Wiken et al. 2011). The mean annual temperature for the area is approximately 10.4°F, with a summer mean of 50.9°F and -9.4°F for winter. The frost-free period ranges from 20 to 70 days. The western part of the region is generally moister; there, mean annual precipitation ranges from about 11.8 to 35.4 inches on the higher mountains (Wiken et al. 2011)

Ray Mountains

The Ray Mountains region (AMP 260-418) are an overlapping series of compact, east-west trending ranges underlain by the Ruby terrane that includes the low hills both north and south of the Yukon River. The Kobuk Ridges and Valleys region (AMP 255-260) has been included with the Ray Mountain region due to the relatively small area (5-mile-long segment) the Alaska Mainline covers of this region. The Ray Mountains consist of metamorphic bedrock usually covered with rubble, and soils are subsequently shallow and rocky. Permafrost is generally discontinuous and ranges from thin to moderate thickness (Nowacki et al. 2001).

The climate is strongly continental with dry, cold winters and somewhat moist, warm summers. Precipitation increases with elevations (Wiken et al. 2011).

The vegetation throughout this ecorgeion is dominated by black spruce woodlands and dwarf tree communities, while closed and open mixed needleleaf and deciduous forests of white spruce, Alaska birch (*Betula neoalaskana*), and aspen (*Populus tremuloides*) usually are restricted to warm, south-facing slopes (Nowacki et al., 2001). Floodplains are dominated by white spruce, balsam poplar (*Populus balsamifera*), alders (*Alnus* spp), and willows (*Salix* spp). Forest understory varies greatly with stand density and the amount of moisture on the forest floor. Common tall shrubs found in various mixtures in white spruce forests include green alder (*Alnus crispa*) and Bebb willow (*Salix bebbiana*) and common low shrubs include Labrador tea, blueberry (*Vaccinium uliginosum*), and especially lingonberry (*Vaccinium vitus-idaea*). In mixed forest stands on floodplains, horsetails (*Equisetum* spp) is a major ground cover, with feathermosses and foliose lichens prominent in the moist habitats (Nowacki et al. 2001). Shrub birch and *Dryas*-lichen tundra prevail at higher elevations. Forest fires only occasionally occur in the summer in the Ray Mountains sub regions (Nowacki et al. 2001).

Yukon-Tanana Uplands

The Yukon-Tanana Uplands ecoregion extends from just north of Fairbanks in the Tatlanika drainage (AMP 418) to the Little Chena River (AMP 470) and in the low hills above the valley bottoms along the Tanana River south of Chena River to the U.S-Canada border (AMP 745). Within this region, the hillsides adjacent to the Tanana River are within the Yukon-Tanana Uplands, whereas the lower elevation along Tanana River are within Tanana-Kuskokwim Lowlands. The Project area meanders through both ecoregions along this portion of the alignment.

The vegetation is dominated by black spruce woodlands, especially on north-facing slopes, while white spruce, Alaska birch, and aspen usually are restricted to warm, south-facing slopes. Black spruce grows in muskegs, lowlands and on north-facing slopes where the annual thaw is shallow and permafrost is close to the surface (Nowacki et al. 2001). The largest black spruce trees reach diameters of 7 inches at breast height and heights of 56 feet, but many are no larger than 4 inches diameters at breast height and 30 feet tall (ADNR 2011). Black spruce stands are the most widespread of all stand types in the Interior, and some stands contain tamarack (*Larix laricina*) and Alaska paper birch (*Betula neoalaskana*). The black spruce trees in muskegs and woodlands are typically scattered and stunted, and the understory is dominated by mosses, sedges (including the tussock-forming cottongrass), ericaceous shrubs, and herbs such as roundleaf sundew (ADNR 2011). Bogs, fens, shrub swamps, and other wetlands are also common in this ecoregion. Scrub-graminoid herbaceous communities, including willow, dwarf birch, Labrador tea, and shrubby cinquefoil (*Potentilla fruiticosa*) occupy lowland bogs and other very wet areas (ADNR 2011).

Floodplains are dominated by white spruce, balsam poplar, alders, and willows (Nowacki et al. 2001). Shrub birch (*Betula glandulosa*) and *Dryas*-lichen tundra prevail at higher elevations. Black spruce woodlands, sedge-tussock communities, and scrub bogs are common in valley bottoms. Above the treeline, dwarf birch, ericaceous shrubs, and *Dryas*-lichen tundra are the dominants. The highest elevations are mostly barren (Nowacki et al. 2001).

This region has one of the highest incidences of lightning strikes in Alaska and wildfires are common (Nowacki et al. 2001).

Tanana-Kuskokwim Lowlands

The Tanana-Kuskokwim Lowlands ecoregion within the Project area occupies a large alluvial plain along the Tanana River and tributaries and extends through the lower-lying areas from the Little Chena River, north of Fairbanks (AMP 470) to the Tetlin National Wildlife Refuge (NWR) (AMP 717). The undifferentiated sediments of fluvial and glaciofluvial origin are capped by varying thicknesses of eolian silts and organic soils (Nowacki et al. 2001). Surface moisture is rather abundant due to the gentle topography, patches of impermeable permafrost, and poor soil drainage. Permafrost is thin and discontinuous, and temperatures are near the melting point. Collapse-scar bogs and fens caused by retreating permafrost are frequent (Nowacki et al. 2001).

The ecoregion has a dry sub-Arctic, continental-influenced climate, marked by cool to mild summers and long cold winters. Summer temperatures can be relatively warm (Wiken et al. 2011).

Boreal forests communities of needleleaf and deciduous, and mixed forest occur resulting from the interplay of permafrost, surface water, fire, local elevation relief, and hill slope aspect. Lightning fires are very frequent. Black spruce woodland and dwarf tree communities occur in bogs, with tamarack in low wet areas. White spruce and balsam poplar are common along rivers. Active floodplains and river bars support tall stands of alders and willows. South-facing slopes support stands of white spruce, Alaska birch, and quaking aspen (*Populus tremuloides*) (Nowacki et al. 2001). The coldest, wettest areas on permafrost flats support birch-ericaceous shrubs and sedge tussocks. Wet sedge meadows and aquatic vegetation occur in sloughs and oxbow ponds. Tall willow, shrub birch (*Betula glandulosa*), and green alder communities are scattered throughout (Nowacki et al. 2001).

3.3.2 TERRESTRIAL PLANT COMMUNITIES

3.3.2.1 Vegetation Classification and Identification

The intent of the vegetation classification effort is to describe vegetation communities to the extent possible within the Project area to Level III of Viereck's Alaska Vegetation Classification System (Viereck et al. 1992), which is based on dominant growth forms (tree, shrub, herb), canopy height and closure, general soil moisture and salinity, and dominant plants. Classification to Level III of the Viereck system provides the detail necessary to characterize plant communities for the purpose of assessing habitat in the Project area. A description of the Level III Viereck vegetation communities that is crossed by the Project is provided in Table 3.3.2-1.

TABLE 3.3.2-1

Alaska Pipeline Project
Potential Vegetation Communities Occurring within the Project Area

Vegetation Community Type [a]	General Location within the Project Area	Representative Plant Species
Forest		
Closed needleleaf (conifer) forest; 60 to 100% canopy	Closed white and black spruce forests are found on floodplain terraces and uplands throughout interior and Alaska.	White spruce, black spruce.
Open needleleaf (conifer) forest; 25 to 60% canopy	Open white and black spruce forest is very common in lowland areas of the Interior. White spruce forest also occurs near the tree line in the Brooks Range.	Tamarack, white spruce, black spruce, Vaccinium spp., feathermoss.
Needleleaf (conifer) woodland; 10- to 25% canopy	Black spruce woodland is common on floodplains, slopes, and ridges throughout the Interior. White spruce and mixed spruce woodland is common at the tree lines of the Interior and the Brooks Range.	White spruce, black spruce, birch, Vaccinium spp., feathermoss.
Closed broadleaf forest; 60 to 100% canopy	Typically occurs in the Interior. Balsam poplar communities occur frequently in the floodplains and in isolated stands on the north slope of the Brooks Range. Alaska birch and quaking aspen are common in uplands, especially on south-facing slopes.	Balsam poplar, birch, quaking aspen.

TABLE 3.3.2-1

Alaska Pipeline Project
Potential Vegetation Communities Occurring within the Project Area

Vegetation Community Type [a]	General Location within the Project Area	Representative Plant Species
Open broadleaf forest; 25 to 60% canopy	Typically occurs in interior and northern Alaska. Alaska birch and quaking aspen forest can be found on well-drained, steep sites. Balsam poplar occurs as open clumps near the tree line and as isolated groves on the north slope of the Brooks Range.	Alaska birch, quaking aspen, balsam poplar, ericaceous shrubs.
Broadleaf woodland; 10 to 25% canopy	Alaska birch woodland typically occurs on dry sites in northern the Interior.	Alaska birch.
Closed mixed forest; 60 to 100% canopy	Typically occurs in the Interior. White spruce mixed forests favor warmer, dry slopes and floodplains while black spruce mixes occur in colder, wet sites.	White spruce, black spruce, Alaska birch, quaking aspen, balsam poplar.
Open mixed forest; 25 to 60% canopy	Typically occurs in upland sites in the Interior.	White spruce, black spruce, Alaska birch.
Scrub		
Open dwarf tree scrub; trees <1 meter tall; 25 to 60% canopy	Dwarf black spruce scrub is typically found in very cold and wet soils in the Interior.	Black spruce.
Dwarf tree scrub woodland; trees ≤3 meters tall at maturity with 10 to 25% canopy	Dwarf black spruce scrub woodland is typically found in wet sites near tree line in the Interior.	Black spruce.
Closed tall scrub; shrubs ≥1.5 meters tall at maturity with 75 to 100% canopy	Found throughout most of Alaska on streambanks and floodplains.	Willow, alder, shrub birch.
Open tall scrub; shrubs ≥1.5 meters tall at maturity with 25 to 75% canopy	Typically found on floodplains, drainages, and near and above the tree line in the Interior.	Willow, alder, shrub birch.
Closed low scrub; shrubs 20 cm to 150 cm tall at maturity	Typically found on floodplains and river terraces and steep slopes near the tree line in interior and northern Alaska. Low willow shrub communities also occur in moist protected drainages and around lakes and ponds on the Beaufort Coastal Plain.	Willow, alder, shrub birch.
Open low scrub; shrubs 20 cm to 150 cm tall at maturity	Shrubby tussock wetlands and tundra occupy vast areas of northern Alaska and are also found in lowlands and alpine areas of the interior. Low willow communities occur in the uplands of northern and the Interior.	Willow, birch, alder, sedge, ericaceous shrubs.
Dryas dwarf scrub	Common in alpine sites throughout the northern two-thirds of Alaska.	Dryas spp., ericaceous shrubs, willow, sedge, lichens.
Ericaceous dwarf scrub	Found in alpine areas throughout interior and northern Alaska.	Ericaceous shrubs (bearberry, crowberry, heath, Vaccinium spp.).

TABLE 3.3.2-1

Alaska Pipeline Project
Potential Vegetation Communities Occurring within the Project Area

Vegetation Community Type [a]	General Location within the Project Area	Representative Plant Species
Willow dwarf scrub; shrubs >20 cm are absent or are <25% cover	Found in alpine and windswept tundra areas throughout the state except for southeastern Alaska.	Willow.
Herbaceous		
Dry graminoid herbaceous	Typically found on dry slopes at low elevation and on sub-alpine, and alpine slopes and plateaus of the Interior.	Grass (festuca spp., poa spp.) sagebrush, ericaceous shrubs, willow.
Mesic graminoid herbaceous	Tussock tundra is widespread in the Arctic foothills and parts of the Beaufort Coastal Plain. Type is also found along floodplains, valley bottoms and on upland slopes throughout the state of Alaska.	Grass (bluejoint), sedge, alder, willow.
Wet graminoid herbaceous (emergent); shrubs provide <25% cover	Common on Arctic lowlands and in alpine areas throughout the state, except for southeastern Alaska.	Sedge (Eriophorum spp.), tundra grass, pendant grass, willow.
Dry forb herbaceous	Sparsely vegetated communities typically found in alpine areas and rocky, well-drained sites throughout Alaska.	dwarf fireweed, dwarf alpine hawksbeard, wild sweetpea, saxifrages.
Mesic forb herbaceous	Found throughout Alaska within marshes, bogs, and along pond and lake margins.	Fireweed, horsetail, marsh marigold, Arctic rush, buckbean.
Bryophyte	Occur in small, widely scattered communities in the southern part of Alaska.	Mosses.
Lichens	Common in windblown rocky sites with little or no soil development primarily in alpine regions throughout Alaska.	Crustose lichen
(Freshwater) Aquatic herbaceous	Widely distributed throughout Alaska in ponds, sloughs, and oxbow lakes.	Pondlily, marestail, buttercup, burrweed, water milfoil, pondweed, willow moss, spiney-spore quillwort.

[a] Based on *The Alaska Vegetation Classification* (Viereck et al. 1992).

Vegetation mapping was conducted on a 300- to 600-foot-wide corridor (150-300 feet on either side of the PT Pipeline and Alaska Mainline centerline). Aboveground Facilities and Associated Infrastructure footprints were also be mapped. Vegetation cover classes are based on existing datasets and aerial photography mapping within the Project area. Supplemental data was collected in the field during 2011 to aid in the mapping effort. [Note: An update of the results of these studies will be included in the final report.]

Detailed wetland community information was collected during the summer 2010 and 2011 field seasons. This detailed site information was converted to the Viereck classification system to the extent possible. Therefore, the wetland communities within the Project area should be well described. Supplemental upland data points were collected by both the wetland and vegetation crews during the 2011 summer field season. The resulting data will be used in conjunction with existing datasets to spot check and refine the vegetation classification map. [Note: An update of the results of these studies will be included in the final report.]

3.3.2.2 Invasive Species Surveys

Several surveys have been conducted to document the locations of invasive plant species in portions of the Project area, including surveys in the Fairbanks Region (Lapina et al. 2007) Dalton Highway corridor (Cortes-Burns et al. 2008), and along the TAPS corridor (McKendrick 2002; Alaska Plant Materials Center 1992). In addition, the Alaska Exotic Plants Information Clearinghouse, a cooperative project among several federal and state agencies including BLM and ADNR, has provided invasive species data for portions of the Project area, including the Dalton Highway area.

Previous surveys in the Project area have found that non-native plant establishment is greatest and most widespread along the Dalton Highway, with aggressively invasive species occurring throughout the area surveyed. Most non-native populations have been restricted to disturbed sites, including road construction areas, parking lots, campgrounds, and Alaska Department of Transportation stations. Once introduced and established along roadsides and in other disturbed areas, invasive species have also been observed spreading to recently burned (but otherwise undisturbed) areas (Cortes-Burns et al. 2008).

BLM manages most of the land surrounding the Dalton Highway and TAPS from the Yukon River Bridge north to about Dalton Highway MP 300, north of Galbraith Lake, and has identified 27 species of non-native invasive plants in this area. BLM has targeted 19 species for treatment in their draft pest management plan for the area (refer to Table 3.3.2-2).

TABLE 3.3.2-2

Alaska Pipeline Project
BLM Invasive Plant Species Potentially Occurring in the Project Area

Common Name	Scientific Name
Meadow foxtail	*Alopecurus pratensis*
Reed canarygrass	*Bromus inermis*
Narrowleaf hawksbeard	*Crepis tectorum*
Delphinium	*Delphinium sonnei*
Smooth brome	*Hieracium umbellatum*
Foxtail barley	*Hordeum jubatum*
Common pepperweed	*Lepidium densiflourm*
Ox-eye daisy	*Leucanthemum vulgare*
Yellow toadflax	*Linaria vulgaris*
Birdsfoot trefoil	*Lotus corniculatus*
Alfalfa	*Medicago sativa* ssp *sativa*
White/yellow sweetclover	*Melilotus officinalis*
Iceland poppy	*Papaver nudicaule*
Reed canary grass	*Phalaris arundinacea*
Spreading bluegrass	*Poa pratensis* var. *irrigate*
Purple sandspurry	*Spergularia rubra*
Common tansy	*Tanacetum vulgare*
Alsike clover	*Trifolium hybridum*
Bird vetch	*Vicia cracca*

Source: BLM 2009.

APP conducted limited supplemental surveys for invasive plant species during the 2011 field season. These surveys were conducted concurrently with rare plant surveys and wetlands surveys. Survey sites were selected from representative disturbed areas within each ecoregion in the Project area (Nowacki et al. 2001). [Note: An update of the results of these studies will be included in the final report.]

3.3.3 UNIQUE, SENSITIVE, AND PROTECTED VEGETATION COMMUNITIES

The BLM maintains a list of sensitive plants known to occur on BLM-managed lands in Alaska and a separate list of "watch" species, which are rare and might occur on BLM lands but have not been documented. These lists were used in conjunction with data received from the Alaska Natural Heritage Program (AKNHP), plant surveys conducted in the Project area (e.g., Carroll et al. 2003; Lipkin and Parker 1995; Cortes-Burns et al. 2009), and project biologists' knowledge of the Project area to develop a list of target species within the Project area.

However, rare plants, including BLM sensitive and "watch" species, that are tracked by the AKNHP are potentially located in the Project area and are listed in Table 3.3.3-1. [Notes: APP will consult with the BLM to determine if other species potentially occupy the Project area on BLM-managed land. This information will be provided in the final report.]

TABLE 3.3.3-1

Alaska Pipeline Project
Rare and Sensitive Plant Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Ecoregion	Global Status	Status
Low sandwort[2]	*Arenaria longipedunculata*	Brooks Range	G3G4Q	S3
Siberian wormwood[1]	*Artemisia laciniata*	Yukon-Tanana Uplands	G4?	S2
Ebony sedge[3]	*Carex eburnean*	Brooks Range	G5	S3
Hudson Bay sedge[2]	*Carex heleonastes*	Yukon-Tanana Uplands	G4	S2S3
Fragile rockbrake[3]	*Cryptogramma stelleri*	Brooks Range, Ray Mountains	G5	S2S3
Muir's fleabane[1]	*Erigeron muirii*	Brooks Range, Ray Mountains	G2	S2
Pygmy wood-aster[3]	*Eurybia pygmaea*	Beaufort Coastal Plain	G2G4	S2
Yukon lupine[2]	*Lupinus kuschei*	Yukon-Tanana Uplands	G3G4	S2
Locoweed[2]	*Oxytropis tananensis*	Tanana-Kuskokwim Lowlands	G2G3Q	S2S3
Sabine-grass[1]	*Pleuropogon sabinei*	Beaufort Coastal Plain	G4G5	S1
Rocky Mountain cinquefoil[2]	*Potentilla rubricaulis*	Brooks Foothills	G4	S2S3
Vahl's alkali grass[2]	*Puccinellia vahliana*	Beaufort Coastal Plain	G4	S2S3
Yellow mountain saxifrage[3]	*Saxifraga aizoides*	Beaufort Coastal Plain	G5	S1
Alaska starwort[2]	*Stellaria alaskana*	Brooks Range	G3	S3
Yukon aster[2]	*Symphyotrichum yukonense*	Brooks Range	G3	S3
Arctic pennycress[2]	*Thlaspi arcticum*	Ray Mountains	G3	S3

1 BLM-listed sensitive species known to occur on BLM managed lands in Alaska
2 BLM "watch" species, which might occur on BLM-managed lands in Alaska, but not documented
3 AKNHP rare plant

Status Codes:
G = Global
S = State
1 = Critically imperiled (typically 5 or fewer occurrences)
2 = Imperiled (6-20 occurrences)
3 = Vulnerable to extirpation or extinction (21-100 occurrences)
4 = Apparently secure (Usually more than 100 occurrences)
5 = Demonstrably secure
Q = Questionable taxonomy that may reduce conservation priority
? = Inexact numeric rank

Source: List of AKNHP rare plants and status codes (AKNHP 2011)

Rare plant field surveys were executed during the 2011 field season using the Intuitive Controlled Method. This method consists of checking representative sites within the Project area with more intensive focus on areas with known rare plant populations or appropriate habitat. Pre-field selection of representative target areas consisted of plotting known locations of the target species (from AKNHP) on maps of the Project area. In total, 13 target areas were selected for survey during the 2011 field season.

The 2011 rare plant surveys focused on BLM lands for several reasons. The BLM-managed Dalton Highway Utility Corridor is known to have a number of rare plant populations and it had some of the highest probability for rare plants within the Project area. In addition, BLM Manual 6840 provides policy directives for the agency to consider conservation of special status species in the management of their lands and to monitor these populations.

[Note: An update of unique and sensitive vegetation information will be provided in the final report.]

3.3.4 CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

3.3.4.1 Vegetation Impacts

The Project crosses nine forested, 10 scrub, and 10 herbaceous upland vegetation communities, which are characterized by canopy cover and/or species composition. Clearing vegetation for the work area, ground disturbance during construction of the pipeline, aboveground and associated facilities will affect these communities within the Project area. Construction of ice roads will also impact vegetation communities, although these impacts would be considered temporary. The following sections provide an evaluation of the Project activities described in Resource Report 1 with the respect to the following effects on these vegetation communities:

- Reduction in vegetation coverage.
- Reduction in ability to provide functions or values (including human-derived values such as subsistence and timber production).

These effects are described in terms of construction and operation phases of the Project. Based on the existing baseline conditions, construction schedule, and mitigation measures that will be implemented during construction, the overall effect on vegetation resources is expected to be negliglble[9] to minor.

Vegetation Coverage

Tables 3C-1, 3C-2, and 3C-3 in Appendix 3C identify the acreage of forested, shrub, and herbaceous communities, respectively that will be impacted by the Project. [Note: These tables will be updated in the final report.]

The primary direct effect from Project construction will be the cutting, clearing, and removal of existing vegetation and rooted material within the construction workspace. The degree of effect will depend on the type and amount of vegetation affected, the degree of soil disturbance/alteration, the type of vegetation and the rate at which this vegetation will regenerate after construction, the type of vegetation that will become established after

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[9] Impact thresholds are defined as follows:

None: Resource is not within the Project area at the time the activities are occurring and there is no loss of habitat.

Negligible: Resource may be present in the Project area at time of the activity; however the resulting impact on the resource and/or their habitat, if it occurs, would be unmeasurable and insignificant.

Minor: There is a measurable impact to the resource on an individual level (i.e., direct loss of habitat, mortality, disturbance response), but not a population level.

disturbance, and the frequency of vegetation maintenance conducted on the right-of-way during pipeline operation. The degree and duration of construction-related impacts will vary between vegetation communities.

Both uplands and wetland communities are crossed by the Project; however the effects on wetlands are discussed in Section 2.4.2 of Resource Report 2. [Note: Information on impacts to vegetation will be updated in the final report.]

Vegetation Functions and Values

Construction Impacts and Mitigation

Fragmentation

The natural landscape crossed by the Project has already experienced fragmentation from the construction of TAPS; the Dalton, Richardson, and Alaska Highways; and North Slope drilling operations. The creation of a new pipeline, access roads, and other Project facilities in forested areas will create new forest edges. The breaking up of contiguous habitats into smaller patches results in vegetation fragmentation and the creation of habitat edges. Forest edges play a crucial role in ecosystem interactions and landscape function, including the distribution of plants and animals, fire spread, vegetation structure, and wildlife habitat. Creation of a new forest edge along dense canopy forests could impact microclimate factors such as wind, humidity, and light, and could lead to a change in species composition within the adjacent forest or increase invasion by non-native species. Fragmentation and a loss of habitat connectivity could also impact wildlife (refer to Section 3.4).

Additional temporary workspaces will also contribute to fragmentation by creating larger patches within contiguous habitats; however, clearing for the additional temporary workspaces will add to the patch size created along the right-of-way rather than create new cleared patches.

Invasive or Noxious Species

Noxious weeds and other invasive plants are non-native, undesirable native, or introduced species that are able to exclude and outcompete desirable native species, thereby decreasing overall species diversity. Vegetation communities are more susceptible to infestations of invasive or noxious weed species following ground disturbances. Vegetation removal and soil disturbance during construction could create optimal conditions for the establishment of undesirable species. Noxious weeds could adversely affect an area when invasive plants become established or when an existing species’s population size increases. Invasive or noxious plants could negatively affect habitat by competing for resources such as water and light, changing the community composition, eliminating or reducing native plants, or by changing the vegetation structure. The changes in community composition or vegetation structure could reduce native plant populations and also negatively affect habitat for wildlife. Soil disturbance and/or removal of existing vegetation for pipeline or road construction could provide openings for invasive or noxious plants to establish or spread. Movement of equipment along the construction right-of-way and access roads also could provide opportunities for seed transport into new un-infested areas. Equipment that crosses waterbodies could distribute noxious or invasive species downstream into areas outside the Project area.

[Note: APP anticipates it will complete data gathering and analysis in 2012 for invasive species. An updated impact analysis on invasive and noxious species will be provided in the final report.]

Vegetation Pathogens

Alaskan forests have not been affected by any introduced tree pathogen (Holsten et al. 2001). Several tree pathogens are known to have been introduced, but their spread has been limited by the available host plants that each can infect. Fungal pathogens such as white pine blister rust (*Cronartium ribicola*) and black knot (*Apiosporina morbosa*), and the bacterial fire blight pathogen (*Erwinia amylovora*) have been introduced into ornamental plantings at several locations, but these organisms are not capable of causing widespread damage to native tree species (Wittwer 2005). Therefore, the Project is not anticipated to impact functions and values of vegetation communities throughout the spread of vegetation pathogens.

Timber Harvesting

APP has conducted a desktop analysis to determine if BLM or state land is present along the alignment that is currently managed for timber production. If no areas of timber management are located within the Project area, then no impact to merchantable timber is anticipated. Timber production areas that are identified within the Project area will be mapped. APP will consult with the appropriate timber resource agency if timber lands will be impacted by the Project. [Note: An update of the results of the timber production desktop analysis will be included with the final report.]

3.4 WILDLIFE AND TERRESTRIAL RESOURCES

3.4.1 GENERAL ECOLOGICAL PROVINCES AND HABITATS

The Beaufort Sea and Stefansson Sound ecosystem and two Level 2 terrestrial ecoregions have been delineated within the Project area (refer to Section 3.3). The Level 2 ecoregions and Level 3 ecoegions include:

- Arctic Tundra Ecoregion
  - Beaufort Coastal Plain
  - Brooks Foothills
  - Brooks Range
- Intermontane Boreal Forest Ecoregion
  - Kobuk Ridges and Valleys
  - Ray Mountains
  - Yukon-Tanana Uplands
  - Tanana-Kuskokwim Uplands.

Ecoregions are based on perceived patterns of a combination of causal and integrative factors including climate, land surface form, natural vegetation, and surficial geology. Transitional areas along ecoregion boundaries are areas sharing characteristics of two or more adjacent ecoregions, and the boundary between regions typically supports species common to each area.

The wildlife species associated with these ecoregions are summarized in Table 3.4.1-1. Wildlife species are described in the following sections:

- Some of the wildlife species identified in Table 3.4.1-1 are federally endangered and threatened species, which are discussed in Section 3.5.
- Section 3.4.2 includes a brief description of representative wildlife found in the Project area.
- Section 3.4.7 includes a general discussion of pipeline construction and operation impacts and potential mitigation for affected species or habitats.
- Finally, Section 3.4.6 describes specific wildlife habitats that are particularly sensitive and/or have special management designations.
- Additional discussions of wildlife species that are listed as endangered or threatened are included in Section 3.5.

TABLE 3.4.1-1

Alaska Pipeline Project
Common and Casual Wildlife Species Potentially Occurring in the Project Area by Ecosystem/Ecoregion

Ecosystems/Ecoregions	Representative Species
Beaufort Sea-Steffanson Sound	Birds: Pacific and common loons, common eider, long-tailed duck, glaucous gull, ivory gull, black gillemot, and red and red-necked phalaropes. Mammals: Polar bear, ringed seal, bearded seal, spotted seal, ribbon seal, Pacific walrus; bowhead, gray, killer, and beluga whales. Reptiles/amphibians: None
Beaufort Coastal Plain	Birds: Arctic loon, yellow-billed, red-throated and common loons, tundra swan; snow, greater white-fronted, cackling, and Canada geese, brant; Steller's, spectacled, common and king eiders; northern pintail, long-tailed duck, greater scaup; gyrfalcon, rock and willow ptarmigan, lesser yellowlegs, Hudsonian godwit, black turnstone, least sandpipers, dunlin, pectoral sandpiper, long-billed dowitcher, red-necked phalarope, parasitic jaeger, glaucous gull, Arctic tern, Sabine's gull, black guillemot, snowy owl, common raven, various warblers; white-crowned sparrow, Lapland longspur, hoary and common redpolls, and snow bunting. Mammals: Arctic ground squirrel, collared and brown lemmings, tundra shrew, barren ground shrew, singing vole, gray wolf, Arctic fox, red fox, wolverine, least weasel, polar and grizzly/brown bears, caribou, and muskoxen. Reptiles/amphibians: None
Brooks Foothills	Birds: rock ptarmigan, snowy owl, gyrfalcon, northern pintail, long-tailed duck, greater scaup, semi-palmated plover, black-bellied plover, lesser golden plover, bar-tailed godwit, whimbrel, lesser yellowlegs, solitary sandpiper, spotter sandpiper, red-necked phalarope, red phalarope, long-billed dowitcher, common snipe, ruddy turnstone, dunlin, sanderling, various sandpipers; parasitic, pomarine, and long-tailed jaegers; Bonaparte's, herring, glaucous, and mew gulls; Arctic tern, alder flycatcher, horned lark; bank and cliff swallow, common raven, gray jay, black-capped chickadee, northern shrike, various warblers, American (water) pipit, various sparrows, Smith's and Lapland longspur, and snow bunting. Mammals: Arctic ground squirrel, collared and brown lemmings, shrews and voles, gray wolf, Arctic and red fox; Canada lynx, grizzly/brown bears, least weasel, wolverine, caribou, and muskoxen. Reptiles/amphibians: None

TABLE 3.4.1-1

Alaska Pipeline Project
Common and Casual Wildlife Species Potentially Occurring in the Project Area by Ecosystem/Ecoregion

Ecosystems/Ecoregions	Representative Species
Brooks Range	Birds: Pacific loon, common loon, horned grebe, red-necked grebe, tundra and trumpeter swans, greater white-fronted, goose snow Canada goose, northern pintail, American widgeon, greater scaup, lesser scaup, long-tailed duck, black scoter, white-winged scoter, common goldeneye, Barrow's goldeneye, bufflehead, common merganser, red-breasted merganser, ruddy duck, bald and golden eagle, northern harriers, sharp-shined hawk, northern goshawk, Swainson's hawk, red-tailed hawk, rough-legged hawk, golden eagle, merlin, peregrine falcon, gyrfalcon, spruce grouse, willow ptarmigan, rock ptarmigan, ruffed grouse, sharp-tailed grouse, American coot, sandhill crane, greater yellowlegs, numerous sandpipers, whimbrel, Hudsonian godwit, ruddy turnstone, dunlin, long-billed dowitcher, common snipe, parasitic jaeger; mew, herring and glaucous gull, Arctic tern, great horned owl, snowy owl, boreal owl, several flycatchers, horned lark, several swallows, common raven, gray jay, Siberian tit, boreal chickadee, red-breasted nuthatch, American dipper; numerous thrushes, northern shrike, several warblers, several buntings and sparrows, and rusty blackbirds. Mammals: Dall sheep, caribou, moose, grizzly/brown and black bear, gray wolf, wolverine, Arctic and red fox, ermine, hoary marmot, pika, Arctic hare, snowshoe hare Canada lynx, Arctic ground squirrel and red squirrel, brown lemmings, and voles and shrews. Reptiles/amphibians: Wood frog
Intermontane Boreal Forest (all sub-regions)	Birds: Pacific loon, red-throated loon, horned grebe, red-necked grebe, tundra and trumpeter swan; greater white-fronted and Canada geese; green-winged teal, mallard, northern pintail, gadwall, American widgeon, canvasback, redhead, greater scaup, lesser scaup, long-tailed duck, black scoter, white-winged scoter, common goldeneye, Barrow's goldeneye, bufflehead, common merganser, red-breasted merganser, and ruddy ducks; bald eagle, northern harriers, sharp-shined hawk, northern goshawk, Swainson's hawk, red-tailed hawk, rough-legged hawk, golden eagle, merlin, peregrine falcon, gyrfalcon, spruce grouse, willow ptarmigan, rock ptarmigan, ruffed grouse, sharp-tailed grouse, sandhill crane, greater yellowlegs, numerous sandpipers, whimbrel, Hudsonian godwit, ruddy turnstone, dunlin, long-billed dowitcher, common snipe, parasitic jaeger; mew, herring and glaucous gull, Arctic tern, great horned owl, snowy owl, boreal owl, several flycatchers, horned lark, several swallows, common raven, gray jay, Siberian tit, boreal chickadee, red-breasted nuthatch, American dipper; numerous thrushes, northern shrike, several warblers, several buntings and sparrows, and rusty blackbirds. Mammals: Shrews, pika, hoary marmot, snowshoe hare, Arctic ground, red squirrel, and northern flying squirrels, meadow jumping mouse; northern red-backed, yellow-cheeked, tundra, and meadow voles, brown and northern bog lemmings muskrat, beaver, porcupine, little brown bat, gray wolf, coyote, red and Arctic foxes, Canada lynx, brown/grizzly and black bear, marten, ermine, least weasel, mink, wolverine, river otter, moose, caribou, and Dall sheep. Reptiles/amphibians: Wood frog
Source: McDonald and Cook 2009; ADFG 1973, 1978b, and 2011c; Nowacki et al. 2001; EPA 2011.	

3.4.1.1 Beaufort Sea and Stefansson Sound Ecosystem

Most of the nearshore seabed of the Alaska Beaufort Sea consists of a soft-bottom featureless plain composed of mud and silty sand (Barnes and Reimnitz 1974); hard substrates in the form of cobbles and boulders occur sporadically (Minerals Management Service [MMS] 1990. Boulder/cobble substrate needed to support boulder patch communities characterized by rich, kelp-dominated flora and fauna has not been observed at the dock area and dredging channel.

Benthic communities constitute an important component of this habitat in this area. Benthic organisms function as prey, predators, and competitors, and can provide shelter on a substrate. Benthic invertebrates typically are classified as either epifauna (on or near surface of the substrate) or infauna (within the substrate). The benthic communities associated with soft-bottom benthic habitat include microalgae, bacteria, and an assemblage of polychaete worms, clams and snails (mollusks), and benthic amphipods and isopods (MMS 1990). The organisms comprising these groups, as well as the general patterns of their distribution and abundance, have been described in the Final Environmental Impact Statement (EIS) documents prepared for Outer Continental Shelf (OCS) Lease Sales 97, 109, 124, and 144 (MMS 1987a, 1987b, 1990, and 1996, respectively); by Thorsteinson and Wilson (1983); the EIS for OCS Lease Sales 186, 195, and 202 (MMS 2003); the Environmental Assessment for OCS Lease Sale 202 (MMS 2006); and the Liberty Environmental Assessment (MMS 2007).

The benthic community of the Prudhoe Bay/Stefansson Sound lagoon system has been regularly sampled and monitored from 1974 until present as various docks, causeways, and production islands have been constructed in the area. This community is composed primarily of infaunal invertebrates (e.g., polychaetes, clams, and various crustaceans) and epifaunal invertebrates (e.g., amphipods, isopods, and mysids) (Broad et al. 1979; Carey et al. 1984; Feder and Jewett 1982; Feder and Schamel 1976; Griffiths and Dillinger 1981). The Beaufort Sea has fewer benthic species than other regions of the Arctic because of the cold, unproductive Arctic water masses and brackish conditions (Curtis 1975). Low numbers of benthic macrofauna species in the Arctic intertidal zone are usually attributed to ice scouring (Ellis 1955). In general, epifaunal species diversity and abundance increase as water depth increases. The proportion of longer-lived sessile (attached to substrate) or sedentary (very-slow-moving) species also increases, as compared to the more motile (fast-moving) and opportunistic species found closer to shore in shallower waters.

The nearshore zone extends from the shoreline to 6.6 feet. The presence of the bottom-fast ice in the nearshore zone prevents most species from over-wintering in this zone. Therefore, the nearshore benthic community is dominated by motile, opportunistic species that can re-colonize the area each year after the ice melts in the spring (Broad 1977; Broad et al. 1978; Chin et al. 1979 a,b; Feder et al. 1976; Grider et al. 1977). Distribution and abundance of most species is likely dependent on annual (or more frequent) colonization. The diversity and biomass of infauna increase and species composition changes in the inshore environment where water depths range from 6.6 to 33 feet. Biomass and diversity in the inshore zone generally increase with depth, except in the shear zone, where the moving pack ice shears against shore-fast ice and shore. Dominant motile invertebrates that live near the seafloor include amphipods, mysids, copepods, and other swimming crustaceans. These organisms are food for some fishes, birds, and marine mammals (Frost and Lowry 1988). Although shorefast ice can occur in the shallower end of the inshore zone, this zone can support a greater diversity of benthic organisms and up to about 10 times the biomass of the nearshore zone.

Benthic infaunal organisms live within the substrate and, as a result, often are sedentary. As mentioned above, relatively few species are found in nearshore waters with depths of less than 6.6 feet. Any polychaetes and clams found in this zone protect themselves from the harsh and variable substrate conditions by burrowing into the sediment. Other infaunal organisms, such as oligochaete worms and clams, increase in abundance toward the deeper edge of this zone, reflecting the greater substrate stability found farther offshore (LGL et al. 1998).

Although most substrates in the Beaufort Sea are silty sediments that are generally unsuitable for settlement and growth of large algae, hard substrates in the form of cobbles and boulders occur sporadically (MMS 1990).

[Note: The dredging and offshore disposal sampling information will be updated in the final report.]

3.4.1.2 Beaufort Coastal Plain Ecoregion

The Beaufort Coastal Plain extends from the north coast of Alaska (Beaufort Sea coastline) southward to the Brooks Foothills. The PT Pipeline PMP 0.0 to the terminus of the PMP 58.4, the Alaska Mainline between AMP 0.0 and AMP 60.0, and the GTP are located in this ecoregion. This ecoregion consists of a low, gradually rising plain characterized by poor drainage, wet graminoid herbaceous vegetation communities, and many numerous thaw lakes that cover up to 50 percent of the surface (Nowacki et al. 2001).

The region has Arctic climate conditions and is underlain by thick, continuous permafrost. Permafrost limits the infiltration of water from snow melt and rainfall. The consequence of the inhibiting layer is an extensive system of wet tundra, marshes, ponds, and lakes found in this portion of the Project area. Similarly, the Beaufort Sea shoreline is complex and convoluted, and comprised of coastal tundra, salt marshes, vegetated flats, peat mats, brackish lagoons, and small streams.

The growing season extends from approximately mid-June to the end of August, although frost can occur in any month. Precipitation is relatively low, ranging from 4 to 11.8 inches, with occasional higher values inland from the coast. Summers are very short and cool, with mean temperatures of 44.0°F.

Areas along the Beaufort Coastal Plain can be highly productive and annually produce 500 to 1,000 pounds of vegetation per acre, an important source of food for wildlife, particularly caribou, waterfowl, and shorebirds. Because of the limited growing season, the vast majority of migratory wildlife species are present on the Beaufort Coastal Plain only during the summer, typically arriving in late May or early June and leaving by late August or September.

In addition to large herds of caribou, mammals of this region include the polar bear, grizzly/brown bear, muskoxen, gray wolf, wolverine, mink, ermine, least weasel, and lemming. Polar bears live on the ice pack; however, polar bears can range up to 60 miles inland. Many of the terrestrial mammals either hibernate or undergo seasonal migration as an adaptation to winter. Other mammals become nomadic (i.e., Arctic foxes) or remain active beneath the snowpack (i.e., collared and brown lemmings).

Arctic fox are common on the ice pack and coastal areas during the winter. Muskoxen and gray wolves are found in limited numbers across the Beaufort Coastal Plain during this time of year. Wolverines are infrequently present (ADFG 1973 and 1978).

Common small mammals inhabiting the Beaufort Coastal Plain include shrews, voles, and brown and collared lemmings. These resident species are critical to the ecosystem as prey items. Lemmings may be the most important mammals on the Beaufort Coastal Plain because several predators, including mammals and birds, depend on them as prey species. In years when there are cyclical declines in the number of lemmings, the Arctic and red fox are forced to switch from lemmings to young birds and eggs as dietary mainstays.

The wet tundra and aquatic habitat, including shallow water wetlands, lakes and ponds, provide productive habitat for millions of migrating waterfowl and shorebirds during the summer months. Canada geese, greater white-fronted geese, snow geese, and brant nest on the Beaufort Coastal Plain and along the northern section of the Project in Alaska from mid-May to early

September. Canada and greater white-fronted geese nest in isolated pairs, while brant and snow geese nest in colonies of a few to several hundred pairs. Tundra swans are also common breeders, nesting from May to early June and brood-rearing from July to mid-September. Eighteen species of ducks have been recorded on the Beaufort Coastal Plain, including spectacled, Steller's, and king eiders; long-tailed ducks; and northern pintails.

The Beaufort Coastal Plain is an important breeding area for several species of shorebirds, approximately 24 of which occur on the central North Slope. Only four species of birds are regular winter residents on the Beaufort Coastal Plain: the common raven, snowy owl, willow ptarmigan, and gyrfalcon. Ravens are relatively common and are often associated with areas of human habitation. Snowy owls can also be common on the Beaufort Coastal Plain in winter when their primary food, lemmings, is available.

Over 30 species of passerines have been recorded on the Beaufort Coastal Plain, but only one, the Lapland longspur, is commonly observed nesting on the tundra. Many of the passerines migrate from wintering areas in temperate and tropical regions in North and South America, though a few species migrate from Asia.

3.4.1.3 Brooks Foothills Ecoregion

The Brooks Foothills ecoregion is comprised of gently rolling hills and broad ridges north of the Brooks Mountain range and is crossed between approximate AMPs 60.0 to 150.0 (ADFG 2006). The foothills are comprised of rolling uplands of moist tundra with outcrops of ridges, mesas, and bluffs, including Gunsight, Table Top, Itigaknit, and Imnavait Mountains, Hatbox Mesa, and Tuktu Bluff. The elevation ranges from a low of 500 feet in the valleys of the northern section of the area to a high of approximately 2,600 feet near Galbraith Lake. A dry polar climate dominates this ecoregion, but it is somewhat warmer and wetter than the Beaufort Coastal Plain (Nowacki et al. 2001). Precipitation is low in the foothills with about 6 to 10 inches annually, and average annual temperature ranges from 9°F to 20°F (ADFG 2006). The average winter temperature is -35°F in the foothills. In July, the average temperature ranges from low to mid-60°F (AEIDC 1975).

The surface is underlain by thick continuous permafrost and slope-related periglacial features, such as solifluction lobes and stone stripes, which are common. Because the permafrost impedes drainage, soils in the active layer are usually saturated and have fairly thick organic horizons. Wetlands are present in more than 83 percent of the Brooks Foothills ecoregion. Wetlands are found in the valleys and basins associated with river systems (ADFG 2006).

Moist tundra is the dominant plant community of the foothills region. The dominant vegetation type across the foothills is of mixed shrub-sedge tussock tundra, with willows in the small drainages, wet sedge tundra in old drained lakes, and *Dryas* tundra on the drier ridges (ADFG 2006). Cottongrass tussocks six to 10 inches high, with other sedges and forbs as well as scattered dwarf shrubs, separated by narrow channels, cover large areas of rolling terrain. Other plants growing with the cottongrass include small shrubs (e.g., dwarf birch, willows, Labrador tea), and herbs (e.g., bistort and cloudberry) (AEIDC 1975).

Prostrate woody shrubs, mosses, sedges, and lichen cover the mountainsides and valleys. The high brush plant community occurs along the floodplains of many large rivers of the Arctic region, particularly in the mountains and foothills. Vegetation along rivers is dominated by willow. The rest of the ecoregion is dominated by vast expanses of mixed shrub-sedge tussock tundra. *Dryas* tundra occurs on ridges, and calcareous areas support sedge-*Dryas* tundra (ADFG 2006).

Soils are usually well-drained gravel, sand, or silt, and the active layer is deeper than in the remainder of the Arctic. Spring floodwaters and floating ice may destroy some vegetation, so the community is constantly changing. Newly exposed gravel bars are invaded by a pioneer flora, including horsetail, alpine bluegrass, and dwarf fireweed (AEIDC 1975).

Wildlife species inhabiting the Brooks Foothills ecoregion are similar to those of the Beaufort Coastal Plain; however, the presence of drier vegetation communities and stream/river riparian areas provide for greater species diversity. Ermine and gray wolves are typically encountered in the Foothills and more infrequently on the Beaufort Coastal Plain (U.S. Department of the Interior [DOI] 1979). In addition, lemming populations differ between these areas with more collared lemmings than brown lemmings in the foothills. There are additional species of shrews and voles in the foothills than are found in the wet tundra areas of the Beaufort Coastal Plain.

Caribou are common across the foothills, and moose are found occasionally in wet meadows and shrub communities along rivers. Carnivorous mammals, including ermine, least weasel, wolverine, red fox, and gray wolf, inhabit the foothills, and their population densities usually reflect those of their respective preferred prey items. Common resident prey species include voles, lemmings, Arctic ground squirrels, and hares. Caribou are also an important prey species for the larger predators such as wolverines, brown/grizzly bears, and the gray wolf.

The increased wildlife diversity in the foothills versus that of the Beaufort Coastal Plain is a direct reflection of the increase in diversity of habitats. These different habitats are indicators of the various soil moisture regimes and soil types found in the foothills. These habitats provide food and cover that are not present on the plain, resulting in the success of herbivorous species, especially small mammals that do not inhabit the Beaufort Coastal Plain. The resulting increase in resident small prey mammals is directly reflected by an increase in the populations of resident carnivorous mammals and predatory birds.

3.4.1.4 Brooks Range Ecoregion

The Project passes through the Brooks Range Ecoregion between AMPs 150 to 230 and reaches elevations of over 4,700 feet at Atigun Pass. In the higher alpine areas, plant cover is discontinuous over barren rock and chiefly consists of low mats of herbaceous and prostrate shrub species as described in Section 3.3. The lack of ground cover over much of the Brooks Range limits the numbers of large and small herbivorous mammals. This, in turn, limits the presence of larger, predatory mammals. At lower elevations, shrews, voles, and lemmings may be present. At higher elevations, small to medium size mammals may be limited to the Alaska vole, hoary marmot, and collared pika, all of which may inhabit rocky substrates.

The Brooks Range is an important sport hunting area in Alaska that supports large mammal such as caribou, grizzly/brown and black bear, gray wolf, and Dall sheep. The Brooks Range is the primary habitat for Dall sheep in the Project area. Caribou migrate through passes of the Brooks Range, but do not spend extensive period foraging or resting in this ecoregion. Larger mammalian carnivores such as wolves may be found in the mountains, but usually only in the vicinity of Dall sheep or migrating caribou. Smaller mammals include wolverine, hoary marmot, red and Arctic fox, Arctic ground squirrel, snowshoe hare, lemming, and pika.

Grizzly/brown bears are common residents in the Brooks Range, but their density is low. Grizzly bears are efficient and flexible omnivores. Although the bulk of their diet is vegetation, bears will eat caribou and calves, moose and calves, Dall sheep lambs, carrion, adult birds, young birds, and eggs when encountered. Ground squirrels are also an important food source for grizzly/brown bears.

During the summer months, the Brooks Range is an important nesting area for several songbirds. Raptors are prominent in much of this area and include golden eagles, peregrine falcons, gyrfalcons, rough-legged hawks, northern harriers, and snowy and short-eared owls. The snowy and short-eared owls are ground nesters, and other raptors nest at traditional sites on cliffs or rock outcroppings (refer to Section 3.3).

3.4.1.5 Intermontane Boreal Forest Ecoregion

After passing through the Brooks Range, the Project enters an area that is generally classified as boreal forest (i.e., taiga) between AMPs 230 and the U.S.-Canada border at AMP 743.1. This segment includes significant physiographic ecoregions including the Ray Mountains, Yukon-Tanana Uplands, and the Tanana-Kuskokwim Lowlands. Underlain by a relatively complex geologic matrix of metamorphic, igneous, and sedimentary rocks, this region is composed of plateaus and highlands of rolling topography and gentle slopes interspersed with frequent valleys. Upland forests and woodlands of white spruce, paper birch, and quaking aspen cover most low slopes on the south and south-facing slopes in the north. Black spruce forest vegetation grows on north-facing slopes. In poorly drained lowlands, the black spruce forest, muskegs, and shrub bog habitats are the dominant communities. At higher elevations, the vegetation is dominated by tundra habitats characterized by grasses and sedges on wetter sites and by low-growing shrubs on drier sites.

Mammals inhabiting the forested areas of the intermountain ecoregion include brown and black bears, moose, caribou, wolves, ermines, least weasels, marten, snowshoe hares, pika, hoary marmot, red squirrel, voles, and shrews. Some of these species, including pika and hoary marmot, are suited to the rocky nature of the higher elevations, while others, including wolves, ermine, and bears, prefer the lower elevation and open forests. Most of these species are resident year-round, but hibernate or undergo seasonal movements locally to optimum foraging grounds. The small mammals are critical to the ecosystem as prey items. Beaver, river otter, mink, and muskrat are common near lakes and large streams of this ecoregion.

The open, mixed deciduous-conifer forests support a large variety of birds. 200,000 to 300,000 sandhill cranes migrate through the Project area along the Tanana River during their spring and fall migrations.

Much of the wildlife found in the Project area in Alaska is particularly important because the species have significant recreational, aesthetic, subsistence or commercial value. As such, several areas in the Project area have been identified as sensitive wildlife habitats or have been designated as wildlife and game management areas. These habitats and areas are discussed in more detail in Section 3.4.6.

3.4.2 WILDLIFE RESOURCES

3.4.2.1 Marine Mammals

All marine mammals are afforded protection under the Marine Mammal Protection Act (MMPA). The MMPA prohibits the *take* of marine mammals in U.S. waters by U.S. citizens, and the importation of marine mammals and marine mammal products into the U.S. Under the MMPA, take is defined as "harassment hunting, capturing, killing, or collecting, or attempt to harass, hunt, capture, kill, or collect."

NOAA Fisheries and FWS are given authority to implement the MMPA. In the Project area, FWS is responsible for the conservation and management of walrus and polar bear; while NOAA Fisheries is responsible for management of pinnipeds (other than walrus) and cetaceans.

APP has initiated consultations with the FWS and the National Marine Fisheries Service (NMFS), and has conducted a review of existing data sources, to identify federally listed threatened and endangered species, and to support the analysis of impacts to ESA- and MMPA-listed species. Using information from the NMFS, FWS, previous studies in the area, previous BAs and Biological Opinions, and recent surveys conducted by the NMFS, FWS, and others, APP will assess the construction and operation impacts of facility components on the MMPA species, described below, and ESA-listed and candidate species presented in Section 3.5.1. [Note: APP will work with FWS, NMFS and FERC to develop an applicant-prepared Biological Assessment (BA) that will assess the construction and operation impacts of facility components on the MMPA and ESA-listed and candidate species to file with the final report in Appendix 3D. Appendix 3D will be filed under a separate cover marked: **"CONTAINS PRIVILEGED INFORMATION – DO NOT RELEASE."** APP will consult with the Alaska Eskimo Whaling Commission and Native groups that conduct subsistence hunting on MMPA species.]

Marine mammals that may be present in the Project area are listed in Table 3.4.2-1. Those marine mammal species that are afforded protection under ESA are further described in Section 3.5.1; those species that are not ESA-listed are described below.

TABLE 3.4.2-1

Alaska Pipeline Project
Marine Mammal Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Relative Abundance	Primary Habitat	Primary Prey	Season(s) Present	ESA Status
Polar Bear	*Ursus maritimus*	Common	Onshore-Offshore -Ice	Seals	Year-round	Threatened (refer to Section 3.5.1.1)
Bowhead Whale	*Balaena mysticetus*	Common	Shelf/Offshore	Fish/Zooplankton	Summer - Fall	Endangered - Depleted (refer to Section 3.5.1.2)
Gray Whale	*Eschrichtius robustus*	Uncommon	Shelf/Offshore	Crustaceans	Summer- Fall	Delisted 1994
Beluga Whale	*Delphinapterus leucas*	Common	Shelf/Offshore	Zooplankton	Summer - Fall	Not listed
Killer Whale	*Orcinus orca*	Uncommon	Shelf/Offshore	Marine mammals-fish	Summer - Fall	Not listed
Ringed Seal	*Pusa hispida*	Common	Shelf	Fish/Zooplankton	Year-round	Proposed for listing (refer to Section 3.5.1.3)
Bearded Seal	*Erignathus barbatus*	Common	Shelf	Shellfish	Summer - Fall (some year-round)	Proposed for listing (refer to Section 3.5.1.4)
Spotted Seal	*Phoca largha*	Common	Shelf	Fish/Zooplankton	Summer - Fall	Not listed

TABLE 3.4.2-1

Alaska Pipeline Project
Marine Mammal Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Relative Abundance	Primary Habitat	Primary Prey	Season(s) Present	ESA Status
Ribbon Seal	*Histriophoca fasciata*	Uncommon	Shelf	Fish/Shellfish	Spring-Summer	Not Listed
Pacific Walrus	*Odobenus rosmarus*	Uncommon	Shelf	Shellfish	Summer - Fall	Candidate Species (refer to Section 3.5.1.5)

ESA - Endangered Species Act.
Status obtained from ESA and MMPA websites on August 25, 2011.
Source: ADFG 2011c.

Gray Whale

The Eastern North Pacific stock of gray whales (*Eschrichtius robustus*) inhabits water along the west coast of North America and spends the summer feeding in the shallow waters of northern and western Bering and Chukchi Seas; although, some gray whales have been reported feeding in the waters off Kodiak Island and Southeast Alaska. Each fall, the whales migrate south along the coast of North America from Alaska to Baja California, Mexico (Frost and Karpovich 2008).

Only a small number of gray whales enter the Beaufort Sea east of Point Barrow from the Chukchi Sea (Frost and Karpovich 2008). A few records have been made of sightings along the Alaska Beaufort Sea coast as far east as Barter Island. Whales were observed in water ranging from 65 to 131 feet deep (Rugh and Fraker 1981). Hunters at Cross Island (near Prudhoe Bay) took a single gray whale in 1933. Only one gray whale was sighted in the central Alaska Beaufort Sea during the extensive aerial survey programs funded by the Bureau of Ocean Energy Management and the oil and gas industry from 1979 to 1997. However, during September 1998, small numbers of gray whales were sighted on several occasions in the central Alaska Beaufort Sea (Treacy 2000). More recently, a single sighting of a gray whale was made in August 2001 near the Northstar production island (Williams and Coltrane 2002). In 2003 and 2004, gray whales were observed in the deeper waters off of Barrow, Alaska, attributed to increased population size and warming Arctic waters (Frost and Karpovich 2008).

The Project will be conducting construction activities in the Stefansson Sound in waters generally less than 25 feet deep and based on distribution information, the use of these waters by gray whales is highly unlikely.

Beluga Whale

The Beaufort Sea stock of beluga whales (*Delphinapterus leucas*) summers in the Beaufort and Chukchi seas and overwinters in the Bering Sea or northern Gulf of Alaska. In the spring, beluga whales migrate closer to shore to warmer waters to molt, give birth, and care for calves while in the winter, they tend to occur offshore in waters associated with pack ice. Ice cover, tidal conditions, access to prey, temperature, and human interaction all play a factor in their seasonal distribution (Angliss and Allen 2007).

The population of the Beaufort Sea stock is estimated at 21,000 whales; the most recent aerial survey was conducted in 1992. The current population trend of this stock of beluga whales is unknown (Angliss and Allen 2007).

Beluga whales summer diet consists of fish, including herring, capelin, smelt, Arctic and saffron cods, salmon, flatfishes, and sculpins; and invertebrates, including octopus, squid, shrimp, crab, and clams. Feeding occurs mostly over the continental shelf and in nearshore estuaries and river mouths. Their winter diet is unknown (Citta and Lowry 2008).

Beluga whale natural mortality results from mass strandings and entrapments and predation by killer whales. Beluga whales are also a valuable subsistence resource for some Alaska Native communities, including Kaktovik located on the Beaufort Sea (Citta and Lowry 2008).

Beaufort Sea beluga whales are not listed as “depleted” under the MMPA or listed as “threatened” or “endangered” under the ESA. Additionally, the Beaufort Sea stock of beluga whales is not classified as a strategic stock (Angliss and Allen 2007).

Killer Whale

Killer whales (*Orcinus orca*) are the most widely distributed cetacean species in the world and occur at higher densities in colder and more productive waters of both hemispheres, with the greatest densities found at high latitudes. Killer whales are considered depleted under the MMPA (Zimmerman 2008).

Killer whales are found throughout all Alaskan marine waters, but most commonly over the continental shelf from Southeast Alaska through the Aleutian Islands and northward to the Beaufort and Chukchi seas. Killer whales migrate northward throughout the Bering Strait in the spring as the pack ice retreats and leave the Beaufort and Chukchi areas in the fall when the ice advances (Zimmerman 2008).

Systematic population assessment studies have not been conducted in the Bering, Chukchi, or Beaufort seas. Based on available information, occurrences of the killer whale in the Project area are unlikely. The Project will be conducting construction activities in the Stefansson Sound in waters generally less than 25 feet and the use of these waters by whales is highly unlikely (Zimmerman 2008).

Killer whales are opportunistic feeders and have been observed to prey on large marine animals and fish (Zimmerman 2008).

Spotted Seals

Spotted seals (*Phoca largha*) are found in the Chukchi, and Beaufort seas in the summer. Seals overwinter in the Bering Sea along the ice edge and make east-west movements along the edge. During spring the seals prefer to the southern edge of the ice and then move nearshore after the sea ice retreats. In summer and fall, spotted seals use coastal haulouts regularly, and may be found as far north as 69 to 72°North in the Chukchi and Beaufort Seas (Allen and Angliss 2009a).

The timing of the formation and persistence of sea ice, and the spotted seals use of sea-ice habitat, roughly varies with latitude throughout the species’ range. From late fall through spring, spotted seal habitat-use is closely associated with the distribution and characteristics of seasonal sea ice. The ice provides a dry platform away from land predators during the whelping, nursing, breeding, and molting periods. When sea ice begins to form in the fall, spotted seals start to occupy it immediately, concentrating in large numbers on the early ice that forms near river mouths and estuaries. In winter, as the ice thickens and becomes shorefast along the coasts, spotted seals move seaward to areas near the ice front with broken ice floes.

Spotted seals commonly make and maintain holes in fairly thin ice and have been known to travel 6 miles or more over solid ice in search of cracks or open patches of water. Spotted seals usually avoid very dense, compacted ice, and stay near the ice front (Boveng et al., 2009; and the Center for Biological Diversity [CBD] 2008).

In summer, after molting and when the usable sea ice disappears, the herds break up and spotted seals move toward the ice-free waters of the coasts where they are concentrated in areas that provide the most favorable food conditions, such as areas having dense schools of spawning herring and smelt. As with whelping and breeding, the timing of these shoreward movements varies with the region (Boveng et al. 2009; CBD 2008).

Spotted seals are generalist feeders with a varied diet. Most studies have found that fishes are spotted seals' primary prey. A study in Russia determined that although the diet was dominated by fish species, there were also large numbers of crustaceans and cephalopods, which suggested that the diverse diet and regional and seasonal differences in foods of spotted seals are related to the seasonal distribution and abundance of their principal prey species. Spotted seals appear to have a flexible diet and can feed on whatever prey items are available and abundant (Boveng et al. 2009; CBD 2008).

Spotted seals consume a wide variety of prey items during the spring when they are associated with sea ice; primary prey items include many schooling fishes such as walleye pollock, Pacific herring, Arctic cod, Pacific sand lance, capelin, saffron cod, and Japanese smelt, as well as greenlings, eelpouts, sculpins, flatfishes, cephalopods, and crustaceans. In the summer, spotted seals primarily consume fishes and crustaceans similar to those they prey on in spring; however, at this time, seals will often redistribute and gather near rivers where they frequently prey on runs of spawning salmon (Boveng et al. 2009).

Spotted seals are not listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the ESA. NMFS received a petition on May 28, 2008, to list spotted seals under the ESA due to loss of sea ice habitat caused by climate change in the Arctic. NMFS published a Federal Register (Fed. Reg.) notice on September 4, 2008, indicating that there were sufficient data to warrant a review of the status of the species (Allen and Angliss 2009a).

Ribbon Seals

Ribbon seals (*Histriphoca fasciata*) are primarly found in the Bering and Oskhotsk seas along the continental shelf break from late-March to early-May. Ribbon seals are found most abundantly in the central and western Bering Sea, where they form small groups on the pack ice in the spring to give birth, nurse pups, and molt. From May to mid-July, ribbon seals move northward with the receding ice, moving into the Chukchi and western Beaufort seas. Ribbon seals are infrequently seen on shorefast ice or land (Allen and Angliss 2009b).

The diet of ribbon seals is diverse and includes a variety of fishes, cephalopods, and crustaceans. Limited information is available on the predators of ribbons seals, but may include polar bears, killer whales, sharks, and Pacific walrus. Ribbon seals are occasionally harvested by Alaska Natives in the Bering and Chukchi seas (Allen and Angliss 2009b).

Currently there is no reliable estimate of ribbon seal population in Alaskan waters; however, NMFS has developed a preliminary estimate of approximately 49,000 ribbon seals in the eastern and central Bering Sea. Ribbon seals are not listed as depleted under the MMPA or listed as threatened or endangered under the ESA; however, NMFS received a petition to list the ribbon seal under ESA in December 2007. After a review of the species, NMFS determined that the listing of the ribbon seals was not warranted at the time (73 Fed. Reg. 79822) (Allen and Angliss 2009b).

3.4.2.2 Terrestrial Mammals

Large Animals

Big game species important to resident and subsistence hunters and wildlife enthusiasts in the Project area include gray wolf, caribou, moose, Dall sheep, muskoxen, grizzly/brown bear, black bear, and bison (refer to Table 3.4.2-2).

TABLE 3.4.2-2

Alaska Pipeline Project
Terrestrial Large Mammal Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Status
Caribou	*Rangifer tarandus*	Present
Moose	*Alces alces*	Present
Grizzly/brown bear	*Ursus arctos*	Present
Black bear	*Ursus americanus*	Present
Dall Sheep	*Ovis dalli*	Present
Muskoxen	*Ovibos moschatus*	Present
Bison	*Bison bison*	Present
Gray wolf	*Canis lupus*	Present
Canada lynx	*Lynx canadensis*	Present
Wolverine	*Gulo gulo*	Present

Status: (Present) = species documented or very likely to occur in the region, (Incidental) = species that, if present, is rare in the area and at the limits of its range, (Absent) = species is not likely to occur in the region.

Caribou

Caribou (*Rangifer tarandus*) are distributed across Alaska in 32 distinct herds, which collectively encompass about 900,000 animals (ADFG 2010). Caribou are the most abundant large mammal of the Beaufort Coastal Plain. The four major caribou herds, based on fidelity to specific calving areas, are found in areas along the Beaufort Coastal Plain, including the West Arctic, Central Arctic, Teshekpuk, and Porcupine herds. Each herd has specific calving areas, distributions, movement patterns, and herd dynamics. Individuals or groups from these distinct caribou herds could potentially be found in or near the Project area in the Beaufort Coastal Plain because occasional exchange of animals between herds does occur. The primary herd using the Project area is the Central Arctic Herd (CAH). The Porcupine Herd will use the eastern portions of the Project area during spring calving and during the summer, and caribou from the Teshekpuk Herd has been known to use the same area to some extent (Carroll 2007).

South of the Brooks Range to the U.S.-Canada border, the Project passes through habitats used by the Fortymile caribou herd, and the periphery of the range used by the Ray Mountains, White Mountains, Delta, MaComb and Mentasta herds. Figure 3.4-1 illustrates the Project area in relation to the approximate caribou herd ranges.

Central Arctic Herd

The CAH, with an estimated population in 2008 of approximately 67,000 animals (compared to 32,000 animals in 2002), was recognized as a distinct herd in the mid-1970s. Its range has historically been north of the Continental Divide in the Brooks Range Mountains from the Itklillik and Colville rivers on the west to the Sadlerochit River on the east (Clough et al. 1987). In most years, several hundred to a thousand individuals also spend the winter near the Sadlerochit Mountains within the Brooks Range. The herd is smaller than the Porcupine caribou herd, which inhabits the Arctic NWR and consists of an estimated 90,000 animals in 2008 (Lenart 2007).

The CAH migrations are much shorter than the Porcupine herd. Females of the CAH winter in the mountains and foothills near the western edge of the Arctic NWR and migrate north-northwest across the rolling uplands south of Camden Bay to the calving grounds on or near the Canning and Staines river deltas, or to their calving grounds on the western side of the Sagavanirktok River in western portions the Prudhoe and Kuparuk Oil Field (Lenart 2007).

In late March, the CAH females and their calves of the previous summer begin moving north first from their wintering grounds in the Brooks Range to the calving grounds, followed by the male calves, and followed later by female calves and many of the non-pregnant cows. By the time spring migration is fully underway in late April, pregnant cows are far in the lead and bulls are only just beginning to leave the wintering areas. Females typically give birth for the first time when they are three years old, but very well fed and healthy cows may give birth at age two, and cows in poor condition may not start having calves until they are four years old. Caribou give birth to a single calf. Well-nourished adult cows give birth every year to calves that are able to run and follow their mothers within a few hours of birth. Nevertheless, young calves are vulnerable to predators such as wolves, golden eagles, and grizzly bears. Calves grow quickly and can consume vegetation when they have reached the age of three weeks. At this age, the calves are also sufficiently large and fast enough to have an increased ability to avoid predation (Lenart 2007).

While small populations of caribou often calve in mountains or forested areas, calves of large, migratory caribou populations like the CAH are typically born in treeless tundra where there are few large predators. Calving activity of the CAH has been concentrated in two areas: 1) west of Prudhoe Bay in the vicinity of the Kuparuk and Ugnuravik rivers, including oil development areas of Milne Point and Kuparuk; and, 2) east of Prudhoe Bay, primarily in the Bullen Point to Canning River delta area. Scattered, low-density calving extends as far east as the Sadlerochit River. After calving, some of the caribou move southeastward to the uplands south of Camden Bay. During the insect season in July, there is typically a strong eastward movement along the coastal habitats between the Canning River delta and Camden Bay, an area used for post-calving and insect relief. The summer ranges include the Prudhoe Bay and Kuparuk oil fields, extending south to the northern Foothills of the Brooks Range (Lenart 2007).

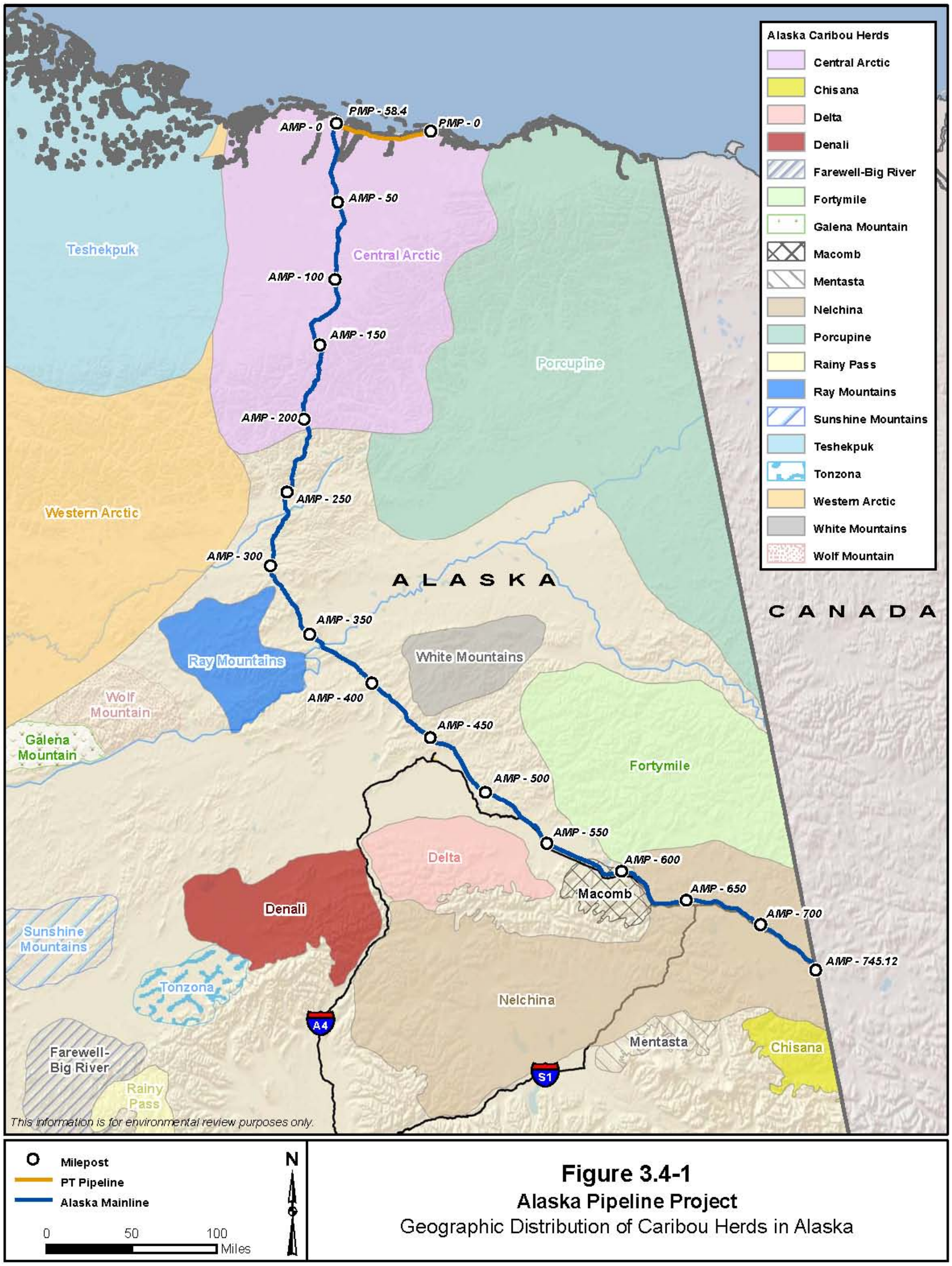

Figure 3.4-1
Alaska Pipeline Project
Geographic Distribution of Caribou Herds in Alaska

Calf survival of the CAH is generally high when the calves are born in the traditional Beaufort Coastal Plain. The Beaufort Coastal Plain calving area is also relatively free of predators; calf survival declines when late snow melt forces caribou to calve in nearby mountains and foothills where wolves, grizzly bears, and golden eagles are more numerous (Whitten and Cameron 1985).

Caribou employ various tactics to minimize the detrimental effects of insect harassment and maximize nutrient intake. Observations of herds suggest that they will often move to regions that have few insects and favorable food resources, which are typically cool and windy, while also employing various behavioral responses (e.g., formation of large dense aggregations). The post-calving movements of the caribou herd begin about two weeks after the peak of the calving period (Calef 1974).

The post-calving period for the Central Arctic caribou herd occurs in the middle of the summer when forage is abundant and at its highest quality. This is also the time of year when large numbers of mosquitoes, warble flies (*Hypodera tanandi*), and nose bot flies (*Oesteridae*) are present. To escape these insects, the herd travels to beaches and river deltas or to mountains and ridgetops, where winds, cooler temperatures, and lack of vegetation reduce insect numbers from those found in the valleys or on the open tundra. As the caribou move back and forth between feeding and insect-relief areas, they tend to gather in larger and larger groups or aggregates. As the insect numbers decline in August, caribou disperse and feed heavily on willow leaves and mushrooms to regain body weight. The fall migration of the CAH begins in late July and August (Learnt 2009).

Movement of the CAH within the North Slope area between the summer and winter ranges is inconsistent, but is predominately north-south along river corridors and through mountain passes, however some may take routes straight over mountains. Fall migration southward for the herd occurs between mid-August and early November, primarily along the Itkillik, Kuparuk, Sagavanirktok, and Ivishak river valleys. During the rut in October, large concentrations can be found from Galbraith Lake to the upper Sagavanirktok River and Accomplishment Creek on the north side of the Brooks Range, to the Chandalar Shelf and upper Chandalar River, located east of the Project area (ADNR 2011). Some members of the herd, however, remain on their summer range north of the mountains throughout the year, seeking out wind-blown valleys and tundra benches in search of lichens. Additionally, animals of the CAH winter near Arctic Village, just beyond the southern boundary of the Arctic NWR, and are an important subsistence resource (Learnt 2009).

<u>Porcupine Herd</u>

The Porcupine herd is an international resource whose range extends from the vicinity of the PT Pipeline and the western boundary of the Refuge in northeastern Alaska to the central Yukon and western fringe of the Northwest Territories in Canada (Griffith et al. 2002). This herd typically calves on the coastal plain and northern foothills of the Brooks Range, within the Arctic NWR, and in the Yukon Province (Lenart 2007). After increasing about 5 percent annually during 1976 through 1989, the Porcupine herd decreased 10 percent from 178,000 in 1989 to 160,000 in 1992 (Whitten and Cameron 1985). The herd declined to approximately 123,000 by 2000 (Griffith et al. 2002).

Caribou from the Porcupine herd only move west across the Canning River infrequently during the insect season. It has been observed that caribou from the Porcupine herd have mixed with caribou from the eastern segment of the CAH and have been found within 7 miles of the Sagavanirktok River Delta (Lawhead and Smith 1990).

Throughout its range, the Porcupine herd is an important subsistence resource for Iñupiat, Gwichin, and Inuvialuit communities in northeastern Alaska and the northern Yukon (Lenart 2007).

Teshekpuk Herd

The Teshekpuk Lake herd may be incidentally found in the Project area. In some years, the majority of the caribou remain in the Teshekpuk Lake area west of the Project area all winter; however, in other years some or all winter in the Brooks Range.

According to the most recent photo censuses, the Teshekpuk herd has increased from 45,000 animals in 2002 to just over 64,000 animals in 2009 (BLM 2003). The herd is primarily found within the National Petroleum Reserve-Alaska with its summer range extending between Barrow and the Colville River.

Teshekpuk Lake caribou migrate seasonally between their calving areas, summer range, and winter range to take advantage of seasonally available forage resources. If movements are greatly restricted, caribou are likely to overgraze their habitat. The caribou diet shifts from season to season and depends on the availability of forage. In general, the winter diet of caribou has been characterized as consisting predominantly of lichens and mosses, with a shift to vascular plants during the spring. However, when caribou winter near Teshekpuk Lake, where relatively few lichens are present, this herd may consume more sedges and vascular plants (BLM 2003 and 2005).

Calving occurs in the spring, generally from late May to late June. The Teshekpuk herd central calving area generally has been located on the east side of Teshekpuk Lake and near Cape Halkett, adjacent to Harrison Bay. Spring migration of parturient female caribou from the overwintering areas to the calving grounds starts in late March. Often the most direct routes are used; however, certain drainages and routes are likely utilized during calving migrations because they tend to have little to no snow (BLM 2003 and 2005).

During calving and post-calving periods, cow/calf groups are most sensitive to human disturbance. Individuals join into increasingly larger groups, foraging primarily on the emerging buds and leaves of willow shrubs and dwarf birch. In the post-calving period, July through August, caribou attain their highest degree of aggregation. Members of the Teshekpuk Lake herd generally aggregate close to the coast for insect relief. However, some small groups gather in other cool, windy areas such as the Pik Dunes located about 18 miles south of Teshekpuk Lake. Caribou aggregations move frequently to insect-relief areas along the Arctic coast (BLM 2003 and 2005).

The Teshekpuk herd was believed to reside year-round in the Teshekpuk Lake area; however, satellite collar data from the Teshekpuk Lake herd indicate that some animals travel great distances to the south, as far as the Seward Peninsula. The movement and distribution of caribou over the winter ranges reflect their need to avoid predators and their response to wind (storm) and snow conditions (depth and snow density), which greatly influence the availability of winter forage. The numbers of caribou using a particular portion of the winter range are highly variable from year to year. Range condition, distribution of preferred winter forage (particularly lichens), and predation pressure all affect winter distribution and movements (BLM 2003 and

2005). Beginning in the early 2000s most of the herd began wintering between Teshekpuk Lake and Anaktuvuk Pass. A portion of the herd migrates in a broad front using all major drainages from the Anaktuvuk River. The herd may use the Brooks Range for wintering, with a few animals wintering on the south side of the range (ADNR 2011).

Western Arctic Herd

The Western Arctic caribou herd is the largest in Alaska. As is the case with all caribou herds, populations fluctuate over time. In the early 1970s, the herd was estimated at 243,000 animals, dropped to 75,000 animals in 1976, and has since rebounded to a current population of 348,000. The highest population estimated was 490,000 animals in 2003. The herd occupies the northwestern quarter of the state, an area of about 140,000 square miles. The herd's summer range encompasses the foothills and mountain of the Brooks Ranges west of the TAPS route (BLM 2003).

Individuals from the West Arctic caribou herd may travel into the Project area and mix with other herds, but these occurrences are considered incidental. The majority of the herd remains well to the west of the Project area.

Fortymile Herd

The Fortymile herd had a historical range that encompassed about 85,000 square miles, extending from Whitehorse, Yukon, to the White Mountains north of Fairbanks. Population estimates from the 1950s were in a range from 46,000 to 60,000 animals. By the 1970s the populations had declined to an estimated low of 5,000 animals. Between 1974 and 1990, the herd grew slowly to 23,000 caribou. The herd population remained at that level until 1995, and since that time the herd has increased to an estimated 51,000 animals in 2010. The increase in the population is due to an intensive non-lethal predator control program, favorable weather conditions, and reduced and controlled hunting pressure (ADFG 2006 and 2010).

The current range of the Fortymile herd is in the Tanana Hills from north of Fairbanks to the Canadian border and primarily west of the Steese Highway. In 2001, however, individuals from the Fortymile herd crossed the Steese Highway for the first time in 30 years. In November of 2002, caribou from the herd crossed the Yukon River and the vast majority of the heard wintered near Yukon, Canada.

Other Caribou Herds

Other caribou herds that inhabit areas on the periphery of the Project include the Nelchina, Delta, Ray Mountains, and White Mountains herds. The Nelchina herd generally inhabits an area centered in the Nelchina Basin northeast of Anchorage and herd winters in the Tetlin Wildlife Refuge (FWS 2011) In 2010, the ADFG estimated the caribou population at 43,370 animals; it is Alaska's largest caribou herd that is in the vicinity of a large population center (ADFG 2010). During seasonal migratory movements between spring/summer and fall/winter ranges, a few of the animals cross the Richardson Highway and the TAPS right-of-way (BLM 2003). APSC Security flight data indicate that the caribou continue to use their traditional migration route while transecting the right-of-way and Richardson Highway (TAPSOwners 2001). Calving areas near the Project occur between AMPs 627 and 660 (APSC 2002), a winter concentration area occurs from AMPs 659 to 693, and a migration area occurs from AMPs 602 to 680 (APSC 2002). The Nelchina herd comprises the majority of the caribou that pass through or winter in the Tetlin NWR (FWS 2011).

The Delta herd inhabits areas typically west of the Project area, but a few individuals may travel to the east of the Delta River, the Project area, and the Richardson Highway during some parts of the year (APSC 2002; Valkenburg et al. 1999). An overwintering concentration area occurs near the Project between AMPs 520 and 555 (APSC 2002).

After growing continuously for nearly 15 years, the Delta caribou herd began to decline in 1989. Most other the Interior herds also began declining. The declines were caused primarily by high summer mortality of calves and increased natural mortality of adult females. Other minor causes included increased winter mortality of calves, and reduced parturition rates of 3-year-old and older females (Valkenburg et al. 1999). The decline in the Delta herd also coincided with increased wolf (*Canis lupus*) numbers, winters with deeper than normal snow, and warm summers. Mean body weight of annual samples of 10-month-old female calves was consistently low during the decline. The most recent population estimate for the Delta herds is approximately 3,200 animals, less than a third of what it was in 1990 when it reached a high of 10,700. The herd’s main wintering area is in the lower Yanert River drainage in the Alaska Range, but during recent winters some animals have crossed the Delta River and used the Donnelly Flats. Donnelly Flats represents the extreme eastern boundary of the herd's range. The herd spends most of its time in the foothills of the Alaska Range.

The Ray Mountains herd, numbering about 1,750 animals, migrates seasonally between the Yukon River to the south and the Kanuti NWR boundary to the north, and between the Ray and Big Salt River drainages to the east and the Tanana-Allakaket winter trail to the west. The majority of the areas used are located in the Tozitna North and South BLM-designated Areas of Critical Environmental Concern (ACEC), well away from the Project area. Observations indicate that the north unit is important to the herd on a year-round basis, but particularly in winter, while the south unit in the Tanana hills has seen little recent use. Instead, the south slopes of the upper Tozitna River have emerged as a core calving area and may prove to be a crucial habitat area. The winter range is principally on the northern side of the Ray Mountain’s Kanuti-Kilolitna drainage (Woolington 1997). The Ray Mountains herd has occasionally been observed in the vicinity of the TAPS right-of-way near Pump Station 5 (APSC 2002), the Dalton Highway at Old Man, and near Caribou Mountain (Woolington 1997).

A small remnant group of caribou from the Fortymile herd, known as the White Mountain herd, is found in the White Mountains National Recreation area in the headwaters of Victoria Creek, Hess Creek, and the Tolovana River, approximately 20 miles east of AMP 520 and Dalton Highway. The herd has not been reported to have crossed the TAPS route or the highway. The overall area of winter use is characterized as generally hilly and covered by black spruce, with white spruce along stream bottoms. Movements on the winter range were generally in a counterclockwise direction through the course of each winter. Early winter use by caribou occurs in the Victoria Creek headwaters, then west to the Hess Creek area and, finally, larger groups of caribou may be present during April and early May in the Beaver area (FWS 2011).

Moose

Alaska supports a moose (*Alces alces*) population between 175,000 to 200,000 animals, and moose is one of the most popular big game animals in Alaska. Moose have expanded their range over much of the state, with exceptions being in large areas of the Beaufort Coastal Plain and areas in far western Alaska and southern Alaska. Moose favor recently burned areas and early successional areas that support willow and birch shrubs. Suitable winter habitat availability is a critical factor for sustaining moose populations. Suitable habitats are restricted to riparian areas of stream or river valleys and lake margins and 5- to 50-year-old burn sites (ADFG 2011c).

Suitable moose habitat is characterized by mixed forest elements, dominated by white spruce, black spruce, paper birch, quaking aspen, and balsam poplar. Shrub communities of alder and willow are most common in riparian sites and surrounding lakes and meadows. Dwarf shrubs such as glandular birch (*Betula glandulosa*), Labrador tea (*Ledum decumbens*), crowberry (*Empetrum nigrum*), and blueberry (*Vaccinium uliginosum*) are common in the uplands (Bertram and Vivion 2002).

Moose are present along the major rivers of Southcentral and The Interior. Moose generally avoid areas of open tundra, and seldom inhabit mountainous areas above 5,000 feet. Moose densities south of the Brooks Range in the interior and eastern regions of Alaska are between 0.310 to 0.470 moose per square mile (Gardner 1996; Stenhouse et al. 1995). This density is similar to those reported in eastern Alaska (Gardner 1996), the Interior, and the Yukon (Stenhouse et al. 1995).

Moose in the Project area include locally migrant and resident populations. A segment of the moose population is considered to be a year-round resident of specific areas, and may not travel outside a 5-square-mile territory. Moose move seasonally between winter ranges and adjacent upland summer ranges, yet studies have indicated that seasonal home ranges overlapped widely, suggesting that moose are non-migratory (Stenhouse et al. 1995).

The estimated home ranges for moose in Alaska average 112 square miles for non-migratory cows, and up to 195 square miles for migratory cows. Cow summer ranges vary from 4 to 100 square miles. Moose ranges are influenced by the sex and age of the individuals, the range characteristics of the cow, and habitat conditions. Moose tend to use traditional migratory routes and calves learn migratory behavior as they follow their mothers on annual migrations. Fall movements to winter habitats occur post-rut and are generally initiated by snow depths of more than 15 inches (Peek 1997). In areas of the western Interior, moose migrate from mountainous habitats down to lowland rutting areas in the fall. In the Fortymile area, moose move up to subalpine rutting areas. Moose are well-adapted to travel across snow, but depths of more than 28 inches can affect movements. Moose might move to closed-canopy needleleaf forests, which generally have lower snow depths, when the snowpack reaches more than 38 inches (Peek 1997).

Dall Sheep

Dall sheep (*Ovis dalli*) are found in the central and eastern Brooks Range, primarily from AMPs 150.0 to 300.0. The physical geography and prevailing microclimate favor Dall sheep. Dall sheep habitats, which can support high densities, are located on the lee sides of linearly arrayed mountain ranges which lie across the routes of prevailing air-flow (Hansen 1996; Nichols and Bunnell 1999; Seip and Bunnell 1985).

Ewes form matrilineal groups with their offspring and show fidelity to annual ranges, while rams live in bands and travel more widely, mixing with ewe groups during the mating season in late November and early December. The movement pattern of Dall sheep contributes to their genetic makeup as does the mountainous terrain they inhabit. Major rivers subdivide the landscape that potentially present barriers to sheep movement, thereby contributing to genetic sub-structuring of the population over time (Craig and Leonard 2009).

Suitable habitat for Dall sheep in the Project area are found within the BLM-managed Galbraith Lake ACEC (refer to Section 3.4.6.1), and nearby mountain valleys of the Interior. This habitat consists of low shrub communities dominated by willow, birch, and various blueberries, bilberry, mountain cranberry, lingonberry, and huckleberry. Habitats in riparian areas are dominated by white spruce, patchy spruce, bogs, and deciduous forests with quaking aspen, balsam poplar, and paper birch. At higher elevations, habitat is predominately treeless dwarf shrub communities and sparsely vegetated escarpments and scree. Other habitat features, including mineral licks and escape terrain, have been shown to be essential components of Dall sheep habitat, which have led to their designation as ACECs (Craig and Leonard 2009).

Sheep lambing areas are generally on steep slopes and cliffs that are snow-free by late May and provide good escape terrain from predators. Timing of births and subsequent patterns of maternal investment seem to vary as a function of forage availability (Rachelow and Bowyer 1998). These areas also offer nutritious, newly emerging vegetation for sheep recovering from the physiological stresses of winter and parturition (Hansen 1996).

Natural mineral licks are used by all North American ungulate species (Jones and Hanson 1985). Those frequented by sheep tend to be found above valley bottoms on steep rocky banks alongside riverbeds (Heimer 1973; Watts and Schemnitz 1985). Licks are thought to have a profound influence on the extent and shape of sheep ranges, as well as the length and patterns of their daily and seasonal movements (Simmons 1982).

A sheep will forage at mineral licks when transitioning from winter to summer range (Heimer 1973). Family groups, especially ewe bands, often concentrate in mineral lick areas immediately after the lambing period. Ewe and ram bands often come together at mineral licks and young rams sometimes take the opportunity to leave their natal ewe band to join a ram band at such congregations (Heimer 1973; Nichols and Bunnell 1999). Some mineral licks are so heavily used that trails lead to the lick from all directions and the lick itself becomes a muddy, trampled pit that is quite obvious to the casual observer (Nichols and Bunnell 1999; Summerfield 1974).

Craig and Leonard (2009) studied the movements and habitat use of Dall sheep in five ACECs on BLM-managed land in the eastern Brooks Range, including the Galbraith Lake ACEC. All of the ACECs in the Craig and Leonard (2009) study were used by sheep year-round for summering, wintering, and lambing areas. Sheep were found to generally select summer habitats that were in the in the high terrain with rock and gravel surface that was sparsely vegetated. Lambing and ewes habitat were commonly located in or near escape terrain.

The primary predators of sheep are wolves, coyotes, and black bears, while golden eagles will prey on lambs (Nichols and Bunnell 1999). Other potential predators include brown bear, lynx, and wolverines (Rachlow and Bowyer 1998).

Dall sheep population in portions of the eastern Brooks Range declined during the early 1970s, but rebounded in the 1980s. A steep decline occurred in the early 1990s that affected the eastern Brooks Range herd and the Alaska Range herd. These declines were attributed to weather-related events. In the late 1990s, the Alaska Range herd increased due to more favorable weather conditions, and the Brooks Range herd experienced a similar increase (Craig and Leonard 2009).

Grizzly/Brown Bear

Grizzly/brown bears (occur throughout Alaska except on islands south of Frederick Sound in southeast Alaska, west of Unimak in the Aleutian Chain, and Bering Sea islands. The population is estimated at 30,000 brown bears statewide. In central Alaska in areas north and south of the Alaska Range, bear densities tend to be intermediate, about one bear per 15 to 25 square miles (Eide and Miller 2008). In the Brooks Range in the late 1980s, the BLM estimated a population of 2,200 to 2,700 bears (BLM 1989). The number and density of grizzly/brown bears inhabiting the Intermontane Ecoregion is unknown.

Grizzly/brown bears are efficient and flexible omnivores. They are opportunistic and wide-ranging foragers but also have seasonal habitat preferences. Immediately after emergence from the den, brown bears typically depend on forbs, horsetails, and grasses, which are found in moist sites. Ungulates may also form a large portion of the initial spring diet either as carrion or from direct predation of caribou or moose. During the summer, bears most frequently feed on grasses and forbs in wet sedge meadows, around remnant snow-bank areas, and tussock tundra. In the fall, brown bears tend to use floodplains and dry ridge areas or mountain slopes where roots, berries, and ground squirrels are preferred food items. Bears also prey on calf and adult moose, muskoxen, and caribou, and can detect carrion and human garbage at a distance of up to a mile (Miller 1990; ADFG 2011c).

The bears enter their dens around September to late October, depending on the geographic area, and remain there until spring. Bears den in a variety of terrain ranging from hydrolaccoliths (i.e., pingos), located along stream and lake banks at low elevations, to mountain slopes near the crest of the Brooks Range. In higher terrain south of the Beaufort Coastal Plain, grizzly/brown bears typically excavate dens in higher elevations on the periphery of the home ranges used during the summer and fall, and no unmodified natural cavities are used. Some individual bears excavate dens in the same general area from year to year (Miller 1990).

Grizzly/brown bears are a species with low reproductive rates and, therefore, are at greater risk of a population decline from increased mortality than species that produce numerous offspring at short intervals (e.g., snowshoe hare and caribou). Grizzly/brown bear data suggest that mortality from human development might increase the risk of population decline due to lower population densities, longer reproductive interval, later age of first reproduction, and smaller litter sizes (Miller 1990).

Black Bear

Black bears (*Ursus americanus*) are generally found in forested habitats in Alaska, often overlapping in distribution with brown/grizzly bears, except in the treeless alpine and tundra habitats. The range of the black bear is, however, not as extensive as the grizzly/brown bears (Miller 1990). The northern limit of the species range is north of Fairbanks, and they are most prevalent in and near the Tanana River Valley (Johnson 2008). In the Project area, bears are most common in the Central and Lower Tanana and Middle Yukon river.

Because of their preference for forested habitats, the size and density of their population are difficult to estimate; yet the ADFG estimate that there are approximately 100,000 black bears in Alaska (Johnson 2008). While accurate estimates of black bear densities are not available, Hechtel (1991) reported 17.5 adult black bears per 100 square miles in the Tanana Valley. In the last two decades, black bear populations have been considered stable at moderate densities in the Project area (Hicks 1996).

During spring, black bears use moist lowlands where early growing vegetation forms the bulk of their diet. Feeding shifts to salmon in summer months, if they are readily available. In the fall, bears feed primarily on berries found in open meadows or alpine areas. Habitats favored by black bears include riverine scrub, lowland broadleaf forest, lowland needleleaf forest, and upland broadleaf forest. Aquatic habitats, bluff meadows, cliffs, and alpine habitats have minimal use (Johnson 2008).

Muskoxen

Muskoxen (*Ovibos moschatus*) were likely extirpated in Alaska in the mid- or late-1800s (Hone 1934), but were successfully reestablished on the Beaufort Coastal Plain from a Greenland herd in 1935 (Spencer and Lensink 1970). Muskoxen were brought to the University of Alaska in Fairbanks in 1930, and a small group was transplanted to Nunivak Island in 1935-36 where they thrived. In 1970, 36 of the Nunivak Island animals were transplanted near the Feather River, 36 miles from Nome. A second transplant followed in 1981, with the release of 35 more animals at the Port Clarence Coast Guard Station, 15 miles west of Teller. The 2005 population census of muskoxen on the Seward Peninsula showed their numbers approaching 3,000. From the original restocking program, animals were subsequently relocated to formerly occupied ranges. The current range of muskoxen in Alaska includes the Arctic NWR, Cape Thomson, Seward Peninsula, Nelson Island, and the Wrangell Mountains (July 2005).

By 2000, nearly 4,000 muskoxen were present in Alaska, and the harvest of these animals has increased steadily in recent years. For example, 98 animals were harvested in 2003, and 258 were harvested in 2007.

Muskoxen were reintroduced to the Arctic NWR in Area 1002 in 1969 and 1970, and the population initially grew significantly because of high productivity and low mortality. In 1985, the post calving refuge population was estimated at 476, a 300 percent increase from 1979. From 1996 to 2001, numbers of muskoxen counted in Area 1002 ranged from 168 to 212 with an additional 300 residing on the Beaufort Coastal Plain. Severe winters and increasing rates of predation were considered the primary factors in the dynamics of the population.

Shifts in distribution and emigration have also occurred since the muskoxen were reintroduced to the Arctic NWR. The herd expanded westward to the Sagavanirktok River and eastward to the Canadian border. The current range of the species on the Beaufort Coastal Plain includes the northern-most area of the Alaska Mainline; however, the core area is confined to the areas east of the Sagavanirktok River (Reynolds et al. 2002). The distribution of animals occupying the Beaufort Coastal Plain varies little between seasons. Muskoxen use riparian areas along river corridors, floodplains, and foothills in all seasons. Moist sedge is preferred in the late winter and calving season; tussock tundra is avoided in the late winter. Wet sedge is used in proportion to availability in summer and early winter, but avoided in other seasons. Upland shrub is used only during the calving season and avoided in other seasons. Bare ground is preferred in all seasons except spring; mountain terrain is avoided (Klein 2000; Reynolds et al. 2002).

Muskoxen prefer sites with shallow snow cover and high vegetation cover. Snow depth is the most important variable distinguishing useable and unusable areas in winter. Preferred feeding zones are primarily along narrow bands of windblown vegetated bluffs adjacent to creeks, rivers, and the coastline, reflecting the importance of terrain features to habitat selection (Klein 2000; Reynolds et al. 2002).

American Bison

ADFG manages four herds of plains bison (*Bison bison*), which total approximately 900 animals. The largest herd is near Delta Junction, and smaller herds have been established by translocation from the Delta herd to other areas in Alaska. The plains bison is an introduced species in Alaska. In 1928, 23 bison were moved from the National Bison Range in Montana to the Delta River area in the Tetlin Wildlife Refuge. The herd expanded to 400 animals over the next two decades, and hunting began in the 1950s (Griffin and Johnson 2007).

The Delta herd ranges in the central Tanana Valley in the vicinity of the Project area near Delta Junction. The management objective is to maintain a herd size of about 360 free-ranging bison at the pre-calving count. Managed by the ADFG, the bison range over an area that extends from the hills north of the Tanana River south to the mountains of the Alaska Range. At times, Delta bison have ranged as far east as Healy Lake and as far west as the Little Delta River, and as far south as Rainbow Mountain in ADFG Game Management Unit (GMU) 13. The herd typically travels toward the floodplain of the Delta River from mid-February to March for calving. The majority of cows calve from late-April to early June on the floodplain. The herd spends the remainder of the summer along the Delta River floodplain and adjacent uplands between Black Rapids Glacier and the mouth of the Delta River (Griffin and Johnson 2007).

In July, August, or September, the bison migrate from the Delta River to the Delta Junction Bison Reserve. The reserve is a 90,000-acre area on the south side of the Alaska Highway and south of the Delta Agricultural Project (DAP), an area that includes extensive cultivation of barley, oat, and hay crops. The bison typically cross the Alaska Highway to graze on private agricultural land in the DAP area during the fall and winter. The ADFG's management goal for the Delta Junction Bison Range is to provide an adequate winter range south of the Alaska Highway; however, bison continue to use the agricultural areas north of the Alaska Highway.

Gray Wolf

The gray wolf (*Canis lupus*) is present in a wide variety of habitats extending from the rainforests of the Southeast Panhandle to the Arctic tundra along the Beaufort Sea. This range includes about 85 percent of Alaska's land area. Alaska has an estimated population of 7,000 to 11,000 wolves. Wolf densities are lowest in the coastal portions of western and northern Alaska and highest in southeast Alaska where there population is supported by their main prey source, Sitka black-tailed deer. Although the distribution of wolves has remained relatively constant in recent times, their abundance is influenced by harvest levels, diseases, and prey availability (ADFG 2011c).

Wolves are not classified as threatened or endangered in Alaska. They are found in nearly all of their historic range, except in urban areas, although they are found on the outskirts of Anchorage, Fairbanks, and Juneau (ADFG 2011c).

In most of mainland Alaska, moose and/or caribou are the primary prey species for wolves, with Dall sheep, squirrels, snowshoe hares, beaver, and occasionally birds and fish as supplements in the diet. The rate at which wolves kill large mammals varies with prey availability and environmental conditions. A pack generally kills a deer or moose every few days during the winter (ADFG 2011c).

Furbearers and Small Mammals

Canada Lynx

Canada lynx (*Lynx canadensis*) are present throughout Alaska, except in the Aleutian Islands, Kodiak archipelago, the islands of the Bering Sea and some islands of Prince William Sound and Southeast Alaska. Lynx are uncommon or absent from the wet coastal forests of Alaska. Both snow conditions and vegetation type are important factors in defining lynx habitat. Across the northern boreal forests of Alaska, snow depths are relatively uniform and only moderately deep (39 to 50 inches). Optimal lynx habitat occurs where fires or other factors create and maintain a mixture of vegetation types with an abundance of early successional growth. This provides the suitable habitat for snowshoe hares and other small prey of lynx (ADFG 2011c).

The lynx serves as one half of a classic predator-prey relationship, feeding primarily on the snowshoe hare. Hares comprise 35 to 97 percent of the diet throughout the range of the lynx. The two species evolved together: the lynx becoming a specialist in killing the hare, the hare becoming adept at eluding the lynx (ADFG 2011c).

Hare populations follow a natural cyclical pattern, changing approximately every 10 years from abundance to scarcity and back to abundance. In Alaska, lynx population numbers commonly cycle upward and downward, coincident with snowshoe hare population cycles. Adult lynx usually survive periods of hare scarcity, but their kittens often do not. As a result, the lynx population follows a similar pattern, with its peaks and valleys lagging one to two years behind those of the hare (ADFG 2011c).

Wolverine

The wolverine (*Gulo gulo*) inhabits tundra, remote mountains, and boreal forests. They generally inhabit areas at or above the timberline, while preferring lower-elevation forests during winter. Wolverines occur throughout the North Slope but are most common in the Brooks Range, Brooks Foothills, and The Interior. The wolverine is highly mobile and has an relatively large home range compared with other mustelids, with researchers estimating upper limits of about 240 square miles for females and 570 square miles for males, including long distance excursions (Banci 1990). Males have considerably larger territories than females, and appear to exclude other males while tolerating females within their range (Murray 1987). Wolverines are most likely polygamous. Researchers believe that food availability (e.g., small mammals and carrion) is the primary factor determining wolverine range and movement. During spring and summer the home ranges of adult males increases, apparently because of breeding activity. Lactating females have the smallest home range (Banci 1990).

Wolverines fequent all types of terrain in the Project area. River drainages and mountains are frequently associated with territorial boundaries. Tussock meadows, riparian willow, and alpine tundra are major habitat types used by wolverines (Department of the Interior [DOI] 1979). Denning areas typically consist of fell fields with deep snow cover.

The wolverine also is important as a subsistence species for its fur, which is used in trimming Native parkas.

Other small mammals present in the Project area are listed in Table 3.4.2-3.

TABLE 3.4.2-3

Alaska Pipeline Project
Furbearers and Small Mammal Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Status
Arctic ground squirrel	*Spermophilus parryii*	√
Pine martin	*Martes Americana*	√
Northern flying squirrel	*Glaucomys sabrinus*	√
Red squirrel	*Tamiasciurus hudsonicus*	√
Porcupine	*Erethizon dorsatum*	√
Collared lemming	*Dicrostonyx groenlandicus*	√
Brown lemming	*Lemmus trimucronatus*	√
Singing vole	*Microtus miurus*	√
Root vole (tundra vole)	*Microtus oeconomus*	√
Northern red-backed vole	*Myodes rutilus*	*
Snowshoe hare	*Lepus americanus*	*
Alaska hare (tundra hare)	*Lepus othus*	*
Tundra shrew	*Sorex tundrensis*	√
Barren ground shrew	*Sorex ugyunak*	√
Alaska tiny shrew	*Sorex yukonicus*	√
Hoary marmot	*Marmota caligata*	√
Alaska marmot	*Marmota broweri*	√
Pika	*Ochotona collaris*	√
Mink	*Neovision vison*	√
Coyote	*Canis latrans*	*
Arctic fox	*Vulpes lagopus*	√
Red fox	*Vulpes vulpes*	√
North American river otter	*Lontra canadensis*	*
Ermine (short-tailed weasel)	*Mustela ermine*	√
Least weasel	*Mustela nivalis*	√
American mink	*Neovison vison*	*
Little brown bat	*Myotis lucifugus*	√

√ = species documented or very likely to occur in the Project area.
* = species that, if present, is rare in the Project area and at the limits of its range.

3.4.3 AVIAN RESOURCES

3.4.3.1 Beaufort Coastal Plain Bird Species

One hundred and thirty-five (135) species of birds have been recorded on the Beaufort Coastal Plain, including numerous shorebirds, geese, ducks, loons, raptors, gulls, and songbirds (FWS 2001a). Bird species that could potentially occur in the Beaufort Coastal Plain during some part of the year are identified in Table 3.4.3-1.

TABLE 3.4.3-1

Alaska Pipeline Project
Beaufort Coastal Plain Bird Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Status [a,b]	Relative Abundance [c]
Greater White-fronted Goose	*Anser albifrons*	Breeder +	Common
Emperor Goose	*Chen canagica*	Visitant	Accidental
Snow Goose	*Chen caerulescens*	Breeder +	Uncommon
Brant	*Branta bernicla*	Breeder *	Common
Canada Goose	*Branta canadensis*	Breeder *	Common
Cackling Goose	*Branta hutchinsii*	Breeder *	Common
Tundra Swan	*Cygnus columbianus*	Breeder +	Common
American Wigeon	*Anas americana*	Breeder +	Uncommon
Mallard	*Anas platyrhynchos*	Visitant +	Rare
Northern Shoveler	*Anas clypeata*	Breeder +	Uncommon
Northern Pintail	*Anas acuta*	Breeder +	Common
Green-winged Teal	*Anas crecca*	Breeder	Uncommon
Canvasback	*Aythya valisineria*	Visitant	Casual
Great Scaup	*Aythya marila*	Breeder +	Uncommon
Lesser Scaup	*Aythya affinis*	Breeder?	Casual
Steller's Eider	*Polysticta stelleri*	Breeder	Casual
Spectacled Eider	*Somateria fischeri*	Breeder *	Uncommon
King Eider	*Somateria spectabilis*	Breeder *	Common
Common Eider	*Somateria mollissima*	Breeder *	Uncommon
Surf Scoter	*Melanitta perspicillata*	Visitant +	Rare
White-winged Scoter	*Melanitta fusca*	Visitant +	Rare
Black Scoter	*Melanitta nigra*	Visitant +	Rare
Long-tailed Duck	*Clangula hyemalis*	Breeder*	Common
Common Goldeneye	*Bucephala clangula*	Visitant	Casual
Red-breasted Merganser	*Mergus serrator*	Breeder +	Uncommon
Willow Ptarmigan	*Lagopus lagopus*	Resident *	Common
Rock Ptarmigan	*Lagopus mutus*	Resident *	Common
Red-throated Loon	*Gavia stellata*	Breeder *	Common
Pacific Loon	*Gavia pacifica*	Breeder *	Common
Common Loon	*Gavia immer*	Breeder+	Casual
Yellow-billed Loon	*Gavia adamsii*	Breeder +	Uncommon
Horned Grebe	*Podiceps auritus*	Visitant	Casual
Red-necked Grebe	*Podiceps grisegena*	Breeder	Uncommon
Short-tailed Shearwater	*Puffinus tenuirostris*	Visitant +	Uncommon
Bald Eagle	*Haliaeetus leucocephalus*	Visitant	Casual
Northern Harrier	*Circus cyaneus*	Visitant +	Uncommon
Sharp-shinned Hawk	*Accipiter striatus*	Visitant +	Rare
Rough-legged Hawk	*Buteo lagopus*	Visitant +	Rare
Golden Eagle	*Aquila chrysaetos*	Visitant +	Uncommon
Gyrfalcon	*Falco rusticolus*	Visitant	Rare
Peregrine Falcon	*Falco peregrinus*	Visitant +	Rare
Sandhill Crane	*Grus canadensis*	Breeder +	Rare

TABLE 3.4.3-1

Alaska Pipeline Project
Beaufort Coastal Plain Bird Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Status [a,b]	Relative Abundance [c]
Black-bellied Plover	*Pluvialis squatarola*	Breeder *	Common
American Golden Plover [d]	*Pluvialis dominicus*	Breeder *	Common
Semipalmated Plover	*Charadrius semipalmatus*	Breeder +	Rare
Killdeer	*Charadrius vociferus*	Visitant	Casual
Lesser Yellowlegs	*Tringa flavipes*	Visitant	Casual
Wandering Tattler	*Heteroscelus incanus*	Visitant	Casual
Upland Sandpiper	*Bartramia longicauda*	Visitant	Casual
Whimbrel [d]	*Numenius phaeopus*	Visitant +	Rare
Hudsonian Godwit	*Limosa haemastica*	Visitant	Casual
Bar-tailed Godwit [d]	*Limosa lapponica*	Breeder +	Uncommon
Ruddy Turnstone [d]	*Arenaria interpres*	Breeder *	Uncommon
Black Turnstone	*Arenaria melanocephala*	Visitant	Casual
Red Knot [d]	*Calidris cauntus*	Migrant +	Casual
Sanderling [d]	*Calidris alba*	Migrant +	Rare
Semipalmated Sandpiper	*Calidris pusilla*	Breeder *	Abundant
Western Sandpiper [d]	*Calidris mauri*	Breeder +	Rare
Red-necked Stint	*Calidris ruficollis*	Visitant	Casual
Least Sandpiper	*Calidris minutilla*	Migrant +	Casual
White-rumped Sandpiper	*Calidris fuscicollis*	Breeder *	Uncommon
Baird's Sandpiper	*Calidris bairdii*	Breeder *	Common
Pectoral Sandpiper	*Calidris melanotos*	Breeder *	Abundant
Sharp-tailed Sandpiper	*Calidris acuminata*	Visitant	Casual
Dunlin [d]	*Calidris alpina*	Breeder *	Common
Stilt Sandpiper	*Calidris himantopus*	Breeder *	Uncommon
Buff-breasted Sandpiper [d]	*Tryngites subruficollis*	Breeder *	Uncommon
Ruff	*Philomachus pugnax*	Visitant	Casual
Short-billed Dowitcher	*Limnodromus griseus*	Visitant	Casual
Long-billed Dowitcher	*Limnodromus scolopaceus*	Breeder *	Common
Wilson's Snipe	*Gallinago delicata*	Breeder +	Uncommon
Red-necked Phalarope	*Phalaropus lobatus*	Breeder *	Abundant
Red Phalarope	*Phalaropus fulicaria*	Breeder *	Common
Pomarine Jaeger	*Stercorarius pomarinus*	Migrant +	Common
Parasitic Jaeger	*Stercorarius parasiticus*	Breeder +	Common
Long-tailed Jaeger	*Stercorarius longicaudus*	Breeder +	Uncommon
Ringed-billed Gull	*Larus delawarensis*	Visitant	Accidental
Herring Gull	*Larus argentatus*	Visitant +	Casual
Slaty-backed Gull	*Larus schistisagus*	Visitant	Casual
Glaucous-winged Gull	*Larus glaucescens*	Visitant	Casual
Glaucous Gull	*Larus hyperboreus*	Breeder *	Common
Sabine's Gull	*Xema sabini*	Breeder *	Common
Ross's Gull	*Rhodostethia rosea*	Migrant	Rare
Ivory Gull	*Pagophila eburnea*	Migrant	Casual
Arctic Tern	*Sterna paradisaea*	Breeder +	Common
Black Guillemot	*Cephus grylle*	Breeder +	Uncommon

TABLE 3.4.3-1

Alaska Pipeline Project
Beaufort Coastal Plain Bird Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Status [a,b]	Relative Abundance [c]
Snowy Owl	*Bubo scandiacus*	Breeder +	Uncommon
Northern Hawk Owl	*Surnia ulula*	Visitant	Casual
Short-eared Owl	*Asio flammeus*	Breeder +	Uncommon
Northern Flicker	*Colaptes auratus*	Visitant	Casual
Common Raven	*Corvus corax*	Resident +	Uncommon
Horned Lark	*Eremophila alpestris*	Visitant +	Casual
Tree Swallow	*Tachycineta bicolor*	Visitant +	Casual
Bank Swallow	*Riparia riparia*	Visitant	Casual
Cliff Swallow	*Petrochelidon pyrrhonota*	Visitant	Casual
Barn Swallow	*Hirundo rustica*	Visitant	Accidental
Arctic Warbler	*Phylloscopus borealis*	Visitant	Rare
Bluethroat	*Luscinia svecica*	Visitant	Rare
Northern Wheatear	*Oenanthe oenanthe*	Visitant	Casual
American Robin	*Turdus migratorius*	Visitant	Casual
Varied Thrush	*Ixoreus naevius*	Visitant	Casual
European Starling	*Sturnus vulgaris*	Visitant	Accidental
Yellow Wagtail	*Motacilla flava*	Breeder +	Common
American Pipit	*Anthus rubescens*	Visitant	Rare
Orange-crowned Warbler	*Vermivora celata*	Visitant	Casual
Yellow Warbler	*Dendroica petechia*	Visitant	Casual
Black-and-white Warbler	*Mniotilta varia*	Visitant	Accidental
American Redstart	*Setophaga ruticilla*	Visitant	Accidental
Northern Waterthrush	*Seiurus noveboracensis*	Visitant	Accidental
Wilson's Warbler	*Wilsonia pusilla*	Visitant	Casual
American Tree Sparrow	*Spizella arborea*	Breeder	Uncommon
Savannah Sparrow	*Passerculus sandwichensis*	Breeder +	Common
Fox Sparrow	*Passerella iliaca*	Visitant	Casual
Lincoln's Sparrow	*Melospiza lincolnii*	Visitant	Casual
White-throated Sparrow	*Zonotrichia albicollis*	Visitant	Casual
Harris's Sparrow	*Zonotrichia querula*	Visitant	Accidental
White-crowned Sparrow	*Zonotrichia leucophrys*	Breeder +	Rare
Golden-crowned Sparrow	*Zonotrichia atricapilla*	Visitant	Casual
Dark-eyed Junco	*Junco hyemalis*	Visitant	Casual
Lapland Longspur	*Calcarius lapponicus*	Breeder *	Abundant
Smith's Longspur	*Calcarius pictus*	Visitant	Casual
Snow Bunting	*Plectrophenax nivalis*	Breeder *	Uncommon
Rusty Blackbird	*Euphagus carolinus*	Visitant	Casual
Common Redpoll	*Acanthis flammea*	Breeder +	Uncommon
Hoary Redpoll	*Acanthis hornemanni*	Breeder	Uncommon

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[a] Status on the Beaufort Coastal Plain (Kessel and Gibson 1978):
Resident-Present throughout the year; known to breed
Migrant-A seasonal transient between wintering and breeding ranges
Breeder-A species known to breed; ? indicates probable or possible breeding

TABLE 3.4.3-1

Alaska Pipeline Project
Beaufort Coastal Plain Bird Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Status [a,b]	Relative Abundance [c]

Visitant-A non-breeding species; also, in fall, one not directly en route between breeding and wintering ranges

[b] Status in the Point Thomson region:
* = Confirmed as breeder in Point Thomson region
+ = Observed in Point Thomson region, but not confirmed as breeding

[c] Abundance on the Beaufort Coastal Plain:
Abundant-Species occurs repeatedly in appropriate habitats, with available habitat heavily used
Common-Occurs in all or nearly all appropriate habitats, but some areas of presumed suitable habitats are occupied sparsely or not at all
Uncommon-Species occurs regularly, but uses little of the suitable habitat, not observed regularly even in appropriate habitats
Rare-Species within its normal range, occurring regularly but in very small numbers

[d] Species of High Concern or Highly Imperiled according to the Alaska Shorebird Group: Alaska Shorebird Conservation Plan (ASG 2004) and U.S. Shorebird Conservation Plan: High Priority Shorebirds (FWS 2004)

Sources: Field et al. (1988); Hohenberger et al. (1994); Johnson and Herter (1989); Kessel and Gibson (1978); Martin and Moitoret (1981); Nickles et al. (1987); Noel et al. (1999a, 1999b, 1999c, 2000); Rodrigues (2002a, 2002b); Troy Ecological Research Associates (TERA) (1993); Woodward-Clyde Consultants and ABR (1983); Wright and Fancy (1980). Common and scientific names follow AOU Checklist of North American Birds (1983 and supplements 35-50).

The majority of the birds found on the Beaufort Coastal Plain are migratory, typically present from May to September. Migratory birds range internationally; nesting and wintering grounds and migration routes may occur not only in different countries, but on different continents (Clough et al. 1987).

Five Beaufort Coastal Plain species are considered residents: rock and willow ptarmigan, snowy owl, common raven, and gyrfalcon. Rock ptarmigan and willow ptarmigan are widespread on the Beaufort Coastal Plain, particularly inland from the coast (Johnson and Herter 1989). Although both species have been observed in the Project area, to date only rock ptarmigan have been confirmed as breeding. Most rock ptarmigan were seen in the moist non-patterned habitats in the area (Woodward-Clyde Consultants and ABR 1983). A few ptarmigan of either species may overwinter in the Project region, but most winter in the foothills of the Brooks Range (Johnson and Herter 1989). Snowy owls are locally common breeders on the coastal plain during years when small mammals are abundant.

Common ravens reside on the Beaufort Coastal Plain, where they are often closely associated with human habitations (Johnson and Herter 1989). Ravens occasionally nest near the coast, primarily on buildings and other structures, including oil field facilities (Johnson and Herter 1989; Ritchie 1991). Small numbers of ravens use the Project area during summer (Rodrigues 2002a,b; Woodward Clyde-Consultants and ABR 1983). Common Ravens are the earliest breeding species on the coastal plain; nesting begins by early April and young fledge by mid-June (Johnson and Herter 1989). Ravens range widely across the tundra in search of food (e.g., bird eggs, small mammals, and carrion) and have been observed taking eggs of waterbirds (e.g., ducks or shorebirds) in the oil fields.

Riparian bluffs along the Sagavanirktok river offer fair to excellent breeding habitat for gyrfalcons (Johnson and Herter 1989).

Among the birds that occur on the Beaufort Coastal Plain, 22 species of shorebirds and waterfowl are common to abundant breeders in the Project area. Pacific loon, red-throated loon, yellow-billed loon, tundra swan, and ducks commonly nest in coastal wetlands and wet meadows throughout the region. Representative species include the spectacled and Steller's eiders, black brant, pintail, American golden-plover, pectoral and semipalmated sandpipers, red-necked and red phalaropes, glaucous gulls, Arctic terns, loons, and Lapland longspur (Clough et al. 1987; Pitelka 1974).

Arctophila ponds and lakes, those with pendant grass (*Arctophila fulva*) in the center surrounded by a fringe of *Carex aquatilis* or *A. fulva* toward the shore, drained-lake basin complex wetlands, and coastal wetlands (saline-influenced habitats) are used most intensively by waterbirds along the Beaufort Coastal Plain. Researchers have also observed greater use of wetlands containing *Arctophila* by various waterbirds than other habitats. Deep, open lakes are important to diving species that nest on the Beaufort Coastal Plain (e.g., loons, long-tailed duck, and scaup) because of the availability of prey such as invertebrates and fish. Larger lakes are used annually by large numbers of molting geese. Coastal wetlands have been identified as important habitat for nesting and staging shorebirds, waterfowl, and Lapland longspurs. The Sagavanirktok River corridor contains an extensive riparian shrub habitat; this habitat type is important for a variety of passerine species, most of which have a limited distribution on the Arctic Slope. Dry tundra, usually limited in distribution at Beaufort Coastal Plain sites, is used preferentially by some species such as golden-plovers and the buff-breasted sandpiper (BLM 1998).

Species descriptions of the spectacled eider, federally listed as threatened throughout its range, and the Steller's eider, federally listed as threatened in Alaska, are presented in Section 3.5.1.3 and 3.5.1.4, respectively.

Pacific loons are widespread on the Beaufort Coastal Plain. This species also prefers deeper aquatic grass (*Arctophila fulva)* wetlands, with deep, open lakes used in the brood-rearing period. Red-throated loons are present with scattered distribution. Red-throated loons also prefer shallow *Arctophila* lakes that are smaller than three acres as well as beaded stream habitat for nesting (BLM 1998).

The yellow-billed loon, a candidate species for listing under the ESA, is also present along the Beaufort Coastal Plain during the nesting season. The species is described in Section 3.5.1.5.

Historic aerial breeding-pair surveys on the Beaufort Coastal Plain indicate that 60 percent of the tundra swans in Alaska use the Beaufort Coastal Plain for nesting. High-density areas are mainly to the west of the Project area in the Colville River delta area. Spring-migrant swans will nest along the Beaufort Coastal Plain follow the Beaufort Sea coast from the east, arriving from mid- to late-May and remaining until early October. A variety of aquatic habitats are chosen for nesting; the most important appear to be deeper *Arctophila* wetlands. Following the hatch, the young are attended by both parents. A*rctophila* and *Carex* wetlands and deeper open lakes appear to be the most important brood-rearing habitats. Family groups apparently move considerable distances between lakes (Earnst 2004).

Breeding, non-breeder, and failed-breeder components of the brant population occupy coastal habitats during the spring, summer, and fall months. Breeding pairs arrive in late May to early June and begin the nesting cycle in early June. Moist sedge-grass meadow tundra in drained lake basins is the preferred nesting habitat on the central Beaufort Coastal Plain; brackish water habitats, saltmarsh, and *Arctophila* wetlands are also used. Brood-rearing brant use larger lakes without emergent vegetation and coastal fringe areas, particularly tidal slough and tide flat habitats. Brant breed in traditional colonies located primarily within 3 miles of the coast but also as much as 18 to 24 miles inland (BLM 1998).

Greater white-fronted geese are the most abundant goose nesting on the Beaufort Coastal Plain. Aerial surveys from 1986 to 2006 indicate that the white-fronted goose comprises about 80 percent of the goose population observed on the Beaufort Coastal Plain (Conant 2006). Although this species is widespread at low to moderate densities in the Project area, greater concentrations are found in the National Petroleum Reserve-Alaska (NPR-A). Canada and snow geese have also be been documented in the Project area (BLM 1998). Of 15 duck species that may be expected to occur in the Project area, pintails and long-tailed ducks are the most common breeding duck on the Beaufort Coastal Plain. On average, these two species comprise approximately 84 percent of the nesting ducks observed. Other duck species typically using the Beaufort Coastal Plain include: three species of scoters, American widgeon, king eider, green-winged teal, mallard, northern shoveler, red breasted merganser, common eider, goldeneye, bufflehead, Steller's eider, and spectacled eider (Conant 2006). Wetland habitat use is varied among species in this group but appears strongly related to food abundance associated with emergent vegetation in aquatic habitats. The most preferred habitat types include shallow *Carex* and *Arctophila* wetlands, deep *Arctophila* lakes, beaded streams, and deep, open lakes (BLM 1998).

Spring migrant long-tail ducks follow leads in the ice along the Beaufort coast, arriving in the Project area in late May. Inland routes also are used. At this time, long-tail ducks congregate on open water of large lakes and use deep *Arctophila* wetlands as available. Egg-laying is not initiated until late June. Long-tail ducks disperse to shallow *Carex* and *Arctophila* ponds, and deep, *Arctophila* ponds for nesting. They frequently nest in clusters or colonies. Males leave the nesting area during hatch and, together with non-breeders/failed breeders, move to large Beaufort Coastal Plain lakes and nearshore Beaufort Sea waters to molt and often form extensive congregations up to 50,000 individuals. Females lead the young to deep *Arctophila,* deep-open, or shallow *Carex* lakes with open water shortly after hatch, and molt on deep-open lakes when the young are almost ready to fly (BLM 1998).

A total of 21 species of shorebirds have been recorded in the Project area, 13 of which are confirmed breeders in the area. Shorebirds are seasonal migrants and breeders on the Beaufort Coastal Plain (May through September) and use a range of habitats for nesting, brood-rearing, and staging for migration (Johnson et al. 2009). The birds begin to arrive in late May, and most are present by early June. Coastal habitats are not used as migration staging areas by shorebirds during spring and early summer because shore-fast ice prohibits access to these areas at that time. After the birds arrive in the spring, they disperse to breeding territories in areas free of snow (Johnson and Herter 1989; TERA 2000). After the nesting season, mid- to late summer, many shorebirds move to the Beaufort Sea coast to feed in intertidal flats and coastal tundra prior to fall migration to wintering areas (Andres 1994; Smith and Connors 1993).

The most common breeding shorebird species in the central Beaufort Coastal Plain region are pectoral sandpiper, semipalmated sandpiper, long-billed dowitcher, red phalarope, and dunlin (Johnson et al. 2009). Other species of shorebirds are locally abundant such as the Baird's sandpiper and American golden-plover (Rodrigues 2002 a,b). However, there can be considerable inter-annual variation in abundance and diversity of shorebirds (Johnson et al. 2009).

Common passerine species include white-crowned sparrow, yellow wagtail, Lapland longspur, hoary and common redpolls, and snow bunting. These species are usually omnivorous, with diets dependent on the availability of food items. Willow and rock ptarmigan are the only gallinaceous birds found on the Beaufort Coastal Plain and are year-round residents (Brewer et al. 2000; Clough et al. 1987).

3.4.3.2 Brooks Foothills Ecoregion Bird Species

The most common bird species present in the Brooks Foothills include the hoary and common redpolls, savannah sparrow, jaegers, phalaropes, Wilson's snipe, green-winged teal, and northern pintail (Kessel and Gibson 1978; Pitelka 1974). Many passerine species use the Brooks Foothills ecoregion to take advantage of the drier uplands and scrub-shrub habitat. Erect riparian willow stands support the highest nesting densities and diversity of passerine species. Waterfowl tend to be less abundant in the foothills because of the decreased presence of wet meadows, lakes, and ponds. However, willow and rock ptarmigan are more abundant, especially in shrub-brush habitat along rivers and streams. Raptors, including the peregrine falcon, gyrfalcon, and rough-legged hawk, are common foragers in the foothills nesting on the cliffs and bluffs along the Sagavanirktok River. Migrating raptors arrive in mid-April, and nestlings are fledged in concert with other bird species that serve as prey. The raven is a resident species (Brewer et al. 2000; Clough et al. 1987).

3.4.3.3 Brooks Range Ecoregion Bird Species

Most birds found in the Brooks Range are largely limited to lower elevations. The diversity of passerine species found at the lower elevations of the Brooks Range ecoregion is similar to those in the adjoining Arctic Foothills. With increasing distance southward and a corresponding increase in altitude, the diversity and abundance of birds decrease dramatically. The Brooks Range offers warmer summer conditions and more protected microsites which allow for a greater development of shrub species and for the development of some of the northern-most stands of trees. The terrain is diverse, including cliffs, canyons, alpine tundra, riverine gravel bars, medium-to-tall shrub thickets, coniferous forest, and scattered wetlands and marshes (Brewer et al. 2000).

Species common to the area include wheatear, gray-cheeked thrush, yellow wagtail, American pipit, Bohemian waxwing, northern shrike, yellow-rumped warbler, Smith's longspur, swallows, rock and willow ptarmigan, common raven, and tree, fox, and white-crowned sparrows in the lower and middle elevations. Additionally, several raptors occur in the area.

3.4.3.4 Intermontane Boreal Forest Bird Species

Birds found in the Intermontane Boreal Forest ecoregions include resident spruce grouse, rock and willow ptarmigan, and several species of passerines. Decreasing numbers of birds are found with increasing elevation. Most passerine species are migratory and use these ecoregions as nesting or resting and staging grounds during their migration. These species include gray jay, chickadees, American robin, thrushes, warblers, redpolls, pipits, and sparrows. Lapland longspur, snow bunting, and redpolls are resident species. Nesting and rearing are likely to occur in June and July, respectively, and the migratory birds depart the area by mid- to late September (Brewer et al. 2000). The region also supports a diverse complement of migratory and resident raptor species. Common ravens are common residents of this ecoregion.

The lowland habitats in this ecoregion provide waterfowl resting, staging, and breeding habitat. The principle species include lesser scaup, northern pintail, three species of scoters, American widgeon, mallard, northern shoveler, green-winged teal, and canvasback. Tundra and trumpeter swans, Canada and white-fronted geese, loons, grebes, and sandhill cranes also are common. The spruce grouse, ruffed grouse, and ptarmigan may be found in drier areas. Passerines are generally similar among areas of the ecoregions.

The Upper Tanana River Valley serves as a prominent migratory bird corridor, being located along three major flyways. The extensive wetlands, rivers, ponds, and forests of the Tetlin NWR and surrounding areas provide resting and breeding habitat for hundreds of thousands of migratory birds. Significant migrations of lesser sandhill cranes and tundra and trumpeter swans occur each spring and fall. Up to 200,000 cranes, approximately one-half of the mid-continental population, migrate through this corridor (FWS 2001a). Bird species potentially present in the Intermontane Boreal Forest Ecoregion are identified in Table 3.4.3-2.

TABLE 3.4.3-2

Alaska Pipeline Project
Intermontane Boreal Forest Ecoregion Bird Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Status [a]	Relative Abundance [b]
Red-throated Loon	*Gavia stellate*	Breeder	Uncommon
Pacific Loon	*Gavia pacifica*	Breeder	Common
Common Loon	*Gavia pacifica*	Breeder	Common
Horned Grebe	*Podiceps auritus*	Breeder	Common
Red-necked Grebe	*Podiceps grisegena*	Breeder	Common
Double-crested Cormorant	*Phalacrocorax auritus*	Visitant	Accidental
Tundra Swan	*Cygnus columbianus*	Migrant	Rare
Trumpeter Swan	*Cygnus buccinators*	Breeder	Common
Greater White-fronted Goose	*Anser albifrons*	Breeder	Uncommon
Snow Goose	*Chen caerulescens*	Migrant	Common
Brant	*Branta bernicla*	Visitant	Accidental
Canada Goose	*Branta Canadensis*	Breeder	Uncommon
Green-winged Teal	*Anas crecca*	Breeder	Common
Mallard	*Anas platyrhynchos*	Breeder	Common
Northern Pintail	*Anas acuta*	Breeder	Common
Blue-winged Teal	*Anas discors*	Breeder	Rare
Northern Shoveler	*Anas clypeata*	Breeder	Common
Gadwall	*Anas strepera*	Breeder	Uncommon
American Wigeon	*Anas americanan*	Breeder	Accidental
Canvasback	*Aythya valisineria*	Breeder	Common
Redhead	*Aythya americana*	Breeder	Rare
Ringed-neck Duck	*Aythya collaris*	Breeder	Common
Great Scaup	*Aythya marlia*	Breeder	Uncommon
Lesser Scaup	*Aythya affinis*	Breeder	Accidental
King Eider	*Somateria spectabilis*	Visitant	Accidental
Harlequin Duck	*Histrionicus histrionicus*	Breeder	Rare
Long-tailed Duck	*Clangula hyemalis*	Breeder	Rare
Black Scoter	*Malanitta nigra*	Breeder	Rare
Surf Scoter	*Melanitta perspicillata*	Breeder	Uncommon

TABLE 3.4.3-2

Alaska Pipeline Project
Intermontane Boreal Forest Ecoregion Bird Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Status [a]	Relative Abundance [b]
White-winged Scoter	*Melanitta fusca*	Breeder	Common
Common Goldeneye	*Bucephala clangula*	Breeder	Uncommon
Barrow's Goldeneye	*Bucephala islandica*	Breeder	Uncommon
Bufflehead	*Bucep[hala albeola*	Breeder	Uncommon
Common Merganser	*Mergus merganser*	Breeder	Rare
Red-breasted Merganser	*Mergus serrator*	Breeder	Uncommon
Ruddy Duck	*Oxyura jamaicensis*	Breeder	Uncommon
Osprey	*Pandion haliaetus*	Breeder	Uncommon
Bald Eagle	*Haliaeetus leucocephalus*	Breeder	Uncommon
Northern Harrier	*Circus cyaneus*	Breeder	Uncommon
Sharp-shinned Hawk	*Accipiter striatus*	Breeder	Uncommon
Northern Goshawk	*Accipiter gentilis*	Breeder	Rare
Swainson's Hawk	*Buteo swainsoni*	Breeder	Occasional
Red-tailed Hawk	*Buteo jamaicensis*	Breeder	Common
Rough-legged Hawk	*Buteo lagopus*	Breeder	Uncommon
Golden Eagle	*Aquila chrysaetos*	Breeder	Uncommon
American Kestrel	*Falco sparverius*	Breeder	Uncommon
Merlin	*Falco columbarius*	Breeder	Rare
Peregrine Falcon	*Falco peregrinus*	Breeder	Uncommon
Gyrfalcon	*Falco rusticolus*	Breeder	Occasional
Spruce Grouse	*Canachites canadensis*	Resident	Common
Willow Ptarmigan	*Lagopus lagopus*	Breeder	Common
Rock Ptarmigan	*Lagopus mutus*	Resident	Uncommon
Ruffed Grouse	*Bonasa umbellus*	Resident	Common
Sharp-tailed Grouse	*Tympanuchus phasianellus*	Resident	Rare
American Coot	*Fulica americana*	Visitant	Occasional
Sandhill Crane	*Grus Canadensis*	Breeder	Common
Black-bellied Plover	*Pluvialis squatarola*	Migrant	Rare
American Golden-Plover[c]	*Pluvialis dominicus*	Breeder	Rare
Semipalmated Plover	*Charadrius semipalmatus*	Breeder	Common
Killdeer	*Charadrius vociferous*	Breeder	Occasional
Greater Yellowlegs	*Tringa melanoleuca*	Migrant	Occasional
Lesser Yellowlegs	*Tringa flavipes*	Breeder	Accidental
Solitary Sandpiper	*Tringa solitaria*	Breeder	Common
Spotted Sandpiper	*Actitis macularius*	Breeder	Common
Wandering Tattler	*Heteroscelus incanus*	Breeder	Occasional
Upland Sandpiper	*Bartramia longicauda*	Breeder	Occasional
Whimbrel[C]	*Numenius phaeopus*	Migrant	Rare
Hudsonian Godwit	*Limosa haemastica*	Migrant	Occasional
Ruddy Turnstone[C]	*Arenaria interpres*	Migrant	Occasional
Surfbird	*Aphriza virgata*	Visitant	Rare
Sanderling	*Caldris alba*	Migrant	Occasional
Semipalmated Sandpiper	*Calidris pusilla*	Breeder	Uncommon
Western Sandpiper[C]	*Calidris mauri*	Migrant	Uncommon

TABLE 3.4.3-2

Alaska Pipeline Project
Intermontane Boreal Forest Ecoregion Bird Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Status [a]	Relative Abundance [b]
Least Sandpiper	*Calidris minutilla*	Breeder	Uncommon
Baird's Sandpiper[C]	*Calidris bairdii*	Migrant	Rare
Pectoral Sandpiper	*Calidris melanotos*	Migrant	Uncommon
Dunlin[C]	*Calidris alpine*	Migrant	Occasional
Stilt Sandpiper	*Calidris himantopus*	Migrant	Occasional
Buff-breasted Sandpiper[C]	*Tryngites subruficollis*	Migrant	Occasional
Long-billed Dowitcher	*Limnodromus scolopaceus*	Migrant	Rare
Wilson's Snipe	*Gallinago delicate*	Breeder	Accidental
Wilson's Phalarope	*Phalaropus tricolor*	Breeder	Occasional
Red-necked Phalarope	*Phalaropus lobatus*	Breeder	Uncommon
Red Phalarope	*Phalaropus fulicaria*	Migrant	Rare
Long-tailed Jaeger	*Stercorarius longicaudus*	Breeder	Rare
Bonaparte's Gull	*Larus phildelphia*	Breeder	Common
Mew Gull	*Larus canus*	Breeder	Common
Herring Gull	*Larus argentatus*	Breeder	Common
Glaucous Gull	*Larus hyperboreus*	Visitant	Accidental
Arctic Tern	*Sterna paradisaea*	Breeder	Common
Rock Pigeon	*Columba livia*	Visitant	Occasional
Mourning Dove	*Zenaida macroura*	Visitant	Accidental
Great Horned Owl	*Bubo virginianus*	Resident	Common
Snowy Owl	*Bubo scandiacus*	Visitant	Occasional
Northern Hawk Owl	*Surnia ulula*	Resident	Uncommon
Great Grey Owl	*Strix nebulosa*	Resident	Uncommon
Short-eared Owl	*Asio flammeus*	Breeder	Uncommon
Boreal Owl	*Aegolius funereus*	Resident	Uncommon
Saw Whet	*Aegolius acadicus*	Visitant	Uncommon
Belted Kingfisher	*Megaceryle alcyon*	Breeder	Uncommon
Downy Woodpecker	*Picoides pubescens*	Resident	Uncommon
Hairy Woodpecker	*Picoides villosus*	Resident	Uncommon
AmericanThree-toed Woodpecker	*Picoides tridactylus*	Resident	Common
Black-backed Woodpecker	*Picoides arcticus*	Resident	Uncommon
Northern Flicker	*Colaptes auratus*	Breeder	Common
Olive-sided Flycatcher	*Contopus cooperi*	Breeder	Uncommon
Western Wood-Pewee	*Contopus sordidulus*	Breeder	Uncommon
Alder Flycatcher	*Empidonax alnorum*	Breeder	Common
Hammond's Flycatcher	*Empidonax hammondii*	Breeder	Rare
Say's Phoebe	*Sayornis saya*	Breeder	Rare
Eastern Kingbird	*Tyrannus tyrannus*	Visitant	Accidental
Horned Lark	*Eremophila alpestris*	Breeder	Uncommon
Tree Swallow	*Tachycineta bicolor*	Breeder	Uncommon
Violet-green Swallow	*Tachycineta thalassina*	Breeder	Uncommon
Bank Swallow	*Riparia riparia*	Breeder	Common
Cliff Swallow	*Petrochelidon pyrrhonota*	Breeder	Common
Gray Jay	*Perisoreus canadensis*	Resident	Common

TABLE 3.4.3-2

Alaska Pipeline Project
Intermontane Boreal Forest Ecoregion Bird Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Status [a]	Relative Abundance [b]
Black-billed Magpie	*Pica hudsonia*	Visitant	Accidental
Common Raven	*Corvus corax*	Resident	Common
Black-capped Chickadee	*Poecile atricaillus*	Resident	Uncommon
Boreal Chickadee	*Poecile hundsonicus*	Resident	Common
Gray-headed Chickadee	*Poecile cintus*	Resident	Rare
Red-breasted Nuthatch	*Sitta canadensis*	Visitant	Occasional
American Dipper	*Cinclus mexicanus*	Breeder	Rare
Ruby-crowned Kinglet	*Regulus calendula*	Breeder	Uncommon
Northern Wheatear	*Oenanthe oenanthe*	Breeder	Rare
Townsend’s Solitaire	*Myadestes townsendi*	Breeder	Occasional
Gray-cheeked Thrush	*Catharus minimus*	Breeder	Uncommon
Swainson’s Thrush	*Catharus ustulatus*	Breeder	Accidental
Hermit Thrush	*Catharus guttatus*	Breeder	Uncommon
American Robin	*Turdus migratorius*	Breeder	Common
Varied Thrush	*Ixoreus naevius*	Breeder	Common
White Wagtail	*Motacilla alba*	Visitant	Accidental
American Pipit	*Anthus rubescens*	Breeder	Uncommon
Bohemian Waxwing	*Bombycilla garrulus*	Breeder	Accidental
Northern Shrike	*Lanius excubitor*	Breeder	Rare
European Starling	*Sturnus vulgaris*	Visitant	Occasional
Orange-crowned Warbler	*Vermivora celata*	Breeder	Uncommon
Yellow Warbler	*Motacilla flava*	Breeder	Common
Yellow-rumped Warbler	*Dendroica coronata*	Breeder	Common
Blackpoll Warbler	*Dendroica striata*	Breeder	Uncommon
Northern Waterthrush	*Seiurus noveboracensis*	Breeder	Common
Wilson’s Warbler	*Wilsonia pusilla*	Breeder	Rare
American Tree Sparrow	*Spizella arborea*	Breeder	Uncommon
Chipping Sparrow	*Sipzella passerina*	Breeder	Rare
Savannah Sparrow	*Passerculus sandwichensis*	Breeder	Common
Fox Sparrow	*Passerella iliaca*	Breeder	Uncommon
Lincoln’s Sparrow	*Melospiza lincolnii*	Breeder	Uncommon
Golden-crowned Sparrow	*Zonotrichia atricapilla*	Breeder	Occasional
White-crowned Sparrow	*Zonotrichia leucophrys*	Breeder	Common
Dark-eyed Junco	*Junco hyemalis*	Breeder	Common
Lapland Longspur	*Calcarius lapponicus*	Breeder	Rare
Smith’s Longspur	*Calcarius pictus*	Breeder	Occasional
Snow Bunting	*Plectrophenax nivalis*	Migrant	Uncommon
Red-winged Blackbird	*Agelaius phoeniceus*	Breeder	Uncommon
Rusty Blackbird	*Euphagus carolinus*	Breeder	Common
Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*	Breeder	Uncommon
Pine Grosbeak	*Pinicola enucleator*	Resident	Uncommon
White-winged Crossbill	*Loxia leucoptera*	Resident	Common
Common Redpoll	*Acanthis flammea*	Resident	Common
Hoary Redpoll	*Acanthis homemanni*	Migrant	Uncommon

TABLE 3.4.3-2

Alaska Pipeline Project
Intermontane Boreal Forest Ecoregion Bird Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Status [a]	Relative Abundance [b]

[a] **Status**: Resident, year-round resident; Breeder, breeding species (migratory); Migrant, non-breeder traveling; Visitant, outside its normal range.

[b] **Relative Abundance**: Abundant, very numerous; Common, certain to be seen or heard in suitable habitat; Uncommon, locally distributed or occurring in low numbers; Rare, species occurs regularly in region but in very small numbers, sighting likelihood poor; Occasional, seen a few times in a 5-year period; Accidental, seen once to twice and may not be seen again.

[c] **Species of High Concern** or **Highly Imperiled** according to the Alaska Shorebird Group: Alaska Shorebird Conservation Plan (ASG 2004) and U.S. Shorebird Conservation Plan: High Priority Shorebirds (FWS 2004)

Original list compiled by K. Sowl, FWS and revised by N. Guldager and M. Bertram, FWS in May 2007. Obtained from the Yukon Flat's FWS (http://alaska.fws.gov/nwr/yukonflats/pdf/Bird_Species_List.pdf)

Raptors

Raptors present in the Project area include the osprey, bald eagle, northern harrier, northern goshawk, sharp-shinned hawk, rough-legged hawk, golden eagle, American kestrel, merlin, Swainson's hawk, Western and Harlans's red-tailed hawk, American and Arctic peregrine falcons, and the gyrfalcon. Owls that are known to be present in the Project area include the great horned owl, great grey owl, northern hawk owl, snowy owl, short-eared owl, boreal owl, and saw-whet owl. Although none of these species are currently listed as threatened or endangered under the ESA, raptors are of special concern to resource managers and regulatory agencies. These birds are also protected under the Migratory Bird Treaty Act (MBTA) as amended, and bald and golden eagles are specifically afforded additional protection under the Bald and Golden Eagle Protection Act (BGEPA).

The Project area between Prudhoe Bay and the U.S.-Canada border is located within important raptor nesting habitats and is aligned with several other pipeline and utility corridors constructed or proposed during the past 32 years. Extensive biological surveys, including location and identification of raptor nest sites, have been conducted in the vicinity of the Project area over the past 30 years. Raptor nest surveys were conducted during planning, construction, and reauthorization of the TAPS, which the Alaska Mainline parallels from Prudhoe Bay to Delta Junction. These surveys were conducted in 1979 and periodically from 1993 to 2002. In 2001, an aerial survey was conducted to identify raptor nests along the proposed Alaska Gas Producers Pipeline Team route, which corresponds with the Alaska Mainline for most of its length in Alaska. The Alaska Gas Producers Pipeline Team report also included a compilation of data from previous nest identification efforts completed by Ritchie, Timm, White and others (Ritchie and Palmer 2002). Craig and Hamfler (2003) conducted cliff-nesting raptors surveys in the Dalton Highway Management Unit from 1999 through 2003. Periodic nest surveys have also been conducted by resource agencies on discrete sections of the Project area between 1991 through 2003 (Timm and Johnson 2006); however, data from the most recent agency-conducted surveys has not yet been released.

Some tree-nesting owls, merlins and American kestrels and ground-nesting raptor species, including the northern harrier, snowy owl, and short-eared owl were not included in the surveys.

Several tree and cliff-nesting raptor species exhibit strong nest fidelity and return year after year to the same nesting area or structure. For this reason, nest surveys that have been previously conducted were used to determine the locations of nesting sites relative to the Alaska Mainline.

Since 2001, a total of 219 individual raptor nests have been identified within a 4-mile swath, 2 miles on either side of the Alaska Mainline and within 1 mile of Aboveground Facilities and Associated Infrastructure. Many of these nests are used year after year. Areas of known concentrated nesting activity include Franklin Bluffs, Sagwon Bluffs, Slope Mountain, Yukon River, Grapefruit Rocks, and along the Tanana River (APSC 2002). Bald eagles were the most common tree-nesting species (71 nests), followed by goshawk (57 nests), red-tailed hawk (31 nests), and osprey (5 nests). The low number of osprey nests identified is likely an indicator that the Project area is located outside of preferred osprey nesting habitat. Tree-nesting raptor species are most abundant in the upper Tanana River Valley. Few nests were identified within the Project area north of the Yukon River. [Note: Maps depicting raptors and bald and golden eagle nests proximate to the Project during summer construction activities will be provided in Appendix 3E in the final report, filed under a separate cover and marked: **"CONTAINS PRIVILEGED INFORMATION – DO NOT RELEASE."** APP will consult with FWS to determine if additional raptor nest surveys are required prior to submittal of the final report.]

Cliff-nesting raptors are sparsely distributed in uplands and along river courses south of Atigun Pass (Ritchie and Palmer 2002). Golden eagles were the most common cliff-nesting species, with 113 nests identified; additionally, 102 peregrine falcon nests were also identified. Peregrine falcon nests were widespread throughout the Project area. Golden eagle nests were found primarily south of Atigun Pass and were concentrated in the cliff habitat of the mountains. Rough-legged hawks (39 nests) and gyrfalcons (16 nests) were the other cliff-nesting species identified within the Project area. Other species, such as unidentifiable owls and smaller hawk species, occupied 23 nest sites.

FWS to determine if additional raptor nest surveys are required prior to submittal of the final report.]

TABLE 3.4.3-3

Alaska Pipeline Project
Accumulative Raptor Nests Identified within Study Corridor[b] of Summer Construction Spreads

Spread AMPs	Bald Eagle	Northern Goshwak	Red-tailed hawk	Golden eagle	Peregrine falcon	Gyrfalcon	Great horned owl	Other [a]	Total
165-180	0	0	0	0	0	0	0	0	0
180-232	0	0	0	77	0	2	1	0	80
286-349	0	1	1	3	1	2	2	0	10
373-438	0	4	5	3	5	0	0	0	17
560-625	8	11	0	2	20	0	2	4	47
625-691	15	12	12	0	13	0	3	10	65
	23	**28**	**18**	**85**	**39**	**4**	**8**	**14**	**219**

[a] Unidentified nests were included in the “Other” category.
[b] 4-mile swath, 2 miles on either side of the Alaska Mainline and within 1 mile of aboveground facilities and associated infrastructure.

No raptor nests have been identified within the Project area from AMPs 165.0 to 180.0, however, one golden eagle nest was located approximately 0.6 mile northeast of the northern end of the spread near AMP 165.0 and approximately 0.5 mile east of the Atigun Pass compressor station.

Eighty-four raptor nests are located within the Project area from AMPs 180.0 to 232.0. This represents the largest number of nests for any spread during which summer construction is proposed.

Fifteen raptor nests have been identified within the Project area from AMPs 286.0 to 349.0. No raptor nests have been identified within 2 miles of the Kanuti River (Old Man) construction camp or the Fort Hamlin Hills compressor station.

Eighteen raptor nest sites are located within the Project area from AMPs 373.0 to 438.0. No raptor nests have been identified within 1.5 miles of the Tatalina River compressor station.

A total of 49 raptor nests are located within the Project area from AMPs 560.0 to 625.0. This section of the Alaska Mainline generally parallels the Tanana River and numerous nest sites have been identified on the cliffs along the river. No raptor nests have been identified within 1.7 miles of the George Lake compressor station; however, five peregrine falcon nests have been identified within 2 miles of the George Lake construction camp and construction yard.

Sixty-five raptor nests are located within the Project area from AMPs 625.0 to 690.0. This spread follows the upper Tanana River, and the adjacent cliffs and woodlands provide numerous nesting sites. No raptor nests have been identified within 0.5 mile of the Cathedral Bluffs storage yard. Nest sites have been identified near the Tok construction camp and construction yard and the Tok River storage yard.

Eighteen eagle nests have been identified within 0.5 miles of the Alaska Mainline (refer to Table 3.4.3-4); however, none of these nests are located within 330 feet of the construction right-of-way. The closest bald and golden eagle nests are approximately 500 and 1,200 feet away, respectively.

TABLE 3.4.3-4

Alaska Pipeline Project
Eagle Nests within 0.5 Miles of the Project Centerline

Species	Approximate Alaska Mainline Milepost	Summer/Winter Construction
Golden Eagle	160.0	Winter
Golden Eagle	188.0	Summer
Golden Eagle	188.0	Summer
Golden Eagle	188.0	Summer
Golden Eagle	201.0	Summer
Golden Eagle	207.0	Summer
Golden Eagle	263.0	Winter
Golden Eagle	424.0	Summer
Bald Eagle	445.0	Winter
Golden Eagle	502.0	Winter
Bald Eagle	503.0	Winter
Bald Eagle	527.0	Winter
Bald Eagle	599.0	Summer
Bald Eagle	629.0	Summer
Bald Eagle	629.0	Summer
Bald Eagle	688.0	Summer
Bald Eagle	741.0	Winter
Bald Eagle	741.0	Winter

Trumpeter Swans

Trumpeter swans have historically used numerous ecosystems, and in Alaska they are known to inhabit the Arctic-alpine, boreal forest, and montane ecosystems. In the Project area, trumpeter swans are restricted to shallow, freshwater marshes, ponds, lakes, and occasionally slow-moving rivers. Suitable wetlands can vary substantially in their physical (i.e., size, topography, elevation, hydrology) and biological (i.e., macrophyte and invertebrate communities, surrounding vegetation) characteristics, but several basic features are required:

- Accessible forage;
- Shallow, non-fluctuating levels of unpolluted water;
- Structural materials to build a nest platform, such as an island, a muskrat lodge, or emergent vegetation; and,
- Low human disturbance.

Records of trumpeter swans in Alaska date to the 1860s, but a breeding population was not described until 1954. Shortly after this, additional nesting trumpeter swans were identified on the Kenai Peninsula, the Gulkana area, and the Minto area near Fairbanks.

The start of the trumpeter swan breeding season usually begins in late April when breeding pairs begin nest-building. Nest-building is often initiated several weeks before the ice has melted from breeding ponds. However, in cold, wet years, nesting may be delayed, because females are often in poor condition. Breeding pairs exhibit strong site fidelity to previous year nest-sites and will often refurbish the previous year's nest, especially if the pair successfully fledged young. Nest construction takes from 11 to 35 days.

Most nests are built in or surrounded by water. Nest placement adjacent to water likely serves several functions: reducing predation by mammals, providing access to aquatic vegetation for foraging, and ensuring that water is nearby when cygnets fledge. Swans often select muskrat or beaver houses, beaver dams, exposed hummocks, floating platforms, or small islands as a foundation for the nest site. Nests are large, up to 3 to 10 feet in diameter, and are constructed from emergent and submerged aquatic vegetation, and occasionally grasses and sedges.

During the nesting period, swans require non-fluctuating water levels to ensure nests do not flood during incubation and water levels persist until cygnets have fledged. Trumpeter swans feed primarily on the leaves, stems, roots, and tubers of submerged, floating, and emergent plants. Cygnets initially feed on aquatic invertebrates, but they shift to an herbivorous diet at the age of five weeks.

Their wide distribution necessitates an overall broad diet; however, within specific locations swans may forage selectively. In Alaska, submerged aquatic plants are the primary food source before and during egg-laying, until horsetail (*Equisetum* spp.) and sedge (*Carex lyngbye*), favored emergent plants, become available.

Most trumpeter swans first breed between 4 and 7 years of age, although pair bonds develop as early as 20 months of age. Pair bonds occur on the breeding grounds in late March to mid-May. Mated birds breed annually.

Early attempts to census trumpeters from the air identified 1,124 in 1959, but the survey did not include all areas of suitable habitat. By 1968 nearly the entire trumpeter swan nesting habitat in Alaska was covered by USGS topographic maps with contour intervals; thus, the 1968 trumpeter swan census included known nesting habitats except the Kuskokwim and the Koyukuk units, and every swan sighting was marked on a map. Statewide aerial censuses in 1975, 1980, 1985, 1990, and 1995 included all summering habitat, followed the same procedures enabling a direct comparison. The total number of trumpeter swans counted in Alaska in 1995 was 15,823; in 2000 a total of 17,155 birds were counted; and in 2005 the population was estimated to be 23,692 birds.

Alaska's trumpeter swans winter near coastal waters from Cordova south to the Columbia River in Washington. A large concentration of trumpeters winters on Vancouver Island.

3.4.3.5 Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act

Migratory birds include bird species that nest in the U.S. and Canada during the summer and migrate south to warmer regions of the U.S., Mexico, Central and South America, and the Caribbean for the winter. The Project is located on the northern limits of the Pacific and Central flyways, which are important corridors for migratory birds during both spring and fall. Consequently, numerous migratory birds may occur within the Project area.

The MBTA, enacted in 1918, protects migratory birds within the U.S. Under provisions of the MBTA , except as authorized by the FWS, it is illegal to pursue, hunt, take, capture, kill; attempt to take, capture, kill, possess; offer for sale, export, import, or transport any migratory bird, part (e.g., feathers), nest, or egg of such birds (16 United States Code [U.S.C. § 703). The lead federal agency for the Project, FERC, finalized a Memorandum of Understanding (MOU) with the FWS in March 2011, which includes commitments related to migratory birds and their habitat. Additional federal guidance relevant to the MBTA and the conservation of migratory bird populations includes Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, 66 Fed. Reg. 3853, (January17, 2001); a December 2008 MOU between the FWS and USFS; and an August 2010 MOU between the FWS and the BLM.

The BGEPA provides additional protection to bald and golden eagles, and their nests. It also prohibits the take, possession, sale, purchase, barter, offer to sell, purchase, or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit (16 U.S.C. § 668[a]).

Many migratory birds, including raptor species, can be sensitive to disturbance when nesting and roosting depending on site-specific conditions, including terrain, presence of trees, unrestricted line of sight, and adaption to development. APP plans to remove vegetation from the construction areas in the winter or during other parts of the year when the migratory birds are not nesting and roosting, prior to the planned construction season, such as trenching and pipeline installation. This avoids potential disturbance to nesting species due to construction activities. [Note: APP, working with the FWS, will develop a draft Migratory Bird Conservation Plan, which will be provided in the final report as Appendix 3F, to identify the potential species impacts, minimization measures, and habitat mitigation that will be undertaken to protect bird species.]

3.4.4 AMPHIBIANS

No reptiles are present in the Project area. Only one amphibian, the wood frog (*Rana sylvatica*), is present north of the Arctic Circle. The wood frog has been documented on the mainland of Southeast Alaska and throughout Central Alaska to Anaktuvuk Pass at the crest of the Brooks Range (sightings of frogs farther north and east on the North Slope have yet to be validated), westward to the Kobuk River Valley, and southward to the base of the Alaska Peninsula.

3.4.5 TERRESTRIAL AND AQUATIC INVERTEBRATES

Invertebrates may include the dominant craneflies, muscids, and chironomids, but may also include other flies, trichoptera, coleoptera, hemiptera, and arachnids. In rivers and streams, trichoptera, ephemeroptera, plecoptera, and chironomids are the most common species (Selkregg 1975).

Terrestrial invertebrate species surviving in the Beaufort Coastal Plain ecoregion include diptera, trichoptera, coleoptera, hemiptera, and arachnids. Aquatic invertebrates include copepods, rotifers, and cladocerans. It is likely that mayflies, stoneflies, and caddis flies are also present. The primary benthic invertebrates are likely to be chironomids; however, dipterans, oligochaetes, steroptera, coleoptera, and gastropoda may also occur (Hobbie 1973).

Mosquitoes and other types of terrestrial invertebrates such as diptera, trichoptera, coleoptera, hemiptera, and arachnids will be abundant in the highlands. Freshwater aquatic/benthic invertebrates are limited since there is little surface water within this subregion. However, stoneflies, mayflies, and dipterans could be found in lower elevation streams (Brown 1987).

3.4.6 SENSITIVE WILDLIFE RESOURCES AND HABITAT AREAS

3.4.6.1 BLM Sensitive and "Watch" List Species

In implementing its obligations under the Federal Land Policy Management Act, the BLM also designates sensitive species and implements measures to conserve certain species and their habitats on BLM land. All federally designated candidate species, proposed species, and delisted species in the five years following their delisting are conserved as BLM-sensitive species. BLM is not obligated to conserve federally designated critical habitat once the proposal to be de-listed becomes final or the habitat is no longer proposed for listing.

Tables 3.4.6-1 and 3.4.6-2 identifies the mammal and bird species the BLM has listed as sensitive on BLM-managed land or are on the "watch" list, which may occur on BLM-Managed lands, but have not been documented.

The Kenai Marten and Alaskan Hare, both identified as sensitive mammals on BLM's list for BLM-managed lands, occur outside the Project area and will not be impacted by the Project. However, the range of both the Osgood's Arctic ground squirrel and Alaska tiny shrew potentially overlap with the Project area; however, limited information is available with regard to their preferred habitat. [Note: APP will consult with the BLM to determine the potential these species have to reside within the Project area on BLM-managed land. Based on these consultations, an update will be provided in the final report.]

TABLE 3.4.6-1

Alaska Pipeline Project
BLM Sensitive[1] and "Watch" List[2] Mammal Species Potentially Occurring in the Project Area

Common Name	Ecoregion	Presence in Project Area
Osgood's Arctic Ground Squirrel	Beaufort Coastal Plain, Brooks Foothill, Brooks Range	Unconfirmed: Potentially present in dry Arctic tundra, bluffs, rocky slopes and mountainous habitats
Alaska Tiny Shrew	Brooks Foothill, Brooks Range, Intermontane Boreal Forest	Unknown: Habitat preference unknown
Kenai Marten	Cook Inlet Basin, Chugach-St. Elias Mountains	Not Present: Only found in the Kenai Peninsula, south of the Project area
Alaskan Hare	Kobuk Ridges and Valleys, Seward Peninsula, Nulato Hills, Yukon-Kuskokwim Delta, Ahklun Mountains, Bristol Bay Lowlands, Alaska Peninsula, Aleutian Islands	Not Present: Found along the west coast of Alaska on the Seward and Alaska Peninsulas south to the Aleutian Islands, west and south of the Project area.

1 BLM-listed sensitive species known to occur on BLM managed lands in Alaska

2 BLM "watch" species, which might occur on BLM-managed lands in Alaska, but not documented

Nineteen bird species are indicated on the BLM sensitive and "watch" lists. Of these, 13 species are potentially found in the Project area. [Note: APP will consult with the BLM to determine the potential for these species to reside within the Project area on BLM-managed land. An update will be provided in the final report, pending further discussions with the BLM.]

TABLE 3.4.6-2

Alaska Pipeline Project
BLM Sensitive and "Watch" List Bird Species Potentially Occurring in the Project Area

Species	Ecoregion	Potential Habitat
Spectacled eider[1]	Beaufort Coastal Plain, Brook Foothills, Kobuk Ridges and Valleys, Seward Peninsula, Kotzebue Sound Lowlands, Nulator Hills, Yukon-Kuskokwim Delta, Ahklun Mountains	Sedge meadow tundra, shallow ponds and lakes (refer to Section 3.5.1.6)
Steller's eider[1]	Beaufort Coastal Plain, Yukon-Kuskokwim Delta, Bristol Bay Lowlands, Alaska Peninsula, Kodiak Island, Alaska Range, Cook Inlet Basin	Coastal tundra adjacent to ponds with drained lake basins; edges of low-centered polygons near ponds with emergent vegetation (refer to Section 3.5.1.7)
Eskimo curlew[1]	Brooks Foothills	Arctic tundra and open grasslands (refer to Section 3.5.1.9)
Yellow-billed loon[1,2]	Beaufort Coastal Plain, Brooks Foothills, Brooks Range, and Kotzebue Sound Lowlands	Freshwater lakes in the Arctic tundra of Alaska on the Beaufort Coastal Plain (refer to Section 3.5.1.8)
Kittlitz's murrelet[1,2]	Chugach-St. Elias Mountains, Gulf of Alaska Coast, Bristol Bay Lowlands, Brooks Foothills, Kotzebue Sound Lowlands, Seward Peninsula, Yukon-Kuskokwim Delta, and Alaska Peninsula	Mountainous and rocky coastal areas where tidewater glaciers meet the ocean in Alaska; unlikely to be present in the Project Area
Emperor goose[2]	Alaska Peninsula, western Alaska	Not present in the Project Area
Dusky Canada goose[2]	Copper River Delta	Not present in the Project Area
Trumpeter swan[2]	Intermontane Boreal Forest	Freshwater lakes and wetlands in the Interior (refer to Section 3.4.3)
Golden eagle[2]	Beaufort Coastal Plain, Brooks Foothills, Brooks Range	Mountain, bluffs in the foothill, along rivers
Short-eared owl[2]	Beaufort Coastal Plain, Brooks Foothills, Brooks Range, Intermontane Boreal Forest	Arctic tundra, bogs in interior,
Olive-sided flycatcher[2]	Intermontane Boreal Forest	Bogs, shrublands, open forests
Blackpoll warbler[2]	Intermontane Boreal Forest	Riparian shrub thickets and/or early successional spruce forests
Rusty blackbird[2]	Intermontane Boreal Forest	Open spruce forests and woodlands
Red-throated loon[2]	Beaufort Coastal Plain, Brooks Foothills, Brooks Range	Freshwater lakes and ponds
Bar-tailed godwit[2]	Western Alaska, Brooks Foothills, Brooks Range	Arctic tundra
Townsend's warbler[2]	Intermontane Boreal Forest	Open and closed spruce forest
Gray-cheeked thrush[2]	Brooks Foothills, Brooks Range, Intermontane Boreal Forest	Shrublands, woodlands and dwarf forests
Red Knot[2]	Beaufort Coastal Plain, Seward Peninsula, and Yukon-Kuskokwim Delta	Beaches and tidal flats in northern Alaska
Buff-breasted sandpiper[3]	Beaufort Coastal Plain	Alaskan tundra close to water

1 ESA listed, candidate, or proposed species (refer to Section 3.5.1)
2 Alaska BLM sensitive species
3 Alaska BLM "watch" list species

3.4.6.2 Areas of Critical Environmental Concern

At various locations along the Alaska Mainline, the Project will cross lands owned by the U.S. and administered by BLM. Between approximately AMP 0.0 and AMP 360.1, the Project area is within land managed by the Arctic and Central Yukon area field offices of the BLM. Between AMP 61.5 and AMP 367.7, the Project area is within the BLM Utility Corridor. The utility corridor is comprised of an “inner” and “outer” corridor and the majority of the Alaska Mainline, and its Aboveground Facilities and Associated Infrastructure will be located in the inner corridor. Various non-energy transportation activities are restricted within the inner corridor, and with few exceptions, the area is primarily devoted to energy transportation. These exceptions include ACECs, where special management attention is required 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 safety from natural hazards. Generally, development activities and future energy transportation systems are allowed (BLM 1989).

The Project will cross only two ACECs: the Toolik Lake Research Natural Area (RNA) and the Galbraith Lake Outstanding Natural Area (ONA) (Figure 3.4-2). The Toolik Lake RNA will be crossed by the Alaska mainline from AMP 127.8 to AMP 140.3 (12.5 miles) and the Project may construct new and/or modify existing access roads, construct one new borrow site, and utilize one existing borrow site (refer to Appendix 1F).

Galbraith Lake ONA will be crossed by the Alaska Mainline for 11.3 miles between AMPs 141.9 and 153.3. The Galbraith Lake Compressor Station is located within the Galbraith Lake ONA. In addition, the Project may construct new and/or modify existing access roads (Appendix 1F), and one new storage yard, and to utilize two existing borrow sites and an existing construction camp site. The Project will also utilize the existing Galbraith Airstrip located within the Galbraith Lake ONA (refer to Tables 8.4.1-2 and 8.4.1-3 of Resource Report 8).

The Toolik Lake ACEC-Research Natural Area is an 82,800-acre parcel that is located within the inner utility corridor and was established to protect a natural lake and tundra biome and is used extensively for Arctic natural resources research. The area was established to protect habitats crucial to species listed as threatened, endangered, candidate or sensitive by the FWS and the State of Alaska (BLM 1989a).

The Galbraith Lake ONA was established to protect historic and cultural resources, Dall sheep lambing areas and mineral licks, to preserve scenic value, geology, and paleontological resources. The Galbraith Lake ONA encompasses Galbraith Lake, three large drainages that discharge into the lake, and the Atigun River valley and the sides of the valleys. Vegetation in this ACEC is predominately dwarf shrub and dwarf shrub-lichen.

The foothills east of Galbraith Lake are valuable to sheep early in the spring, both as a lambing area and spring foraging area, particularly for the nursing ewes. The ACEC contains four known lambing areas. Sheep use the west- and south-facing slopes on the east side of the Atigun River valley near Atigun Gorge during the spring as lambing-nursery areas. Vegetation in this area emerges earlier in the spring in these areas, providing an abundant food source. BLM representatives have observed up to 200 sheep on Black Mountain, a site where early vegetation growth is prevalent. As summer progresses, seasonal movements of sheep to higher elevations occur, including movements out of the ACEC. Winter range covers much of the high ridges of the ACEC.

Figure 3.4-2
Alaska Pipeline Project
Special Management Areas Relative to the Project

The BLM has established management practices and allowable uses to limit activities and excessive human disturbance that could affect these habitats required to sustain viable sheep populations. Specifically, the BLM generally requires that projects involving surface-disturbing activities develop and implement a plan that includes protective stipulations and mitigation measures to reduce restricting sheep movement and disturbing sheep habitat. BLM-authorized camps and support facilities located within the boundaries of the ACEC shall be temporary and must be removed after their designated purpose has been accomplished. Additionally, aircraft associated with BLM-authorized activities are required to fly a minimum of 2,000 feet above ground level from May 1 to August 31, unless doing so would endanger human life or be an unsafe flying practice.

3.4.6.3 National Wildlife Refuges

Arctic National Wildlife Refuge

Near Galbraith Lake in the Brooks Range at two locations, the Project passes within 0.25 mile of the Arctic NWR (Figure 3.4-2). Managed by the FWS, this is the most northern and one of the largest refuges within the NWR System. Including large, contiguous tracts of the Beaufort Coastal Plain, Arctic foothills, and portions of the Brooks Range, Arctic NWR supports diverse and abundant wildlife populations. Species found in Arctic NWR include caribou (Porcupine and Central Arctic herds), brown bear, moose, muskoxen, wolves, and numerous migratory birds. No component of the project will be located in or encroach upon Arctic NWR.

Yukon Flats National Wildlife Refuge

The third largest conservation area in the NWR System, the nine million acre Yukon Flats NWR boundary is located approximately 5 miles from the Alaska Mainline (Figure 3.4-2). The Project will not be constructed within the refuge.

Kanuti National Wildlife Refuge

The Kanuti NWR is approximately 22 miles to the west of the Project on the south slope of the Brooks Range (Figure 3.4-2). The Project will not be constructed within the refuge; however, will cross several rivers that are tributaries to streams within the refuge, including the Middle and South Forks of the Koyukuk River and Jim River.

Tetlin National Wildlife Refuge

The Tetlin NWR is located northeast of the Alaska Range, adjacent to the U.S.-Canada border, and is bordered to the south by Wrangell-St. Elias National Park and Preserve, Canada to the east, and the Alaska Highway along its northeast border (Figure 3.4-2). The 932,000-acre refuge consists of about 700,000 acres of lands managed by the FWS. Approximately 3 miles of the Alaska Mainline currently cross land that is part of the Tetlin NWR managed by the FWS (refer to Section 8.5.1.2, Resource Report 8). APP is actively engaged with various agencies on options and details associated with access to the 3-mile segment of Tetlin NWR that the pipeline corridor crosses. Updated information regarding access will be provided in the final report.

3.4.6.4 Alaska Game Management Units

Under Alaska Administrative Code Title 5, Chapter 92, Section 450 and managed by the ADFG, 26 GMUs were established to allow residents and visitors to Alaska to have fair and equal hunting rights in all regions of the state, and to effectively manage and control hunting through legal regulations specific to each unit or sub-unit. The GMUs assist in managing large mammal populations, based on biologically relevant characteristics such as population density or herd distributions. Each GMU has specific regulations that describe the restrictions and instructions that apply for each subunit, including the seasons when hunting is allowed, what permits are required, where specific hunting is permitted, how many animals may be harvested each season, types of hunting that are permitted, and who is allowed to hunt. This information is subsequently used to frame the big game hunting seasons and regulations, bag limits per species, and appropriate hunting restrictions within each GMU. GMUs crossed by the Project area are presented in Section 8.4.2.2 in Resource Report 8. Additionally, the Dalton Highway Corridor Management Area consists of those portions of GMUs 20 and 24-26 extending 5 miles from each side of the Dalton Highway.

3.4.7 CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

3.4.7.1 Marine Mammal Species

The following sections describe the impacts that could potentially result from the construction and operation of the Project, as described in Resource Report 1, on marine mammal resources. The Project construction schedule is provided in Section 1.5 and Figure 1.5-1 of Resource Report 1. Construction activities that could impact marine mammals include dredging of the barge channel near West Dock, disposal of dredge material, dock construction activities, and aircraft noise. Wildlife populations and their habitats could be also be affected by increased traffic, and human interaction and habituation. The significance of the effects on wildlife and their habitats will depend on the exact location, duration, and extent of the activity.

The following sections provide an evaluation of the Project activities described in Resource Report 1 with the respect to the following effects:

- Mortality
- Change in spatial/geographic distribution
- Habitat suitability

These effects are described in terms of construction and operation phases of the Project. Based on the existing baseline conditions, construction schedule, and mitigation measures that will be implemented during construction, the overall effect on marine mammal species and habitats is expected to be negligible[10] to minor, localized, and short-term.

The effects from construction and facilities operations on the endangered, threatened, and ESA-candidate species are described in Section 3.5. These species include bowhead whales, ringed seals, bearded seals, Pacific walrus, and polar bears.

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[10] Impact thresholds are defined as follows:

None: Resource is not within the Project area at the time the activities are occurring and there is no loss of habitat.

Negligible: Resource may be present in the Project area at time of the activity; however the resulting impact on the resource and/or their habitat, if it occurs, would be unmeasurable and insignificant.

Minor: There is a measurable impact to the resource on an individual level (i.e., direct loss of habitat, mortality, disturbance response), but not a population level.

Gray, Beluga, and Killer Whales, and Spotted and Ribbon Seals

Gray, beluga, and killer whales, and spotted and ribbon seals could potentially occur in the Project area in shallow water areas of Stefansson Sound; however it would be considered a rare occurrence. Refer to Section 3.4.2.1 for a discussion of the life history and seasonal use areas of these marine mammals. Construction and dredging activities are planned for the summer and impacts are considered to be short term and negligible.

Mortality

Construction Impacts and Mitigation

Due to the limited presence of gray, beluga, and killer whales and spotted and ribbon seals within the Project area and the short duration of construction activities to occur in the Stefansson Sound, the Project is not anticipated to contribute to marine mammal mortality.

Operation Impacts and Mitigation

During operations marine mammal impacts are not anticipated since there will be no activities conducted in marine waters except marine vessel traffic using existing shipping lanes.

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

Dredging activities could potentially have short-term effects on marine mammals, including behavioral disruption or temporary displacement (Richardson et al. 1995). The behavioral responses of marine mammals to anthropogenic disturbances are highly variable. Effects are anticipated with dredging and construction activities, particularly for pile driving associated with West Dock improvements/expansion. However, due to the limited presence of these species within the Project area, these impacts are considered to be negligible.

[Note: APP is evaluating the potential for noise impacts to wildlife and will provide additional information prior to construction.]

Operations Impacts and Mitigation

Operation of the Project is not anticipated to affect marine mammals since there will be no Project activities conducted in marine waters following completion of construction.

Habitat Suitability

Construction Impacts and Mitigation

Gray, beluga, and killer whales, and spotted and ribbon seals have been observed in the Beaufort and Chukchi seas during the summer for feeding (refer to Section 3.4.2). However, it would be unlikely to observe these species within the Project area during construction activities. The dredging and disposal activities off of West Dock and in the Stefansson Sound may cause increases in turbidity that could temporarily displace fish and mobile invertebrate prey species and may also cause mortality of epifaunal invertebrate prey; however, these effects are anticipated to be short-term and localized and the impact on the availability of prey to these marine mammals species would be negligible.

Operations Impacts and Mitigation

Operation of the Project is not anticipated to affect marine mammals since there will be no Project activities conducted in marine waters following completion of construction.

[Note: APP will work with various applicable agencies to develop additional analysis of impacts to marine mammals protected under the MMPA and ESA-listed species and mitigation in final report in the Biological Assessment, which will be provided in Appendix 3D.]

3.4.7.2 Terrestrial Species

The following sections describe the impacts that could potentially result from the construction and operation of the Project, as described in Resource Report 1, on terrestrial wildlife resources. The Project construction schedule is provided in Section 1.5 and Figure 1.5-1 of Resource Report 1.

Activities that could impact terrestrial wildlife resources include clearing, grading and construction of the pipeline and above-ground facilities; blasting activities, excavation in borrow sites for padding material; construction and use of associated transportation systems (e.g., airstrips, helipads, roads, access roads, bridges, etc.); and construction and use of multiple camps. Wildlife populations and their habitats could be affected by increased traffic, equipment activity and noise (i.e., sensory disturbance), and human interaction and habituation. The significance of the effects on wildlife and their habitats will depend on the exact location, duration, and extent of the activity.

The following sections provide an evaluation of the Project activities described in Resource Report 1 with the respect to the following effects:

- Mortality
- Change in spatial/geographic distribution
- Habitat suitability

These effects are described in terms of construction and operation phases of the Project. An assessment of the impacts of construction and operation activities on terrestrial wildlife resources is described in the following subsections. Based on the existing baseline conditions, construction schedule, and mitigation measures that will be implemented during construction, the overall effects on terrestrial wildlife species and habitats is expected to be minor, localized, and short-term.

An assessment of the federal- or state-listed threatened, endangered, or candidate species, and BLM or state-designated sensitive species is provided in Section 3.5.

Caribou

A number of caribou herds have seasonal historic ranges that encompass or could be in proximity to the Project area. However, only the CAH in the Beaufort Coastal Plain and northern Brooks Range is anticipated to be potentially affected by construction activities. Other caribou herds that have historic ranges in the general vicinity of the Project include the Porcupine, Teshekpuk, Western Arctic, Delta, Macomb, Nelchina, Fortymile, Ray Mountains, White Mountains, Mentasta, and Chisana. Refer to Section 3.4.2.2 for a discussion of the life history activities and seasonal use areas of these caribou herds.

Pipeline construction for the PT Pipeline and the Alaska Mainline between Prudhoe and Galbraith Lake, and construction of the GTP pads are planned to occur during the winter. The recognized winter range of the CAH encompasses a portion of this construction segment from approximately AMP 40 to the southern limit of winter construction in this area at AMP 165. Although the specific area of caribou wintering presence varies from year to year, caribou of the CAH could be expected along this segment of winter construction activity. The PT Pipeline, which is also planned for winter construction, is located north of the CAH traditional wintering area, and therefore caribou would not be expected in this area during PT Pipeline winter construction.

Summer construction activities within the CAH historical range will occur from Alaska Mainline AMP 165 to AMP 232, an area where caribou from this herd are present only in the winter. Therefore, summer construction scheduled for the Atigun River valley near Galbraith Lake and extending over Atigun Pass, Chandalar Shelf, and the upper Dietrich River will occur when CAH caribou are north of the Brooks Range in calving areas and summer feeding/insect relief areas.

Summer construction activities south of Galbraith Lake could encounter occasional CAH caribou, but very few animals are anticipated since the primary CAH caribou calving and summer range is north of the construction area on the Beaufort Coastal Plain.

Mortality

<u>Construction Impacts and Mitigation</u>

Construction activities are not anticipated to contribute to caribou mortality, with the possible exception of direct mortality from vehicle-wildlife collisions as a result of increased traffic on the highways during construction (refer to Table 1.6.1-1 in Resource Report 1 for description of transportation of equipment and materials to be transported to the construction site). APP will work with the appropriate agencies to establish and implement the appropriate mitigation measures. With the effective implementation of mitigation measures, the effects to caribou are expected to be minor.

<u>Operations Impacts and Mitigation</u>

Operations activities are not anticipated to contribute to caribou mortality.

Change in Spatial/Geographic Distribution

<u>Construction Impacts and Mitigation</u>

Construction of the ice pad and ice roads to lake water sources (initial early winter activities), construction equipment activities associated with trenching and pipe installation, lighting of active construction sites as the construction spread advances, and maintenance of the ice pad trafficable surface is anticipated to deter CAH caribou presence in the immediate area of construction activities. APP will place periodic openings in the strung pipe and hard plugs across the area of the trench. Gradual ramps will be in the excavated pipe trench up to the hard plugs to accommodate exit for caribou. In addition, the period that the excavated trench is open will be limited, and the pipeline will be installed and backfilled over a short period, which can reduce the disruption of caribou movement. Impacts to caribou movement are anticipated to be localized and minor.

Displacement of CAH caribou is not expected to be an issue for the area of summer construction since the caribou will be using calving and summer feeding/insect relief habitats in areas to the north on the Beaufort Coastal Plain.

Recognizing the low likelihood of summer or winter construction interaction with other caribou herds that occupy ranges in the vicinity of the Project, it is anticipated that construction effects on habitat or caribou displacement along the balance of the Project would be minor and temporary in duration, if they occur at all.

With reclamation following construction, it is not anticipated that the Project would present a barrier to caribou migrating from wintering habitat to calving areas along the Beaufort Coastal Plain; from calving areas to summer habitat, from summer habitat to winter areas, or other movement across the right-of-way. Caribou are adapted to navigating a wide range of tundra, wetland, river, and foothills/mountain habitats that naturally occur within their range. Aboveground pipelines and access roads do not typically present a physical barrier to caribou movement. Impacts to caribou movement are anticipated to be localized and minor.

[Note: APP is evaluating the potential for noise impacts to wildlife and will provide an update to this evaluation prior to construction.]

Operations Impacts and Mitigation

Workers may be onsite periodically to perform monitoring, inspection, and preventative maintenance, including erosion control at specific locations as needed. The right-of-way will also be flown at regular intervals. These activities should not have an appreciable effect on caribou. Caribou will habituate slowly to large moving objects, such as trucks, but have little or no problem with structures, noise, or odors (Cronin et al. 1994). Impacts to caribou movement are anticipated to be localized and minor.

[Note: APP is evaluating the potential for noise impacts to wildlife and will provide an update to this evaluation prior to construction.]

Habitat Suitability

Construction Impacts and Mitigation

Winter construction of the PT Pipeline and the Alaska Mainline segment from Prudhoe Bay to the Galbraith Lake area will modify caribou habitat within the construction areas, principally over the area of the excavated trench and buried pipe where permafrost tundra habitat will be disturbed. The temporary loss of habitat is not expected to affect the availability of adequate winter feeding habitat for CAH caribou, given the limited area of disturbance relative to the winter habitat resources available on the Beaufort Coastal Plain winter range. The potential effects of habitat loss are expected to be minor, localized, and would extend through reclamation of the disturbed habitat.

As with winter construction in the range of the CAH caribou, summer construction will result in the loss of habitat within the construction area, primarily over the excavated trench. This loss of habitat is anticipated to be minor and of short duration, extending to the time period needed to reclaim the habitat.

On a Project level, construction activities will be minor and short term affecting a limited area of summer foraging habitat along the Beaufort Coastal Plain, and a limited area of wintering habitat in the Brooks range. Areas affected by the placement of construction pads or gravel access roads would be expected to result in the permanent loss of a small amount of terrestrial habitat compared to the relative abundance of available habitat in the area adjoining the Project.

Operations Impacts and Mitigation

Routine operations for the Project in the range of the CAH caribou will generally not require equipment access or vegetation control measures. Therefore, operations are not anticipated to affect summer foraging, calving, or wintering habitat of the CAH. Unanticipated effects to habitat would be expected to be minor, short-term, and restricted to localized areas on the operations right-of-way.

Moose

Moose occupy nearly all habitat types crossed by the Project area, and are widely dispersed across most of the Project area. The highest population densities occur in the Intermontane Ecoregion, south of the Brooks Range to the U.S.-Canada border. Moose have extended their range on the North Slope, but are generally confined to narrow riparian habitats along major rivers, and densities are greater in the foothills relative to the coastal plain (Lenart 2008). Moose densities south of the Brooks Range in the interior and eastern regions of Alaska are between 0.31 to 0.47 moose per square mile (Gardner 1996). Refer to Section 3.4.2.2 for a discussion of the life history activities and habitat of these moose within the Project area. The potential effects from construction and operation of the Project on moose are expected to be minor and short-term.

Mortality

Construction Impacts and Mitigation

Project construction activities present a direct risk to moose through the potential to increase vehicle-wildlife collisions (refer to Table 1.6.1-1 in Resource Report 1 for description of transportation of equipment and materials to be transported to the construction site). Most vehicle collisions on rural Alaska highways and road systems occur where the Project crosses prime habitat areas (e.g., lowland marshes and tundra below 200-400 feet) and migration corridors. Accidents peak in December and January when Alaska experiences longer hours of darkness. Similarly, accidents are most common at dawn and dusk when visibility is low and moose are most active. APP will work with the appropriate agencies to establish and implement the appropriate mitigation measures. With the effective implementation of mitigation measures, the effects to moose are expected to be minor.

Operation Impacts and Mitigation

Operations activities are not anticipated to contribute to moose mortality.

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

Ditches, berms, slash piles, and strung or welded pipe on blocks could be physical barriers to moose movement during pipeline construction. Pipe on skids might create too high an obstacle to jump over, but not sufficiently high to walk under. Entrapment of an animal in an open trench is rare; however, APP will place periodic openings in the strung pipe and hard plugs across the area of the trench. Gradual ramps will be in the excavated pipe trench up to the hard plugs to accommodate exit for moose. The period that the excavated trench is open will be limited, and the pipeline will be installed and backfilled over a short period, which can reduce the disruption of moose movement.

Some short-term displacement of moose is expected to occur due to construction activities. Individuals are expected to avoid construction activities and will likely use suitable habitat in areas adjacent to the Project area. Moose are more vulnerable to disturbance in winter when movements are restricted by deep snow and individuals can experience energy deficits. When the snow depth exceeds 36 inches and impedes mobility, winter construction may have an increased effect on a few individuals. Given the relatively large seasonal ranges of this species and its ability to habituate to some level of human activity, the effects on moose from displacement is currently expected to be minor and very localized.

Operation Impacts and Mitigation

Human activities causing sensory disturbance in the Project area will be substantially less during the operation of the facilities, and generally limited to aerial monitoring or periodic ground inspections and maintenance. Increased access to these areas can expose moose to additional hunting pressure and to sensory disturbance from snowmachining use and human presence. These minor impacts may occur over the life of the Project. These activities may result in minor impacts over the life of the Project.

[Note: APP is evaluating the potential for noise impacts to wildlife and will provide an update to this evaluation prior to construction.]

Habitat Suitability

Construction Impacts and Mitigation

Although efforts were made during Project planning to avoid as many riparian areas along large river systems as practical, vegetation clearing in alluvial floodplains areas supporting extensive moose winter browse habitats will occur. Cleared areas would be limited to the construction areas. On a local level, effects from construction of the pipeline on moose habitat availability will extend from the time of vegetation clearing for construction through the first few years following reclamation. Impacts to moose habitat suitability are anticipated to be localized and minor

Operation Impacts and Mitigation

A cleared right-of-way can increase the ease of access into wooded and riparian areas where moose concentrate during the winter. In addition, preferred forage (i.e., willows and other woody shrubs) will invade the edges of the construction right-of-way, enhancing and improving the habitat during years of operations. The Project will provide forage for moose as reclamation progresses; although, as there is a natural abundance and opportunities for forage, it is unlikely that the habitat provided by the Project activities would result in a substantial increase in habitat availability. As a result, the positive effects of Project activities are anticipated to have a minor beneficial impact on moose.

Grizzly/Brown and Black Bears

Grizzly/brown occur throughout Alaska and the Project area, while black bears are generally only found in forested habitats. Refer to Section 3.4.2.2 for a discussion of the life history and habitat of bears within the Project area.

Mortality

Construction Impacts and Mitigation

Although anticipated to be less common than moose, the project construction activities present a direct risk to grizzly/brown and black bears through the potential to increase vehicle-wildlife collisions. APP will work with the appropriate agencies to establish and implement the appropriate mitigation measures. With the effective implementation of mitigation measures, the effects to bear are expected to be minor.

Operation Impacts and Mitigation

Operations activities are not anticipated to contribute to grizzly/brown or black bear mortality.

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

Both bear species may be affected by summer construction activities and the presence of people. Grizzly/brown bears have a lower tolerance for, and seek to avoid human activity relative to black bears. Black bears also will tend to avoid the disturbed area, but are typically more accommodating to human activity than brown bears. Blasting activities may displace individual bears away from noise emitting sources, but the effects are expected to be minor. Both species could be attracted to the construction areas through improperly handled garbage, or through curiosity, which could result in interactions with humans (Johnson 2008; Eide and Miller 2008). However, attraction of bears to camps and other facilities will be reduced by implementing proper waste storage and disposal procedures and facility exclusion fencing.

Operation Impacts and Mitigation

Human activities causing sensory disturbance in the Project area will be substantially less during the operation of the facilities, and generally limited to aerial monitoring or periodic ground inspections and maintenance. These effects may occur over the life of the Project; but the impacts are anticipated to be minor and short-term in duration.

[Note: APP is evaluating the potential for noise impacts to wildlife and will provide an update to this evaluation prior to construction.]

Habitat Suitability

Construction Impacts and Mitigation

Construction activities could affect grizzly/brown and black bears by disturbing denning sites. Construction activities could result in den abandonment if replacement dens are not quickly found. Bears den from November to April, a period which will overlap with blasting activity (refer to Resource Report 6 for list of blasting locations). Ground vibrations from blasting may impact dens in proximity to the Project area (Reynolds et al. 1986).

Both black and brown bears are currently expected to experience some level of temporary habitat loss; however, the losses are currently expected to be minor. During summer construction, bears may avoid suitable habitat affected by active construction sites, but the relatively small footprint of the construction area relative to the area of undisturbed bear habitat would have a minor effect on bears and their movements. Additionally, alterations in habitat availability during summer construction as a result of clearing, topsoil removal, and gravel extraction will be minor.

Operation Impacts and Mitigation

Operations of the Pipeline Facilities are expected to have negligible, short-term effects on bears. Disturbance to bears might occur from aircraft overflights and routine maintenance activities.

Dall Sheep

The Alaska Mainline crosses potential Dall sheep habitat in the Brooks Range. In areas of Dall sheep habitat, the Alaska Mainline is located adjacent to the Dalton Highway near Slope Mountain along the Atigun River, the Chandalar Shelf, and the Dietrich River valley. Foothills and steep terrain, with the exception of Atigun Pass, are avoided as much as practicable.

In the Galbraith Lake ACEC, the foothills east of Galbraith Lake are important sheep habitat early spring, both as a lambing and foraging areas. Sheep use the west- and south-facing slopes on the east side of the Atigun River valley near Atigun Gorge during the spring as lambing-nursery areas (Craig and Leonard 2009).

Refer to Section 3.4.2.2 for a discussion of the life history activities and habitat of Dall sheep within the Project area.

Mortality

Construction Impacts and Mitigation

Construction activities are not anticipated to contribute to Dall sheep mortality. Increased vehicle traffic on the Dalton Highway during construction is not expected to result in an increased mortality for Dall Sheep due to the general lack of preferred habitat adjacent to the Project area.

Operation Impacts and Mitigation

Operation activities are not anticipated to contribute to Dall sheep mortality.

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

Construction through the Galbraith Lake ACEC (Section 3.4.6.1) is planned to occur during the winter season when the majority of the Dall sheep traditionally occupy ridge tops and higher elevations of the area, thereby reducing Project impacts on animals. Craig and Leonard (2009) observed wintering animals throughout the ACEC on high ridges. They also observed rams and ewes using the lower slopes of the northwest section of the ACEC and near Black Mountain, located about 2 miles northeast of the Project area.

Dall sheep may experience disturbance during construction, particularly if blasting occurs in proximity to occupied range (refer to Resource Report 6 for a list of blasting areas). Aircraft use may also disturb sheep. Craig and Leonard (2009) observed sheep using escape terrain when aircraft approached occupied areas during summer and winter aerial surveys of the ACECs.

Operation Impacts and Mitigation

The Galbraith Lake Compressor Station is planned to be installed within the Galbraith Lake ACEC in close proximity to TAPS Pump Station 3 and will be a source of continuous noise emissions; however, considering the distance of the station from identified Dall sheep lambing and mineral lick areas, and type of noise emitted (i.e., constant background vs. startling noises), impacts to Dall sheep are expected to be minor.

Occasional sensory disturbance will also occur during aerial monitoring or periodic ground inspections and maintenance of the pipeline and facilities. These effects may occur over the life of the Project; but the impacts are anticipated to be minor and short-term in duration.

[Note: APP is evaluating the potential for noise impacts to wildlife and will provide an update to this evaluation prior to construction.]

Habitat Suitability

Construction Impacts and Mitigation

Because of the timing of construction and alignment of the Alaska Mainline and Aboveground Facilities with respect to known sheep habitats and seasonal movement patterns, the potential for impacts from construction on Dall sheep is expected to be negligible. Construction will not permanently alter habitat availability.

Operation Impacts and Mitigation

Operation activities are not anticipated to contribute to impacts on Dall sheep habitat suitability.

Muskoxen

Muskoxen are dispersed from the Arctic NWR westward into the Project area. In the winter, muskoxen are typically found in small groups along floodplains of larger rivers. They have been documented east of the Sagavanirktok River, and winter in riparian areas along the Kadleroshilik and Shaviovik rivers. Muskoxen inhabiting the area between the Canning and Shaviovik river drainages are most likely to be found near the PT Pipeline, but the rare occurrence of the animals in the Project area makes such encounters unlikely.

Muskoxen have not been documented to be present east of the Sagavanirktok River during the winter; therefore, it is not expected that muskox will be present in the area of winter construction for the Alaska Mainline Pipeline from Prudhoe Bay south. Refer to Section 3.4.2.2 for a discussion of the life history activities and habitat of muskoxen within the Project area.

Mortality

Construction Impacts and Mitigation

Construction activities are not anticipated to contribute to muskoxen mortality.

Operations Impacts and Mitigation

Operation of the Project will not increase predator access to the animals and no direct effects to muskoxen are expected to result from the operation of the Project.

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

Construction of the PT Pipeline and Alaska Mainline may disturb and displace the muskoxen that inhabit the Project area. Muskoxen may be displaced in specific areas if disturbed by construction activity; however, muskoxen in the Prudhoe Bay area have been subject to low-flying aircraft and construction activities. Miller and Gunn (1979) found that there was no definite negative response by muskoxen cows and calves during helicopter flyovers.

During construction, muskoxen have the potential to fall into the pipeline trench, and become injured or entrapped when attempting to jump over welded pipe strings. APP will place periodic openings in the strung pipe and hard plugs across the area of the trench. Gradual ramps will be in the excavated pipe trench up to the hard plugs to accommodate exit for muskoxen. The period that the excavated trench is open will be limited, and the pipeline will be installed and backfilled over a short period, which can reduce disruption to muskoxen movement.

Activities will be confined to the construction area; therefore, the displacement of animals from the work area, if it occurs, would be temporary and localized. Muskoxen have been known to avoid areas when machinery approached within approximately 350 to 450 yards of a herd. Observations of muskoxen in the oil fields indicate that muskoxen readily cross roads, but the behavioral effect of traffic on muskoxen is unknown (McLaren and Green 1985). Impacts to muskoxen resulting from construction activities are anticipated to be minor.

Operations Impacts and Mitigation

Maintenance activities, including periodic pigging, repairs, and ground checks, will be performed at specific locations as needed. The Project will also be surveyed from aircraft at regular intervals. Behavioral response of muskoxen to operations activity is expected to be minor.

[Note: APP is evaluating the potential for noise impacts to wildlife and will provide an update to this evaluation prior to construction.]

Habitat Suitability

Construction Impacts and Mitigation

Construction will temporarily reduce the access to and the amount of available winter forage (e.g., willow, grasses, sedges, forbs, and other woody plants) for the muskoxen; however, the construction-affected area represents a very small portion of the available habitat along the Beaufort Coastal Plain. Therefore, the effects of the reduction in habitat availability will be minor as riparian habitat becomes re-established following completion of construction.

Operations Impacts and Mitigation

Operation activities are not anticipated to contribute to effects on muskoxen habitat suitability.

American Bison

The Delta bison herd ranges in the central Tanana Valley in the vicinity of the Project area near Delta Junction. The bison range over an area that extends from the hills north of the Tanana River south to the mountains of the Alaska Range. Refer to Section 3.4.2.2 for a discussion of the life history activities and habitat of American bison within the Project area.

Mortality

Construction Impacts and Mitigation

Construction activities are not anticipated to contribute to bison mortality.

Operations Impacts and Mitigation

Operation activities are not anticipated to contribute to bison mortality.

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

The Project will generally parallel seasonal use bison habitat on the northeast side of the Alaska Highway. However, during the summer pipeline construction period, most of the bison are anticipated to have moved south to their preferred summer habitat along the Delta river. Construction activities associated with the Project could temporarily interfere with bison movements on agricultural lands, but the effect will be minor and short-term.

During construction, bison have the potential to fall into the pipeline trench, and become entrapped. APP will place periodic openings in the strung pipe and hard plugs across the area of the trench. Gradual ramps will be in the excavated pipe trench up to the hard plugs to accommodate exit for bison. The period that the excavated trench is open will be limited, and the pipeline will be installed and backfilled over a short period, which can reduce bison movement disruption.

Operations Impacts and Mitigation

Disturbance to bison could occur from aircraft overflights and routine maintenance activities; however, these impacts are expected to be minor and short-term, as the majority of the regular operation and maintenance activities would occur outside of bison habitat.

[Note: APP is evaluating the potential for noise impacts to wildlife and will provide an update to this evaluation prior to construction.]

Habitat Suitability

Construction Impacts and Mitigation

Construction activities are not anticipated to contribute to impacts on bison habitat suitability.

Operations Impacts and Mitigation

Operation activities are not anticipated to contribute to impacts on bison habitat suitability.

Furbearers and Small Mammals

Furbearers, including Canada lynx, Arctic and red foxes, wolves, wolverines, and coyotes; and small mammals, including, beaver, muskrats, porcupine, snowshoe hare, Arctic ground squirrels, red squirrels, pika, little brown bat, hoary marmot, shrews, and voles, are widely distributed over the Project area. Refer to Section 3.4.2.2 for a discussion of the life history of Canada lynx and wolverine within the Project area.

Mortality

Construction Impacts and Mitigation

Due to the highly mobile nature of most of these animals, construction activities are not anticipated to contribute to the mortality of furbearers or small mammals within the Project area beyond a limited number of individuals, especially voles and shrews, inadvertently taken during vegetation clearing activities. Overall, effects of construction on furbearer and small mammal mortality are expected to be minor.

Operations Impacts and Mitigation

Operation activities are not anticipated to contribute to the mortality of furbearers or small mammals within the Project area.

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

Construction activities will temporarily displace these animals from the immediate construction work areas, access roads, and adjacent areas near the Project; however, the home ranges of many of these species are relatively large in comparison to the work area and there is a large amount of available undisturbed habitat in surrounding areas. The effects from construction are anticipated to be minor.

Operations Impacts and Mitigation

Operation activities are not anticipated to contribute to the effects on the spatial or geographic distribution of furbearers or small mammals within the Project area.

Habitat Suitability

Construction Impacts and Mitigation

All or most of the terrestrial area affected by the Project provides furbearer and small mammal habitat; however, within the relatively small area of disturbance of the Project, the overall impacts from construction on furbearers are expected to be minor and short-term.

Pine martens are found in the Project area and have a small home range relative to other furbearers. However, the direct habitat loss will be minor in respect to the region where these species are found. Habitat fragmentation is expected to be minor.

Operations Impacts and Mitigation

Operation activities are not anticipated to contribute to effects on habitat suitability of furbearers and small mammals.

3.4.7.3 Avian Species

The following sections describe the impacts that could potentially result from the construction and operation of the Project, as described in Resource Report 1, on avian resources. The Project construction schedule is described in Section 1.5 and Figure 1.5-1 of Resource Report 1. Construction of the project will result in a wide range of effects on both resident and migratory birds. The significance of the effects on avian resources and their habitats will depend on the exact location, duration, and extent of the activity.

The following sections provide an evaluation of the Project activities described in Resource Report 1 with the respect to the following effects:

- Mortality
- Change in spatial/geographic distribution
- Habitat suitability

These effects are described in terms of construction and operation phases of the Project. An assessment of the impacts of construction and operation activities on avian resources is described in the following subsections. Based on the existing baseline conditions, construction schedule, and mitigation measures that will be implemented during construction, the overall effects on waterfowl, shorebirds, raptors, passerines and other bird species that nest, feed, or roost within the Project are considered minor.

An assessment of the federal- or state-listed threatened, endangered, or candidate species, and BLM or state-designated sensitive species is provided in Section 3.5.

Refer to Section 3.4.3 for a discussion of the life history activities and habitat of avian resources within the Project area.

Mortality

Construction Impacts and Mitigation

Construction activities are not anticipated to contribute to the mortality of most of the avian resources within the Project area. Vegetation would be cleared during the non-breeding season (late fall and winter) to limit the inadvertent destruction of nests with eggs or young. These nesting birds would be addressed according to APP's Migratory Bird Conservation Plan, which would be developed prior to construction and in coordination with the applicable agencies. This plan would address avian issues associated with the, MBTA, BGEPA, the ESA, and other avian management and habitat issues. Overall, effects of construction on bird mortality are expected to be minor.

Operations Impacts and Mitigation

APP operation activities are not anticipated to contribute to the mortality of avian resources within the Project area.

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

Summer construction will include several activities (i.e., equipment noise, vehicle traffic, aircraft noise, and blasting) that may be disturbing to birds in the Project area (refer to Resource Report 6 for a list of blasting locations). Most of these activities will occur from late May or early June to mid-August, the period when many birds are present in the Project area. Potential disturbance and displacement during summer construction could result in minor effects to raptors, waterfowl, shorebirds, passerines and other bird species. Clearing and/or vegetative removal construction areas will occur in the winter months when the majority of migratory birds are absent from the Project area. Winter construction is especially important to reduce impacts on the high number and diversity of shorebirds crossed by the Project in the Beaufort Coastal Plain. Winter construction will also greatly reduce impacts to geese, waterfowl, loons, gulls, terns, grebes, and songbirds that use tundra habitats on the coastal plain. Construction-related impacts on spatial/geographic distribution of avian resources are anticipated to be minor.

Operations Impacts and Mitigation

Some operation and maintenance (i.e., aircraft noise) may be disturbing to birds in the Project area. The overall effect of routine maintenance activities is anticipated to be negligible for most species, but could be elevated to minor for species that are uncommon, decreasing, or have recently declined.

[Note: APP is evaluating the potential for noise impacts to wildlife and will provide an update to this evaluation prior to construction.]

Habitat Suitability

Construction Impacts and Mitigation

The Alaska Mainline will be constructed in 15 construction spreads and the PT Pipeline will be constructed in one construction spread (Figure 1.5-1 of Resource Report 1). Engineering constraints, weather, and terrain conditions will require that some spreads be constructed during the summer months, typically from June through September, when raptors are nesting and rearing young. Preliminary scheduling indicates that summer construction activity will occur in portions of spreads from AMPs 165.0 to 180.0, AMPs 286.0 to 349.0, and AMPs 560.0 to 625.0 during the first summer season; and in portions of spreads AMPs 180.0 to 232.0, AMPs 373.0 to 438.0 and AMPs 625.0 to 691.0 during the second season (refer to Table 3.4.3-3). Eight compressor stations will also be constructed at locations along the alignment. These Aboveground Facilities will take approximately one year to construct, including work during the summer. Winter construction activity is much less likely to directly affect raptor nesting activity. In all cases, the construction areas will be cleared of vegetation in the winter or during other parts of the year when migratory birds are not nesting and roosting, prior to the construction season such as trenching and pipeline installation. Overall, the effect of the project on raptor habitat is considered minor.

Additionally, because the majority of raptor prey species, such as small mammals (voles, shrews, and hares) and passerines will also likely not experience appreciable effects due to construction activities, and based on their relatively large hunting areas, effects on prey availability are considered negligible.

Pre-construction clearing, trampling of vegetation, or other affects to habitat from construction activities will occur in winter for a majority of the Project when migratory birds are absent from the Project area; therefore, this activity will have only minor direct effects on migratory birds in these areas. Resident birds would be affected by direct loss of foraging habitat in winter as a result of the clearing. However, the linear nature of the clearing would reduce the amount of habitat loss as birds would be able to use habitats adjacent to the Project. In areas of summer construction, clearing in winter would reduce the likelihood of use by nesting birds, but it is assumed that some nests would be established prior to ground disturbing activities. These nesting birds will be addressed according to APP's Migratory Bird Conservation Plan, which will be developed prior to construction and in coordination with the appropriate agencies. This plan will address avian issues associated with the MBTA, BGEPA, the ESA, and other avian management and habitat issues.

Direct effects of habitat loss to passerine species will be minor as these species will likely use similar habitats adjacent to the Project area. Loss of forest habitat might cause a change in species composition, with forest-dwelling species being replaced by those preferring early stages of vegetative succession. Both the effects to the former occupants of the Project and benefits to the latter occupants will be low even on a local basis because of the large areas of equivalent habitat that will be undisturbed in adjacent areas. Indirect impacts will be minor, even on a local basis.

Operations Impacts and Mitigation

During operations, periodic maintenance clearing of vegetation along the right-of-way is expected to have negligible impacts on the habitat suitability of avian resources within the Project area.

3.5 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

3.5.1 FEDERALLY LISTED, PROPOSED THREATENED AND ENDANGERED, OR CANDIDATE SPECIES

The ESA provides for the protection of threatened and endangered plants and animals and the habitats in which they are found. Under the ESA, NMFS, FWS are obligated to assess the impacts of a federally permitted project for those individual permits as well as for the National Environmental Policy Act (NEPA) analysis undertaken for that project. The analysis is led by the lead federal agency completing the NEPA document in consultation with the NMFS, in this case, the FERC. The consultation is documented with the completion of a Biological Assessment (BA) within the Final EIS. FERC has designated APP as the non-federal representative to communicate and coordinate the consultation required under the ESA up to the time of the APP application with FERC.

APP has initiated consultations with the FWS and NMFS, and has conducted a review of existing data sources, to identify federally listed threatened and endangered species, and to support the analysis of impacts to ESA- and MMPA-listed species. Using information from the NMFS, FWS, previous studies in the area, previous BAs and Biological Opinions, and recent surveys conducted by the NMFS, FWS, and others, APP will assess the construction and operation impacts of each facility component on the MMPA species, described below, and ESA-listed and candidate species presented in Section 3.5.1. APP will work with FWS, NMFS, and FERC to develop an applicant-prepared Biological Assessment (BA) that will assess the construction and operation impacts of each facility component on ESA-listed and candidate species to file with the final report (refer to Appendix 3D). APP will consult with the Alaska Eskimo Whaling Commission and Native groups that conduct subsistence hunting on MMPA species.

Nine ESA-listed, candidate, or proposed wildlife species are discussed below and identified in Table 3.5-1 based on potential links to the Project area. No plants listed under the ESA are located in the Project area. The one ESA-listed plant in Alaska, Aleutian shield fern (*Polystichum aleuticum*), is currently known only on Adak Island. Specific details regarding potential Project impacts on the federally listed species will be addressed in the Biological Assessment. These species are briefly described in the following subsections.

TABLE 3.5-1

Alaska Pipeline Project
Federally Listed and Proposed Threatened and Endangered and Candidate Species Potentially Occurring in the Project Area

Common Name	ESA Species Status	Potential Presence in Project Area	Season Present	Comments
Polar bear	Threatened	Yes	Fall/Winter/Spring	Present primarily in the winter within designated Critical Habitat area.
Bowhead whale	Endangered	Unlikely	Summer/Fall	Present primarily outside (north) of barrier islands.
Ringed Seal	Proposed	Unlikely	Winter	Uses sea ice over the continental shelf outside the Project area in summer, and non-grounded ice for birthing lairs in winter..
Bearded Seal	Proposed	Unlikely	Winter	Uses sea ice over the continental shelf outside the project area.
Pacific Walrus	Candidate	Unlikely	Summer/Fall	Seasonal use areas are generally located west of the Project area.
Spectacled eider	Threatened	Possible	Spring/Summer	Nesting is sparse.
Steller’s eider	Threatened-Alaska	Possible	Spring/Summer	Primary nesting habitat is generally west of Project area, and nesting is sparse.
Yellow-Billed Loon	Candidate	Possible	Spring/Summer	Primary nesting habitat is generally west of the Project area, and nesting is sparse.
Eskimo curlew	Endangered	Not Present	Summer	Not expected to be present in the Project area, if it still exists.

3.5.1.1 Polar Bear

Polar bears (*Ursus maritimus*) are protected under provisions of the MMPA and were listed as a threatened species under the ESA on May 15, 2008 (73 Fed. Reg. 28,212). On December 7, 2010, the FWS designated more than 187,000 square miles of onshore barrier islands, denning areas, and offshore sea-ice as critical habitat for the threatened polar bear under the ESA (75 Fed. Reg. 76,086). Critical habitat is defined as areas of habitat that are crucial to the survival of a species and essential for its conservation, and that have been formally designated as such by rule published in the Fed. Reg. The designation identifies geographic areas containing features considered essential for the conservation of the polar bear that require special management or protection.

The Project involves several components that may affect polar bear habitat. These components (herein after referred to as the Northern Portion), which are planned to be constructed and operated within the polar bear designated critical habitat, include (refer to Sections 1.3 and 1.4 of Resource Report 1):

- PT Pipeline (entire route);

- GTP including West Dock modifications, barge channel dredge area, offshore disposal area, module laydown area, process and potable water source and pipeline, and borrow sites;
- Alaska Mainline (AMP 0.0 to approximate AMP 6.2); and
- Selected access and ice roads in the above referenced areas.

Construction of the facilities are planned to occur year-round in polar bear designated critical habitat area, and these activities will be subject to incidental take regulations issued under authority of the MMPA and ESA. Details regarding potential Project impacts on the polar bear and its habitat will be addressed in a Biological Assessment that will be provided in the final report in Appendix 3D. A brief discussion of the potential Project impacts is presented in Section 3.5.3.

Polar bears have a circumpolar distribution in the Northern Hemisphere, primarily around the rim of the Polar Basin and into the seasonally ice-covered regions of contiguous seas. In Alaska, polar bears occur most commonly within 200 miles of the Arctic Ocean coast (Amstrup and DeMaster 1988). Nineteen semi-discrete subpopulations (stocks) of polar bears have been identified throughout the species range (Amstrup et al. 2007; Schliebe et al. 2006), the 2006 population was estimated at 20,000 to 25,000 animals range-wide. The individual stocks vary from a few hundred to a few thousand animals each (Schliebe et al. 2006; Stirling 2002).

Bears from three stocks occur in Alaska waters, but only one stock has potential to be present in the Project area, the Southern Beaufort Sea (SBS) stock. The SBS stock occupies the Beaufort Sea off the northern coast of Alaska (Amstrup 2003a; Bethke et al. 1996; Schliebe et al. 2006).

Although polar bears are classified as marine mammals and are strong swimmers, polar bears rely principally on the availability of sea-ice habitats to provide a substrate on which to travel, hunt, breed, den, and rest. Preferred habitats are located in the active seasonal ice zone that overlies the continental shelf and associated islands and in areas of heavy offshore pack ice (Durner et al. 2004, 2009; Stirling 1988). Adult males usually remain in those locations, rarely coming ashore (Amstrup and DeMaster 1988).

Habitat use changes seasonally with the formation, advance, movement, retreat, and melt of sea ice (Amstrup 2000; Durner et al. 2004, 2009; Ferguson et al. 2000; Schliebe et al. 2008). During winter and spring, polar bears tend to concentrate in areas of ice with pressure ridges, at floe edges, and on drifting seasonal ice at least eight inches thick (Schliebe et al. 2006; Stirling et al. 1975, 1981). The primary prey of polar bears in the Beaufort Sea is the ringed seal, and floe edges and drifting seasonal ice allow polar bears the best access to this prey. Bears capture seals by waiting for them at breathing holes and at the edge of leads or cracks in the ice. Polar bears also stalk seals resting on top of the ice and catch young seals by breaking into pupping chambers in snow on top of the ice in the spring.

Polar bears use mostly shallow water areas in winter, in areas of active ice with shear zones and leads (Durner et al. 2004). During the pupping season of ringed seals in the spring, bears move to the landfast ice. In late summer and early autumn, bears migrate to multi-year ice as the pack ice retreats to its minimal extent (Durner et al. 2004; Ferguson et al. 2000). In order to protect their young cubs, female polar bears may retreat to areas with a greater stability in ice cover (Mauritzen et al. 2003).

Apart from ringed seals, bears prey on bearded seals, walrus, and beluga whales, and also feed on carrion, including whale, walrus, and seal carcasses found along the coast (Amstrup 2003b; Schliebe et al. 2006). They occasionally eat small mammals, bird eggs, and vegetation when other food is not available. Polar bears are extremely opportunistic hunters and may approach human developments in search of food.

Polar bears are a long-lived species, reaching reproductive maturity relatively late in life. They have relatively few young, an extended period of maternal care, and comparatively high survival rates, especially after attaining maturity (Amstrup 2003a). Mating occurs primarily from March to late May or early June, when both sexes are active on the sea ice. During the breeding season, males actively seek out females by following their tracks on the sea-ice. Adult males and non-pregnant females are active all year, using dens only as temporary shelter during severe weather. Some pregnant females of the SBS population construct and enter natal dens in October, but the majority enter the dens in mid- to late November (Amstrup and Gardner 1994).

Pregnant polar bears excavate maternal dens in compacted snow drifts adjacent to coastal banks (barrier islands and mainland bluffs), river or stream banks, and other areas with at least 4 feet of vertical topographic relief (Amstrup and DeMaster 1988; Durner et al. 2001, 2003, and 2006). The common characteristic among suitable denning habitats is the presence of topographic features that collect blowing snow in early winter. Dens have been found most frequently at the edge of stable sea ice on the shoreward side of barrier islands; onshore, in drifts along the coastline and, to a lesser extent, along river or stream banks (Durner et al. 2003). Female polar bears do not necessarily return to the same den, but females tend to den on the same type of substrate (pack ice or land) from year to year and may return to the same general area to den (Amstrup 2003b; Amstrup and Gardner 1994; Schliebe et al. 2006; Fischbach et al. 2007).

The Beaufort Sea is an area of widespread, low-density denning in comparison with known denning concentration areas in other parts of the species range (Amstrup 2003b; Schliebe et al. 2006). The main area of terrestrial denning for the SBS stock is located along the coast between Point Barrow and Barter Island, including the barrier islands and the onshore coastal area extending up to 25 miles inland (FWS 2009a). The Northern Portion runs through an area of relatively less denning habitat located in the coastal area and inland 30 miles between the Shaviovik River and the eastern edge of the Canning River Delta. However, the number of polar bear dens in the Northern Portion within a given year cannot be estimated with confidence

Until the latter part of the 20th century, most maternal dens were found largely by ground-based observers in mainland or landfast-ice habitats, and the inference was that most polar denning occurred on land, even though local environmental knowledge of Alaska Native hunters recognized that maternal dens also occurred on drifting ice (FWS 1995; Kalxdorff 1997). Lentfer (1975) confirmed that denning occurred, to an unknown extent, on drifting ice. Of 90 dens located during the 1981 to 1991 period in the Beaufort Sea region, 48 (53.3 percent) were on drifting pack ice, 38 (42.2 percent) were on land, including barrier islands, and four (4.5 percent) were on landfast ice (Amstrup and Gardner 1994). Dens on land occurred mainly in a narrow band along the coast, although one was 38 miles inland.

The most recent analysis of den locations used by collared polar bears has documented notable shifts in the distribution of maternal dens in northern Alaska (Fischbach et al. 2007). The analysis indicated a landward and eastward shift in maternal denning locations, including the area between the Sagavanirktok and Canning rivers, in which a portion of the Project area is located (PT Pipeline). The proportion of dens located on drifting pack ice decreased from 62.3 percent from 1985-1994 to 37.1 percent from 1998-2004, and proportionately fewer dens on pack ice occurred in the western Beaufort Sea in the latter period.

The increasing population of bears denning on land in the Beaufort Sea region was initially attributed to the restriction of hunting after 1972 (Amstrup and Gardner 1994; Stirling and Andriashek 1992). However, more recently the landward and eastward shift in denning by SBS bears has been attributed to reductions in stable sea-ice cover and a later autumn freeze-up (Fischbach et al. 2007). Because of their greater proximity to settlements, industrial sites, and coastal areas of human activity, dens on land and landfast ice are presumed to be more vulnerable to human-induced disturbance.

Although polar bears could occur in the Northern Portion at any time of year, there are periods when the probability of their presence is low. Pregnant and subsequently post-parturient females can be present in dens, although not obvious, from late November through early April; most commonly on or close to the barrier islands (Amstrup 2002). During mid-March 2011, a female polar bear and cub were noted denning in proximity to an ongoing oilfield development site at an offshore island; site development activities were suspended for approximately two weeks until the female and cub emerged from the snow den and moved offshore from the activity.

Non-denning bears can be expected to roam through the area during those same months, although their preferred hunting habitat in winter and spring is farther seaward in areas of more active ice. The lowest probability of presence in the Northern Portion is from May through July or early August, although that probability may increase as more bears spend time on land in response to decreasing summer sea-ice cover. Stirling (2002) noted that the greatest proportion of a polar bear's total annual caloric intake occurs during spring and early summer when newly weaned ringed seal pups, on which they prey extensively, are fat. Ringed seal abundance in the Project area is low, and the few that occur there generally depart when the sea ice melts in summer.

As noted by several Alaska Native residents in FWS, 1995), bears become increasingly abundant on the mainland and barrier islands before (August) and during the fall open water and whaling season. Aerial surveys for bowhead whales conducted by the Bureau of Ocean Energy Management along the coast and offshore have recorded incidental sightings of polar bears. Aerial surveys conducted during the period August to October since 2000 along the Beaufort Sea coast between Point Barrow and the Canadian border have typically identified from 50 to 100 polar bears per survey (maximum count was 125); 82 percent of the total sightings have occurred on barrier islands, 11 percent on the mainland, and six percent on landfast ice (Gleason and Rode 2009). Peak numbers generally occur in late September to early October (Kalxdorf et al. 2002; Schliebe et al. 2001 and 2008; FWS 1995). Polar bears congregate on the barrier islands in the fall and winter because of available food such as bowhead carcasses and favorable environmental conditions (Miller et al. 2006; Schliebe et al. 2008). This is a modification of their normal activity during the ice free season and apart from the attraction to a large food source, could be the result of increased habituation to the structures, noises, and activities associated with nearby communities and oilfield development activities. More individual polar bears likely move through the Project area at that time, when bears are present along the entire Beaufort Sea coast from Demarcation Point to Point Barrow.

The population increased during the 1980s and is thought to have remained stable during the 1990s. The minimum population size in 2002 was calculated as 1,973 animals, based on an estimate of up to 2,272 animals in the SBS population in 2001. The best information currently available, however, suggests that the SBS population is now declining (FWS 2009a). The SBS stock was estimated at 1,526 animals in 2005 (Regehr et al. 2006).

3.5.1.2 Bowhead Whale

The bowhead whale (*Balaena mysticetus*) was first protected under the 1931 League of Nations Convention. In 1964, commercial whaling of bowheads was regulated by the International Whaling Commission. The species was later protected by the Endangered Species Preservation Act of 1966 then the Endangered Species Conservation Act. In 1973 it was listed as endangered under the ESA. The bowhead whale is also listed as depleted under the MMPA.

Bowhead whales only occur at high latitudes in the northern hemisphere and have a disjunct circumpolar distribution (Reeves 1980). These whales are one of only three whale species (the others being beluga and narwhal) that spend their entire lives in the Arctic. Bowhead whales occur in the western Arctic in the Bering, Chukchi, and Beaufort seas, the Canadian Arctic. Project activities will only occur within the range of the Bering-Chukchi-Beaufort Sea (BCB).

Bowhead whales are an important subsistence resource for residents of the villages along the Chukchi and Beaufort seas. The BCB stock winters in the central and western Bering Sea and largely summers in the Canadian Beaufort Sea (Brueggeman 1982; Moore and Reeves 1993; Quakenbush et al. 2009). Spring migration from the Bering Sea follows the eastern coast of the Chukchi Sea to Point Barrow in nearshore leads from mid-March to mid-June before continuing through the Western Beaufort Sea through offshore ice leads (Braham et al. 1984; Moore and Reeves 1993). Some bowheads arrive in coastal areas of the eastern Canadian Beaufort Sea and Amundsen Gulf in late May and June but most may remain among the offshore pack ice of the Beaufort Sea until mid-summer. Bowhead whales calve during spring in the Bering Sea and during the migration.

After leaving the Canadian Beaufort Sea, bowheads migrate westward from late August or September to mid- or late-October. The tracks of satellite-tagged whales suggest that some whales leave Canadian waters in early October to begin the fall migration (Quackenbush et al. 2009). Fall migration into Alaska waters is primarily during September and October; however, in recent years bowheads have been seen or heard offshore from Point Barrow to Kaktovik during summer and early fall (Blackwell et al. 2004; Greene 1997; Greene et al. 1999; Ireland et al. 2008; LGL and Greeneridge 1996; Treacy 1993;). Consistent with this pattern, Nuiqsut whalers have stated that a small number of the earliest arriving bowheads have apparently reached the Cross Island area earlier (late August) than in past years.

Although some whales summer in the Alaska Beaufort Sea, it likely represents a small proportion of the total population on the basis of past research and historic accounts. It is not clear if this is a new trend, or related to the increased numbers of whaling crews and researchers in the Beaufort Sea detecting more bowhead whales and other marine mammals. The Bureau of Ocean Energy Management has supported late-summer/early fall aerial surveys for bowhead whales in the Alaska Beaufort Sea since 1979 (Ljungblad et al., 1986; Moore et al., 1989; Treacy, 1988-1998, 2000, 2002 a,b). Bowheads tend to migrate west from Canada in deeper water (farther offshore) during years with higher-than-average ice coverage than in years with less ice (Moore et al. 2000; Treacy et al. 2006). During fall migration, most bowheads migrate west in waters ranging from 49.2 to 656.2 feet deep (Miller et al. 1999). In addition, the rate of bowhead sightings tends to be lower in heavy ice years and more widespread in light ice years (Treacy et al. 2006). Some bowheads enter shallower water, particularly in light ice years, but very few whales occur shoreward (south) of the barrier islands. Survey coverage far offshore in deepwater is usually limited, and offshore movements of bowheads may be underestimated. However, the main migration corridor is widespread over the continental shelf.

Examination of stomach contents from whales taken in the Iñupiat subsistence harvest indicates that bowhead whales feed on a variety of invertebrates and small fishes (Lowry 1993). Recent analysis of stomachs collected from harvested whales found mainly copepods in whales harvested off Kaktovik and euphausiid-like prey for those harvested off Barrow (Goetz et al. 2009).

The BCB stock of bowhead whales was estimated at 10,400 to 23,000 animals in 1848, before commercial whaling decreased the stock to between 1,000 to 3,000 animals by 1914 (Woodby and Botkin 1993). This stock has slowly increased since 1921 after commercial whaling ended, and now numbers at least 10,545 whales with an estimated 3.5 percent (greater than 350 animals per year) annual rate of population increase (Angliss and Outlaw 2008; Brandon and Wade 2004; George et al. 2004 a,b; Zeh and Punt 2004).

3.5.1.3 Ringed Seal

On September 4, 2008, the NMFS announced a 90-day finding on a petition to the ringed seal as threatened or endangered under the ESA. On December 10, 2010 NMFS published the comprehensive status review of the ringed seal under the ESA and announced a 12-month finding on a petition to list the ringed seal as a threatened or endangered species. Based on consideration of information presented in the status review report, an assessment of the factors in the ESA, and efforts being made to protect the species, the NMFS determined the Arctic (*Phoca hispida hispida*) and Okhotsk (*Phoca hispida ochotensis*) subspecies of the ringed seal are likely to become endangered throughout all or a significant portion of their range in the foreseeable future. Accordingly, NMFS issued a proposed rule to list this subspecies of the ringed seal as threatened species (73 Fed. Reg. 51615; 75 Fed. Reg. 77476).

Ringed seals are circumpolar and are found in all seasonally ice-covered seas of the Northern Hemisphere, as well as in certain freshwater lakes. They range throughout the Arctic Basin and southward into adjacent seas, including the southern Bering Sea. Throughout most of its range, the Arctic subspecies does not come ashore, but uses sea ice as a substrate for resting, pupping, and molting. Pups are normally born in sub-nivean lairs (snow caves) on the sea ice in late winter to early spring. The seasonality of ice cover strongly influences ringed seal movements, foraging, reproductive behavior, and vulnerability to predation. Kelly et al. (2010) referred to the open-water period when ringed seals forage most intensively as the “foraging period”, early winter through spring when seals rest primarily in sub-nivean lairs on the ice as the “sub-nivean period”, and the time period between abandonment of the lairs and ice breakup as the “basking period”.

The ringed seal foraging period is characterized by both short and long distance movements during the open-water period. Some seals forage within 60 miles of their shorefast ice breeding habitat, while others make extensive movements of hundreds or thousands of miles to forage in highly productive areas and along the pack ice edge. Movements during the open-water period by ringed seals that breed in the pack ice are unknown. Tracking and observational records indicate that adult Arctic ringed seals breeding in the shorefast ice show inter-annual fidelity to breeding sites (IUCN 2011).

High quality, abundant food is important to the annual energy budgets of ringed seals. Fall and early winter periods, prior to the occupation of breeding sites, are important in allowing ringed seals to accumulate enough fat stores to support estrus and lactation (IUCN 2011).

At freeze-up in fall, ringed seals surface to breathe in the remaining open water of cracks and leads. As these openings freeze over, the seals push through the ice to breathe until it is too thick. They then open breathing holes by abrading the ice with the claws on their fore flippers. As the ice thickens, the seals continue to maintain the breathing holes by scratching at the walls. The breathing holes can be maintained in ice two meters or greater in thickness but often are concentrated in the thinner ice of refrozen cracks. As snow accumulates and buries the breathing hole, the seals breathe through the snow layer. Ringed seals excavate lairs in the snow above breathing holes where snow depth is sufficient. These sub-nivean lairs in annual shorefast and pack ice are occupied for resting, pupping, and nursing young (IUCN 2011).

The number of ringed seals hauled out on the surface of the ice typically begins to increase during spring as the temperatures warm and the snow covering the seals' lairs melts. Although the snow cover can melt rapidly, the ice remains largely intact and serves as a substrate for the molting seals that spend many hours basking in the sun. Adults generally molt from mid-May to mid-July, although there is regional variation (IUCN 2011).

Ringed seals eat a wide variety of prey in the marine environment. Most ringed seal prey is small, and preferred fishes tend to be schooling species that form dense aggregations. Arctic cod is often reported to be among the most important prey species, especially during the ice-covered periods of the year. Other members of the cod family, including polar cod (*Arctogadus glacialis*), saffron cod, and navaga (*Eleginus navaga*) are also seasonally important to ringed seals in some areas. Other fishes reported to be locally important to ringed seals include smelt (*Osmerus* sp.) and herring (*Clupea* sp.). Invertebrates appear to become more important to ringed seals in many areas during the open-water season, and are often found to dominate the diets of young seals (IUCN 2011).

Ringed seals are most commonly preyed upon by Arctic foxes and polar bears, and less commonly in various locations by other terrestrial carnivores, sharks, and killer whales. When ringed seal pups are forced out of sub-nivean lairs prematurely because of low snow accumulation and/or early melts, gulls and ravens also successfully prey on them. Avian predation is facilitated not only by lack of sufficient protective snow cover, but also by conditions favoring influxes of birds (IUCN 2011).

Population assessments of ringed seals in the Beaufort and Chukchi Seas have been mostly confined to U.S. and Canadian waters. Based on the available abundance estimates for study areas within this region and extrapolations for pack ice areas without survey data, a reasonable population estimate for the Chukchi and Beaufort Seas is one million seals (IUCN 2011).

3.5.1.4 Bearded Seal

On March 28, 2008, NOAA announced an initiation of a status review of bearded seal. On December 10, 2010, NOAA indicated that a comprehensive status review of the bearded seal under ESA had been completed and announced a 12-month finding on a petition to list the subspecies of the bearded sea, *Erignathus barbatus nauticus*, as a threatened or endangered species (73 Fed. Reg. 16617; 75 Fed. Reg. 77496).

In the Beaufort Sea, suitable habitat for bearded seals is more limited because the continental shelf is narrow and the ice edge can occur off the shelf over water too deep for bearded seals to dive and feed. Bearded seals in the western Beaufort Sea occur in landfast and pack ice during the winter, and move to the pack ice front where it overlaps with the Beaufort Sea shelf in the summer (Center for Biological Diversity 2008).

Sea ice is an essential component to the survival of the bearded seal. Spring surveys conducted in 1999 and 2000 along the Alaskan coast indicate that bearded seals tend to prefer areas of between 70 percent and 90 percent sea ice coverage. Bearded seals are typically more abundant 20 to 100 nautical miles from shore than within 20 nautical miles of shore (Center for Biological Diversity 2008).

Sea ice provides an essential platform for bearded seal reproductive activities of birthing and nursing. Bearded seals give birth to a single pup on the sea ice in March through May, followed by a three-week period when the pup is nursed on the sea ice. The ice provides several advantages that influence subsequent pup survival. The sea ice allows bearded seals to avoid excessive predation on their dependent young by terrestrial predators. The sea ice also provides an important resting platform for pups during the three-week nursing period. Although bearded seal pups actively dive throughout the nursing period, pups spend 50 percent of their time resting on the ice, half of which is spent sleeping (Center for Biological Diversity 2008).

Bearded seals require the sea-ice platform for the annual molt of their fur since they do not haul out on land to molt. Bearded seals undergo a diffuse molting period from April through August and may shed hair year-round. However, during May through July, bearded seals haul out on the sea ice during a concentrated molting period when they depend on increased summer temperatures and day length to raise their skin temperature to facilitate epidermal growth. Therefore, persistence of the sea ice through July is critical to allowing bearded seals adequate time to complete their molt (Central for Biological Diversity 2008).

Being closely associated with sea ice, particularly pack ice, the seasonal movements and distribution of bearded seals are linked to seasonal changes in ice conditions. To remain associated with their preferred ice habitat, bearded seals generally move north in late-spring and summer as the ice melts and retreats, and then move south in the fall as sea ice forms. Bearded seals use the sea ice for resting throughout the year, although peak haulout occurs during the concentrated molting period in May and June. Breeding and molting activities are physiologically demanding and the sea ice provides an important resting platform, which may also serve in thermoregulation (Center for Biological Diversity 2008).

Bearded seals follow the seasonal sea ice advance and retreat over the shallow continental shelf in many regions. Of the ice-associated seals in the Arctic, bearded seals seem to be the least specific about the type and quality of ice on which they are observed. Bearded seals generally prefer ice habitat that is in constant motion and produces natural openings and areas of open water, such as leads, fractures, and polynyas for breathing, hauling out on the ice, and access to water for foraging. They usually avoid areas of continuous, thick, shorefast ice, and are rarely seen in the vicinity of unbroken, heavy, drifting ice or large areas of multi-year ice. Although bearded seals prefer sea ice with natural access to the water, observations indicate that bearded seals are able to make breathing holes in thinner ice (Center for Biological Diversity 2008).

Bearded seals appear to actively select regions of high benthic biomass for foraging, and feed primarily on epibenthic fauna and infauna as well as some schooling demersal fish. Although bearded seals consume a wide array of prey species, relatively few species compose the bulk of the diet. Decapod crustaceans and molluscs appear to comprise the bulk of the bearded seal diet across its range, although species composition varies geographically. The proportions of prey species in the diet reflect seasonal and regional differences in prey availability, vary with age, and may be influenced by interspecific competition with Pacific walruses. In the Beaufort Sea, crabs, shrimp, and Arctic cod were the most important prey, and more cod were eaten in winter (Center for Biological Diversity 2008).

Because the bearded seal feeds predominantly on benthic prey, its distribution is generally restricted to relatively shallow shelf waters of less than 150 to 200 meters depth where benthic prey are more abundant. Although foraging dives of 130 to 200 meters have been reported, bearded seals appear to prefer shallower depths less than 100 meters, and especially 25 to 50 meters (Center for Biological Diversity 2008).

The primary predators of bearded seals are polar bears. In Alaskan waters, polar bear predation peaks during late summer and fall when bearded seals and polar bears are concentrated together along the margin of multi-year ice, and decreases in winter when most bearded seals are located in the Bering Sea south of the polar bear distribution. Bearded seals exhibit behaviors that are presumed adaptations to polar bear predation. The bearded seal rests on the edges of wide leads or large holes in the ice, or on the points of small ice floes, facing toward the water and downwind. When alarmed, they bolt into water by raising and propelling their bodies with simultaneous movements of both foreflippers (Center for Biological Diversity 2008).

Bearded seals are an important source for Alaska Native subsistence hunters of coastal northern and western Alaska. For more information on subsistence activities within the project area, refer to Appendix 5E of Resource Report 5.

The global population of the bearded seal is difficult to estimate since the species inhabits remote and difficult-to-access environments, has a scattered distribution, and spends part of their time underwater. The current size of the bearded seal population is unknown; however, a 2002 estimate indicated likely numbers in hundreds of thousands throughout the Arctic. In the early 1980s, an estimated 750,000 individuals were considered the worldwide population, excluding the Canadian Arctic.

3.5.1.5 Pacific Walrus

On February 10, 2011 the FWS announces a 12-month finding on a petition to list the Pacific walrus (*Odobenus rosmaurs*) as endangered or threatened and to designate critical habitat under the ESA, as amended. After review of all the available scientific and commercial information, the FWS determined that listing the Pacific walrus as endangered or threatened is warranted; however, listing the Pacific walrus was precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants and the FWS added the species to the candidate species list (76 Fed. Reg. 7634).

The Pacific walrus is a large pinniped that mainly inhabits the shallow continental shelf waters of the Bering and Chukchi seas. Its distribution varies considerably with the seasons. Virtually the entire population occupies the pack ice in the Bering Sea in the winter months. Through the winter walrus typically congregate in two areas: one immediately southwest of St. Lawrence Island, and the other in outer Bristol Bay. As the Bering Sea pack ice begins to break up in April, walrus move northward and their distribution becomes less concentrated. By late April the distribution extends from Bristol Bay northward to the Bering Strait (FWS 2008a). The Project area is at the northeastern limit of walrus seasonal distribution, and the presence of walrus in the Beaufort Sea near the Project area would be an accidental occurrence.

During the summer months as the pack ice continues to recede northward, most of the population migrates into the Chukchi Sea. The largest concentrations during the summer are found near the coast, between latitude 70°North and Point Barrow in the east and between Bering Strait and Wrangell Island in the west (FWS 2008a).

In October as pack ice develops in the Chukchi Sea and large herds of walrus begin to move southward. Many come ashore on haulouts in the Bering Strait area. Depending on ice conditions, the haulout sites continue to be occupied through November and into December, but with the continuing development of ice, most walrus move south of St. Lawrence Island and the Chukchi Peninsula by early to mid-December (FWS 2008a).

Pacific walrus are typically found in waters of 100 meters or less, possibly because of higher productivity of their benthic foods in the shallower water. Feeding areas typically are comprised of sediments of soft, fine sands; compacted sediments apparently inhibit foraging. Walruses also forage along rocky substrates. The sensitive vibrissae (i.e., whiskers) locate prey items in the sediments of the sea floor. Bivalve molluscs are the preferred food; however, other invertebrates such as sea cucumbers, crabs, and segmented worms are frequently consumed. Walrus rarely consume fish. They are frequently reported to prey on small seals such as ringed and ribbon seals. The incidence of seal eating may vary with location and population status (FWS 2008a).

Pack ice serves as a substrate for resting and giving birth, and walrus require pack ice that will support their weight and allow ready access to the water in which they forage. While walrus can break ice up to seven inches thick, they require ice thicknesses of 24 inches or more to support their weight. Ice that rises too high out of the water, such as multi-year floes, prevents walrus from coming out of the water (FWS 2008a).

Walrus prefer to occupy first-year ice with natural openings such as leads and polynyas, and are not found in areas of extensive, unbroken ice. Therefore, their concentrations in winter are in areas of divergent ice flow or along the margins of persistent polynyas. In summer walrus associated with ice are found along the southern margin of the Chukchi pack ice, moving farther into the pack in stormy seas. Ice floe size and topography appear to be important in the selection of haulout sites (FWS 2008a).

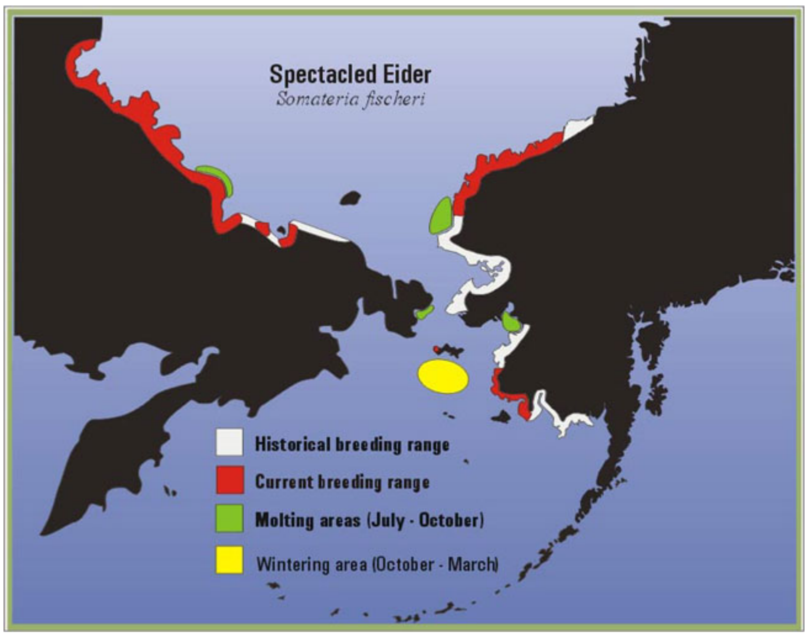
Walrus depend on hauling out to complete their molt and grow new hair, to whelp, to nurse young, and to rest. At those times even temporary displacement from haulout areas can be detrimental to the population. There is some evidence of haulouts being completely abandoned as a result of prolonged disturbance but those cases must be assessed carefully because evidence also exists for changes in walrus distribution for reasons not fully understood (FWS 2008a).

Walrus are preyed upon by polar bears, killer whales, and subsistence hunters. The magnitude of natural effects is unknown but is assumed to be low, given the population's low productivity (FWS 2008a).

The current size of the Pacific walrus population is not well known. Surveys initiated in 1975 estimated the walrus population at 221,360. In 1980, the estimated walrus population was at 246,360, dropping to 234,020 in 1985, and 201,039 in 1990. However, the 1990 survey did not survey a considerable portion of the eastern Chukchi Sea usually inhabited by walrus due to lack of ice coverage (FWS 2008a).

3.5.1.6 Spectacled Eider

All breeding populations of spectacled eider (*Somateria fischeri*) were listed as threatened under the ESA on May 10, 1993, due to severe declines in the Yukon-Kuskokwim Delta population and indications of reduced populations in the other two primary breeding areas, the Russian and Alaska Beaufort Coastal Plain (58 Fed. Reg. 27474) (Figure 3.5-1). Eiders nesting and rearing young on the Beaufort Coastal Plain are of primary interest due to the potential overlap between the nesting range of this population and the Project area



Source: http://alaska.fws.gov/media/SpecEider_RangeMap.htm

Figure 3.5-1 Spectacled Eider Range

The North Slope breeding population of spectacled eiders depart their wintering range, south of St. Lawrence and St. Matthew islands, in March and April and follow the eastern Chukchi Sea spring lead, arriving on the Beaufort Coastal Plain in mid-May or early June (MMS 2006; FWS 2007 and 2008). Pairs established in their wintering range migrate to nesting grounds up to 10 miles inland from the coast and construct nests in sedge meadow tundra, usually within 10 feet (3 meters) of shallow ponds or lakes (MMS 2006; FWS 2007). Females show strong fidelity to nesting areas and often return to within 1 mile of the same nesting site (MMS 2006). Males depart breeding areas around the time of nest initiation (Troy Ecological Research Associates [TERA] 1997).

Female spectacled eiders lay one to eight eggs (average three to five) in late June. After a 20- to 25-day incubation period, clutches hatch in mid to late July (FWS 2008b; Quakenbush et al. 2004). Broods are raised in shallow, fresh or brackish water ponds or on flooded tundra, within 3 miles of where they were hatched (FWS 2007). The young fledge after approximately 50 days and, with the females, move to nearshore marine habitats, usually by mid-September (MMS 2006; FWS 2007).

Critical habitat was designated for spectacled eiders in February 2001 (FWS 2002a) (66 Fed. Reg. 8850 and 9146). Though proposed in the draft designation, no critical habitat was designated on the Beaufort Coastal Plain. The nearest critical habitat for spectacled eiders is the Ledyard Bay Critical Habitat Unit, which is approximately 350 miles west of the Project area.

FWS has estimated the current North Slope breeding population of spectacled eiders to be at least 5,000 to 7,000 pairs (Larned et al., 2009). The most recently reported (2009) spectacled eider population index (5,525) was below the 17-year mean (6,540), however, the population appears relatively stable, and between 1993 and 2007, there was an average annual growth rate of 0.987 (0.969-1.005, 90 percent confidence interval) (FWS 2008b).

Spectacled eider breeding density ranges widely across the North Slope, from approximately 0 to 0.95 nests per square kilometer, and is highest in the Barrow region (FWS 2007; Larned et al. 2006 and 2009). The FWS estimates that fewer than three percent of the current North Slope breeding population nests east of Gwydyr Bay (FWS 2009b) and they occur at low densities throughout much of the Prudhoe Bay area (TERA 1997). Refer to Figure 3.5-2 for an illustration of spectacled eider FWS observation points in the vicinity of the Project area.

Spectacled eiders have been recorded nesting and rearing broods in the Project area by previous surveys (e.g., Ritchie and Palmer 2002; TERA 2002; Larned et al. 2009). Density generally increases from east to west in the Project area with relatively higher use west of the Sagavanirktok River and between West Dock and AMP 15 (TERA 1996; Ritchie and Palmer 2002; Larned et al. 2006, 2008, and 2009).

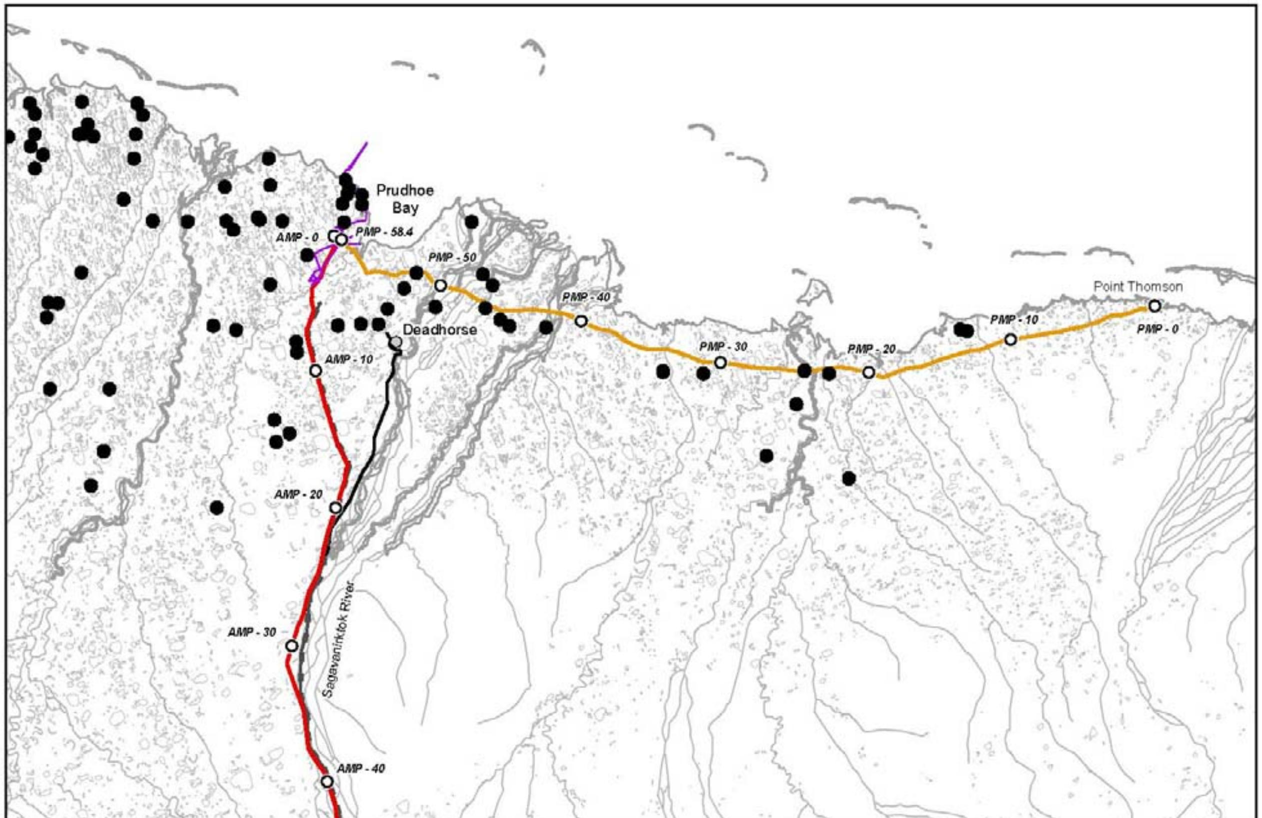
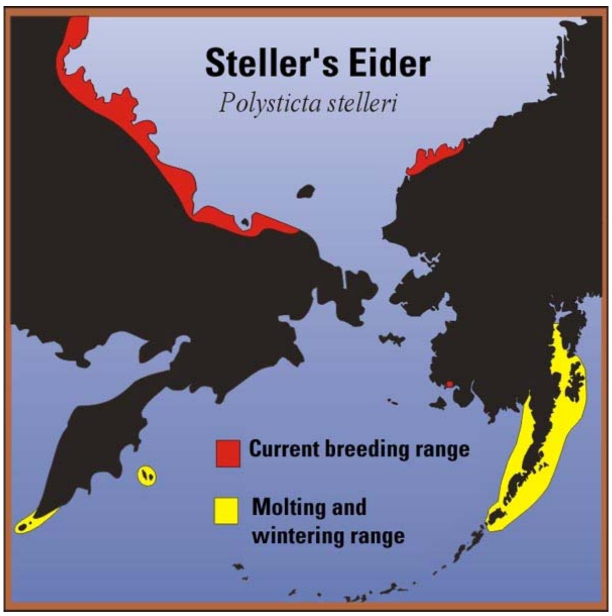


Figure 3.5-2
Alaska Pipeline Project
Spectacled Eider Observations

Source: NMFS 2011

3.5.1.7 Steller's Eider

Three primary breeding populations of Steller's eiders (*Polysticta stelleri*) have been identified, two in Arctic Russia (Atlantic and Pacific) and one in Alaska. On June 11, 1997, the Alaska-breeding population was listed as threatened based on a substantial decrease in the species' breeding range (62 Fed. Reg. 31748). This population currently nests in low numbers on the Alaska Beaufort Coastal Plain, concentrating near Barrow, and in extremely low numbers on the Yukon-Kuskokwim Delta (Figure 3.5-3) (MMS 2006). As with the spectacled eider, Steller's eiders nesting and rearing young on the Beaufort Coastal Plain are of primary interest due to the potential overlap between the nesting range of this population and the Project area.



Source: http://alaska.fws.gov/media/SpecEider_RangeMap.htm

Figure 3.5-3 Steller's Eider Range

Steller's eiders arrive in pairs on the Beaufort Coastal Plain in early June (MMS 2006). Like some other eiders, they are episodic breeders. From 1991 to 2008, Steller's eiders near Barrow, Alaska nested in 10 of 17 years (Rojek 2008). This behavior is typically related to inadequate body condition, but has also been correlated to lemming numbers and other environmental cues (Quakenbush and Suydam 1999; Quakenbush et al. 2004). In nesting years, Steller's eiders construct nests and lay one to eight eggs (average five eggs) in the first half of June (FWS 2002b). Preferred nesting habitat includes coastal tundra adjacent to small ponds and within drained lake basins up to 56 miles (90 kilometers) inland from the coast (FWS 2002b and 2007). Quakenbush et al. (2004) found that most Steller's eiders nesting near Barrow utilize the edge of low-centered polygons near ponds with emergent vegetation, particularly those with sedges and pendant grass (*Arctophila fulva*). During nesting, their food is believed to be mostly the relatively large, benthic larvae of the chironomid midge, common in Arctic tundra ponds (MMS 2006).

Following breeding in July, males and some females with failed nests leave nesting areas and return to marine waters. Eggs hatch from early July to early August, following an incubation period of approximately 24 days (Quakenbush et al. 2004; FWS 2007). Broods are raised in nearby freshwater, often within 0.5 miles of their nest sites, and fledge 32 to 37 days after hatching (Quakenbush et al. 2004). Once fledged, the young depart with the females, moving to marine waters (FWS 2008b).

Critical habitat was designated for Steller's eiders in February 2001 (66 Fed. Reg. 8850 and 9146). Though proposed in the draft designation, no critical habitat was designated on the Beaufort Coastal Plain (FWS 2001b).

Steller's eider is the least-abundant eider in Alaska (Rother and Arthur 1994). There is insufficient data to calculate the current North Slope breeding population with much certainty, but FWS estimates that several hundred return to the Beaufort Coastal Plain between Point Lay and the Colville River Delta in most years (FWS 2008b; Quakenbush et al. 2002 a and b).

The average nesting density across the North Slope during 2002 to 2006 was 0.0045 birds per square kilometer (DOI FWS 2007) and surveys conducted in the past decade suggest that the breeding range on the Beaufort Coastal Plain is now restricted mainly to the vicinity of Barrow (Quakenbush et al. 2002a and b; Larned et al. 2009; Obritschkewitsch and Ritchie 2008). Even in the area around Barrow, the breeding population has been diminished to a density of 0.03 birds per square kilometer (Obritschkewitsch and Ritchie 2008). Few observations of Steller's eiders have been recorded as far east as the Project area (FWS 2009b) and none of the surveys reviewed have documented them within 5 miles of the Project area since 1998 (Ritchie and Palmer 2002; FWS 2006a).

3.5.1.8 Yellow-Billed Loon

The yellow-billed loon (*Gavia adamsii*) is a candidate for listing as threatened or endangered under the ESA and is a BLM sensitive species. The loon is considered to be a vulnerable species because of a low population size, low reproductive rate, and specific habitat requirements. In 2009, the FWS determined that listing the yellow-billed loon as a threatened or endangered species was warranted, but that action was precluded by other higher-priority listing actions (FWS 2009b). As a candidate species, the yellow-billed loon is not afforded statutory protection, but the FWS encourages cooperation with other state and federal agencies and industry to limit detrimental effects of activities on this species.

Northern Alaska breeding grounds support an average of 3,369 yellow-billed loons, and about 780 additional birds occupy habitat in western Alaska. The population size estimate for North Slope breeding grounds was at 2,221 in 2003 (Earnst 2004).

The yellow-billed loon breeds in small, distinct areas throughout the sub-Arctic and Arctic tundra of northern Alaska. For the Beaufort Coastal Plain, the range of the yellow-billed loon extends from the Canning River westward to Point Lay. However, most of the breeding population lies in the central portion of this area, specifically between the Colville River and Meade River; breeding elsewhere is sparse. The breeding lake size, depth, connectivity to streams, shoreline complexity, and proportion of shoreline in moist to aquatic cover types are essential elements in yellow-billed loon habitat (Earnst 2004). Presence of low-lying cover types along the shore may be an indication of a gradually sloping shoreline, and convoluted shorelines provide nesting and brood-rearing sites. Lake depth and connectivity are interpreted as measures of fish availability. Although connectivity is generally favorable for loons, lakes on the Colville River Delta that have large connections to a major river channel are susceptible to fluctuating water levels and are avoided for nesting (North and Ryan 1989). However, lakes with smaller connections that have flowing water only during high water events on the Colville River Delta or elsewhere are used.

Pair members are thought to migrate separately from one another and to establish or re-establish pair bonds soon after arrival on the breeding grounds. First arrival in northern Alaska is usually the last third of May, and peak arrival is somewhat later. Individuals and small groups may occupy open river channels before breeding lakes are sufficiently free of ice. Larger flocks may stage in marine bays (Earnst 2004)

Nests are placed at the water's edge, typically in a low-lying, gently sloping area. Of the 11 to18 nest sites investigated annually on the Colville River Delta, on average, 55 percent were on islands, 27 percent on peninsulas, 14 percent on lake shores other than peninsulas, and four percent on rafts or underwater hummocks formed from peat and emergent vegetation (Earnst 2004).

Yellow-billed loons raise broods on the lakes where they nest; forage in lakes within their territories; and use lakes for escape habitat (Johnson et al. 2009; Earnst 2004).

Deep *Arctophila* lakes are used most frequently by nesting yellow-billed loons (North and Ryan 1989). Yellow-billed loons require nesting and brood-rearing lakes that:

- Are large enough to allow easy take-off from open water;
- Form an ice-free moat around shore in early spring that is large enough to protect nests from wind-blown ice and to allow adults to take flight;
- Have clear water with a substantial population of small fish which can be eaten by adults and fed to chicks;
- Have segments of gently sloping shoreline on which nesting and brooding can occur; and
- Have sheltered areas, often vegetated, where chicks can rest and take refuge during disturbances.

Yellow-billed loons are larger and heavier than the other tundra-breeding loons, and require a larger area of open water to ensure take-off and landing. More importantly, young are fed entirely from the brood-rearing waterbody; thus, successful reproduction apparently is restricted to lakes deep and large enough to support overwintering fish (North and Ryan 1998).

Most breeding territories consist of one waterbody, usually 42 acres to more than 247 acres, which is used for nesting and brood-rearing (North and Ryan 1989). A few loon territories consist of a section of one or more waterbodies. On the Colville River Delta, a few extremely large lakes with multiple bays and inlets which provide visual isolation and multiple brood-rearing sites, may support more than one yellow-billed loon territory or a combination of yellow-billed loon and Pacific loon territories (Earnst 2004).

Adults on breeding territories typically forage in deep, open water where they make repeated, lengthy dives that average 47 seconds (Earnst 2004). Yellow-billed loons are opportunistic foragers, capturing prey in relation to their availability and ease of capture and consuming most prey underwater (Barr 1997). Yellow-billed loon chicks are fed small, minnow-sized fish throughout July and August to an age of approximately six to seven weeks. Ninespine sticklebacks and least cisco are thought to be the primary foods of chicks on the Colville River Delta based on time-budget observations of adults feeding chicks and subsequent sampling of fish availability at sites where loons forage (Earnst 2004). Alaska blackfish, fourhorn sculpin, isopods, and amphipods also are available and utilized to some extent on breeding territories.

Adults usually leave territories in northern Alaska during late August to mid-September. Breeders are reported to leave territories soon after fledging, sometimes moving to open rivers until forced out by ice. Adults are thought to migrate separately from their offspring. Fall staging of 30 to 300 individuals in late August to mid-September has been reported in Wainwright Inlet (Earnst 2004).

The yellow-billed loon winters regularly, but sparsely, in nearshore marine waters from Kodiak Island through Prince William Sound, and throughout southeast Alaska and British Columbia. It winters irregularly southwest of Kodiak Island along the Aleutian chain and along the coast of Washington to Baja California. Of the 11 birds marked with satellite transmitters on Alaskan breeding grounds, all wintered off the coast of North Korea, Japan, or China (Earnst 2004)

The Project area is in a part of the Beaufort Coastal Plain that supports low densities of yellow-billed loons with less than one individual per 38.6 square miles (Earnst 2004). No nests of yellow-billed loons have been documented in the Project area, but several loons were observed in the early 1980s during fall staging and migration (Woodward-Clyde Consultants and ABR, 1983). Birds were also observed near Point Gordon and Point Sweeny in 1980. Yellow-billed loons have been observed on the Canning River Delta to the east of Point Thomson (Kendall et al. 2003). Low densities, less than 0.05 bird per square mile, were recorded during aerial transects along the barrier islands of Lions Lagoon in August and September 1998 and 1999 (LGL et al. 1999; Noel et al. 2000). Most observations of yellow-billed loons in the Project area have been recorded in the nearshore waters between the barrier islands and the mainland, but a few sightings of loons have been recorded onshore, south of Tigvariak Island near the Shaviovik River.

3.5.1.9 Eskimo Curlew

Available data supports the premise that the Eskimo curlew (*Numenius borealis*) no longer inhabits Alaska (NOAA Fisheries 2011). Additionally, the official position expressed by the Canadian Wildlife Service is that there are no recent, confirmed nest records from Arctic Canada (Faanes and Senner 1991). This bird has been recorded on multiple occasions in Alaska, but nesting was never documented (Gabrielson and Lincoln 1959). Potential breeding habitat occurs along a narrow band in the north foothills of the Brooks Range. Considering the best scientific evidence available, the species does not inhabit Alaska; therefore, it will not be affected by construction of the Project.

3.5.2 SPECIAL STATUS SPECIES

3.5.2.1 BLM-Sensitive Species

BLM Sensitive Species are presented under each resource as follows: BLM-sensitive fish resources are discussed in Section 3.2.1.4, BLM-sensitive plant species are described in Section 3.3.3, and BLM-sensitive wildlife and bird species are presented under Section 3.4.6.

3.5.2.2 State-Sensitive Species

The ADFG is responsible for determining and maintaining a list of endangered species in Alaska under AS 16.20.190. A species or subspecies of fish or wildlife is considered endangered when the Commissioner of ADFG determines that its numbers have decreased to such an extent as to indicate that its continued existence is threatened.

As of August 15, 2011, the ADFG no longer maintains a Species of Special Concern list. The list has not been reviewed and revised since 1998 and it is out of date and no longer considered valid. As an alternative, the ADFG developed Alaska Comprehensive Wildlife Conservation Strategy. This program is intended to be a guide for an overall conservation approach; one that sustains Alaska overall diversity of game and non-game wildlife. The program describes broad strategies that promote wildlife conservation while furthering responsible development and addressing other needs, and outlines the conservation needs of hundreds of species and many species assemblages.

3.5.3 CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

APP has initiated consultations with the FWS and NMFS, and has conducted a review of existing data sources, to identify federally listed threatened and endangered species. Consultations are ongoing and are expected to continue after the filing of this Resource Report. APP will work with FWS, NMFS, and FERC to develop an applicant-prepared Biological Assessment (BA) that will assess the construction and operation impacts of each facility component on ESA-listed and candidate species to file in the final report (refer to Appendix 3D).

The following sections describe the impacts that could potentially result from the construction and operation of the Project, as described in Resource Report 1, on ESA-listed species. The Project construction schedule is described in Section 1.5 and Figure 1.5-1 of Resource Report 1. Construction activities that could impact ESA-listed species include clearing, trenching, and blasting associated with the construction of the PT Pipeline and northern portion of the Alaska Mainline (from AMP 0 to approximately AMP 65), dredging of the barge channel near West Dock, disposal of dredge material, dock construction activities, and aircraft noise. Wildlife populations and their habitats could be also be affected by increased traffic, and human interaction and habituation. The significance of the effects on wildlife and their habitats will depend on the exact location, duration, and extent of the activity.

The following sections provide an evaluation of the Project activities described in Resource Report 1 with the respect to the following effects:

- Mortality
- Change in spatial/geographic distribution
- Habitat suitability

These effects are described in terms of construction and operation phases of the Project. Based on the existing baseline conditions, construction schedule, and mitigation measures that will be implemented during construction, the overall effect on ESA-listed, candidate, or proposed species and habitats is expected to be negligible[11] to minor, localized, and short-term.

3.5.3.1 Polar Bear

Mortality

Construction and Operations Impacts and Mitigation

Interaction with humans presents risks of injury and other impacts for bears and humans, and may result in the need to engage in non-lethal take such as hazing or, on rare occasions, lethal take in defense of human life. Encounters between polar bears and humans in the Project area are most likely to occur along the coastline in late summer/autumn (late August through November) and late winter/spring (March, April, and May). Sightings of polar bears at industrial sites in the Beaufort Sea region have increased in recent years, as summer sea ice diminishes and coastal habitats are used more frequently (Schliebe et al. 2008; FWS 2008b). As a consequence, sightings and hazings have increased (FWS 2008x, 2009a) and in August 2011, a polar bear was killed for personal protection.

To mitigate potential human-bear interactions, APP will develop and implement a Polar Bear and Wildlife Interaction Plan that will require the monitoring and reporting of bear sightings and encounters using trained observers, as well as training of personnel in nonlethal means of protection (hazing). Although camps and other activity areas have the potential to attract polar bears, experience has proven that these risks can be mitigated effectively by implementing several strategies, including detection monitors and motion/infrared sensors; safety gates, fences, and cages for workers, as well as skirting of elevated buildings; effective waste handling and snow management; chain-of-command procedures to coordinate responses to sightings; and employee education and training programs (Perham 2005; FWS, 2006b, 2008a, 2009a).

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

Much of the Project construction will occur during winter, which increases the potential for effects on polar bears that use onshore snow accumulation areas for denning. Use of Beaufort Coastal Plain habitats for denning by polar bears is greatest from late fall through late winter. Construction activities have the potential to cause sensory disturbances to maternal females during the winter denning period, which could result in den abandonment (Amstrup 1993; Durner et al. 2006; Linnell et al. 2000). Polar bear dens may occur in the Project area.

As required by the current incidental take regulations, APP will conduct den surveys in a 1-mile buffer surrounding the areas affected by Project activities within polar bear critical habitat using forward-looking infrared sensors or trained dogs before initiation of construction. This method

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[11] Impact thresholds are defined as follows:

None: Resource is not within the Project area at the time the activities are occurring and there is no loss of habitat.

Negligible: Resource may be present in the Project area at time of the activity; however the resulting impact on the resource and/or their habitat, if it occurs, would be unmeasurable and insignificant.

Minor: There is a measurable impact to the resource on an individual level (i.e., direct loss of habitat, mortality, disturbance response), but not a population level.

has proven effective in locating dens during other oil and gas development projects (Amstrup et al. 2004; Perham 2005; Shideler and Hechtel 2000; York et al. 2004). If dens are detected, APP will implement measures identified in the Polar Bear and Wildlife Interaction Plan as approved by the FWS.

Operations Impacts and Mitigation

Noise levels generated from normal operation of the facilities is not anticipated to affect denning polar bears. Polar bears searching for onshore denning sites will be subject to background noise levels and would generally avoid areas with excessive levels. The GTP will be located in an industrial area with existing background noise levels and the noise emissions generated from this facility are not expected to substantially increase the cumulative noise levels in the area. The PT Pipeline and associated facilities are also not expected to generate noise levels that contribute to a substantial increase in cumulative background noise levels.

[Note: APP is evaluating the potential for noise impacts to wildlife and will provide an update to this evaluation prior to construction.]

Habitat Suitability

Construction Impacts and Mitigation

Development of the ice roads, construction work surfaces, and water/ice withdrawal activities could impact potential denning habitat in the designated critical habitat area. Potential denning habitat occurs within the 1-mile buffer around the ice roads and construction area. FWS den records show that at least six maternal dens were occupied on the Sagavanirktok River delta from 2002 to 2009 (ExxonMobil Corporation 2009); however, these denning areas were more than 1 mile north of the Project. As indicated above , APP will conduct den surveys in a 1-mile buffer surrounding the areas affected by Project activities within polar bear critical habitat using forward-looking infrared sensors or trained dogs before initiation of construction. If dens are detected, APP will implement measures identified in the Polar Bear and Wildlife Interaction Plan as approved by the FWS.

APP will develop and implement a SPCC Plan that will provide safeguards against spills and leaks to mitigate potential impacts to the SBS stock of polar bears. A preliminary SPCC Plan is provided in Appendix 2A of Resource Report 2 and will be updated in the final report. In addition, APP personnel will be trained to prevent, detect, and promptly respond to spills and leaks.

Operations Impacts and Mitigation

APP operations activities are not anticipated to contribute to impacts on polar bear habitat suitability. Maintenance procedures will adhere to the requirements identified by the FWS.

3.5.3.2 Bowhead Whale

Mortality

Construction Impacts and Mitigation

Construction activities are not anticipated to contribute to bowhead whale mortality. Bowhead whales are unlikely to be found in the Project area during construction activities.

Operations Impacts and Mitigation

During operations, impacts on bowhead whales are not anticipated since there will be no activities conducted in marine waters except marine vessel traffic using existing shipping lines.

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

Construction activities that could impact bowhead whale include dredging and the disposal of dredged material in an area approximately 4 miles north northeast of West Dock in 20 to 25 feet of water between the barrier islands and West Dock. Underwater noise and elevated turbidity generated by the dredges and offshore disposal of dredged material could disrupt bowhead whales migration.

However, studies indicate that bowhead whales are generally not in the Project area during July – September when these construction activities will occur. Bowhead whales use continental shelf habitats north of the barrier islands in the summer in water generally greater than 100 feet (Moore et al. 1989; Moore et al. 2000; Ljunblad et al. 1986). Therefore, the potential effect of dredging activities on bowhead whales is anticipated to be negligible.

Although dredging and use of support vessels for dredging are not anticipated to interfere with whales, APP will work with the appropriate agencies to address any potential effects on bowhead whales.

[Note: APP is evaluating the potential for noise impacts to wildlife and will provide additional information prior to construction.]

Operations Impacts and Mitigation

During operations, impacts on bowhead whales are not anticipated since there will be no activities conducted in marine waters except marine vessel traffic using existing shipping lanes.

Habitat Suitability

Construction Impacts and Mitigation

The dredging and disposal activities off of West Dock and in the Stefansson Sound may cause increases in turbidity that could temporarily displace fish and mobile invertebrate prey species and may also cause mortality of immobile invertebrates; however, these effects are anticipated to be short-term and localized and the impact on the availability of prey to bowhead whale species would be negligible.

Operations Impacts and Mitigation

During operations, impacts on bowhead whales are not anticipated since there will be no activities conducted in marine waters except marine vessel traffic using existing shipping lanes.

3.5.3.3 Ringed Seal

Construction and operation activities are not expected to affect ringed seals. During summer, the high densities of ringed seals are associated with ice remnants (MMS 2003) in the Beaufort Sea well off shore from Prudhoe Bay. Ireland et al. (2008) reported widespread ringed seal occurrence in open water during summer and fall between Barrow and Kaktovik, but did not indicate any area of high geographic preference. Ringed seal summer use of the Beaufort Sea most commonly occurs on ice remnants and open water during summer.

3.5.3.4 Bearded Seal

Construction and operation activities are not expected to affect bearded seals. Seasonal movements of bearded seals are directly related to the advance and retreat of sea ice and to water depth (Kelly 1988). During winter, most bearded seals are in the Bering Sea. In the Beaufort Sea, favorable conditions are more limited, and consequently, bearded seals are scarce there during winter. From mid-April to June, as the ice recedes, some of the bearded seals over-wintering in the Bering Sea migrate northward through the Bering Strait. During summer, the seals occur near the widely fragmented margin of multi-year ice covering the continental shelf of the Chukchi Sea and in nearshore areas of the central and western Beaufort Sea.

3.5.3.5 Pacific Walrus

Construction and operations activities are not expected to affect the Pacific walrus. The Pacific walrus mainly inhabits the shallow continental shelf waters of the Bering and Chukchi seas, with very small numbers entering the Beaufort Sea. The distribution of Pacific walruses varies markedly with the seasons. Virtually the entire population occupies the pack ice in the Bering Sea in winter (Fay 1982). As the Bering Sea pack ice begins to loosen in April, walruses begin to move northward. By late April, the distribution extends from Bristol Bay northward to the Bering Strait, and by May into the southern Chukchi Sea. During summer, as the pack ice continues to recede northward, nearly all of the adult females, calves, and sub-adults migrate into the Chukchi Sea and a few into the Beaufort Sea, while most adult males remain in the Bering Sea. Broad-scale surveys conducted by Ireland et al. (2008) in the Beaufort Sea from 2006-2008 reported 0–11 walruses, including five or fewer single walruses, offshore of Camden Bay and Prudhoe Bay, considerably beyond the barrier islands.

3.5.3.6 Spectacled Eider

Spectacled eiders have been recorded nesting and rearing broods within 2 miles of the PT Pipeline and Alaska Mainline to approximately the TAPS Pump Station 2 by previous surveys (e.g., Ritchie and Palmer 2002; TERA 2002; Larned et al. 2009). Density generally increases from east to west in the study area with relatively higher use west of the Sagavanirktok River and between West Dock and AMP 15 (TERA 1996; Ritchie and Palmer 2002; Larned et al. 2006, 2008, and 2009)

Mortality

<u>Construction Impacts and Mitigation</u>

There is a potential that during poor weather conditions, low-flying spectacled eiders could collide with marine vessels during dredging and disposal activities; however the potential for collisions is low. Construction activities are not expected to contribute to spectacled eider mortality.

<u>Operations Impacts and Mitigation</u>

There is a potential that during poor weather conditions, low-flying spectacled eiders could collide with elevated Project structures or towers; however the potential for collisions is low.

Effective waste management will be implemented at facilities to reduce the attraction of predators to the facilities and remove this potential source of impact on the bird's nest, eggs, and young. Operations activities are not anticipated to contribute to spectacled eider mortality.

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

Summer activities such as surveys, drilling, gravel mining, pipeline construction, and helicopter and fixed-wing aircraft flights, could temporarily increase disturbance levels. Subsequent use of pads, staging areas, and roads could also increase disturbance levels (BLM 2008). Effects on breeding eiders from these sources can range from temporary displacement of individuals to abandonment of nests, loss of eggs or young exposed to predators and inclement weather, and direct or indirect loss of nesting and brood rearing habitat (TERA 1997; Flint et al. 2006; Livezey 1980; Dau 1974).

A recent study on the Colville River Delta of the effects of construction and operation of a remote drilling site and airstrip revealed that spectacled eiders were not displaced or changed habitat use or breeding productivity near the drill site during three years of construction and operations of the site (Johnson et al. 2007). Spectacled eiders are not frequently disturbed by vehicular traffic on oil field roads, as long as vehicles do not stop near eiders (Anderson et al. 2009). Because most spectacled eiders use habitats well to the west of the Project area, the effects of construction activites are considered to be minor.

Operations Impacts and Mitigation

The overall impacts from operations on the eiders are anticipated to be minor. Disturbances to spectacled eiders from operation-related activities (e.g., vehicles, aircraft, and facility noise) will be similar to those described above for construction. The relative effect of disturbance may be somewhat more reduced during the operation of the facilities, as several studies have suggested that eiders may tolerate or become habituated to human presence, established facilities, and relatively high levels of noise, such as that produced by low-level aircraft (TERA 1996; Johnson et al. 2007).

[Note: APP is evaluating the potential for noise impacts to wildlife and will provide an update to this evaluation prior to construction.]

Habitat Suitability

Construction Impacts and Mitigation

Habitat loss can occur from development in potential eider nesting habitat. Construction of the pipeline in potential nesting habitat is planned for the winter months when this species is not present and therefore would not directly disturb them; however, these activities may affect their habitat. Gravel placement will result in the long-term loss of a small amount of wet sedge tundra/tundra pond complexes that are preferred nesting habitats (Anderson et al. 2009; Johnson et al. 2007). Some additional loss of habitat could result from the placement of gravel for access roads development of material sources and installation of construction pads. Spectacled eiders, however, are uncommon nesters in the Project area on the Beaufort Coastal Plain and numerous drained lakes with more optimal habitats are located in the surrounding area.

Effects of spills on spectacled eider and eider habitat will be reduced by the implementation of a SPCC Plan that will provide safeguards against spills, and train APP personnel to prevent, detect, and promptly respond to spills. Because most spectacled eiders use habitats well to the west of the Project area, the effects of spills are considered to be minor.

Operations Impacts and Mitigation

Operations activities are not anticipated to contribute to effects on spectacled eider habitat suitability.

3.5.3.7 Steller's Eider

Currently, Steller's eiders nest in relatively low numbers on the Beaufort Coastal Plain from approximately Point Lay east to Prudhoe Bay. Aerial surveys have been conducted in nearshore waters along barrier islands of the Beaufort Coastal Plain from the southern end of Kasegaluk Lagoon to the Canadian border found low densities of Steller's eiders away from Barrow. Only one Steller's eider was recorded between Lonely and Teshekpuk Lake (Obritschkewitsch and Ritchie 2008). Other surveys conducted along the Beaufort Coastal Plain over a five-year period reported only three Steller's eiders pairs (MMS 2006).

Mortality

Construction Impacts and Mitigation

There is a potential that during poor weather conditions, low-flying Steller's eiders could collide with marine vessels during dredging and disposal activities; however the potential for collisions is low. Construction activities are not expected to contribute to Steller's eider mortality.

Operations Impacts and Mitigation

There is a potential that during poor weather conditions, low-flying Steller's eiders could collide with elevated Project structures or towers; however the potential for collisions is low. Operations activities are not expected to contribute to Steller's eider mortality.

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

Summer activities such as surveys, drilling, gravel mining, pipeline construction, and helicopter and fixed-wing aircraft flights, could temporarily increase disturbance levels. Subsequent use of pads, staging areas, and roads could also increase disturbance levels (BLM 2008). Effects on breeding eiders from these sources can range from temporary displacement of individuals to abandonment of nests, loss of eggs or young exposed to predators and inclement weather, and direct or indirect loss of nesting and brood rearing habitat (TERA 1997; Flint et al. 2006; Livezey 1980; Dau 1974). However, because of the low occurrence of Steller's eiders in this part of the Beaufort Coastal Plain, the effect on Steller's eider distribution from construction activities is considered negligible.

Operations Impacts and Mitigation

Disturbance to Steller's eiders from operation-related activities (e.g., vehicles, aircraft, and facility noise) will be similar to those described above for construction. The relative effect of disturbance may actually be somewhat more during the operation of the facilities as the amount of vehicular traffic in spring and summer will be expected to increase; however, the effect will be negligible because of the low occurrence of Steller's eiders in this part of the Beaufort Coastal Plain. The overall impact from operations on the Steller's eider will be negligible.

[Note: APP is evaluating the potential for noise impacts to wildlife and will provide an update to this evaluation prior to construction.]

Habitat Suitability

Construction Impacts and Mitigation

The probability of Steller's eiders nesting or temporarily using waterbodies in the Project area is low. Although portions of the Project are located in suitable eider nesting habitat, potential effects from construction on the Steller's eider of the Project are expected to be minor. Construction of the pipeline in potential nesting habitat is planned for the winter months and will have no impact on the species. GTP summer construction activities will not affect nesting habitat.

The Project was routed and sited to attempt to avoid relatively larger ponds and drained lakes in the Project area, thereby reducing potential loss or alteration of Steller's eider habitat. The lack of evidence for Steller's eiders use or nesting in the Project area; the limited acreage affected by construction pads; and the minimal acreage of potential habitat would result in negligible impacts.

Effects of spills on spectacled eider and eider habitat will be reduced by the implementation of a SPCC Plan that will provide safeguards against spills, and train APP personnel to prevent, detect, and promptly respond to spills. Because most spectacled eiders use habitats well to the west of the Project area, the effects of spills and inadvertent releases are considered to be low and the overall effect is considered to be minor.

Operations Impacts and Mitigation

Operations activities are not anticipated to contribute to effects on Steller's eider habitat suitability.

3.5.3.8 Yellow-Billed Loon

Mortality

Construction Impacts and Mitigation

Predator populations have increased in the Prudhoe Bay and Kuparuk oil region as a result of increased availability of anthropogenic foods, creation of additional nesting sites or denning sites, and attraction of predators to human facilities (Day 1998). Yellow-billed loons are susceptible to predators during nesting when incubating adults and eggs are most vulnerable to predators. Earnst (2004) identified the increase in nest predators as having an important negative effect on yellow-billed loon productivity, because predation is the primary cause of egg loss and contributes to some proportion of chick impacts. Predation by red fox, grizzly bear, and wolverine on other loons eggs have been reported, although predation on adult yellow-billed loons is rare (Johnson et al. 2009; North 1994). Proper waste management will prevent the attraction of predator to Project fatalities and reduce the potential for effects on loons.

Yellow-billed loons are at a low risk for collision with marine vessels as the birds move along the coast when visibility is poor. The magnitude of the potential impact is not measureable, insignificant, and therefore the effect is considered negligible.

Operations Impacts and Mitigation

Effective waste management will be enforced at facilities to reduce the attraction of predators to the facilities and remove this potential source of impacts on the bird's nest, eggs, and young.

There is a potential that during poor weather conditions, low-flying yellow-billed loons could collide with elevated Project structures or towers; however the potential for collisions is low. Operations activities are not expected to contribute to yellow-billed loons mortality.

Change in Spatial/Geographic Distribution

Construction Impacts and Mitigation

Yellow-billed loons using nearshore marine waters during construction may be disturbed by dredging activities. The response of the birds to these activities is expected to include avoidance or displacement. The overall negative effects on loons, however, are likely to be negligible given the local scale and short duration of these disturbances.

Operations Impacts and Mitigation

No change in spatial/geographic distribution of yellow-billed loons is expected to occur during operation of the Project. If a maintenance Project was to affect a known yellow-billed loons, APP will only proceed after consultations with and authorizations from the FWS.

Habitat Suitability

Construction Impacts and Mitigation

The potential effects from construction of the project on the yellow-billed loon are expected to be minor. Construction of the pipeline in potential nesting habitat is planned for the winter months, which will have no impact on the species. GTP summer construction activities will not affect nesting habitat.

Development of ice roads and a construction work area could affect loon habitat availability following construction. However, yellow-billed loons are uncommon breeders and nesting has not been documented in the area affected by the Project. These birds commonly use nesting habitat restricted to a relatively small area between the Meade and Colville rivers (Earnst 2004). When birds have nested in the general vicinity of the Project area, the low densities have been less than one individual per 38.6 square miles (Earnst 2004). No nests have been documented within the Project area; therefore the overall effect of construction activities on the yellow-billed loon habitat suitability is expected to be negligible.

Effects of spills on yellow-billed loons and loon habitat will be reduced by the implementation of a SPCC Plan that will provide safeguards against spills, and train APP personnel to prevent, detect, and promptly respond to spills. Because yellow-billed loons do not use habitat within the Project area, and mitigation measures will be implemented to reduce the spills and inadvertent releases, impacts on yellow-billed loon habitat suitability are considered to be negligible.

Operations Impacts and Mitigation

No habitat loss or alteration of existing habitat is expected to occur during operation of the Project. If a maintenance Project was to affect a known yellow-billed loon nest site, APP will only proceed after consultations with and authorizations from the FWS.

3.5.3.9 Eskimo Curlew

The species is considered probably extinct by ADFG with the last confirmed sighting by the FWS in Nebrasa in 1987. The Project will affect traditional Eskimo Curlew habitat, but the probability of affecting the species is highly unlikely. Therefore, while the Project will not affect the species, habitat suitabile for the species may be affected. The Project is not expected to have an overall impact on the Eskimo Curlew due to the high unlikelihood of finding the species in the Project area.

3.6 CUMLATIVE IMPACTS

[Note: Field surveys and agency consultation are ongoing. Cumulative impacts associated with fish, vegetation, and wildlife will be updated in the final report.]

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