APPENDIX Q

WILDLIFE TECHNICAL REPORT

JUNEAU ACCESS IMPROVEMENTS SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT

STATE PROJECT NUMBER: 71100
FEDERAL PROJECT NUMBER: STP-000S (131)

Prepared for

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

TABLES

FIGURES

ATTACHMENT

ACRONYMS AND ABBREVIATIONS

ADF&G	Alaska Department of Fish and Game
ADT	Average Daily Traffic
AKNHP	Alaska Natural Heritage Program
AMHS	Alaska Marine Highway System
ATOC	Acoustic Thermometry of Ocean Climate
BBS	Breeding Bird Survey
BPIF	Boreal Partners in Flight
dbh	diameter at breast height
DEIS	Draft Juneau Access Improprement Environmental Impact Statement
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FR	Federal Register
FVF	fast vehicle ferry
FWCA	Fish and Wildlife Coordination Act
GIS	Geographic Information System
GMU	Game Management Units
HCI	Habitat Capability Index
LFA	Low Frequency Active
MBTA	Migratory Bird Treaty Act
MIS	Management Indicator Species
MMPA	Marine Mammal Protection Act
NARCAM	North America Reporting Center for Amphibian Malformations
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NMML	National Marine Mammal Laboratory
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
PWS	Prince William Sound
SDEIS	Supplemental Draft Environmental Impact Statement
SEI	Sustainable Ecosystems Institute
State	State of Alaska
TLMP	Tongass National Forest Land and Resource Management Plan
U.S.	United States
U.S.C	United States Code
UCS	Union of Concerned Scientists
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WAA	Wildlife Analysis Areas
WDNR	Wisconsin Department of Natural Resources

EXECUTIVE SUMMARY

The 1997 Draft Juneau Access Improvements Environmental Impact Statement (DEIS) *Wildlife Technical Report* assessed the impacts on wildlife using habitat capability models that were developed for a limited number of Management Indicator Species by the United States Forest Service (USFS), the Alaska Department of Fish and Game (ADF&G), and the United States Fish and Wildlife Service (USFWS) for the Tongass National Forest Land and Resource Management Plan (TLMP) (Forest Service, 1997). The 1997 DEIS used habitat capability models to assess the distribution of high to moderate quality habitats in the project area and to analyze impacts on brown bears, black bears, marten, and mountain goats. It also used consumptive use data from ADF&G for these four species and for moose.

Public and agency comments on the 1997 DEIS *Wildlife Technical Report* requested an expansion of species considered for analysis, the incorporation of information on eulachon runs and wildlife use of Berners Bay, and pointed out limitations of the habitat capability models to assess habitat loss impacts from highway development. During 2003 agency scoping meetings, methods were agreed upon to address these concerns but no additional field investigations were deemed necessary. This technical report responds to the public and agency comments by expanding the species list and addressing a wider range of impact categories.

Among the hundreds of bird, mammal, and amphibian species present in the project area, 29 species were selected for assessment because they represented specific conservation concerns or susceptibilities to highway development impacts. Two of these species, Steller sea lions and bald eagles, are assessed in separate technical reports. Twenty-seven of the selected species are assessed in this technical report.

This report discusses the direct effects of the project alternatives on wildlife. Direct effects of the alternatives arise from construction, maintenance, and operation of transportation facilities. For wildlife, direct effects include loss of habitat, disturbance from construction activities, disturbance and mortality from highway and marine traffic, habitat fragmentation, and use of the highway for travel and snow avoidance. The impact analysis in this document does not rely solely on the habitat capability modeling that was presented in the 1997 DEIS, and no new habitat capability modeling has been developed for this report. Statistics from the 1997 modeling are incorporated in this report where appropriate.

This report does not discuss the indirect effects of the project alternatives on wildlife. Indirect effects arise from improved access in the Lynn Canal region and the potential for the introduction of exotic plant and animal species along the highway corridor. Indirect effects are discussed in the *Indirect and Cumulative Impact Technical Report*.

Calculations of habitat loss are derived from the cut and fill limits of proposed highway and ferry facilities. Many construction facilities such as camps and material sources would be located within these limits. The calculations do not include habitat loss from off-site material sources or barge landing sites outside the fill limits. The size and location of these off-site construction facilities would be determined during the permitting phase of the project. They would be sited to minimize impacts and those impacts would be small relative to overall project impacts. These impacts would also be temporary, as the sites would be restored at the conclusion of construction.

Alternatives 2 and 2C would have the greatest impacts on wildlife in comparison to the other alternatives. Both of these alternatives would result in the direct loss of 629 acres of terrestrial habitat, 382 acres of which would be old-growth forest including 80 acres of forested wetlands. Approximately 90 percent of this habitat is located within the beach and estuary fringe. This direct loss of habitat represents about 0.8 percent of the habitat available to wildlife species on the east side of Lynn Canal. In addition to direct habitat loss, the highway would act as a barrier to the movement of some species, most notably brown bears. The highway would separate brown bear denning sites at higher elevations from important spring and summer foraging areas on the beach and estuarine fringe. Mountain goats would also likely lose portions of winter habitat where it occurs in the beach fringe due to disturbance from the highway. Vehicle collisions would result in some mortality to terrestrial mammals and birds. The moose population in the Berners Bay watershed is particularly vulnerable to vehicle collision mortality, which could affect game management of that herd. Terrestrial birds would be affected by loss of habitat, nest disturbance, and increased exposure to predators on the highway edge.

For Alternatives 2 and 2C, traffic noise could result in harbor seals not hauling out between Sherman Point and the Katzehin River in those areas where the highway would be close to or on the beach. Increased shuttle ferry traffic between Katzehin and Haines under Alternative 2 and Skagway and Haines under Alternative 2C would incrementally increase the risk of vessel collisions along the ferry routes. This could affect humpback whales on an irregular basis but is not likely to adversely impact their population trend.

Alternative 2A would result in the direct loss of 534 acres of terrestrial habitat, 85 percent of which is located within the beach and estuary fringe. Impacts to forest habitat include a loss of 294 acres of old-growth forest including 62 acres of forested wetland. This loss of habitat is less than Alternatives 2 and 2C because it would not include a highway around the eastern shore of Berners Bay between Sawmill Cove and Slate Cove. Direct habitat loss caused by the presence of a highway represents about 0.7 percent of the habitat available to wildlife species on the east side of Lynn Canal. Habitat fragmentation caused by the presence of the highway is likely to have the greatest impact on brown bear. While the highway would not create a barrier to brown bear movement in the river drainages at the north end of Berners Bay, it could have this effect in other medium and high quality brown bear habitats along the east side of Lynn Canal including the wetland areas between Slate Cove and Comet Landing and near the Katzehin River. Alternative 2A would not pass through any winter moose habitat. Alternative 2A would impact non-winter moose habitat from Slate Cove Ferry Terminal to the Independence Lake area. Alternative 2A would have similar effects on wildlife outside Berners Bay as Alternative 2 and 2C.

Alternative 2B would result in the loss of 456 acres of terrestrial habitat, 314 acres of which is classified as old-growth forest, including 80 acres of forested wetlands. Approximately 91 percent of the habitat lost to the highway is within the beach and estuary fringe. Alternative 2B would result in the smallest direct loss of terrestrial habitat of any of the East Lynn Canal Highway alternatives because the highway would end just north of the Katzehin River. However, most of the high quality habitat for terrestrial wildlife is located between Echo Cove and the Katzehin River. Therefore, the direct impacts of Alternative 2B on wildlife would be similar to those of Alternatives 2 and 2C.

Under Alternative 3, approximately 423 acres of terrestrial habitat would be lost of which 314 acres is classified as old-growth forest. About 31 acres of the old-growth forest is forested wetlands. Approximately 79 percent of the total terrestrial habitat loss is within the beach and estuary fringe. The direct loss of habitat caused by the West Lynn Canal Highway represents about 0.6 percent of the habitat available to wildlife species on the west side of Lynn Canal. Habitat fragmentation and disturbance would be important in high quality habitats such as the Sullivan, Endicott, and Chilkat River valleys, especially for brown bears. Moose distribution is more widespread on the west side of Lynn Canal than on the east side. Alternative 3 crosses about six miles of moose winter habitat in the vicinity of the Sullivan and Endicott rivers and the Chilkat River Valley area. The West Lynn Canal Highway would result in the loss of about 58 acres of this habitat, which represent about 0.6 percent of the roughly 10,000 acres of winter moose habitat on the west side of the Canal north of William Henry Bay. Vehicle collisions would result in mortality to terrestrial animals. Marine and terrestrial birds would face a similar level of disturbance and habitat loss as Alternative 2.

Alternative 3 would introduce shuttle ferry traffic into Berners Bay, and across Lynn Canal to William Henry Bay. This would incrementally increase the potential for vessel collisions with marine mammals. The presence of ferries and their engine noise may also cause disturbance to marine birds and mammals. Because collisions between ferries and marine mammals are rare, the incremental increase in risk is unlikely to adversely affect marine mammals including humpback whales. Harbor seals could be disturbed by traffic noise at their haulout on Pyramid Island and other points where the alignment is on or near the beach.

Alternatives 4A and 4C would involve no new transportation facilities on land. Therefore, impacts would be limited to marine wildlife. The principal impact would be a small increase in the risk of collision between marine mammals and shuttle ferries. Because collisions between ferries and marine mammals are rare, the incremental increase in risk is unlikely to adversely affect marine mammals.

Alternatives 4B and 4D would require the construction of a highway from Echo Cove to Sawmill Cove and a ferry terminal at Sawmill Cove. This would result in the loss of 55 acres of terrestrial habitat, virtually all of which is old-growth forest, including 10 acres of forested wetlands. This habitat loss would represent about 0.07 percent of the available habitat on the east side of Lynn Canal.

Alternatives 4B and 4D would introduce ferry traffic in Berners Bay that would incrementally increase the risk of collisions with marine mammals. Because ferry collisions with marine mammals are rare, this increase is not likely to adversely affect marine mammals in the Canal.

Actual impacts of the alternatives on wildlife species would be dependent on avoidance and minimization efforts, especially concerning the timing of construction activities. For some species, avoidance of particular areas or certain construction activities during the breeding and rearing season would substantially reduce the potential for impacts. In other cases, observers would be used to monitor for the presence of particular species (e.g., marine mammals during pile driving activities) or disturbance at a nest or den site (e.g., goshawk, trumpeter swan, and wolf) during construction. Such monitoring efforts would be used to refine construction schedules or types of work that are conducted in order to minimize impacts to wildlife. Specific areas and time period for these avoidance and minimization measures would be established during the permitting process through consultation with the appropriate resource agencies.

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1.0 PROJECT DESCRIPTION

1.1 Project Purpose and Need

The purpose of and need for the Juneau Access Improvements Project is to provide improved surface transportation to and from Juneau within the Lynn Canal corridor that will:

- Provide the capacity to meet the transportation demand in the corridor
- Provide flexibility and improve opportunity for travel
- Reduce travel time between Lynn Canal communities
- Reduce state costs for transportation in the corridor
- Reduce user costs for transportation in the corridor

1.2 Project Description

Lynn Canal, located approximately 25 miles north of Juneau, is the waterway that connects Juneau with the cities of Haines and Skagway via the Alaska Marine Highway System (AMHS). At present there is no roadway connecting these three cities. The Glacier Highway originates in Juneau and ends at Echo Cove, approximately 40.5 miles to the northwest.

As required by the National Environmental Policy Act (NEPA), the Supplemental Draft Environmental Impact Statement (SDEIS) for the Juneau Access Improvements Project considers the following reasonable alternatives:

Alternative 1 – No Action Alternative – The No Action Alternative includes a continuation of mainline AMHS service in Lynn Canal as well as the operation of the fast vehicle ferry (FVF) *M/V Fairweather* between Auke Bay and Haines and Auke Bay and Skagway. The *M/V Aurora* would provide shuttle service between Haines and Skagway, beginning as early as 2005.

Alternative 2 (Preferred) – East Lynn Canal Highway with Katzehin Ferry Terminal – This alternative would construct a 68.5-mile-long highway from the end of Glacier Highway at the Echo Cove boat launch area around Berners Bay to Skagway. A ferry terminal would be constructed north of the Katzehin River delta, and operation of the *M/V Aurora* would change to shuttle service between Katzehin and the Lutak Ferry Terminal in Haines. Mainline ferry service would end at Auke Bay, and the existing Haines/Skagway shuttle service would be discontinued. The *M/V Fairweather* would be redeployed on other AMHS routes.

Alternative 2A – East Lynn Canal Highway with Berners Bay Shuttles – This alternative would construct a 5.2-mile highway from the end of Glacier Highway at Echo Cove to Sawmill Cove in Berners Bay. Ferry terminals would be constructed at both Sawmill Cove and Slate Cove, and shuttle ferries would operate between the two terminals. A 52.9-mile highway would be constructed between Slate Cove and Skagway. A ferry terminal would be constructed north of the Katzehin River delta, and the *M/V Aurora* would operate between the Katzehin and the Lutak Ferry Terminals. Mainline ferry service would end at Auke Bay, and the existing Haines/Skagway shuttle service would be discontinued. The *M/V Fairweather* would be redeployed on other AMHS routes.

Alternative 2B – East Lynn Canal Highway to Katzehin with Shuttles to Haines and Skagway – This alternative would construct a 50.5-mile highway from the end of Glacier Highway at Echo Cove around Berners Bay to Katzehin, construct a ferry terminal at the end of the new highway, and run shuttle ferries to both Skagway and Haines from the Katzehin Ferry

Terminal. The Haines to Skagway shuttle service would continue to operate, two new shuttle ferries would be constructed, and the *M/V Aurora* would be part of the three-vessel system. Mainline AMHS service would end at Auke Bay. The *M/V Fairweather* would be redeployed on other AMHS routes.

Alternative 2C – East Lynn Canal Highway with Haines/Skagway Shuttle – This alternative would construct a 68.5-mile highway from the end of Glacier Highway at Echo Cove around Berners Bay to Skagway with the same design features as Alternative 2. The *M/V Aurora* would continue to provide service to Haines. No ferry terminal would be constructed at Katzehin. Mainline ferry service would end at Auke Bay, and the *M/V Fairweather* would be redeployed on other AMHS routes.

Alternative 3 – West Lynn Canal Highway – This alternative would extend the Glacier Highway 5.2 miles from Echo Cove to Sawmill Cove in Berners Bay. Ferry terminals would be constructed at Sawmill Cove and William Henry Bay on the west shore of Lynn Canal, and shuttle ferries would operate between the two terminals. A 38.9-mile highway would be constructed between William Henry Bay and Haines with a bridge across the Chilkat River/Inlet connecting to Mud Bay Road. The *M/V Aurora* would continue to operate as a shuttle between Haines and Skagway. Mainline ferry service would end at Auke Bay, and the *M/V Fairweather* would be redeployed on other AMHS routes.

Alternatives 4A through 4D – Marine Options – The four marine alternatives would construct new shuttle ferries to operate in addition to continued mainline service in Lynn Canal. All of the alternatives would include a minimum of two mainline vessel round trips per week, year-round, and continuation of the Haines/Skagway shuttle service provided by the *M/V Aurora*. The *M/V Fairweather* would no longer operate in Lynn Canal. All of these alternatives would require construction of a new double stern berth at Auke Bay.

Alternative 4A – FVF Shuttle Service from Auke Bay – This alternative would construct two FVFs to provide daily summer service from Auke Bay to Haines/Skagway.

Alternative 4B – FVF Shuttle Service from Berners Bay – This alternative would extend the Glacier Highway 5.2 miles from Echo Cove to Sawmill Cove in Berners Bay, where a new ferry terminal would be constructed. Two FVFs would be constructed to provide daily service from Sawmill Cove to Haines/Skagway in the summer and from Auke Bay to Haines/Skagway in the winter.

Alternative 4C – Conventional Monohull Shuttle Service from Auke Bay – This alternative would construct two conventional monohull vessels to provide daily summer service from Auke Bay to Haines/Skagway. In winter, shuttle service to Haines and Skagway would be provided on alternate days.

Alternative 4D – Conventional Monohull Shuttle Service from Berners Bay – This alternative would extend the Glacier Highway 5.2 miles from Echo Cove to Sawmill Cove in Berners Bay, where a ferry terminal would be constructed. Two conventional monohull vessels would be constructed to provide daily service from Sawmill Cove to Haines/Skagway in the summer and alternating day service from Auke Bay to Haines/Skagway in the winter.

2.0 STUDIES AND COORDINATION

A number of federal laws address wildlife and development issues, including the Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), Marine Mammal Protection Act (MMPA), and Fish and Wildlife Coordination Act (FWCA). These laws designate regulatory and oversight responsibilities for the conservation of wildlife, primarily with the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). However, the State of Alaska (State) retains the right and responsibility to manage its fish and wildlife resources under the Alaska State Constitution. The Alaska Department of Fish and Game (ADF&G) regulates the harvest of fish and game species for the benefit of residents of the State. This overlap in federal and state wildlife agency responsibilities requires coordination and cooperation for long-term planning as well as day-to-day regulatory and research activities. In addition, a number of federal, state, and local agencies have jurisdiction over land management and resource development activities that may affect wildlife habitat. Since a great majority of the land within the project area is in the Tongass National Forest, the United States Forest Service (USFS) has a major role in deciding how wildlife habitat will be managed. Coordination and consultation between the various land and wildlife resource agencies is sometimes formalized in a “Memorandum of Understanding,” but in other cases, consultation on specific projects is more informal.

The ADF&G is responsible for regulating the harvest of game and furbearing animals on a sustainable yield basis. ADF&G collects data from hunters and trappers on effort, location, and take (as well as mode of transport and other factors) and conducts population surveys for some species. For administrative and management purposes, ADF&G has divided the State into Game Management Units (GMU) and subunits. These units are further divided into Wildlife Analysis Areas (WAA) for data analysis and reporting purposes. The Juneau Access Improvements Project area includes portions of GMU 1C (south of Eldred Rock, including the area around Berners Bay) and GMU 1D (north of Eldred Rock to Haines and Skagway). Alternatives 2 through 2C would pass through seven WAAs, Alternative 3 would pass through five WAAs, and Alternatives 4B and 4D would pass through two WAAs (Figure A-1, Attachment A). For many species in this report, population and consumptive use data have been taken from ADF&G reports, either on the level of WAA or GMU subunit.

NMFS is responsible for the conservation of all marine mammals except sea otters, walrus, and polar bears, which are under the jurisdiction of the USFWS. NMFS conducts a wide variety of research on marine mammals, including population surveys, diet studies, and causes of disturbance and mortality, which it publishes in an annual Stock Assessment Report and other documents. Because most marine mammals spend all of their time in the water, most of NMFS conservation programs are directed toward marine vessels and fisheries. However, seals and sea lions regularly haul out on land so there is some overlap in management responsibilities with land management agencies such as the USFS.

The USFWS is the lead federal agency for managing and conserving birds. Its Ecological Services Program addresses fish and wildlife conservation, endangered species, and contaminants issues through the review of federally permitted projects. USFWS biologists evaluate effects of land and water resource development projects and recommend mitigation measures to the developer or responsible federal agency. The USFWS Office of Migratory Bird Management is responsible for monitoring migratory bird populations, and their distribution and abundance. Its goals are to (1) conserve migratory bird populations and their habitats in sufficient quantities to prevent them from being considered as threatened or endangered and (2) to ensure continued opportunities to enjoy both consumptive and non-consumptive uses of migratory birds and their habitats.

The majority of land directly affected by the Juneau Access Improvement Project is within the Tongass National Forest. The USFS manages these lands according to the principles and land-use designations described in the Tongass National Forest Land and Resource Management Plan (TLMP) (USFS, 1997). This comprehensive plan includes specific standards and guidelines for the protection of wildlife habitat from resource development and construction activities. USFS biologists work in conjunction with biologists from other federal and state agencies to monitor the abundance and distribution of specific species in support of forest management activities.

The Fish and Wildlife Coordination Act (16 United States Code [U.S.C.] §§ 661-667e) as amended, pertains to federal projects that modify the flow or drainage into any body of water. This law requires the agency responsible for the action to consult with the USFWS and the appropriate State agency, in this case ADF&G, regarding the conservation of wildlife resources.

2.1 1997 Draft EIS

The 1997 Draft Juneau Access Improvements EIS (DEIS) *Wildlife Technical Report* assessed the impacts on wildlife using habitat capability models that were developed for a limited number of Management Indicator Species by the USFS, ADF&G, and USFWS for the TLMP (USFS, 1997). The DEIS used HCI models to assess the distribution of high to moderate quality habitats in the project area and to analyze impacts on brown bears, black bears, marten, and mountain goats.

The habitat capability models were based on Geographic Information System (GIS) vegetation data supplied by the USFS. In addition, a vegetation study was conducted in 1994 to describe the existing plant community types and to determine if any rare or sensitive plant species would be affected by the proposed project. Two field surveys were conducted along the East and West Lynn Canal project corridors to focus on early-flowering and late-flowering species. The vegetation study results were used to verify the USFS GIS data and contributed to the *Wetlands Technical Report*.

Using the USFS GIS information and the highway alignments as they were proposed in 1994, the 1997 DEIS calculated the total amount of three different wildlife habitat types that would be lost by construction of the highway alternatives. The 1997 DEIS found that the 1994 East Lynn Canal Highway alignment would eliminate 411 acres of old-growth forest habitat, 375 acres of beach fringe habitat, and 58 acres of estuary fringe habitat. However, total habitat loss cannot be calculated from these figures because beach fringe and estuary fringe were defined as including all vegetation types within a certain distance of the water and thus include old-growth forest as well as grasslands, shrubs, and rocky areas with little vegetation. For comparison, the 1994 West Lynn Canal Highway alignment would eliminate 337 acres of old-growth forest habitat, 10 acres of beach fringe habitat, and 29 acres of estuary fringe habitat. The highway section from Echo Cove to the ferry terminal at Sawmill Cove, common to the east and west alignments as well as the Marine Options Alternatives, would eliminate 34 acres of old-growth forest habitat, 5 acres of beach fringe habitat, and 4 acres of estuary fringe habitat. Because the beach fringe and estuary fringe habitat are geographic areas, they overlap with old-growth habitat and wetlands habitats.

The 1997 DEIS analysis concluded that the East Lynn Canal Highway alignment would have the largest impacts of all the alternatives on the five terrestrial mammals considered, especially on brown bear in the Berners Bay area. The West Lynn Canal Highway alignment would have similar but somewhat reduced effects on these species. The AMHS improvement alternatives had the least impact of all alternatives except the no-build alternative.

2.2 Supplemental DEIS

Public and agency comments on the 1997 DEIS *Wildlife Technical Report* requested an expansion of species considered for analysis and pointed out limitations of the habitat capability models to assess impacts from highway development. This document is intended to update and build on the information presented in the DEIS. The following analysis assesses the direct impacts of the SDEIS Alternatives on 27 representative species of mammals, birds, and amphibians. Direct effects to Steller sea lions and bald eagles are discussed in separate technical reports. Direct effects of the highway/ferry alternatives include loss of habitat, disturbance from construction activities, disturbance and mortality from land and marine traffic, habitat fragmentation, and use of the highway for travel and snow avoidance by wildlife. The impact analysis presented in this document does not rely on the habitat capability modeling presented in the 1997 DEIS. However, since this document is intended to supplement the 1997 DEIS, relevant statistics from the previous habitat capability model analyses are incorporated where appropriate.

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3.0 AFFECTED ENVIRONMENT

3.1 Wildlife Habitats

Wildlife habitat refers to the environmental characteristics that are important to the reproductive success and survival of wildlife species. Each species has its own needs and preferences such that certain types of habitat are more valuable to that species than others. Habitat types are usually described in a combination of physical and biological terms: elevation, topography, slope and aspect, vegetative cover, and food availability.

Three general habitat types were described in the 1997 DEIS: old-growth forest, beach fringe, and estuary fringe. The information presented in this chapter on these three general habitat types is from Section 3.1 of the 1997 DEIS *Wildlife Technical Report*. The wetlands and unvegetated marine habitat areas common to the project study area were identified in the SDEIS *Wetlands* and *Essential Fish Habitat Assessment Technical Reports*. The project area has been defined in terms of the Wildlife Analysis Areas (WAA) through which the alternatives would pass. WAAs are geographic areas used by ADF&G to analyze harvest, population, and habitat data for wildlife planning and management. The amount of old-growth forest, beach fringe, and estuary fringe contained in each WAA was calculated using GIS and is presented in Table 3-1. The locations of the WAAs is provided in Figure A-1 of Attachment A. The habitat types have a substantial overlap. For example beach fringe can include areas of muskegs, emergent wetlands, and forested wetlands (counted as "old-growth" forest as well as beach fringe habitat). A similar overlap occurs with estuary fringe habitat. Therefore, the acreages of the habitat types cannot reliably be added together to calculate a total habitat impact.

Table 3-1
Acreage Of Available Wildlife Habitat Types By ADF&G WAA[1]
All Data From 1997 DEIS Wildlife Technical Report

WAA	Description	Old-Growth Forest (acres)	Beach Fringe (acres)	Estuary Fringe (acres)
2514	Cowee, Davies Creek	22,224	1,830	147
2409	Berners Bay	9,201	1,162	1,028
2413	Gilkey River Drainage	4,892	0	0
2411	Lace River Drainage	8,186	0	0
2410	Berners River Drainage	5,463	0	0
2408	Point Saint Mary – Eldred Rock	4,610	1,271	123
4408	Eldred Rock – Katzehin River	15,142	1,165	399
4407	West Side Taiya Inlet	6,561	1,103	31
2304	St. James Bay	15,830	2,334	1,619
2203	Endicott River Drainage	16,144	179	395
2202	Sullivan River and Island	11,687	2,003	759
4302[1]	Lower Chilkat, Kelsall River Valleys	8,585	1,871	2,649

Note: [1] Data is for ADF&G Minors 201, 202, and 203 only.

Two other general habitat types are common to the project study area, alpine and subalpine, but were not included in the habitat calculations because the highway alignments would not traverse any of these habitats. However, they are important habitat types for some species discussed in this technical report and are therefore briefly described below. Note that the following habitat types are not to be confused with the TLMP Land Use Designations (LUDs) for forest-wide standards and resource guidelines. All of the highway segments of project alternatives are identified as Transportation and Utility System LUDs in the current TLMP.

3.1.1 Old-Growth Forest

Terrestrial habitat in the project study area consists mostly of coastal coniferous rainforest, and is characterized by an overstory dominated by western hemlock (*Tsuga heterophylla*), Sitka spruce (*Picea sitchensis*), and some scattered mountain hemlock (*T. mertensiana*), Alaska or yellow cedar (*Chamaecyparis nootkatensis*), and red alder (*Alnus oregona*). The USFS has designated this climax stage of the spruce/hemlock or hemlock forest habitat as old-growth forest. Old-growth forest is a predominant habitat type in southeast Alaska and is characterized by the presence of large trees, decaying logs and snags, lush understory vegetation, and multiple canopy layers. Old-growth forests are defined as dynamic, steady-state forests where the death of old trees is balanced by the growth of new trees (Schoen *et al.*, 1988). Seedlings, saplings, and pole-sized trees grow in scattered openings that are created as large old trees die and fall. An abundance of forbs, ferns, and shrubs grow on the forest floor beneath the multi-layered canopies including Sitka alders (*A. crispa*), rusty menziesia (*Menziesia ferruginea*), blueberry (*Vaccinium ovalifoloun* and *V. alaskensis*), red huckleberry (*V. parvifoloium*), salmonberry (*Rubus spectabilis*), shield fern (*Dryopteris dilitata*), devils club (*Echinopanax horridum*), and yellow skunk cabbage (*Lysichiton americanum*). Dominant trees typically exceed 300 years of age, 180 feet in height, and 9 feet in diameter at breast height (dbh). Large snags and decaying logs add to the ecological diversity of old-growth forests. Numerous species rely on habitat characteristics of old-growth forests, including marten, brown bears, the Alexander Archipelago wolf, Queen Charlotte goshawks, and marbled murrelet.

The 1997 DEIS defined old-growth as forest over 150 years old with an average diameter at breast height (dbh) greater than nine inches and timber volume greater than 8,000 board-feet per acre. Using USFS GIS data, the 1997 DEIS calculated that there were 76,279 acres of old-growth forest in the eight WAAs along the east side of Lynn Canal crossed by the highway alignment for Alternative 2 and 74,470 acres of old-growth forest in the five WAAs along the east side and west side of Lynn Canal crossed by the highway alignment for Alternative 3 (Table 3-1) (USDA Forest Service, 1997). Most of the old-growth forest is located in low elevation areas along the coast, and along the floodplains of the larger rivers.

Deciduous forest or mixed deciduous/needle-leaf forest communities are found interspersed within the larger area of old-growth forest, primarily in association with floodplains of larger rivers. The dominant tree species in these areas are the black cottonwood (*Populus balsamifera*) with a shrub layer of Sitka alder, thinleaf alder (*A. tenuifolia*), and willow (*Salix* spp.).

3.1.2 Beach Fringe

Beach fringe habitat was defined as the area within a 500-foot slope distance inland from the mean high tide line in the 1997 DEIS[1]. Beach fringe habitat is a transition zone between land and water, saltwater and freshwater, and vegetated and non-vegetated conditions. Within the

[1]It should be noted that the current TLMP defines beach fringe as the land within 1,000 feet of the shoreline. For analyzing impacts to wildlife, this report retains the 500 foot distance for beach fringe.

beach fringe are several vegetation/habitat types including old-growth forest, muskeg, shrub, grassland, and emergent wetlands. Beach fringe habitat has high seasonal value for black and brown bears, river otters, and Sitka black-tailed deer. The DEIS calculated a total of 6,531 acres of beach fringe habitat in the eight WAAs along the east side of Lynn Canal for the alignment of Alternative 2 and 8,217 acres of beach fringe habitat in the five WAAs along the east and west sides of Lynn Canal for the alignment of Alternative 3.

Shrub communities in the study area consist of open dwarf tree complexes, tall shrub communities, and low shrub communities. Dwarf tree communities are primarily dominated by mountain hemlock (*T. mertensiana*), smaller amounts of shore pine (*Pinus contorta*), and an understory of blueberry (*Vaccinium* spp.) shrubs. Tall shrub communities are found on steep slopes, along stream banks, and in floodplains. Dominant species on steep terrain typically include Sitka alder (*A. crispa*). A mixture of willow (*Salix* spp.), alder (*Alnus* spp.), and cottonwood (*Populus* spp.) is typically found near stream banks and floodplains of rivers such as the Antler River on the east side of Lynn Canal and the Endicott River on the west side of Lynn Canal. Low shrub communities are typically found in poorly drained bog habitat and are dominated by ericaceous shrubs such as Labrador tea (*Ledum groenlandicum*), crowberry (*Empetrum nigrum*), leatherleaf (*Chamaedaphne decumbens*), and deer cabbage (*Fauria crista-galli*).

Grassland communities typically consist of sedge/grass/forb meadow communities on outwash plains, wet meadow communities in poorly drained wetlands areas with emergent grasses, sedges (*Carex* spp.), and cottongrasses (*Eriophorum* spp.). A description of wetland communities is provided in the *Wetlands Technical Report*.

3.1.3 Estuary Fringe

Estuaries are the transition areas between freshwater streams and marine waters in protected bays, consisting mostly of intertidal mudflats and saltwater marshes. Salt marsh communities occur in tidally influenced areas, typically at the mouth of rivers, streams, or along outwash plains, and are dominated by salt-tolerant species such as sea beach lyme-grass (*Elymus mollis*), beach lovage (*Ligusticum scoticum*), seaside plantain (*Plantago maritima*), and seaside arrowgrass (*Triglochin maritimum*).

Estuary fringe habitat is defined as estuary areas within a 1,000 feet slope distance inland from the high tide line. Brown bears, great blue herons, waterfowl, marten, river otters, and bald eagles are the primary users of estuary fringe habitat. The DEIS calculated a total of 1,728 acres of estuary fringe habitat in the eight WAAs along the east side of Lynn Canal for the alignment for Alternative 2 and 5,569 acres of estuary fringe habitat in the five WAAs along the east and west side of Lynn Canal for the alignment of Alternative 3.

3.1.4 Alpine and Subalpine Habitats

These high elevation habitat types are defined by their lack of trees (alpine) or restricted size of trees (subalpine) and are characterized by low-growing herbaceous and shrubby vegetation including blueberry, Aleutian heather (*Phyllodoce aleutica*), Arctic willow (*Salix arctica*), salmonberry, and a variety of grasses, wildflowers, ferns, and mosses, and areas of bare rock, talus, and snow. The acreage of alpine and subalpine habitats in the project area was not calculated because no highway alignments would traverse these habitat types. However, they are abundant in the project area and many wildlife species discussed in this report use these habitat types at least on a seasonal basis. These habitat types are especially important for mountain goats, but are also used by brown bears, black bears, wolves, and moose.

3.1.5 Wetland Habitats

The dominant wetlands in the project study area include palustrine forested, scrub shrub, persistent emergent wetlands, and aquatic beds/emergent wetlands. Forested wetlands are primarily included within the old growth category and consist mostly of the needle-leaved evergreen subclass. Most of the forested wetlands are classified as old-growth forest; therefore, there is considerable overlap between these categories. Tidally influenced wetlands include estuarine emergent wetland and mudflats. The functional values of project study area wetlands were evaluated in the *Wetlands Technical Report* for the SDEIS. Wetlands around Berners Bay were identified as potentially high value for many wetland functions, including habitat for disturbance-sensitive wildlife, and provide important habitat for moose, bear, and waterfowl. Mudflats also provide pupping areas for harbor seal and a resting place for seals and their pups during low tide.

Because of their potential as wildlife habitat, wetland impacts are presented for each of the alternatives in Section 4 of this report along with the total area of habitat lost. The total area of existing wetlands, by subregion, was identified from the National Wetland Inventory database. The results are presented in Table 3-2. A total of 13,679 acres of wetland exist in the study area. On the east side of Lynn Canal, the study area extends from Echo Cove north to Skagway and is bounded by Lynn Canal on the west and the first ridge line inland from the Canal on the east. On the west side of Lynn Canal, the study area extends from William Henry Bay north to Haines and is bounded on the west by the Chilkat Range and eastern boundary of Endicott River Wilderness Area and by Lynn Canal on the east.

3.1.6 Legal Protections and Management Authority

The Endangered Species Act (16 U.S.C. 1531 *et seq.*), enacted in 1973 and reauthorized in 1988, provides broad protection for fish and wildlife species that are listed as threatened or endangered. Responsibilities for implementing the ESA are shared by the USFWS (freshwater fish, birds, terrestrial mammals, and plants) and NMFS (anadromous and marine fish, marine mammals, and sea grasses). Section 7(a)(2) of the ESA requires federal agencies to ensure that any action authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence or recovery of the species or result in the destruction or adverse modification of its critical habitat. The appropriate oversight agency (either USFWS or NMFS) must concur with the conclusions regarding adverse effects on a listed species through a consultation process. The oversight agency may impose mitigation measures on the proposed project before allowing it to proceed or it may halt the project if it finds unavoidable adverse effects that place the species in jeopardy, regardless of economic consequences for the project.

3.1.7 Legal Protections and Management Authority

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Table 3-2
Wetland Habitat[1] Types In Project Study Area

Wetland Type	East Lynn Canal Sub-Region	East Lynn Canal Acres	West Lynn Canal Sub-Region	West Lynn Canal Acres
Forested	Echo Cove to Slate Creek	1,218	William Henry Bay to Davidson Glacier	1,037
Scrub-Shrub		1,772		643
Emergent		1,063		320
Salt Marsh		556		191
Total		4,609		2,191
Forested	Slate Creek to Sherman Point	5,014	Davidson Glacier Outwash Plain	0
Scrub-Shrub		25		22
Emergent		698		19
Salt Marsh		13		198
Total		5,750		239
Forested	Sherman Point to Katzehin River	388	Davidson Glacier to Haines	0
Scrub-Shrub		122		5
Emergent		22		1
Salt Marsh		1		4
Total		533		10
Forested	Katzehin River to Skagway	100		
Scrub-Shrub		215		
Emergent		29		
Salt Marsh		3		
Total		347		
Forested	Total Wetlands in Project Study Area – East Lynn Canal	6,720	Total Wetlands in Project Study Area – West Lynn Canal	1,037
Scrub-Shrub		2,134		670
Emergent		1,812		340
Salt Marsh		573		393
Total		11,239		2,440

Note: [1] Does not include palustrine aquatic bed (PAB) habitat (20 acres- east side and 10 acres -west side)

The Alaska Endangered Species Law (AS 16.20.180 - 16.20.210) establishes a program for the continued conservation, protection, restoration and propagation of species or subspecies of fish and wildlife that are now or may be in the future threatened with extinction. This law requires state agencies to preserve the natural habitat of listed species and to mitigate other natural or man-made factors that affect their continued existence.

The Marine Mammal Protection Act of 1972 (16 U.S.C. 1361 *et seq.*), as amended, establishes a federal responsibility to conserve marine mammals. Management responsibility for cetaceans (whales) and pinnipeds (seals), other than walrus, is vested with NMFS. The primary management objective is to maintain the health and stability of the marine ecosystem, with a goal of obtaining an optimum sustainable population of marine mammals within the carrying capacity of the habitat.

The Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712, 50 CFR 231 and 50 CFR 13) implements the United States' (U.S.) commitment to four international conventions with Canada, Japan, Mexico, and Russia for the protection of shared migratory bird resources. With certain exceptions, the MBTA prohibits the taking, possession, or transport of any migratory bird or their eggs and nests except as authorized under a valid permit (50 CFR 21.11). The USFWS administers the regulations and permits to take migratory birds.

On May 25, 1993, the Commissioner of the ADF&G established a new administrative list of Species of Special Concern (amended in October 1998) to complement the Alaska Endangered Species List. This list includes species native to Alaska that have undergone a long-term decline in abundance or are vulnerable to a significant decline due to low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance. Among the management goals for these species are to prevent them from declining to endangered status and to focus conservation efforts on ecosystem and habitat-level problems.

3.2 Species Considered for Analysis

There are hundreds of wildlife species (mammals, birds, and amphibians) that live within or pass through the Juneau Access Improvements Project study area on a seasonal basis. Some of these species are much more likely to be affected by the project alternatives than others. NEPA documents are intended to facilitate an informed decision-making process by providing a relevant comparison of the alternatives. In order to avoid overwhelming the public and decision-makers with an assessment of impacts on hundreds of species, much of which would be repetitive or based on very little data, a subset of species has been selected for analysis through the NEPA scoping process. Some species are included because they are listed on federal or state agency conservation plans (Table 3-3). Other species are included because they are susceptible to the effects of highway construction or are representative of the management concerns for similar species.

3.2.1 Federal and State of Alaska Endangered Species

These species have suffered major declines in abundance such that their continued existence is of concern. These include the humpback whale (endangered), the eastern stock of Steller sea lion (threatened), and Kittlitz's murrelet (candidate for listing). Steller sea lions are addressed in a separate *Steller Sea Lion Technical Report* for the SDEIS.

3.2.2 Forest Service Management Indicator Species

Management Indicator Species (MIS) are species whose response to land management activities can be used to predict the likely response of other species with similar habitat requirements. The USFS recognizes limitations in the MIS concept but uses it to represent the complex of habitats, species, and associated management concerns for planning, assessment, and monitoring purposes (USFS, 1997). Based on coordination with the USFS and other resource agencies during scoping, this technical report assess impacts to MIS black bears, brown bears, martens, river otters, Alexander Archipelago wolves, Sitka black-tailed deer, and mountain goats. Bald eagles are addressed in a separate *Bald Eagle Technical Report* for the SDEIS. The MIS red squirrels, Vancouver Canada goose, red-breasted sapsucker, and hairy woodpecker were not identified as relevant MIS for this project.

Table 3-3
Species Considered For Analysis And Status Under Federal And State Regulations Or Management Concerns

Species Group	Federal and State of Alaska	USFS Tongass National Forest			State of Alaska	Juneau Access Improvements Project
	Endangered Species Act	Management Indicators	Species of Concern	Sensitive Species	Species of Concern	Other Indicators
Amphibians						
Wood frog	-	-	-	-	-	X
Birds						
Great blue heron	-	-	X	-	-	-
Trumpeter swan	-	-	-	X	-	-
Harlequin duck	-	-	-	-	-	X
Bald eagle[1]	-	X	-	-	-	-
Queen Charlotte goshawk	-	-	X[2]	X	X	-
American peregrine falcon	-	-		X	X	-
Marbled murrelet	-	-	X[2]	-	-	-
Kittlitz's murrelet	(candidate for listing)	-	-	-	-	-
Olive-sided flycatcher	-	-	-	-	X	-
Gray-cheeked thrush	-	-	-	-	X	-
Townsend's warbler	-	-	-	-	X	-
Blackpoll warbler	-	-	-	-	X	-
Mammals						
Black bear	-	X	-	-	-	-
Brown bear	-	X	X	-	-	-
Marten	-	X	X	-	-	-
River otter	-	X	-	-	-	-
Alexander Archipelago wolf	-	X	X	-	-	-
Moose	-	-	X	-	-	-
Sitka black-tailed deer	-	X	-	-	-	-
Mountain goat	-	X	-	-	-	-
Marine Mammals						
Harbor seal	-	-	-	-	X	-
Humpback whale	X (Endangered)	-	-	-	-	-
Steller sea lion[3]	X (Threatened)	-	-	-	-	-

Table 3-3 (continued)
Species Considered For Analysis And Status Under Federal And State Regulations Or Management Concerns

Species Group	Federal and State of Alaska	USFS Tongass National Forest			State of Alaska	Juneau Access Improvements Project
	Endangered Species Act	Management Indicators	Species of Concern	Sensitive Species	Species of Concern	Other Indicators
Mammals (continued)						
Minke whale	-	-	-	-	-	X
Harbor porpoise	-	-	-	-	-	X
Dall's porpoise	-	-	-	-	-	X
Killer whale	-	-	-	-	-	X
Sea otter	-	-	-	-	-	X

Note: [1] Addressed in the Bald Eagle Technical Report
[2] Also a USFWS Species of Concern
[3] Addressed in the Steller Sea Lion Technical Report

3.2.3 Forest Service Species of Concern

These species are considered vulnerable to habitat loss or over-exploitation, at least on a localized basis. Three species of birds and four species of mammals are included in this group: great blue heron, Queen Charlotte goshawk, marbled murrelet, brown bear, marten, Alexander Archipelago wolf, and moose.

3.2.4 Forest Service Sensitive Species

These are species that are considered susceptible or vulnerable to habitat alterations and management activities to the extent that there is concern for the long-term persistence of the species. Species assessed in this technical report include the trumpeter swan, Queen Charlotte goshawk, and American peregrine falcon. No Forest Service sensitive plant species were identified as relevant for the project alternatives.

3.2.5 State of Alaska Species of Special Concern

This list includes species native to Alaska that have undergone a long-term decline in abundance or are vulnerable to a significant decline due to low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance. One of the management goals for these species is to prevent them from declining to endangered status and to focus conservation efforts on ecosystem and habitat-level problems. Species assessed in this report include Queen Charlotte goshawk, American peregrine falcon, olive-sided flycatcher, gray-checked thrush, Townsend's warbler, blackpoll warbler, and harbor seals.

3.2.6 Other Species

These species are included as representatives for analyzing effects on similar species in the region. Effects on harlequin ducks approximate the effects on similar waterfowl species and wood frogs are representative of similar effects on spotted frog and boreal toad. At the request of regulatory agencies, five additional marine mammals were added to the list of species receiving individual assessments and include minke whale, harbor porpoise, Dall's porpoise, killer whale, and sea otter.

3.3 Species Accounts

The following accounts are presented in a standard phylogenetic order. They are intended to provide a baseline description of the biology and status of each species relevant to the assessment of potential impacts of the proposed project. Some information is also presented on other anthropogenic effects and management issues as background for the cumulative effects analysis.

3.3.1 Amphibians

3.3.1.1 Wood Frog (Rana sylvatica)

The wood frog is widespread in North America, ranging from treeline in Alaska south to Georgia (NatureServe, 2003). This species is not state or federally listed. It has been chosen as an indicator species to analyze potential effects of the project to amphibians in the area. It is the only amphibian found north of the Arctic Circle in the western hemisphere (AmphibiaWeb, 2003). Alaska wood frogs are common in various types of wetland habitat and are widespread from southeast Alaska to north of the Brooks Range (Broderson, 1994, Carstensen, *et al.*, 2003). Their overall population is considered secure although local populations are vulnerable to large-scale habitat changes such as that caused by clear-cut logging or drainage of wetlands (Nature Serve, 2003).

Adult wood frogs are found in a variety of mainly terrestrial habitats in Alaska, including muskegs, forested wetlands, scrub-shrub wetlands, and along rivers. Adults reach sexual maturity at two to three years of age and breed in early spring. Eggs are laid a few weeks after the breeding season in shallow temporary or permanent pools. Some studies show that breeding adults always return to the same pool where the first breeding occurred (NatureServe, 2003). The eggs are attached to submerged vegetation in order to avoid predation. The eggs quickly develop into tadpoles, which feed on algae, plant tissue, debris and small aquatic invertebrates. The tadpoles then develop over the summer into froglets that typically leave the pools by August (Broderson, 1994; NatureServe, 2003). The froglets and adult frogs feed mostly on terrestrial invertebrates (NatureServe, 2003). During the winter months, wood frogs burrow into duff and are covered by another layer of duff and snow, which helps insulate them from extreme temperatures. Wood frogs can withstand temperatures down to 23 degree Fahrenheit (Northern Prairie Wildlife Research Center, 1997).

Two cases of Alaska wood frog malformations have been reported to the North America Reporting Center for Amphibian Malformations (NARCAM). Both cases occurred in Anchorage and were reported in August of 1997 (NARCAM, 1997). Recent cases have also been reported to the Alaska Natural Heritage Cook Inlet Amphibian Monitoring Program from Eklutna Lake and Kenai National Wildlife Refuge (Alaska Natural Heritage Program [AKNHP], 2003). Amphibian malformations are normal in healthy populations; however, reported North American malformations are higher than expected for normal conditions and have scientists concerned. So far, only 3 to 3.5 percent of reported amphibian malformations have occurred in wood frogs. Scientists are actively recording malformations throughout North America and are researching the potential causes for the increase (NARCAM, 1997).

3.3.2 Birds

3.3.2.1 Great Blue Heron (*Ardea herodias*)

The great blue heron is a widespread and common species, ranging from southeast Alaska to South America (Heron Working Group, 2001). The TLMP calls for a 600-foot windfirm buffer around active nests. Highway construction and other disruptive activities inside the buffer are discouraged during the nesting season (USFS, 1997).

In southeast Alaska and British Columbia, great blue herons lay three to six eggs annually, beginning in March or April (DesGranges, 1990). Herons may congregate in large colonies, small groups of less than 20 pairs, or as lone pairs (Heron Working Group, 2001). Nests are built in woodland areas at the tops of trees, located within a short distance of favored feeding areas. Herons generally return to the same nesting area every year, and may even reuse the same nest (DesGranges, 1990). Adult great blue heron have few predators and can live to about 18 years, although the average is around 10 years (Heron Working Group, 2001). Mortality of eggs and young chicks is high due to predation (by crows, ravens, gulls, and birds of prey), heavy rains and cold weather at hatching, and scarcity of food. Herons prey mainly on fish species, but may also consume shellfish, insects, rodents, amphibians, reptiles, and small birds (DesGranges, 1990).

Great blue herons are very common birds throughout the U.S. and breeding bird survey estimates indicate a positive trend in the population (1966-2002) (Sauer *et al*., 2003). Accurate abundance and trend data for southeast Alaska populations are not available. Human impacts to heron populations come mostly in the form of habitat fragmentation including the draining of wetland areas and fragmentation of nesting habitats (DesGranges, 1990). This may cause reductions in prey availability and increase the access of predators to nesting sites. Sudden noises can startle herons off their nests, further increasing the susceptibility of their young. Scientists recommend circular buffers between 500 and 1,000 feet around heron nesting sites to mitigate human noise disturbances (Heron Working Group, 2001). Herons are also sensitive to chemical contamination (i.e., pesticides) and are good biological indicators of ecosystem health and habitat suitability (Smithsonian Marine Station at Fort Pierce, 2001).

3.3.2.2 Trumpeter Swan (*Cygnus buccinator*)

Trumpeter swans are the largest waterfowl species native to North America. The species was once common throughout the northern U.S. and Canada until hunted to near extinction during the 19th century. Restoration programs have been launched in several midwestern states in order to reestablish migratory and breeding populations in the contiguous U.S (Matteson *et al*., 2003). Trumpeter swans were not discovered in Alaska until 1850 and a breeding population was not identified until 1954 (Rosenberg and Rothe, 1994). Trumpeter swans are listed as a “sensitive species” by the USFS and their habitat is protected by measures established in the TLMP. Development is limited within one-half mile of wetlands that serve as trumpeter swan nesting sites and the construction of overhead wires or other structures, which could interfere with flight paths, is avoided (USFS, 1997).

The trumpeter swans of southeast Alaska are part of the Pacific Coast population, one of three main populations in North America (Matteson *et al*., 2003). This population of approximately 13,000 birds spends its summers in the interior and southcentral Alaska and winters from Cordova south to the Columbia River, Washington (Rosenberg and Rothe, 1994). A total of 334 adults and 43 juveniles were recorded throughout southeast Alaska in 2000/2001 (USFS, 2003). Trumpeter swans nest and rear young from April through September in the wetlands of the Antler, Lace, and Berners River drainages in Berners Bay, with a concentration of nests on the

Lace River near its confluence with Berners Bay (USFS, 2001). Trumpeter swan nests are often built upon muskrat or beaver lodges or consist of mounds of sedges and cattail tubes and contain an average of five to six eggs (McKelvey, 2002). Territories range from 6 to 150 acres and are located in shallow wetlands (1 to 3 feet of water) with emergent and open water vegetation (Matteson *et al*., 2003). Their diet consists mainly of emergent vegetation leaves, tubers and roots, sedges, bulrushes, cattails, horsetail, cinquefoil, and rushes (Wisconsin Department of Natural Resources [WDNR], 2003c).

3.3.2.3 Harlequin Duck (*Histrionicus histrionicus*)

The western population of harlequin duck breeds along the pacific coast from northeast Siberia to California and is estimated at between 200,000 and 300,000 individuals (Amirault, 1997). Wintering populations are found along the shores of the Aleutian Islands, Gulf of Alaska, and southeast Alaska (Rosenberg *et al*., 1994).

Harlequin ducks are unique among sea ducks because they nest along inland swift-moving freshwater rivers and streams. Their nests are built on the ground, hidden by vegetation, and lined with down. The ducks reach sexual maturity between two and three years of age, a relatively late first age of breeding (Amirault, 1997). Harlequin ducks form monogamous seasonal pairs and the females may return to the same nesting site year after year. An average of five to seven eggs are laid annually in late May to early June. If the eggs are lost, a new clutch will not be laid (Bourne, 2003). While in their freshwater habitat, the ducks feed on aquatic invertebrate larva and fish eggs. In the winter, the ducks move to marine coastal intertidal zones, preferring turbulent waters and rocky shores. Here, the ducks feed on marine invertebrates including snails, limpets, crabs, chitons, mussels, and herring spawn (Street, 1997). Predators of harlequin ducks include red fox, mink, ravens, and gyrfalcons (Bourne, 2003).

Harlequin ducks are vulnerable to oil and industrial pollution since the birds tend to gather in coastal waters and forage in intertidal habitats (Rosenberg *et al*., 1994). The TLMP requires that significant waterfowl habitat must be protected with a minimum buffer of 330 feet, and with minimum human disturbance to known nesting and foraging areas (USFS, 1997).

3.3.2.4 Northern Goshawk (*Accipiter gentilis*)

The Queen Charlotte goshawk (*A.g. laingi*) is the smallest of three subspecies of the northern goshawk. This subspecies is found in southeast Alaska and coastal British Columbia and is considered nonmigratory, remaining in the region throughout the winter (Iverson *et al*., 1996). Queen Charlotte goshawk nesting sites in southeast Alaska most often occur in closed-canopy, productive, old-growth coniferous forests (Iverson *et al*., 1996). Nesting sites have been verified on the Lace River and may also exist near Skagway (Iverson *et al*., 1996). Goshawks generally prey on small and medium-sized birds and mammals, including jays, thrushes, crows, grouse, woodpeckers, waterfowl, snowshoe hares and squirrels (Lowell, 2001). A study conducted in the Yukon Territory, Canada, indicated that the goshawk population was primarily influenced by prey abundance cycles, such as the snowshoe hare cycle (Iverson *et al*., 1996). Current goshawk population levels and trends are poorly known, with abundance estimates ranging between 100 and 800 nesting pairs in southeast Alaska (Iverson *et al*., 1996).

The USFWS received a petition to list the Queen Charlotte goshawk as endangered under the ESA in 1994 but it has not been listed to date (Kennedy, 2003). However, the subspecies is currently considered a "Species of Concern" by the USFS and ADF&G, a "Sensitive Species" by the USFS, and is considered "Imperiled in State" by the AKNHP (AKNHP, 1998a). The TLMP requires buffer zones around known nest sites to minimize disturbance to nesting goshawks (AKNHP, 1998a).

Because of their low population densities and conservative reproductive strategy, Queen Charlotte goshawks are vulnerable to habitat changes and disturbance (AKNHP, 1998a; McClaren, 2003). Human-caused habitat fragmentation through the harvest of timber posses the greatest threat to the subspecies. Loss of mature old-growth forests may result in a reduced number of suitable nesting areas, decreased prey abundance and availability, increased competition with other avian predators, reduced juvenile dispersal and gene flow, increased disturbance, and altered microclimate (McClaren, 2003). After an old-growth forest is clear-cut, it can take 60 to 100 years for the habitat to again become suitable for goshawk nesting sites (AKNHP, 1998a).

3.3.2.5 Peregrine Falcon (*Falco peregrinus*)

Two subspecies of peregrine falcons are found in southeast Alaska: American peregrine falcons (*F.p. anatum*) and Peale's peregrine falcons (*F.p. pealei*). American peregrine falcons are found throughout North America south of the arctic tundra biome and are mainly migratory except in their southern range. Peale's peregrine falcons are mainly resident birds off the coast of Alaska and British Columbia (Blood, 2002). Special federal and state regulations permit falconry and captive propagation of peregrines. The TLMP contains measures to protect peregrine falcon nest sites as well as seabird rookeries and waterfowl areas that are important foraging habitats for the falcons (USFS, 1997). It was federally delisted in 1987.

Peregrine falcons nest in forested areas on cliffs (called aeries), often located along rivers or near lakes (Ambrose, 2002). Several nests have also been found on building and bridge ledges in urban environments (USFWS, 1999). In southeast Alaska, Peale's peregrine falcon nests are found near seabird colonies on the outer coast, generally on cliffs facing the open ocean. Birds will return to the same nesting site year after year. Peregrine falcons breed between two and three years of age and mate for life. Three to five eggs are laid annually and females may lay another clutch if the first is lost. Peregrine falcons can live up to 18 to 20 years of age, although the average life span is two to eight years (Ambrose, 2002). Peregrine falcons generally feed on small- to medium-sized birds and require large areas of open space for hunting (e.g., open waters, marshes, fields, tundra) (USFS, 2003).

Peale's peregrine falcon populations appear to have remained stable since the 1940s up through the present (USFWS, 1999; USFS, 2003). Presently, 36 Peale's peregrine falcon nests have been found in southeast Alaska, of which 32 are located in the Tongass National Forest (USFS, 2003). None of these nests are located in the project area.

American peregrine falcons suffered a sharp decline in population beginning in the 1940s, primarily due to the effects of chemical pesticides, leading to their listing as endangered under the ESA in 1973. The population began to recover after DDT and other organochlorine pesticides were banned (1972) and reintroduction programs were established (WDNR, 2003b). The American peregrine falcon was removed from the ESA list on August 25, 1999, although the subspecies is still considered a species of special concern in Alaska (USFWS, 2001; Ambrose, 2002) because of their sensitivity to environmental disturbance. Currently, approximately 300 pairs of American peregrine falcons nest in interior Alaska (Ambrose, 2002). Although many harmful chemical pesticides are banned in the U.S., DDT and others are still used in foreign countries where American peregrine falcons winter (Ambrose, 2002).

3.3.2.6 Marbled Murrelet (*Brachyramphus marmoratus*)

Marbled murrelets are found along the pacific coast of North America as far south as northern California (Kaiser, 1991). The largest populations of marbled murrelets are found within southeast Alaska and British Columbia, Canada (Sustainable Ecosystems Institute [SEI], 2003). This species is designated as a species of management concern by the USFWS because of their vulnerability to a significant decline due to low population size, and has been listed as threatened under the ESA in Washington, Oregon, California, and British Columbia (USFS, 1997). It is not listed as threatened in Alaska. The marbled murrelet is also classified as a USFS Species of Concern, which allows for specific conservation measures but is not associated with the protective status of ESA.

The preferred nesting habitat of marbled murrelets is uncertain, but research indicates that southeast Alaska populations prefer low elevation, open canopy, old-growth stands of Sitka spruce, or mountain or western hemlock (GeGange, 1996). Nesting sites are generally in close proximity to coastal waters. Marbled murrelets are found in these old-growth stands throughout the year, except for two months in the fall when the birds are flightless. Marbled murrelet nest sites are protected by measures within the TLMP that proscribe a 600-foot circular buffer surrounding identified murrelet nests, with minimized disturbance within the buffer during the nesting season (May 1 to August 15). Marbled murrelets forage in nearshore marine waters and are most abundant in sheltered waters (e.g., bays, fjords). Their diet in southeast Alaska consists of Pacific sand lance, capelin, Pacific herring, eulachon, and pollock (DeGange, 1996).

Estimates of marbled murrelet abundance are uncertain and range from 70,000 to 250,000 in southeast Alaska (USFS, 1997). Marbled murrelets have a conservative reproductive strategy, laying only one egg per year, but are a relatively long-lived species (DeGange, 1996). This means that short-term events that impact reproductive success in any one year may not affect long-term population trends. Scientists have estimated a 4 to 6 percent annual decline in the rangewide population (USFS, 1997) One of the greatest threats to marbled murrelet survivorship is increased predator abundance, especially to eggs and chicks in the nests (SEI, 2003). Predation is worsened by fragmentation of old-growth habitat by timber harvests and highway building, which increases access to nesting sites by predators such as jays, crows, and ravens. Other human-induced impacts include oil spills, such as the *Exxon Valdez* oil spill, which can decimate large concentrations of the diving birds, and incidental catch in fishing nets (DeGange, 1996). Oceanographic events may also be causing declines in marbled murrelet prey availability (SEI, 2003).

3.3.2.7 Kittlitz's Murrelet (*Brachyramphus brevirostris*)

Kittlitz's murrelets are endemic to the North Pacific Ocean, ranging along the coast of Alaska from Point Barrow south to Prince of Wales Island (AKNHP, 1998d). In 1995, the USFWS listed Kittlitz's murrelets as a Species of Management Concern. They are also listed as "rare or uncommon in State" by the Alaska Natural Heritage Program (AKNHP, 1998d). The USFWS received a petition to list Kittlitz's murrelets as endangered under the ESA in 2001 (Center for Biological Diversity *et al.*, 2001) and published a notice of intent to consider the species a candidate for listing on May 4, 2004 (USFWS, 2004).

Kittlitz's murrelets are not colonial nesters like many seabirds. They nest at scattered sites located high on recently de-glaciated rocky slopes, which can be as far as 47 miles (75 km) from the water. One egg is laid annually on the bare ground (United States Geological Survey [USGS], 2003). So far, only 20 nesting sites have been discovered in Alaska (Piatt, 2003). Kittlitz's murrelets forage in sheltered, nearshore waters that are glacially affected, such as at the heads of glacial rivers or tidal glaciers. Their diet consists of Pacific herring, Pacific sand lance, capelin, and occasionally marine invertebrates (AKNHP, 1998d; USGS, 2003).

Recent abundance estimates for Kittlitz's murrelets are uncertain, but many sources estimate from 20,000 (AKNHP, 1998d; USGS, 2003) to low tens of thousands of birds (Piatt, 2003), with the largest population in Glacier Bay. The Kittlitz's murrelet population underwent a dramatic decline in Prince William Sound (PWS) following the Exxon Valdez oil spill. The population suffered an average decline of 14 percent per year from 1989 to 1998 in PWS. Since murrelets form concentrated groups when on the water and dive for their prey, their vulnerability to mortality caused by oil pollution is high (88 out of 100 on the Oil Vulnerability Index) (AKNHP, 1998d). Although the Exxon Valdez oil spill contributed to the population decline in PWS, the Glacier Bay population, which was not directly affected by the oil spill, also underwent a decline of nearly 80 percent between 1991 and 1999 (NMFS, 2003). It is estimated that 3,300 Brachyramphus murrelets are caught annually in the Alaskan gillnet fisheries; Kittlitz's murrelets are estimated to represent 30 percent of this bycatch (NMFS, 2003). Murrelet population declines are also attributed to decreases in forage fish prey availability and global warming, which may reduce foraging habitat by increasing the rate of coastal glacier retreat (AKNHP, 1998d).

3.3.2.8 Olive-Sided Flycatcher (*Contopus cooperi*)

The olive-sided flycatcher breeds across Alaska and Canada and south to Baja California (Royal BC Museum, 2003). This flycatcher is considered a National Species of Management Concern and an Alaska Species of Special Concern by the USFWS (Wright, 2002).

The olive-sided flycatcher breeds primarily in central Alaska and winters in South America. They are considered rare in southcoastal and southeast Alaska (USGS, 2003). The flycatchers make their nests in late May on limbs of coniferous trees and lay an average of four eggs per season. They begin returning to their winter habitat in late August. Olive-sided flycatchers feed mostly on large insects, including bees, wasps, ants, dragonflies, and bark beetles. This requires foraging areas with open spaces, such as muskegs, meadows, burns, and open water areas. The interaction of uneven canopy and wet areas for insects seems to be the preferred foraging habitat of this species (Wright, 2002).

Breeding bird survey results for Alaska populations of olive-sided flycatchers are uncertain, but indicate a decreasing trend (1980 to 2002). Survey-wide data (all of U.S.) also indicates a negative trend in the breeding population (Sauer *et al*., 2003). The decline in olive-sided flycatcher populations is largely attributed to the significant loss of wintering habitat in the Andes Mountains due to logging. Suitable breeding and foraging habitats have also been lost in the U.S. and Canada due to forest harvest activities and possibly fire suppression (Wright, 2002). The application of forest pesticides and herbicides in both wintering and breeding habitats may impact the level of food availability and indirectly affect the reproductive rates of the flycatchers.

3.3.2.9 Gray-Cheeked Thrush (*Catharus minimus*)

The gray-cheeked thrush is a neo-tropical migrant that breeds in boreal forests of Siberia, Alaska, and Canada and winters in South America (Swanson and Nigro, 2003; Nova Scotia Museum of Natural History, 2003). Accurate data on gray-cheeked thrush abundance are not available for Alaska but population trend indices appear to be declining, leading to their designation as an Alaska Species of Special Concern (AKNHP, 1998b).

Gray-cheeked thrush nest in coniferous and mixed woodlands, building their nests in low shrubs or at the base of trees. The nests are cup-shaped, constructed of grasses, sedges, twigs, lichens and mosses. Three to six eggs are laid per season. Gray-cheeked thrush diet consists of insects, which are gleaned while the birds walk on the ground, worms and berries. There are no measures in the TLMP that specifically protect gray-cheeked thrush habitat (USFS, 1997). Like the olive-sided flycatcher, these birds are vulnerable to habitat destruction of the evergreen forests in their wintering habitats (Swanson and Nigro, 2003).

3.3.2.10 Townsend's Warbler (*Dendroica townsendii*)

Townsend's warblers breed along the Pacific Northwest from eastern interior Alaska to Oregon and winter in coastal California, Mexico, and Central America (USGS, 2003a). Abundance and trend data for Townsend's warblers are uncertain, but breeding bird surveys in Alaska indicate that the population is stable (1966 to 2002). The population also appears to be stable or slightly increasing throughout its U.S. and Canadian range (Sauer *et al*., 2003). Townsend's warbler is considered an Alaska Species of Special Concern (ADF&G, 1998b).

Townsend's warblers are common from Interior Alaska through southcentral and southeast Alaska. In southeast Alaska, their nests are found in coniferous forests, in muskegs and occasionally along rivers in red alder thickets. Large, continuous areas of mature coniferous forests with tall trees often have a high abundance of Townsend's warbler nests. Their nests are cup-shaped and made of bark, needles, grasses, lichens and animal hair and are placed on branches well-concealed by foliage. Five to seven eggs are laid in Alaska and the northern latitudes, while only three to five eggs are laid in the contiguous U.S. (USGS, 2003a). Townsend's warblers feed mainly on insects, but will also feed on seeds and plant galls in their wintering habitats.

Townsend's warblers are vulnerable to habitat fragmentation in their breeding grounds due to forestry techniques such as clear-cutting and even-aged management. Habitat fragmentation may also increase edge effects, including increased vulnerability to predators. Loss of wintering habitat from California to Mexico poses the greatest threat to Townsend's warbler populations. Large tracts of forests have already been lost to logging activities and converted into farmlands or residential areas (USGS, 2003a).

3.3.2.11 Blackpoll Warbler (*Dendroica striata*)

The blackpoll warbler is a neo-tropical migrant that breeds from northwestern Alaska across northern Canada and winters in South America (Gough *et al*., 1998; USGS, 2003a). Abundance and trend data for the Alaskan breeding populations of blackpoll warblers indicate a decline (1966 to 2002), leading to their designation as an Alaska species of special concern (ADF&G, 1998b). Data for their entire U.S. breeding range also indicates a negative trend (Sauer *et al*., 2003).

In Alaska, blackpoll warblers breed mainly in the interior and are considered uncommon in southeast Alaska. These birds typically nest in conifers, but occasionally nest on the ground within tall shrub or woodland habitat types. The blackpoll warbler diet consists of insects, ants and spiders, which are either gleaned off of branches or captured through hawking. Berries are also eaten, mostly during the fall months. Their winter habitat consists of broadleaf evergreen forests in Ecuador, Columbia, Venezuela, Chile, and Peru (USGS, 2003a). Similar to other neo-tropical birds, blackpoll warblers are considered to be highly vulnerable to habitat fragmentation in their wintering habitat caused by logging activities.

3.3.3 Mammals

3.3.3.1 Brown Bear (*Ursus arctos*)

Brown bears are widespread and common in many areas of Alaska, including southeast Alaska, because of huge salmon runs that provide an abundant source of protein. Brown bears also eat berries, leaves, and roots of many plants and prey on a variety of small and large mammals (Eide and Miller, 1994). Brown bears use a variety of habitats, including alpine and subalpine meadows, coastal sedge meadows, riparian areas, and old-growth forests. High quality habitat areas for this species include riparian old-growth forest along fish-bearing steams and estuary fringe habitat. Moderate quality habitats include upland old-growth forest, high elevation forest, and beach fringe. Low quality habitats include clearcuts and second growth forest. Much of the project study area encompasses brown bear habitat (Figure 3-1).

In the summer, bears concentrate in low elevation coastal salmon streams and old-growth forests dominated by Sitka spruce and devil's club (Schoen *et al.*, 1993). In late fall and winter, bears move higher into the mountains on ridges and grassy timber sites to hibernate in caves or under trees and shrubs (USFS, 2002).

Two cubs are typically born in January or February in the den. Female bears mature at five to eight years of age and live 22 to 26 years; males live approximately 22 years (Eide and Miller, 1994).

The USFS has designated brown bears as a Species of Concern and an MIS (USFS, 1997). A brown bear habitat capability model was developed for the TLMP (Schoen *et al.*, 1993). This model rated habitats on the basis of their value during the late summer season which is considered to be the most critical time period (Schoen *et al.*, 1992). A habitat suitability analysis using this model and GIS data for the Juneau Access Improvements Project study area indicates that there are numerous moderate to high quality brown bear habitats on both sides of Lynn Canal, especially in the drainages of Berners Bay, Katzehin River, and Endicott River (Figure A-2, Attachment A). Riparian vegetation and meadows at the mouths of the Lace and Antler rivers appear to be used heavily used for food by brown bear in the spring and summer (Christensen and Van Dyke, 2004). Results of the habitat capability model for each of the WAA around Lynn Canal are listed in Table A-1 in Attachment A.

The only predators of brown bears are other brown bears and humans. Population success is heavily dependent on the quality of late summer habitat and forage, which are critical for bears to store enough fat for hibernation. During this time, bears concentrate in riverbeds and coastal areas, which elevates their vulnerability to humans and management activities. Brown bear hunting is regulated by ADF&G and harvest data are reported by WAA. From 1984 to 1992, hunters took an average of 1.8 brown bears per year from the WAAs surrounding Berners Bay. From 1996 to 2002, hunters took an average of almost one bear per year from Berners Bay. North of Berners Bay on the east side of Lynn Canal, brown bears are rarely taken. On the west side of Lynn Canal, hunters took an average of 2.2 brown bears per year from 1984 to 1992 and 2.1 brown bears per year from 1996 to 2002 (ADF&G, 2003).

The TLMP includes Standards and Guidelines for brown bears and black bears (Forest Service, 1997). The Standards and Guidelines include continuing to implement strategies which prevent habituation of bears to human foods and garbage and reduce the chances of human/bear incidents. The strategies include requiring incinerators and/or other bear-proof garbage disposal methods at work camps, recreation sites, administrative and research facilities; requiring Special Use Authorizations in bear habitat; where feasible, locating seasonal and permanent work camps, recreation facilities, and operational facilities more than one mile from sites of important seasonal bear concentrations; minimizing adverse impacts to brown bear habitat including seasonal restrictions on activities; and requiring storage of human food in ways to make it unavailable to bears. The TLMP also requires the evaluation of buffers around important brown bear habitat during project planning.

3.3.3.2 Black Bear (*Ursus americanus*)

The black bear is widely distributed in North America and is common throughout the mainland of southeast Alaska. Black bears are USFS MISs. Black bears feed primarily on new plant growth in spring, berries during summer, and spawning salmon during summer and fall (Johnson, 1994a). Many of the foods preferred by black bears, such as grasses, sedges and forbs, grow best in openings near forest habitats, such as estuaries, avalanche slopes, burned and logged areas, and subalpine meadows (USFS, 2002). Winter den sites include excavated and natural depressions under tree roots, stumps, and fallen logs, characteristics typically associated with old-growth forests (Suring *et al.,* 1988). Black bears hibernate between four and seven months out of the year, usually between October and May. An average of two cubs are born in the den between November and February, and females give birth every two or three years (Johnson, 1994a). During spring and fall, black bears migrate between the higher elevation dens and the grass flats along the beach. Telemetry studies of black bears in the Berners Bay area indicate that males have a home range of approximately 16,000 acres or up to 7 times greater than females (Robus and Carney, 1996). The studies also indicate that males roam through a wide range of elevations in comparison to females (Robus and Carney, 1996). Most of the project study area encompasses black bear habitat (Figure 3-2).

A black bear habitat capability model was developed for the TLMP (Suring *et al.,* 1988) to help assess impacts on this MIS. A habitat suitability analysis using this model and GIS data for the Juneau Access Improvements Project study area indicated that there are numerous moderate to high quality black bear habitats on both sides of Lynn Canal, especially along the major stream drainages (Table A-1 and Figure A-3, Attachment A). High quality habitat includes old-growth forest, muskeg, and grassland located in estuary or beach fringe habitats or along fish-bearing streams. One of the highest quality habitat areas for spring through fall use is in Berners Bay where there is a broad expanse of estuarine habitat comprised of a mixture of grassland, old-growth forest, and fish-bearing streams. High quality winter denning habitat is located along the shoreline between Point Saint Mary and Point Sherman. Many black bears den in the hillsides above the beach in this area. Black bears move down from their winter dens to the shoreline in mid-April and early May, although the specific timing of movement depends on snow levels.

Black bears are highly adaptable and can tolerate moderate disturbances as long as basic requirements for food and cover are satisfied (Suring *et al.,* 1988). However, due to their low reproductive rate and late sexual maturation, black bears are vulnerable to over harvesting and incidental take. Black bears are attracted to human garbage and this often leads to human-bear conflicts in residential areas and construction camps. Between 1998 and 2002, 16 black bears were killed in defense of life and property in Game Management Unit 1C (Southeast Mainland and Lynn Canal Region). Approximately two to three bears per year have been killed on the road system (mostly in Mendenhall Valley) and ADF&G is concerned that construction of a highway between Echo Cove and Cascade Point, with additional developments, will increase black bear road kills, increase hunter access to black bear habitat, and increase bear access to refuse (Barten, 2002a).

Black bear hunting is regulated by ADF&G and harvest data are reported by WAA. From 1984 to 1992, hunters took an average of 8.1 black bears per year from the WAAs surrounding Berners Bay. From 1996 to 2002, that average declined too 3.9 black bears per year. North of Berners Bay on the east side of Lynn Canal, an average of 3 black bears have been taken yearly since 1984. On the west side of Lynn Canal, hunters took an average of 14 black bears per year between 1984 and 1992 and 15.6 black bears per year between 1996 and 2002 (ADF&G, 2003).

3.3.3.3 Marten (*Martes americana*)

Martens are members of the weasel family and are abundant throughout forested regions of Alaska (Shepherd and Melchior, 1994). They have been designated as a species of concern and an MIS by the USFS. Martens are nocturnal, solitary animals that feed on a wide variety of small rodents, birds, amphibians, insects, fish, and vegetable matter (WDNR, 2003a). Between two and four kits are born per litter in March or April and are weaned six to seven weeks later. Dispersal occurs in the late summer or early fall (WDNR, 2003a). Population estimates are not available for marten in the Juneau Access Improvements Project study area but they appear to be stable and common judging from trapper interviews and harvest data (Barten, 2001a) (Figure 3-1).

Martens prefer high volume old-growth coniferous or mixed forests with fallen logs and other woody debris in the understory which provides shelter, cover, and an abundance of prey (Suring *et al*., 1992). The preferred hunting habitat of the marten is along fringes of spruces thickets and streams or the edges of bog meadows (Shepherd and Melchior, 1994). Most of the high quality habitat along the east side of Lynn Canal is located south of Berners Bay. The steep topography north of the bay limits the suitability of habitat for this species. High quality habitat is more continuous along the west side of Lynn Canal because the topography is not as steep as on the east side of the Canal.

A habitat capability model was developed for marten to help assess the effects of management measures in the TLMP (Suring *et al*., 1992). A habitat suitability analysis using this model and GIS data for the Juneau Access Improvements Project area indicated that moderate to high quality marten habitats exist mostly along major river drainages on both sides of Lynn Canal (Figure A-4, Attachment A). Results from the 1997 DEIS habitat capability modeling are listed in Table A-1 in Attachment A.

Martens are managed as a fur-bearing species by ADF&G and are the most widely trapped animal in Alaska (Shepherd and Melchior, 1994). Between 1984 and 1992, an average of 23 martens were trapped in the WAAs surrounding Berners Bay. North of Berners Bay on the east side of Lynn Canal, only 5 marten were taken on average. On the west side of Lynn Canal, trappers took an average of 44 marten per year from 1984 to 1992.

The TLMP includes Standards and Guidelines both to avoid over-harvesting of martens and to maintain important habitat. These measures include restricting road access and off-road vehicle use in areas where data indicates that access is a significant contribution to unsustainable marten mortality, and to avoid logging areas that are characteristic of high-value marten habitat[2] (USFS, 1997).

[2] High value marten habitat as defined in the TLMP includes high volume productive old-growth timber below 1,500 feet in elevation (Forest Service, 1997).

3.3.3.4 Mountain Goat (*Oreamnos americanus*)

The USFS has designated mountain goats as a Species of Concern and MIS (USFS, 1997). Male mountain goats are typically solitary except during the November and December breeding season. Females give birth to a single kid in late May or early June, usually in brushy subalpine areas that provide good cover. Females often form small groups and keep their young with them until the next spring (USFS, 2001). An estimated 5,000 to 7,500 mountain goats live in southeast Alaska on steep, rocky terrain ranging from sea level to 10,000 feet. Mountain goat home ranges vary from approximately four to eight square miles. The preferred habitat of mountain goats satisfies three main needs; predator avoidance, forage availability, and thermoregulation (shelter from extreme weather conditions) (Fox 1983). The goats seldom wander far from steep slopes or cliffs generally staying within 1,600 feet of escape routes (Fox, 1983, Smith, 1985, Schoen and Kirchhoff, 1982, and Johnson, 1994b). In the project study area, mountain goats occur throughout the steep mountain habitat and upper forested slopes on both sides of Lynn Canal (Figure 3-1).

Distribution and abundance of mountain goats in the upper Lynn Canal has been monitored by the Bureau of Land Management (BLM), primarily on the west side north of Sullivan River and by ADF&G with periodic aerial surveys and anecdotal observation from flight-seeing operations during the summer (BLM, unpublished data, ADF&G, 2003). In the summer, mountain goats graze on succulent grasses, shrubs, and herbs in alpine and subalpine areas, generally between 2,000 and 6,000 feet in elevation (Schoen and Kirchhoff, 1982, Smith, 1983, J. Denton, BLM, 2004, personal communication). During winter, deep snow conditions force goats to lower elevations, generally between 750 and 1,500 feet, where they seek food (understory shrubs and mountain hemlock) and shelter in old-growth forests (Fox, 1983, Smith 1985, Fox *et al.*, 1989). Forested mountain goat winter habitats near tidewater are also used in some areas of Lynn Canal (Fox, 1983). Few area-wide surveys of goat winter habitats have been conducted since goats are difficult to detect in winter. However, telemetry studies of radio-collared goats in winter have shown a strong preference for low-elevation forested habitat and higher wind-blown slopes (Smith 1985, Schoen and Kirckhoff 1982, Robus and Carney 1986). High quality winter habitat for mountain goats has been defined as old-growth forest on south-facing slopes and within 1,300 feet of a cliff (Schoen and Kirchhoff 1982). This type of habitat is located in the vicinity of Lions Head Mountain in WAAs 2408 and 2409, and in the vicinity of Davidson Glacier and Pyramid Harbor in WAA 4302. Moderate to high densities of mountain goats are located in these areas (Figure 3-1). Lower densities of mountain goats occur along Lynn Canal between the Katzehin River and Skagway.

The availability of high quality winter habitat is believed to be the limiting factor for mountain goat populations in southeast Alaska (USFS, 2001). The USFS developed a mountain goat habitat capability model for the Tongass Land Management Plan (TLMP) (Suring *et al.,* 1988). A habitat suitability analysis using this model and geographic information systems (GIS) data for the project study area indicated that there are numerous moderate to high quality mountain goat habitats on both sides of Lynn Canal (Figure A-5, Attachment A).

Results from the 1997 DEIS habitat capability modeling are listed in Table A-1 in Attachment A.

The TLMP (USFS, 1997) suggests that human activities and facilities be located as far from wintering and kidding habitat as possible, indicating that a mile buffer should be provided from development facilities. When a mile buffer is not possible, site-specific mitigation measures should be applied. During project planning, old-growth forest within 1,300 feet of a slope of 50 percent or more should be avoided as potential mountain goat habitat. Corridors between seasonal habitats should be identified and maintained. In addition, aircraft should maintain

1,500 feet of clearance from mountain goat habitat, kidding areas, and mountain goats (USFS, 1997).

Mountain goat hunting is regulated by ADF&G and harvest data are reported by WAA. From 1984 to 1992, hunters took an average of 2.1 mountain goats per year from the WAAs surrounding Berners Bay. From 1996 to 2002, hunters took an average of 3.3 goats per year from Berners Bay. North of Berners Bay on the east side of Lynn Canal, hunters took an average of 7.2 goats per year from 1984 to 1992 and 7.3 goats per year from 1996 to 2002. On the west side of Lynn Canal, hunters took an average of 4.3 goats per year from 1984 to 1992 and 2.6 goats per year from 1996 to 2002 (ADF&G, 2003).

3.3.3.5 Moose (*Alces alces*)

Moose are established throughout forested and shrubby areas of Alaska, especially in areas where fires or clear cutting occurred between 15 to 20 years before and browse production and cover is abundant. It is a USFS species of concern. Moose feed on sedges, horsetail, pondweeds and grasses in the spring; shallow pond vegetation and forbs in the summer; and willow, birch, and cottonwood twigs throughout the fall and winter. Cow moose usually begin breeding at 28 months, although some start as early as 16 months, and continue every year for the rest of their lives. Moose rarely live beyond 16 years of age. One or two calves (rarely three) are born in late May to early June. The bond between cow and calf continues for 12 months until just before the next calf is born, at which point the mother chases off her one-year-old (Rausch and Gasaway, 1994). Natural predators include wolves, brown bears, and black bears.

Some moose inhabit a five-mile area throughout their lives, while others make seasonal migrations up to 100 miles from mountainous habitats in summer to lowlands in the fall for breeding and to avoid high snowfall. On the east side of Lynn Canal, moose are found primarily in the river drainages of Berners Bay, with smaller numbers in the Katzehin River valley. The Berners Bay population is the result of two transplants in 1958 and 1960 and has grown to between 100 and 150 animals, a level believed to be near the carrying capacity for this area (Barten, 2002b). These animals range in and out of higher elevations during the summer and retreat to shoreline habitats around Berners Bay in the winter. On the west side of Lynn Canal, moose from the Chilkat Range population use a number of river drainages, especially the Endicott River. This population is estimated at around 150 animals and is believed to originate from migrants from the Chilkat Valley (Hessing, 2002). The Chilkat Valley holds the largest number of moose in the Lynn Canal area, with between 300 to 400 animals (Hessing, 2002). On the west side of Lynn Canal, the Alaska Department Natural Resources has identified an area near Pyramid Harbor and the Davidson Glacier outwash as winter moose concentration areas (Figure 3-3).

Moose are the most sought after big game animal in Alaska (Kellyhouse, 2002). The Berners Bay hunt is by permit only, with 10 to 20 permits issued yearly for both bulls and cows, and draws 1,200 to 1,700 entrants each year (Barten, 2002b). ADF&G statistics indicate that an average of seven moose were taken in Berners Bay between 1984 and 1992 (Table 3-12 in the 1997 DEIS Wildlife Technical Report). That average harvest increased to 13.3 moose per year from 1996 to 2002 (ADF&G, 2003). North of Berners Bay, on the east side of Lynn Canal, hunters take only about one moose per year (ADF&G, 2003). On the west side of Lynn Canal, hunters took an average of 22 moose per year from 1984 to 1992 (about half of which were taken from the Murphy Flats area near Haines) and 16.7 moose per year from 1996 to 2002 (ADF&G, 2003).

Moose are often killed in accidents with cars, especially at night. Moose are attracted to the packed snow or cleared roadways for travel and/or the vegetation lining the road (Rausch and Gasaway, 1994). Roads may also intersect moose corridors, becoming an obstacle as they move between habitats. In 2001, there were 785 moose/car collisions in Alaska, 38 percent of which occurred on national highways (DOT&PF, 2003).

The Standards and Guidelines for moose in the TLMP call for development of a habitat management direction for moose in coordination with ADF&G (Forest Service, 1997). Planning would include an inventory of vegetation in moose habitat, development of habitat improvement projects, and management of roads to minimize adverse effects of human access on moose populations.

3.3.3.6 River Otter (*Lutra canadensis*)

River otters inhabit a wide range of aquatic environments, from marine to high-elevation mountain lakes, usually surrounded by a variety of riparian vegetation where food is plentiful and open water is available for winter use (USFS, 2002). They are primarily nocturnal and stay active throughout the winter. Otters use dens for shelter, often using natural cavities created by large snags, fallen logs, and undercut banks, but also use dens built by beavers and other animals. Their diet consists mainly of fish and crustaceans with smaller amounts of insects, birds and mammals (USFS, 2002). Females become sexually mature at two to three years of age, but many will not breed every year. Males mature at two years of age, but in high density situations may not become successful breeders until five to seven years of age (USFS, 2002). An average of two to four young otters are born in early spring and within three months they are able to forage for themselves. Young otters disperse after 12 to 13 months (USFS, 2002; Solf and Golden, 1994).

River otters are managed as a furbearing species by ADF&G. Otter pelts from southeast Alaska are considered to be of high quality. However, otters are difficult to trap and pelt preparation is time consuming so trapping pressure is highly dependent on price (Barten, 2001a). An average of only 2 otters per year have been taken from the project study area since 1990, mostly from the Berners Bay area (ADF&G, 2003). This appears to be more an indication of low trapper effort since the number of otter tracks sited during winter moose surveys appears to indicate that the otter population is doing well (Barten, 2001a).

River otters are occasionally entangled in fishing nets and caught in crab pots (Solf and Golden, 1994). Development of riparian habitats for recreational or economic uses decreases habitat quality as well as quantity. The TLMP includes standards and guidelines that maintain buffers along riparian areas that serve to protect the preferred habitats of this MIS (USFS, 1997). Roads and railroad tracks that cross streams are responsible for a considerable amount of mortality each year. Between 1998 and 1999, at least four river otters were killed by cars in Game Management Unit 1C (Barten, 2001a). Relatively high amounts of pesticides and acidic mining solutions have also been found in river otter tissues (USFS, 2002).

3.3.3.7 Alexander Archipelago Wolf *(Canis lupus ligoni)*

The Alexander Archipelago wolf, one of two subspecies of wolf recognized in Alaska, inhabits the mainland of southeast Alaska and the large islands south of Frederick Sound. The total population was estimated as between 700 and 1,100 wolves in autumn 1995 (Person *et al.*, 1996), with 60 to 70 percent living on the islands. The USFS lists the Alexander Archipelago wolf as a Species of Concern and as a MIS. Although wolves are listed as threatened under the ESA in the contiguous 48 states, they are not listed in Alaska. The commitment of the USFS to adequately protect old-growth forest habitat in the TLMP was an important element in the

USFWS decision not to list the wolf in Alaska. Wolf habitat extends throughout the project study area (Figure 3-2).

Wolves in southeast Alaska primarily prey on Sitka black-tailed deer but will also take moose, mountain goat, beaver, black bear, spawning salmon, geese, and small mammals (Person *et al*., 1996). As indicated below, beaver are an important source of food for many wolves in southeast Alaska while they are denning and rearing pups. In late summer and early fall, wolves will often feed on salmon in river estuaries, particularly young wolves recently separated from their mothers.

Breeding occurs in early spring and four to seven wolf pups are born in May and early June (USFS, 2002). Wolves den in old-growth forest typically within 100 to 300 feet of fresh water. The dens are usually found below 325 feet in elevation and 75 percent of the wolf dens in southeast Alaska are found below about 100 feet in elevation (Dave Person, personal communication, 2004). The dens are typically located under the roots or fallen trunks of large diameter trees. More than half of the dens surveyed in southeast Alaska are associated with riparian zones that contain beavers (Dave Person, personal communication, 2004). Based on examination of these dens, beaver can be an important source of food for many wolves while they are denning and rearing pups.

Alexander Archipelago wolves travel over an average home range of 109 square miles in packs of six to seven individuals. Larger packs consisting of parents and juveniles occur for a few months at the end of the summer and beginning of fall. About 40 percent of wolves, mostly age two years or older, disperse each year from their natal home range (Stephenson, 1994).

The primary factors affecting the Alexander Archipelago wolf population are the numbers and habitat quality of Sitka black-tailed deer, and road access that facilitates human harvest of wolves (Person, 2001). The TLMP has incorporated a wolf habitat management program that includes road access management, so that road densities would be sustained at 0.7 to 1.0 mile of road per square mile of known wolf habitat. A 1,200-foot forested buffer around active wolf dens would be maintained where possible, and road construction planned within 600 feet of an active den (April 15-July 15) would require consultation with the USFS (USFS, 1997). Alexander Archipelago wolves are managed as a furbearing species by ADF&G with regular hunting and trapping seasons in the fall and winter. In the mid-1980s, trappers took four or five wolves every year from Berners Bay but no wolves have been taken since 1993. On the west side of Lynn Canal, trappers have taken 22 wolves from the St. James and Endicott River drainages since 1984 (ADF&G, 2003).

3.3.3.8 Sitka Black-Tailed Deer (*Odocoileus hemionus sitkensis*)

Sitka black-tailed deer are native to coastal rain forests of Alaska's southeast region. Breeding occurs in November, and usually two fawns are born annually during late spring. Females begin breeding during their second year and continue for eight to 10 years. Twelve to 15 years is the maximum life expectancy for females, and approximately 10 years for males (Merriam *et al*., 1994). Sitka black-tailed deer are an MIS for the USFS. Population estimates for deer in the project study area are not available although densities are believed to be low.

Some deer are migratory, spending summer months in alpine and subalpine areas feeding on herbs and shrubs, and moving to lower elevations in winter to escape deep snow. Others remain in low elevation forests throughout the year. Deer prefer stands of uneven aged, old-growth forests around 300 years old with 60 to 80 percent canopy cover, since these stands provide partial snow cover and contain more browse than younger stands (USFS, 2002). During extreme snow accumulation, deer congregate in heavy timber stands or move onto beaches. When heavy and deep spring snows persist, deer die of starvation. Population size depends heavily on the severity of the winter (Merriam *et al.*, 1994). Deer populations also respond to predation pressure and hunting mortality. Predation by wolves in particular is thought to significantly retard the recovery of the deer herd from mortality resulting from deep-snow winters (Smith *et al.*, 1986).

In most of southeast Alaska, Sitka black-tailed deer are by far the most important terrestrial wildlife species for subsistence and sport hunting (USFS, 1997). However, data from ADF&G indicate that only 15 deer were harvested in the project study area during the 2001-2002 season and all of those were taken in drainages south of Berners Bay (ADF&G, 2003). Alaska Department of Natural Resources habitat use mapping also indicates that Sitka black tail deer occur in low numbers from Berners Bay north to Skagway with higher densities on Sullivan Island and the Chilkat Peninsula (Figure 3-3).

3.3.3.9 Sea Otter (*Enhydra lutris*)

Unlike seals, which rely on a heavy layer of blubber for protection against cold water, sea otters depend on air trapped in their fur for maintaining body temperature. Sea otters mate at all times of the year, and young may be born in any season, but most pups in Alaska are born in late spring. Females can produce one pup a year, but in areas where food is limited, they may produce pups every other year. Sea otters seldom travel far unless an area has become overpopulated and food is scarce. They are gregarious, sometimes resting in pods of 10 to more than 1,000 animals. Many sea otters live for 15 to 20 years (Schneider 1994).

Three genetically and geographically distinctive stocks of sea otters are recognized in Alaska: the Southwest Alaska stock, which extends from the Bering Sea, Aleutian Islands, and Alaska Peninsula to the western shore of Cook Inlet; the Southcentral Alaska stock, which extends from Cook Inlet east to Cape Yakataga, including Kachemak Bay, the Kenai Peninsula coast, and PWS; and the Southeast Alaska stock, which extends from Cape Yakataga to the southern boundary of Alaska (Gorbics and Bodkin 2001).

Sea otters inhabit shallow coastal waters of the North Pacific Ocean and the southern Bering Sea (Estes 1980, Estes and Van Blaricom 1985, Estes and Palmisano 1974). Habitat is generally shallow (less than 34 m) nearshore marine waters with sandy or rocky bottoms supporting substantial populations of benthic invertebrates. In some areas, large numbers of sea otters occur offshore. For example, in the Copper River Delta and inside PWS, sea otters are often present more than 8 km from shore (Garshelis and Garshelis 1984). Large aggregations have also been observed more than 30 km north of Unimak Island in the Bering Sea (Kenyon 1969).

Sea otters eat a wide variety of slow-moving benthic invertebrates, including sea urchins, clams, mussels, crabs, snails, octopus, squid, and epibenthic fishes (Kenyon 1969, Estes and Van Blaricom 1985, and Reidman 1987). The sea otter's diet consists of an estimated 82 percent invertebrates and 18 percent fish (Kenyon 1969, Kenyon 1981, and Lowry *et al.*, 1982). The fish component includes lumpsuckers, sculpin, rock greenling, Atka mackerel, rockfish, sablefish, Pacific cod, and pollock. Predators on sea otters include the bald eagles, which prey primarily on the newborn pups, and transient killer whales prey on adults. In past years, predation rates were considered insignificant in regard to population growth (Schneider 1994).

Historically, sea otters occurred all across the coastline of the North Pacific and were estimated to number between 150,000 and 300,000 in the early 1700s (Kenyon 1969 and Johnson 1982). Following the arrival of Russian explorers in 1741 and continued through the 18th and 19th century, commercial harvest of otters for fur nearly resulted in their extinction. In 1911, sea otters were provided protection under the International Fur Seal Treaty in 1911, there were probably fewer than 2,000 animals remaining in thirteen remnant colonies (Kenyon 1969).

After being essentially extirpated by the fur trade, sea otters in the southeast Alaska stock resulted from a translocation of 412 animals from PWS and Amchitka Island between 1965 and 1969. The population has increased rapidly since that time and is presently continuing to increase its numbers and expand its range. The most recent estimates of the sea otter population in southeast are based on small-boat and aerial surveys in 1994 and 1995, and aerial surveys in 2002. Combining corrected and uncorrected counts yields an estimated abundance of 8,807 sea otters in the earlier surveys and corrected counts of 12,637 in the most recent (Evans, *et al.*, 1997 and Udivitz 1997). Although rates of population growth vary among locations, the trend for the southeast stock is one of growth (USFWS 2002).

For the southeast sea otter stock, local subsistence harvest has ranged between 90 and 825 animals per year with an average of 301 otters between 1996 and 2000, representing 35 percent of calculated potential biological removal rate (PBR) (USFWS 2002).

In recent years, sea otters have been expanding into the Lynn Canal regions. However, densities are still very low and aerial surveys of northern southeast Alaska for sea otters in 2003 did not cover this area due to the low numbers. No sea otter concentrations have been identified in the Lynn Canal region although sea otters have been observed in Berners Bay (J. Heddix, USFWS, Personal Communication, 2004).

3.3.3.10 Harbor Seal (*Phoca vitulina*)

Harbor seals occur in marine waters and estuaries throughout Alaska. Harbor seals are most often found in water but come onto land to rest, birth, and care for their young. Their haulout sites consist of reefs, beaches, bars, and ice. They occasionally pursue fish up into rivers and lakes. Harbor seals feed on a variety of fish, including pollock, Pacific cod, Pacific sand lance, sculpins, salmon and flatfishes, and oily fish such as capelin, eulachon, smelt, and Pacific herring. Harbor seal concentrations have been documented in Berners Bay during spring herring and eulachon runs (Marston, *et al.*, 2002 and USFWS, 2003). The seals also feed on octopus, squid, and shrimp (Kinkhart and Pitcher, 1994 and NMFS, 2003). Harbor seals reach sexual maturity between three and seven years of age and females bear one pup between May and mid-July. Mortality rates for male seals tend to be higher than females, creating an uneven sex ratio favoring females (Kinkhart and Pitcher, 1994). Natural predators include transient killer whales, Steller sea lions and sharks (NMFS, 2003). The stock structure of harbor seals is currently being reviewed in light of new genetic information (Angliss and Lodge, 2003). Population estimates are not available for the project area but harbor seals appear to be increasing in most areas of southeast Alaska (Angliss and Lodge, 2003).

Harbor seals are protected by the MMPA of 1972, and are only hunted by Alaska Natives for subsistence use. An average of 1,749 harbor seals were harvested annually in southeast Alaska between 1992 and 1996, approximately 83 percent of the recommended maximum rate of harvest (Angliss and Lodge, 2003). Harbor seals are also incidentally caught in fishing nets, especially in the salmon drift and set net fisheries. Approximately 35 to 40 seals from the southeast Alaska stock are reported as being caught by State salmon and federal groundfish fisheries per year (Angliss and Lodge, 2003). Harbor seals are also impacted by environmental contamination, including oil spills. The Exxon Valdez oil spill reported the death of 300 seals immediately following the spill (NMFS, 2003).

The TLMP Standards and Guidelines include a general guideline to locate developments such as camps and log transfer facilities no closer than one mile from known marine mammal haulouts. This guideline also suggests that approved USFS activities not intentionally approach within 100 yards of hauled out marine mammals (USFS, 1997). NMFS is currently investigating the disturbance of harbor seals by cruise ships in Disenchantment Bay, Alaska (National Marine Mammal Laboratory [NMML], 2003). Harbor seals frequently haul out at low tide in a number of places within the project study area, including sandbars in Berners Bay and the Katzehin River (Figure 3-4).

3.3.3.11 Humpback Whale (Megaptera novaeangliae)

Commercial whaling decimated humpback whales until the International Whaling Commission imposed a moratorium in 1965, and listed the whales as "endangered" under the ESA in 1973. They were consequently listed as "depleted" under the MMPA. Humpback populations are presently divided into management stocks based on their fidelity to particular summer and wintering grounds. The whales that spend the summer and fall in southeast Alaska tend to winter in Hawaiian waters and are considered part of the central north pacific stock (Angliss and Lodge, 2003). Surveys conducted in Hawaii during the early 1990s provided an estimate of about 4,000 whales in this stock, with an estimated 961 whales using southeast Alaska in summer (Angliss and Lodge, 2003). Humpback whales feed in the Gulf of Alaska through the summer and fall and begin their migration south to breeding grounds in November, although individuals have been observed in Lynn Canal all months of the year. Peak numbers of whales are usually found in nearshore waters during late August and September, but substantial numbers may remain until early winter. NMFS is currently considering whether to designate the whales in southeast Alaska as a separate stock under the MMPA, based on a lack of interchange with whales that summer elsewhere in the Gulf of Alaska (Angliss and Lodge, 2003).

The humpback whale is a large baleen whale that feeds on schools of herring and other small fish, and concentrations of euphausiids. Humpbacks are famous for their long and complicated songs, which appear to be important for courtship and feeding purposes (Zimmerman, 1994). Females reach sexual maturity at four to six years of age and give birth in tropical waters every two to three years. The two thousand pound newborn will stay with its mother and suckle for up to a year, and then return annually to their mother's traditional feeding ground (Zimmerman, 1994). Pods of transient killer whales are known to attack humpback whales during migration.

The local distribution of humpback whales in southeast Alaska is correlated with the density and seasonal availability of prey species, particularly herring, euphausiids (small crustaceans), and, within Berners Bay, eulachon. Humpback whales enter Berners Bay in April and May to feed on eulachon and other forage fish (USFS, 2004). Up to three humpback whales were documented in Berners Bay during boat surveys in 2000 (USFWS, 2003), and a maximum of five humpback whales have been observed feeding in Berners Bay during the spring eulachon run (USFS, 2004).

Humpbacks are occasionally killed by ship strikes and through entanglement in fishing nets. In the past five years, the average mortality from these sources in southeast Alaska is estimated at 3.0 humpbacks per year (Angliss and Lodge, 2003). Studies in Hawaii are pursuing the effects of noise pollution from the Acoustic Thermometry of Ocean Climate (ATOC) program, the U.S. Navy's Low Frequency Active (LFA) sonar program, and other anthropogenic sources (i.e., shipping and whale watching) (Angliss and Lodge, 2003).

In both Hawaii and Alaska there is a growing whale watching industry, and marine mammal viewing regulations have increased in order to relieve some of the stress on the whales and to prevent them from abandoning preferred habitat because of noise disturbance (Angliss and Lodge, 2003). The MMPA prohibits the “take” of all marine mammal species in waters of the U.S. Take includes actions that produce harassment, which is defined as "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild; or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to migration, breathing, nursing, breeding, feeding, sheltering." NMFS has developed a guide that is intended to help people avoid violating this law. It recommends that people remain at least 300 feet away from marine mammals and limit the time they spend watching a given animal to 30 minutes or less. While these guidelines are only suggestions, NMFS believes that, in most cases, following these guidelines will avoid taking marine mammals, including harassment (67 Federal Register [FR] 4379).

3.3.3.12 Minke Whale (*Balaenoptera acutorostrata*)

Minke whales are relatively small baleen whales (up to 31 feet long and are found all oceans of the world (Leatherwood *et al.*, 1982). Two minke whale stocks are recognized in U.S. waters; Alaskan stock and the California/Oregon/Washington stock (Angliss and Lodge, 2003). Minke whales are not listed as threatened or endangered under the ESA nor are they listed as depleted under the MMPA. Its not know whether the whales that occur in Southeast Alaska are from the Alaska or California-Oregon-Washington Stock. No population estimates exist for the Pacific population as a whole or for the Alaskan stock. Females in the North Pacific reach sexual maturity at approximately 24 feet (7.3 meters) in length; males reach sexual maturity between 21 and 23 feet (6.4 and 7 meters; Horwood, 1990). Gestation time is estimated to be 10 months (Best 1982), resulting in birthing peaks from December through January and June through July (Horwood, 1990).

There are several studies of minke whale feeding from the North Pacific and none of quantitative significance from the eastern North Pacific (Horwood, 1990). Stomach contents of minke whales taken in the northwest Pacific (Japanese Minke whale fishery) indicate that minke whales feed on a variety of fishes and invertebrates such as Japanese anchovy, Pacific saury, and walleye pollock and euphausiids (krill) (Tamura and Fujise, 2000).

In Glacier Bay, west of the project study area, minke whale sightings of between five and eight individuals annually were reported between 1996 and 1999 (Gabriele and Lewis, 2000). From these numbers, relatively few minke whales are expected to occur in the project study area in Lynn Canal.

3.3.3.13 Harbor Porpoise (*Phocoena phocoena*)

Harbor porpoises are odontocetes (toothed whales), as are Dall’s porpoises and the killer whales. Harbor porpoises in the eastern North Pacific range from Point Barrow, Alaska, to Point Conception, California, inhabiting shallow coastal waters (Rice, 1998;Angliss *et al.*, 2003). There are approximately 43,000 in Alaska waters (Angliss and Lodge, 2003)

Because regional populations are believed to exist, it was considered prudent to establish three management units within Alaska: southeast Alaska, GOA, and BSAI stocks. Based on aerial surveys corrected for undetected animals and unsurveyed habitat, the most recent estimate of harbor porpoise numbers in southeast Alaska is approximately 11, 000 (1997 survey). The Southeast Alaska stock inhabits waters from the northern border of British Columbia to Cape

Suckling, Alaska; including the project study area. Individuals either the Southeast Alaska and Gulf of Alaska stocks could potentially occur in the study area.

Reproduction in harbor porpoises appears to either be annual or biannual (Read and Hohn, 1995; Hohn and Brownell, 1990). Reproduction is thought to be strictly seasonal, with parturition, ovulation, and conception occurring in the spring or summer (Read and Hohn, 1995). Individuals are thought to live up to 10 years of age. Harbor porpoises are known to feed on several species of fishes, including herring, capelin, hake, lantern fish and various species of cephalopods (Palka *et al*., 1996).

3.3.3.14 Dall's Porpoise (*Phocoenoides dalli*)

Dall's porpoises are endemic to the northern North Pacific Ocean and adjoining seas, inhabiting both nearshore habitats and pelagic deep waters over the continental shelf and the oceanic basins (Rice, 1998; Angliss and Lodge, 2003). The Alaskan population of Dall's porpoise is managed as a single stock ranging from Southeast Alaska to the northern Bering Sea, present throughout the year, and is estimated to be approximately 83,000 individuals (Angliss and Lodge, 2003). This number, however, may be inaccurate due to the vessel attraction behavior of this porpoise (Turnock and Quinn, 1991). There is no reliable data on population trends for this species (Angliss and Lodge, 2003).

Dall's porpoises are assumed to calve yearly (Ferrero and Walker, 1999). Females reach sexual maturity when they are between 3.8 and 4.4 years and males reach sexual maturity 4.5 to 5 years (Ferrero and Walker, 1999). Males and females reach physical maturity at 7.2 years (Ferrero and Walker 1999).

A variety of prey items have been recorded for Dall's porpoises. In the nearshore waters of Washington, British Columbia, and the Gulf of Alaska, Dall's porpoises fed heavily on capelin, Pacific herring, and cephalopods.

3.3.3.15 Killer Whale (*Orcinus orca*)

Killer whales inhabit all oceans and contiguous seas from the Arctic to the Antarctic, though they are generally more abundant near shore and toward the poles of both hemispheres (Rice, 1998). Two stocks of killer whales are regularly found in Alaska. The eastern North Pacific Northern Resident stock (residents) occurs from British Columbia north and west through all Alaskan marine waters. The eastern North Pacific Transient stock (transients) occurs from Washington north and west through all Alaskan marine waters (Angliss and Lodge, 2003). A third type of killer whale, termed the "offshore" type, has been observed in Southeast Alaska but is found in more southern waters (Angliss and Lodge, 2003). Killer whales occur in stable social groups called pods. Resident-type killer whales usually feed on fish (Olesiuk *et al*., 1990), travel in pods of 10 to 50 individuals (identified by biologists using a system of letters and numbers), vocalize more, and have smaller home ranges than transient killer whales. Transient killer whales mainly feed on marine mammals, including seals, sea lions, porpoise and other whales; travel in smaller pods of one to 15 individuals and are rarely seen in association with resident whales (Olesiuk *et al*., 1990). Whales from the different pod types are genetically distinct and do not appear to interact with each other.

Female killer whales reach sexual maturity when they are 15 to 16 feet (4.6 to 4.9 meters) long, or about 15 years of age (Olesiuk *et al*., 1990). Female killer whales are thought to reach reproductive senescence at about 40 years; i.e., the female is beyond her reproductive age. Males appear to reach sexual maturity between 15 and 21 years of age, and reach maximum size at about 21 years (Olesiuk *et al*., 1990). Females typically give birth to a single calf every two to 12 years, with a mean of 5.3 years (Oliseuk *et al*., 1990). The fecundity rate (the proportion of females that produce viable calves each year) for the British Columbia population was estimated to be 0.224 (Olesiuk *et al*., 1990).

During the 1980s, photo-identification techniques were used for the first time in Southeast Alaska and in PWS to determine the number of individuals and pods of killer whales occurring in those two areas. Following the *Exxon Valdez* oil spill, these studies were expanded and carried out on a more systematic basis. As a result of this research, 250 resident killer whales have been identified in Southeast Alaska as of 1999; (total for Alaska is approximately 745 residents). Of the four main pods that occur in Southeast Alaska, pods AF (42 individuals) and AG (24 individuals) are the more likely to occur in the project study area (Dahlheim *et al*., 1997). The two other pods, AP (30 individuals) and AZ pod (23 individuals) are less likely to occur in the area on a regular basis (Dahlheim *et al*., 1997). AF pod, the largest pod in the region, ranges from the inland waters of northern southeast Alaska to Prince William Sound (Dahlheim *et al*., 1997). At present, population trends of resident whale population in southeast Alaska are difficult to discerned (Angliss and Lodge, 2003).

The number of transient killer whales that range within southeast Alaska waters and British Columbia includes approximately 219 individuals in several pods and assemblages. An additional 14 whales in Southeast Alaska have been provisionally identified as transients (based on morphological characteristics visible in photographs). At present there are little data on transient whale to indicate population trends (Dahlheim, 2001; Angliss and Lodge, 2003).

Resident killer whales appear to feed primarily on a wide variety of fish such as salmon, herring, halibut, and cod. Transient killer whales are opportunistic feeders and have been observed to prey on virtually any large marine animal available including large whales (Jefferson *et al*., 1991). Killer whales also have been observed to prey on river otters, squid, and several species of birds and often feed cooperatively within the pod. Large groups of killer whales are often cooperatively involved in feeding on schools of fish. Smaller groups of transient killer whales (two to eight animals) will more often cooperating when preying on marine mammals such as seals or porpoises (Baird, 2000).

Killer whales come under the jurisdiction of the NMFS PRD, and are protected under the MMPA, but neither the resident nor transient stocks are considered "depleted" or "strategic." The MMPA established a moratorium on the taking of all marine mammals in the U.S. However, killer whales are not taken by Alaska Natives for subsistence purposes.

4.0 ENVIRONMENTAL IMPACTS

In the 1997 DEIS *Wildlife Technical Report*, the main tools used to assess the impacts on wildlife were habitat capability models that were developed for a limited number of management indicator species by the USFS, ADF&G, and USFWS for the TLMP (USFS, 1997). As explained in the 1997 *Wildlife Technical Report*:

> Habitat capability models are based on the concepts of habitat and carrying capacity. Habitat capability is defined as the long-term potential of an area to support animals rather than an estimate of actual numbers present. Rarely, if ever, will habitat variables predict actual populations. Actual population sizes may vary considerably from those predicted by the models. Populations may exceed habitat capability due to a series of mild winters or may be below the estimated habitat capability due to predation, winter mortality, hunting, trapping, or other factors. However, it is assumed that without suitable habitat, populations will be depressed or will cease to exist. The models are designed for use in situations where land use and associated habitat conditions are likely to change. They are intended to allow assessments of resultant changes in habitat quality and availability for selected wildlife species.

The DEIS used habitat capability models to assess the distribution of high to moderate quality habitats in the project study area and to analyze impacts on brown bear, black bear, marten, and mountain goat. It also used consumptive use data from ADF&G for these four species and for moose. Although the models were used to estimate some impacts of the highway within a zone of influence, the original purpose of the models was to help forest managers assess the impacts of large-scale habitat changes, such as from commercial logging, rather than the assessment of impacts along narrow, linear facilities such as a road (USFS 1999 and 2000). The models are useful for some types of analysis but they do not address some important aspects of habitat change associated with highway construction, especially in areas that are presently roadless.

The habitat capability models are “broad brush” measures of habitat impact that produce outputs in terms of numbers of animals lost but they are not based on actual population estimates or distribution data. The impact analysis presented in this document does not rely solely on the habitat capability modeling presented in the 1997 DEIS and no new habitat capability modeling has been developed for this report. Relevant statistics from the 1997 model analyses are incorporated in this report where appropriate.

The following section assesses the potential direct effects on wildlife of the reasonable alternatives. Construction camps, if any, are anticipated to be located within the footprint of the project. Most material sources and access points would be located within the fill limits of the project. Off-site material sources and access points outside the project fill limits are not considered in this analysis because their locations are not known. The impacts from these off-site construction facilities would be temporary and small in comparison to overall project impacts. Direct effects of the project alternatives arise from their construction, maintenance, and use by vehicular traffic as well as their replacement of various habitat types with an open highway surface. For wildlife, these direct effects include:

- Loss of habitat due to development of new transportation facilities (including fill, edge effects, and blowdown of exposed trees [windthrow]);
- Habitat fragmentation;
- Disturbance from construction activities (including right-of-way clearing);

- Disturbance from highway maintenance and avalanche mitigation;
- Disturbance from vehicular traffic (including marine traffic);
- Increased mortality from vehicular collisions; and
- Wildlife use of the highway as a dispersal corridor and for heavy snow avoidance.

The 27 marine and terrestrial wildlife species described in Section 3.3 are considered in this analysis. These species represent hundreds of other species that would have similar types of impacts from the proposed alternatives, although the intensity of the effects may vary substantially between species. In order to facilitate the analysis of potential effects, and to minimize the repetition of information, the species are discussed within functional groupings. Species within these groups share similar types of concerns or susceptibilities to impacts from different parts of the project.

- **Marine mammals** – including the humpback whale, harbor seal, minke whale, killer whale, harbor porpoise, Dall's porpoise, and sea otter;
- **Marine birds** – including the marbled murrelet, Kittlitz's murrelet, harlequin duck, great blue heron, and trumpeter swan;
- **Terrestrial mammals** – including the mountain goat, Sitka black-tailed deer, river otter, marten, brown bear, black bear, wolf, and moose;
- **Terrestrial birds** – including the Queen Charlotte goshawk, American peregrine falcon, olive-sided flycatcher, gray-cheeked thrush, blackpoll warbler, and Townsend's warbler; and
- **Amphibians** – represented by the wood frog.

Each species group is most susceptible to particular types of direct effects. For example, marine mammals are susceptible to disturbance from marine vessels while terrestrial mammals are more susceptible to habitat loss from highway construction. The most important direct effects are discussed for each species group. The different types of impacts are initially discussed in a qualitative manner, followed by more detailed discussions on individual species.

This report does not discuss the indirect effects of the project alternatives on wildlife. Indirect effects of the project alternatives would arise from the human activities that would be facilitated by improved access. Indirect impacts occur later in time or removed in distance from the project site. These may include additional hunting pressure; loss of habitat and disturbance from additional recreational developments and recreational traffic; and the introduction of exotic plant species through the highway corridor. These types of impacts are discussed in a separate *Indirect and Cumulative Impact Technical Report*.

4.1 Alternative 1 – No Action

Direct effects of Alternative 1 would be the same as they are under present conditions. AMHS ferries currently travel in deep waters through Lynn Canal and do not approach any concentration areas for marine mammals or birds other than possibly flocks of gulls as they approach the ferry terminals. Disturbance to marine birds is very temporary in nature and is not likely to affect reproduction or survival of any species. There are no records of any adverse interactions between AMHS ferries and humpback whales, harbor seals, or any other species of marine mammal in the past. The *M/V Fairweather* has just begun operating in Lynn Canal and does not have a history to base a conclusion on its potential effects on marine wildlife. However, AMHS has established procedures for identifying and avoiding marine mammals in operating this vessel. Since this alternative would not entail any new construction projects or activities on land, no direct impacts on terrestrial wildlife species are expected.

4.2 Build Alternatives

4.2.1 Impacts Common to All Alternatives

All of the build alternatives except Alternatives 4A and 4C would include a new highway on the east or west side of Lynn Canal, and all of the build alternatives would increase ferry traffic at one or more locations. Therefore, there would be many similarities in the types of impacts the alternatives would have on marine mammals and birds and terrestrial wildlife. This overview describes those potential impacts. This is followed by a discussion of the magnitude of the wildlife impacts for each alternative.

4.2.1.1 Overall Habitat Loss

The direct loss of different habitat types within the cut and fill limits of the highway alignment and the footprint of new ferry terminals was calculated using USFS GIS data. The results for all alternatives and all habitat types are presented in Table 4-1.

Much of the area occupied by a new highway and ferry terminals is beach and estuary fringe. As indicated in Section 3.1.2, beach fringe is defined as the area within a 500-foot slope distance of the mean high tide line. A variety of vegetation types occur in this area including old-growth forest, muskeg, grassland meadows, shrub-scrub, and emergent wetlands. Habitats in the beach fringe are often important foraging areas in the spring and summer for black and brown bears, river otters, and Sitka black-tailed deer. Estuary fringe, which is defined as the area within a 1,000-foot slope distance of estuaries, is comprised primarily of intertidal mudflats and saltwater marshes. It can also be an important foraging area for bears, martens, and river otters, and provides resting and foraging habitat for many marine birds.

More than 90 percent of the terrestrial habitat impacted by a new highway would be forest, more than half of which is classified as old-growth forest. This habitat is important to all of the terrestrial wildlife considered in this analysis. It provides nesting and foraging habitat for neo-tropical birds migrating through southeast Alaska such as the olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler. It also provides nesting and foraging habitat for the Queen Charlotte goshawk. Old-growth forest near flowing streams is important habitat for brown and black bears, wolf, moose, and marten. Mountain goats use old-growth forest as shelter in the winter during periods of heavy snow.

As described in Section 3.1.2, the acreages of wildlife habitat within the project study area have been defined in terms of WAAs through which the alternatives would pass. The amount of old-growth forest, beach fringe, and estuary fringe areas contained in each WAA was calculated in the 1997 DEIS and is presented in Table 3-1. Within these defined boundaries, there are approximately 76,279 and 74,470 acres of old-growth forest along the eastern and western highway routes, respectively. The amount of old growth habitat lost as a direct result of the footprint of the highway and ferry terminals would be a very small fraction of the total habitat acreage (382 acres for Alternative 2 and 318 acres for Alternative 3). For Alternative 2, the direct loss of beach and estuary fringe habitat would be 566 acres out of a total of 8,259 acres along the alignment for Alternatives 2 and 2C. For Alternative 3, 336 acres of beach and estuary fringe would be lost out of 13,786 acres along the alignment for Alternative 3.

Table 4-1
Wildlife Habitat Lost by Alternative (Acres[1,2])

Habitat Type	Alternative 2	Alternative 2A	Alternative 2B	Alternative 2C	Alternative 3	Alternatives 4A & 4C	Alternatives 4B & 4D
Coastal Fringe Habitat[2,3]							
Beach Fringe	446	405	309	446	220	0	10
Estuary Fringe	120	57	105	120	116	0	38
SUBTOTAL	**566**	**462**	**414**	**566**	**336**	**0**	**48**
Terrestrial Habitat[2]							
Old Growth Forest	382	294	314	382	314	0	53
Other Forest	233	230	128	233	95	0	0
Meadow/Muskeg and Shrub	13	9	13	13	14	0	2
Rock	1	1	1	1	0	0	0
SUBTOTAL	**629**	**534**	**456**	**629**	**423**	**0**	**55**
Wetlands[2]							
Forested	80	62	80	80	31	0	10
Scrub-shrub	1	1	1	1	1	0	1
Emergent	7	3	7	7	2	0	<1
Salt Marsh	6	6	6	3	2	0	0
SUBTOTAL	**94**	**72**	**94**	**91**	**36**	**0**	**11**
Marine Areas							
Beach Bars	1	2	1	1	5	0	2
Rocky Shores	25	27	25	21	7	0	0
Intertidal/ Subtidal[4]	31	35	31	22	13	1	3
SUBTOTAL	**57**	**64**	**57**	**44**	**25**	**1**	**5**

Notes: [1]Rounded to nearest acre
[2]There is overlap between categories. Terrestrial habitat provides the total for all habitat classifications. The other classifications are subtotals with some overlap.
[3]This area consists of project facilities located with approximately 500 feet of saltwater and include all types of terrestrial and wetland habitats as well as rocky shores and beach bars.
[4]Includes fill and dredge for ferry terminals and highway construction but not sidecasted shot rock.

All of the build alternatives that include a highway would result in the loss of wetlands, more than 90 percent of which would be forested wetlands. The maximum loss of wetlands resulting from the build alternatives would impact a small fraction of the 13,679 acres of wetland habitat available in the project study area (both sides of Lynn Canal). (See the *Wetlands Technical Report* for further information on wetlands impacts).

Habitat changes may also take place as a result of the introductions of non-native plant species that could change the structure of vegetation communities. Based on past experience, DOT&PF has found that construction activities are a major source for the potential introduction of non-native plant species along highways. Federal Highway Administration (FHWA) regulations and DOT&PF contract specifications require construction contractors to use specific techniques and procedures to minimize the accidental introduction of foreign plant species carried on construction equipment and to use certified local seed sources and native or non-invasive plant species for hydroseeding of exposed embankments. Soil management on the construction site would also minimize weed introduction. Only soils from the surrounding areas would be used during restoration. Compliance with these best management practices would minimize the risk of introducing foreign plant species to the highway corridor during construction.

The use of the highway may lead to the introduction of invasive species. One invasive species that has been introduced in southeast Alaska and that is presently subject to eradication efforts is the Japanese knotweed (*Polygonum cuspidatum*) (Union of Concerned Scientists [UCS], 2003). Other invasive species of concern to the USFS that either have been introduced to southeast Alaska or could potentially be introduced are listed in Table 4-2. These species could be introduced during highway construction or operation. Best management practices to avoid their introduction during construction are discussed above. While it is not possible to control introduction of plant species carried on vehicles using a public highway, DOT&PF would vegetate all soil slopes prior to the highway opening to the public. This would limit the opportunity for invasive species to become established in the highway corridor.

4.2.1.2 Marine Mammals

Construction Activities – Highway construction activities close to the beach, including blasting, rock drilling, sidecasting, placement of fill, and pile driving for bridges and terminal construction would be sources of underwater noise. The intensity and frequencies of underwater noise generated by construction activities would depend on a number of geomorphic and water variables at each site (National Park Service [NPS], 2003).

The reactions of the marine mammals considered in this assessment to underwater construction noise would depend on how far away they were from the disturbance and what they were doing at the time, among other variables. For example, humpback whales may or may not alter their behavior in response to underwater noise generated by marine vessels and construction activities (NPS, 2003). In some cases, humpback whales change course and speed to avoid a noisy ship. In other cases, especially when they are feeding in an area of high prey availability, whales tolerate very loud noises and may even suffer inner ear damage as a result (Todd *et al.*, 1996; Borggaard *et al.*, 1999). In a pile installation and demonstration project in San Francisco Bay, harbor seals and sea lions in the vicinity of pile driving rapidly left the area when pile driving commenced (California Department of Transportation, 2001; SRS Technologies, 2000; Illingworth and Rodkin, 2001).

NMFS has indicated that underwater sound pressure levels of 190 dB should be the maximum level of noise sustained by marine mammals, especially seals. In the pile installation and demonstration project referenced above, measurements of underwater sound during the driving of large piles for the Oakland-Bay Bridge using a large, 1,700-kilojoule hammer, indicated that underwater linear peak sound levels at a 20-foot depth were roughly 190 dB at a distance of 1,200 feet from the source (California Department of Transportation, 2001). Construction noise measurements done at Seal Island in the Beaufort Sea found that noise from pile driving, generators, and heavy equipment reached 112 to 139 dB at a range of 0.25 nautical mile, and from 92 to 121 dB at 1 nautical mile (Blackwell and Greene, 2001). This would indicate that marine mammals within about ¼ mile of blasting, pile driving, or other percussive noises in or near marine waters from construction at ferry terminals, bridges across the estuaries of rivers, and construction of the highway on the beach could be impacted by noise. Based on the work done by Blackwell and Greene (2001), it is likely that marine mammals would change their behavior as a result of underwater construction noise at distances greater than ¼ mile from the noise source. That behavioral change could include moving out of the area when noise-generating construction activities are taking place. The distance from the noise source that

Table 4-2
Potential Invasive Plant Species From Vehicle Traffic

Scientific Name	Common Name
Acroptilon repens	Russian knapweed
Alliaria petiolata	garlic mustard[3]
Cardaria draba	hoary cress
Centaurea maculosa	spotted knapweed
Cerastium fontanum	common mouse-ear[1]
Chrysanthemum leucanthemum	oxeye daisy
Cirsium arvense	Canada thistle[2]
Convolvulus arvensis	field bindweed
Crepis tectorum	narrow-leaf hawksbeard
Cytisus scoparius	Scotch broom[2]
Dactylis glomerata	orchard grass[2]
Elytrigia repens	quackgrass
Euphorbia esula	leafy spurge
Galeopsis tetrahit	hempnettle[2]
Galinsoga parviflora	smallflower galinsoga
Hieracium aurantiacum	orange hawkweed[2]
Hordeum jubatum	foxtail barley
Hypericum perforatum	common St. John's Wort[2]
Impatiens glandulifera	Himalayan balsam[2]
Lactuca pulchella	blue lettuce
Linaria vulgaris	butter and eggs[1]
Lythrum salicaria	purple loosestrife
Melilotus albus	white sweetclover[2]
Myriophyllum spicatum	Eurasian watermilfoil
Onopordum acanthium	Scotch thistle
Phalaris arundinacea	reed canarygrass[2]
Polygonum convolvulus	wild buckwheat
Polygonum cuspidatum	Japanese knotweed[2]
Ranunculus repens	creeping buttercup[1]
Rorippa austriaca	Austrian fieldcress
Senecio jacobaea	tansy ragwort[2]
Solanum carolinense	horsenettle
Sonchus arevensis	perennial sowthistle
Spergula arvensis	corn spurry
Vicia cracca	tufted vetch

Notes: [1]These species were detected in the project area during the Juneau Access Improvements Project sensitive plant surveys (August 2004).
[2]These invasive species have become established in some areas in the Tongass National Forest (Foster Wheeler Environmental Corporation 2003) and southeast Alaska (Borchert 2003; CNIPM 2003).
[3]This species has already appeared in Juneau (Foster Wheeler Environmental Corporation 2003).
Plants listed in this table were derived from the CNIPM website (http://cnipm.org/plants.html) and BLM Noxious Weeds in Alaska website (http://www.ak.blm.gov/ak930/noxwds.html)

marine mammals may react to underwater construction noise is not known but could be as much as a mile.

To reduce potential underwater noise from construction, in-water pile driving that would take place at ferry terminal sites and bridges that cross the estuaries of major rivers would be conducted using vibratory hammers where possible, which greatly reduces generated noise. In order to minimize construction impacts to marine mammals, monitors would be on site during pile driving and blasting in areas with a high probability of noise impacts to watch for the presence and/or disturbance of marine mammals.

In addition to underwater noise, harbor seals would be susceptible to airborne noise disruption at their haulouts. USFS Standards and Guidelines in the TLMP suggest that developments such as camps and log transfer facilities be no closer than one mile from known marine mammal haulout sites. Harbor seals haulout on sandbars and rocky shores at many locations in Lynn Canal. Construction noise at these haulouts would be attenuated by distance and would be masked by background noise generated by waves, wind, and frequent marine vessel traffic, including AMHS ferries, cruise ships, fishing boats, small aircraft, and recreational vessels. Construction noise levels would vary, with brief peaks during blasting, but would likely be attenuated at or below ambient noise levels at a distance of one mile.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – The build alternatives would cause the direct loss of a maximum of approximately 29 acres (Alternative 2A) of beach bars and rocky shores that could be used by marine mammals to haulout. None of the areas that would be impacted by the build alternatives have been identified as marine mammal haulout sites.

Vehicle traffic along most of the highway for the build alternatives is estimated to be at 65 dBA L_{eq} within 35 feet of the centerline. Based on noise attenuation theory, traffic noise would decrease by approximately 6 dBA with every doubling of distance from the noise source (worst-case noise attenuation over hard ground or water). Therefore, traffic noise would decrease to 59 dBA at 70 feet from the highway centerline, 53 dBA at 140 feet, and 47 dBA at 280 feet. Noise measurements taken along the shore of Lynn Canal for the project (see the *Noise Technical Report*) indicate that ambient noise ranges from about 32 dBA up to 52 dBA. Therefore, vehicle traffic would be within the range of ambient noise at about 100 yards or less from the highway centerline. None of the project alternatives include a highway segment within 100 yards of known harbor seal haulouts except Alternative 3. The bridge over the Chilkat River/Inlet for that alternative is immediately north of Pyramid Island which is used as a haulout by harbor seals. Pile-driving and other activities associated with construction of the bridge would likely cause harbor seals to avoid Pyramid Island. Harbor seals may also avoid using the island as a haulout because of traffic noise from the West Lynn Canal Highway. Harbor seals occasionally haulout on many of the rocks and beach bars along the east and west coasts of Lynn Canal. The highway alignments on the east and west sides of Lynn Canal come to the shore at several locations. It is possible that harbor seals would avoid hauling out in these locations.

Lynn Canal is currently used by hundreds of marine vessels daily, with peaks of activity in the summertime when marine mammals are most prevalent in the Canal. This marine traffic includes large cruise ships, AMHS vessels, private fast ferries, commercial fishing vessels, and private recreational vessels. AMHS mainline ferry service would stop at Auke Bay with Alternatives 2 through 2C and 3. Therefore, these alternatives would eliminate the risk of collisions between mainline ferries and marine mammals along the former AMHS mainline ferry routes in Lynn Canal. There have been no reports of existing AMHS ferries striking humpback whales or any other marine mammals. All of the build alternatives would increase shuttle ferry traffic in specific locations within Lynn Canal such as Berners Bay, Chilkoot Inlet, and Taiya Inlet. This increased shuttle ferry traffic would increase the risk of collisions with humpback whales, harbor seals, and minke whales along the shuttle ferry routes. However, based on the past history of ferry operations in Lynn Canal, this increased risk of collisions is not likely to be high enough to affect these marine mammals. Fast-moving and maneuverable species such as the killer whale, harbor porpoise, and Dall's porpoise are more likely to be able to avoid collisions with marine vessels and are not likely to be impacted by the ferry traffic associated with the build alternatives.

Underwater noise from mainline or shuttle ferries could disturb marine mammals. Marine mammals vary widely in their responses to noise, depending on the species, their behavior at the time (feeding, resting, mating, etc.), distance to the source of the noise, the intensity and frequency of the noise, and other variables (LGL, 2002). Determining the conditions under which a given species responds to noise becomes a statistical exercise, with a few animals responding at great distances, the majority reacting when the source is closer, and a few not responding until the source is very close or not responding at all (LGL, 2002). Although it is assumed that chronic exposure to loud noises could damage hearing sensitivity in marine mammals, there is little direct evidence for what intensities and duration of noise exposure would cause adverse affects or whether such hearing loss would be temporary or permanent (LGL, 2002). All of the different types of ferries considered in the alternatives could generate noises loud enough to disturb marine mammals. However, they would generally travel through an area quickly so high noise levels would not be continuous in any given location. It is likely that most marine mammals would move away from or avoid sources of loud noises before they reach levels that are uncomfortable or painful.

Humpback whales and harbor seals may habituate to strong noise signals. The failure of acoustical harassment devices (greater than 200 dB to keep seals and sea lions from aquacultural facilities or fishing equipment is an indication of habituation. Watkin's impression from 25 years of research was that Cape Cod humpback whales over time changed their responses to whale-watching boats and other vessels from strongly negative to strongly positive reactions (Watkins, 1986).

Sea otters are sensitive to noise and would likely avoid ferry traffic associated with the build alternatives. Because of the low numbers of sea otters in Lynn Canal, increase ferry traffic is not likely to impact this species.

4.2.1.3 Marine Birds

Construction Activities – Loud, periodic noises from construction activities are likely to disturb seabirds and waterfowl in nearby areas. If the birds are feeding or resting, they would fly or swim away from the disturbance and resume their normal behavior in another location. Such short-term displacements would cost birds a small amount of energy and time but would be unlikely to affect reproductive success or survival. In addition, road construction could inhibit birds from nesting or foraging near the right-of-way, thereby increasing the effective area of disturbance during construction. Disturbance of nesting birds would decrease their chances of reproductive success for the season, or could cause them to abandon their nests. Most marine birds in the project study area, such as harlequin ducks, begin breeding in May or June and fledge their young by July. However, some species begin breeding activities as early as March 1 (bald eagle, great blue heron), and some do not fledge their young until the middle of August or early September (bald eagle) (USFS, 2003). Therefore, construction activities during the spring and summer seasons have the most potential for adverse disturbance of birds. Nesting surveys for certain species (e.g., trumpeter swan, bald eagle, and Queen Charlotte goshawk) would be conducted prior to construction in a specific area to avoid disturbing nesting activities during this period.

Great blue heron nest in trees near preferred feeding areas along shoreline and marshy areas between March 1 and July 31. Construction activities could cause great blue herons to avoid nesting near the highway alignment.

Marbled murrelets in southeastern Alaska prefer low elevation, open canopy, old growth stands near coastal waters. They have the potential to nest in these areas along the highway corridor and would be susceptible to construction disturbance during the breeding season.

Kittlitz's murrelets appear to be rare in the project area and nest in high elevation talus slopes. They are unlikely to be affected by highway construction other than temporary disturbance while they are foraging or roosting on nearby waters.

Harlequin ducks nest inland along swift-running rivers and stream banks throughout the east and west sides of Lynn Canal and spend the rest of the year in coastal waters, often resting on boulders along remote beaches. These birds are wary of people and will swim or fly away when approached (Rosenberg *et al.,* 1994). Construction activities would likely disturb harlequins if they could see activity from the water. This could potentially lead them to abandon nearshore resting and feeding areas where the highway alignment runs along the beach or at the edge of the forest.

Trumpeter swans typically nest in marshy areas near small lakes and are very sensitive to disturbance, with consistent disturbance causing abandonment of nests (Rosenberg and Rothe, 1994). Most of the trumpeter swan nests in the Berners Bay area are well upstream of the highway corridor for Alternatives 2, 2B, and 2C. There is at least one known nest site that is approximately 3,200 feet from the highway corridor on the delta between the Antler and Lace rivers (USFS, 2001), but it is separated from the highway corridor by a wide belt of spruce forest that would buffer construction noise and prevent visual disturbance.

The USFWS conducted all-season surveys for water birds in Berners Bay but did not record trumpeter swans. However, these skiff surveys could not go upstream into the estuarine areas most likely to be used by swans. Given the number of nesting trumpeter swans in the area, it is likely that some of these swans, and perhaps wintering swans from other parts of Alaska, spend at least some time foraging in estuarine and marshy areas of the Berners Bay drainage.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – The type of nesting and feeding habitat preferred by great blue herons is abundant in the project study area. Great blue herons have habituated to human presence and vehicle traffic in many urban areas, including Juneau, so they would be likely to habituate to normal maintenance and vehicle traffic along the highway.

Build alternatives would result in the loss of potential nest trees for marbled murrelets in old growth forest. However, the direct loss of old-growth forest due to the project alternatives would result in the loss of less than one percent of the old-growth forest preferred by marbled murrelets for nesting in the study area; therefore, the loss of some nesting trees would not have a population-level effect on this species.

Because the Kittlitz's murrelet is rare in the project area and nests in high-elevation talus slopes well away from the highway alignment on the east or west side of Lynn Canal, this species would not be affected by highway maintenance and traffic.

Highway traffic noise could disturb harlequin ducks in nearshore resting and feeding areas where the highway alignment is at the shoreline. Because these ducks nest inland along the banks of swift-running rivers and streams, nesting habitat would not be impacted by the build alternatives. For these reasons, project alternatives would not result in population level effects to this species.

As indicated above, at least one trumpeter swan nest site is known to exist approximately 3,200 feet from the alignment of Alternatives 2, 2B, and 2C on the delta between the Antler and Lace rivers (USFS, 2001). This site is separated from the alignment by a wide belt of spruce forest. At this distance, vehicle noise would not be noticeable at the nesting site and the forest would prevent visual disturbance of swans using the site. Alternatives 2, 2B, and 2C pass through forested areas as they cross the Antler and Lace rivers, so vehicle traffic would not be likely to cause disturbance of wintering swans.

Shuttle ferry traffic associated with the build alternatives in Berners Bay, Chilkoot Inlet, and in Lynn Canal between Echo Cove and William Henry Bay could cause marine birds and waterfowl such as harlequin ducks or marbled murrelets feeding or resting along the ferry routes to fly or swim away from approaching ferries. The shuttle between Sawmill Cove and Slate Cove would have the highest potential to affect marine birds due to higher concentration during certain times of the year. Because shuttle ferries would travel essentially the same routes on a regular basis, it is possible that marine birds would become habituated to them and avoid the areas where the ferries travel.

4.2.1.4 Terrestrial Mammals

Construction Activities – Some species in the terrestrial mammals group, such as bears, wolves, river otters, and martens, give birth in dens during the winter or spring. Highway construction during these months could cause some direct or indirect mortality of adults and young if dens are abandoned or inadvertently destroyed. Because bears tend to choose den sites at higher elevations than the highway corridor on the east or west side of Lynn Canal, the potential for disturbance of denning is much smaller for bears than it is for river otters, wolves, or marten.

Wolves have been known to abandon denning sites due to disturbance from human activities (Paquet and Darimont, 2002; Ballard *et al.*, 1987; Person and Ingle, 1995; Paquet *et al.*, 1996; Weaver *et al.*, 1996). The degree to which wolves may abandon den sites varies depending on the quality of the habitat, the level of habituation with humans, and the individual nature of the wolf. DOT&PF would conduct pre-construction wolf den surveys within 600 feet of the project construction limits in any areas that consultation with resource agencies identify as having high potential for wolf dens to minimize impacts to denned wolves.

Black bears and brown bears typically avoid humans and highways. However, bears are attracted to human garbage and food supplies, which often brings them into conflict with humans and results in bears being shot in defense of life or property. This is often a problem for remote construction camps and remote campers and hunters (McLellan, 1989). Best management practices and control measures would be taken to minimize the potential for this to occur.

The highway for any of the build alternatives would transect the territories of river otters in the larger river and stream valleys in the project area. Construction activities near streams and beaches would temporarily disrupt the natural movement patterns of river otters.

For wolves, the primary response to human activities and structures is avoidance. This type of disturbance response leads to changes in movement patterns and habitat use rather than direct interactions with humans or vehicles.

Moose and deer tend to avoid active construction zones but habituate easily to human structures. They will often feed near highways even when vehicles are present and will rest or travel along cleared highways during heavy snow conditions.

Mountain goat summer habitat is primarily at higher elevations than the highway alignment proposed on the east and west sides of Lynn Canal. In areas where goats use low elevation habitats near the coast, construction noise and human activity could displace some animals from established ranges to other areas.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Behavior avoidance of a highway or physical features of a highway such as steep embankments or retaining walls may function as a barrier to movement for some species and may fragment their habitat by limiting their ability to use all of their range. Other species such as moose and deer readily cross highways so habitat fragmentation from highways is not an issue for these species. Mountain goat summer habitat is primarily at higher elevations than the highway alignment proposed on the east and west sides of Lynn Canal; therefore, fragmentation would not be an issue for this type of goat habitat. In winter, mountain goats venture down to lower elevations in old-growth forest habitat to escape deep snow. Disturbance from traffic and human activity could reduce the available winter habitat in some areas where it is in close proximity of the highway.

Black bears in southeast Alaska tend to migrate seasonally between winter den sites at higher elevations and summer feeding grounds at lower elevations. This means that bears would likely cross portions of the proposed highway corridor on the east or west side of Lynn Canal. In some areas, black bears would have to cross the highway or under highway bridges to access estuarine emergent wetlands and meadows below the highway/bridges to feed on grass and sedges during the spring. Black bear would also need to cross the highway to access feeding concentration areas such as at the mouth of Sawmill Creek or scavenge along the shoreline for fish or marine mammals. A lack of escape cover near some portions of the highway and traffic disturbance could block some bears from portions of their existing home ranges. Because black bears are highly adaptable and often learn to coexist near human development, a highway is not likely to result in a substantial barrier to the movement of this species. One exception would be where tall and steep cuts could create a physical barrier to their movement. These types of cuts would occur at some locations along the alignment of Alternatives 2 through 2C from Comet Landing to Katzehin and for Alternatives 2, 2A, and 2C from Katzehin to Skagway.

Brown bears also move seasonally between higher elevation den sites and lower elevation foraging habitat that includes rivers and estuarine wetland areas. Brown bears tend to avoid highway traffic much more than black bears. One study found that brown bears avoided roads regardless of traffic volume (McLellan and Shackleton, 1988). This means that they would be more likely than black bears to abandon certain parts of their range rather than cross the highway. Brown bears could still access habitat on either side of a highway on the east or west side of Lynn Canal by passing under the many bridges if they are unwilling to cross the highway. Because the highway on the east or west side of Lynn Canal would separate higher elevation habitats from beach fringe and estuary habitats and these areas often contain important food resources, such as new vegetation growth in the spring, the effective loss of habitat could cause brown bears to be displaced from habitat areas surrounding the highway (Schoen *et al.*, 1993). This impact could be reduced by using wildlife underpasses at appropriate locations along the highway.

Martens have relatively small home ranges compared to bears and do not move great distances; therefore, habitat fragmentation would not be an issue for this species. The direct impacts of the highway for the build alternatives would be concentrated on those animals that lived near the proposed highway corridor. Project alternatives would result in the direct loss of less than one percent of the old-growth forest habitat that marten use in the project study area (Figure A-4, Attachment A). The greatest impact of a highway on marten would be increased accessibility to the region by trappers. Marten are particularly vulnerable to trapping, and increased access to the region resulting from a highway would increase trapping pressure on this species. This potential impact is discussed further in the *Indirect and Cumulative Impact Technical Report*.

River otters live and travel near fresh and marine waters and are closely associated with old-growth forests within 500 feet of the beach (USFS, 1997). The build alternatives would involve construction of a highway through old-growth forest and beach fringe along much of its length, as well as crossing riparian corridors. This would likely destroy some burrow and den sites and would transect the territories of an unknown number of river otters. The resulting habitat fragmentation would require some otters to pass under bridges, through culverts, or cross the highway.

Wolves actively avoid highways (USFS, 2000; Person, 2001) and because the highway alignment is mostly at lower elevations, access to beaches and riparian areas along the corridor may be restricted for wolves. Habitat fragmentation could decrease their use of some estuarine areas. However, habitat loss and fragmentation resulting from a highway would have substantially less effect on wolf populations than the increased hunting and trapping that would result from improved access to the region (Dave Person, personal communication, 2004). As indicated in Section 3.3.3.7, a major factor affecting the Alexander Archipelago wolf population is road access that facilitates human harvest of wolves (Person, 2001). This potential impact is discussed further in the *Indirect and Cumulative Impact Technical Report*.

Sitka black-tailed deer use a variety of habitat types (USFS, 1997), and their populations appear to be limited by heavy snow conditions and the quality of winter habitat. Based mostly on lack of hunter success and lack of high quality winter habitat, the deer population is considered to be very small on the east side of Lynn Canal north of Echo Cove and the west side of the Canal north of William Henry Bay (Figure 3-3). Therefore, the build alternatives would cross only a few miles of Sitka black-tailed deer habitat. Deer readily cross roads and habitat fragmentation is not an issue.

DOT&PF would use helicopters to deliver explosive devices to unstable avalanche zones along an East Lynn Canal Highway during the winter. Helicopters would also be used to conduct snow studies along the West Lynn Canal Highway during the winter as part of an avalanche control program. Howitzer fire would be used to control buildup of unstable snow along the West Lynn Canal Highway.

Avalanche control would be a regular maintenance activity that would vary in frequency depending on annual weather conditions. Mountain goats are very sensitive to human disturbance in their alpine habitats, especially from helicopter traffic (Foster and Rahs, 1983, Cote, 1996 and USFS, 2001). The intensity of disturbance reactions increases with the frequency of flights and as helicopters come closer to the ground. Disturbance reactions range from alertness to panic. This would result in a temporary decrease in foraging efficiency by forcing animals into less productive escape terrain or, in some cases, injury or death from collisions and falling (Cote, 1996 and USFS, 2001). Physiologic stress such as increased heart rate and metabolic rates or disruption of rumination can occur from fleeing from a perceived threat even though the animals do not appear to be directly affected (MacArthur *et al.*, 1982 and

Maier, 1996). Pregnant goats can also be displaced from preferred winter habitat from repeated disturbance, thereby affecting reproductive success. There appear to be little, if any, habituation of mountain goats over time to helicopter disturbance (Foster and Rahs, 1983 and Cote, 1996).

During heavy snow conditions, when avalanche danger is highest, goats tend to retreat to lower elevations and seek shelter under dense-canopied old-growth forests (Schoen and Kirchhoff, 1982, Fox, 1983, and Fox and Smith, 1988). However, they are never far from steep escape terrain and are therefore likely to be near avalanche chutes at least some of the time. Goats have also been observed at high elevations and traversing slide zones during late winter in the project study area (D.R. Klein, personal communication, 2003). Mountain goats are therefore susceptible to disturbance from helicopters, explosive devices, and howitzer fire used for avalanche control.

Regular maintenance of avalanches chutes would reduce the frequency of large avalanches, resulting in less snow reaching the forested margins of avalanche areas. This would potentially reduce the likelihood of goat mortality from these larger events. Surveying of open areas for mountain goats prior to avalanche mitigation would likely haze exposed animals into forested areas.

Any crossings of the highway would place wildlife in danger of collisions with vehicles. The number of collisions will depend on the speed and frequency of traffic as well as driver visibility and population density of animals (USFS, 2000). The numbers of animals killed on the highway would likely vary considerably between seasons and years and is unpredictable.

Vehicle collisions may become a source of bear mortality, particularly black bear, especially at night when bears are more active yet harder to see. In some locations, brown bears tend to avoid roads regardless of traffic volume (McLellan and Shackleton, 1988). Brown bears would therefore be less likely to cross the road and have less chance of being killed by vehicles. There are many reported cases of brown bear in southeast Alaska crossing roads. In fact, towns such as Yakutat, Angoon, and even Juneau have yearly sightings of brown bear on road. In fact, towns such as Yakutat, Angoon, and even Juneau have yearly sightings of brown bears on well-traveled roads. The extent to which brown bears adapt to crossing the highway would increase their susceptibility to vehicle collisions and decrease their susceptibility to habitat fragmentation. Bridges along major migration corridors would address both concerns.

River otters and martens travel in forested areas as well as along waterways and will cross roads when they encounter them. Otters are killed on an infrequent but regular basis by vehicles in the Juneau area (Barten, 2001a). Some research indicates that martens and other mustelids (weasels) use drainage culverts to cross under roads safely (Clevenger *et al.,* 2001), so river otters and martens traveling along streams could pass through culverts as well as under bridges rather than going across the highway.

Sitka black-tailed deer are susceptible to vehicle collision mortality during winter as they move toward the beach and use the highway to escape deep snow conditions. Because most of the deer in the project area are south of Echo Cove and William Henry Bay, this issue would be primarily limited to the Echo Cove – Sawmill Cove section of highway for all project alternatives except Alternatives 4A and 4C which do not include a highway segment. Deer populations in this area are at low densities. Currently there is very minimal winter traffic on the Glacier Highway near Echo Cove because the state does not maintain this section of the highway during winter. Alternatives 2 through 2C and 3 would result in increased winter traffic volume with a probable increase in deer mortality from vehicle collisions.

Deer populations are at higher densities between Auke Bay and Echo Cove than between Echo Cove and Sawmill Cove. Traffic volumes are also higher on this section of Glacier Highway than they would be on the highway segments of any build alternative. Traffic collisions with deer on Glacier Highway are relatively rare. Therefore, increased mortality from vehicle collisions on a new highway from Echo Cove to Sawmill Cove is unlikely to have a population-level effect on Sitka black-tailed deer.

Moose are often attracted to highways to feed on roadside grasses and brush and to escape deep snow. This association with highways is responsible for hundreds of moose being killed in Alaska each year, with an unknown number of others sustaining potentially fatal injuries. DOT&PF publishes statistics each year on the location and circumstances of reported highway vehicle accidents in Alaska, including those involving moose (DOT&PF, 2003). For many sections of highway in the report, including the Sterling, Seward, Parks, Glenn, and Richardson highways, traffic levels are much higher than the 930 and 730 annual average daily traffic (AADT) demand projected for Alternatives 2 and 2C, respectively, in 2038 (see Section 4.3.7.1, Capacity and Demand, in the SDEIS). However, the number of collisions with moose does not appear to be correlated with traffic volume; low collision rates occur on many busy sections of highway and high collision rates occur on some stretches of road having an AADT near 2,000. For example, on an eight-mile stretch of the Sterling Highway near Ninilchik (between mileposts 42 and 50) that has an ADT of 2,080 vehicles, 6 moose were reported hit in 2001. In one of the worst sections of the Sterling Highway, a 17-mile stretch near Skilak Lake Road with an AADT of 2,600 vehicles, 12 moose were reported hit in 2001. On other sections of highway with similar traffic volumes, none to several collisions with moose are reported per year.

Frequency of moose collisions appears to be more a function of the density of moose in an area, snow conditions that affect moose movements, and poor road/environmental conditions that limit driver visibility rather than traffic volume. Moose collisions are much more common in winter months and at night (DOT&PF, 2003). The highway alignment on the east and west sides of Lynn Canal would pass through areas of moose winter habitat. Although winter traffic volumes would be low for all build alternatives, a highway would increase the potential risk of moose mortality from vehicle collisions. DOT&PF would post warning signs cautioning motorists to help minimize the vehicle collision mortality on moose.

In areas where the highway passes near mountain goat winter habitat, goats could be attracted to snow-free areas along the road and be exposed to collision mortality. However, noise and disturbance from traffic would likely limit the use of areas along the road by mountain goats.

4.2.1.5 Terrestrial Birds

Construction Activities – Loud, periodic noises from construction activities are likely to disturb terrestrial birds in nearby areas. If the birds are feeding or resting, they would fly away from the disturbance and resume their normal behavior in another location. Such short-term displacements would cost birds a small amount of energy and time but would be unlikely to affect reproductive success or survival. In addition, road construction could inhibit birds from nesting or foraging near the right-of-way, thereby increasing the effective area of disturbance during construction. Disturbance of nesting birds would decrease their chances of reproductive success for the season, or could cause them to abandon their nests. Many of the terrestrial bird species considered in this assessment nest in the type of old-growth forest habitat that would be crossed by the highway. To comply with the Migratory Bird Treaty Act, clearing activities would be avoided during the nesting season in areas used by migratory birds including the olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – For many terrestrial bird species in southeast Alaska, conservation concerns are the result of landscape-scale loss of habitat due to commercial logging (BPIF, 1999). The amount of habitat that would be lost by the build alternatives is negligible in comparison, even if one includes habitat effectively lost due to disturbance and displacement. However, highways create openings in previously closed forest canopies that lead to "edge effects." Some species, like ravens, jays, and crows, prefer to live on the edge of forests and tend to prosper around roads (USFS, 2000). These species are also predators on forest-dwelling species, whose populations will tend to decline as the edge-dwelling populations increase. Many forest-dwelling species will readily fly across highway openings much as they would cross streambeds (Cassaday St. Clair, 2003). Birds that fly across highways are sometimes killed by passing vehicles to the benefit of scavenger species.

Queen Charlotte goshawks are heavily dependent on old-growth forests for nesting and hunting and they avoid open habitats. The direct loss of habitat due to the footprint of the highway for the build alternatives would be less than one percent of old-growth habitat in the area. However, the opening in the forest canopy created by the highway corridor may inhibit goshawk movements and affect the establishment or use of territories, especially in narrow strips of forest between the beach and the highway.

Peregrine falcons may be present in the project area during migration but they have not been detected in breeding bird surveys in the area (Alaska Off-Road Breeding Bird Survey, 2003; Smith *et al*., 2001). Any direct effects of the highway for the build alternatives from habitat loss would be negligible. This species has recently been delisted from endangered status.

Olive-sided flycatchers, gray-cheeked thrush, and blackpoll warblers have all become State of Alaska Species of Conservation Concern because of declining population trends nation-wide. These species primarily nest in interior forests. Upper Lynn Canal, therefore, is on the edge of their breeding ranges. Olive-sided flycatchers and blackpoll warblers have not been detected on any of the 11 off-road breeding bird survey routes in the Juneau area (Alaska Off-Road Breeding Bird Survey, 2003). Gray-cheeked thrush were observed on 3 of the 11 routes but only about once every two years. The highway for the build alternatives would likely affect a minimal amount of nesting habitat for these three species (less than one percent of available habitat).

Townsend's warbler is considered a State of Alaska Species of Special Concern (ADF&G, 1998), primarily because of concerns for loss of habitat from clearcut logging. Townsend's warblers were commonly observed on 10 of the 11 routes (Alaska Off-Road Breeding Bird Survey, 2003) and were listed as abundant at Limestone Creek south of Juneau (Smith *et al.,* 2001). The project area has an abundance of suitable mature forest habitat so they could be common along the highway corridor for the build alternatives. Direct loss of habitat from the build alternatives would be less than one percent of what is available for this species, even allowing for decreased habitat values near the highway corridor due to edge effects.

4.2.1.6 Amphibians

Construction Activities – Frogs and toads live in both marshy and forested wetlands. The build alternatives would result in the loss of 11 (Alternatives 4B and 4D) to 88 (Alternatives 2 and 2C) acres of this habitat (Table 4-1). Because these species cannot move rapidly enough to avoid construction equipment, individual amphibians present in the construction area would be lost.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Since amphibians have rather small home ranges and do not appear to travel far from their natal areas (NatureServe, 2003), potential habitat loss and fragmentation would only affect amphibians that lived near the highway corridor for the build alternatives. The build alternatives would result in the permanent loss of less than one percent of the wetland habitat on the east (11,239 acres) or west (2,440 acres) side of Lynn Canal (see *Wetlands Technical Report* for further information on wetlands in Lynn Canal). While some of the wetlands in this total are above an elevation that would provide suitable habitat for amphibians, the bulk of the wetlands are at low elevations and would support amphibians. Therefore, this loss of habitat would not have a measurable impact on amphibian populations in the region.

The primary highway-related concerns for amphibians are the potential for vehicle collision mortality and the pollution of breeding ponds from highway stormwater runoff or accidental spills (USFS, 2000). Highway runoff is not anticipated to be in excess of Alaska Water Quality Standards; therefore, it would not impact amphibians. Fuel spills from vehicle accidents where fuel is discharged into adjacent wetlands would be rare occurrences. Such accidents would cause localized impacts to amphibian populations.

4.2.2 Alternative 2 – East Lynn Canal Highway with Katzehin Terminal and Alternative 2C – East Lynn Canal Highway with Shuttle to Haines from Skagway

Alternatives 2 and 2C would have similar potential impacts on wildlife and are therefore discussed together. Both alternatives consist of a highway from Echo Cove around Berners Bay and continuing along the east coast of Lynn Canal to Skagway. Alternative 2 includes shuttle ferry service between Haines and a new ferry terminal north of the Katzehin River. Alternative 2C does not include the Katzehin terminal. Shuttle ferry service would be provided between Haines and Skagway with this alternative. Mainline AMHS ferry service would end at Auke Bay under both alternatives.

4.2.2.1 Overall Habitat Loss

Alternatives 2 and 2C would result in the loss of approximately 629 acres of terrestrial habitat, 90 percent of which is located in the coastal fringe. This direct impacts to forest habitat include a long-term loss of 382 acres of old-growth habitat and 233 acres of other forest consisting of timber stands with an average diameter-at-breast-height (dbh) less than 9 inches and/or timber volume less than 8,000 board feet per acre. Loss of non-forested habitat includes 13 acres of shrub, open meadow, and muskeg communities (Table 4-1). The direct loss of this terrestrial habitat represents about 0.8 percent of the 76,279 acres of old-growth forest on the east side of Lynn Canal.

Alternatives 2 and 2C would also result in the lost of 80 acres of forested wetlands (also included in the old growth category totals on Table 4-1), 1 acre of scrub-shrub wetlands, and 7 acres of emergent wetlands. Alternative 2 would result in the loss of six acres of estuarine emergent wetlands. Because it does not include a new ferry terminal at Katzehin, Alternative 2C would result in the loss of approximately three fewer acres of estuarine emergent wetlands than Alternative 2. There are 6,720 acres of forested wetlands, 2,134 acres of scrub-shrub wetlands, and 1,812 acres of palustrine emergent wetlands within the project study area on the east side of Lynn Canal. The loss of forested wetlands resulting from Alternatives 2 and 2C would represent one percent of that type present in the study area on the east side of Lynn Canal. The loss of scrub-shrub and palustrine emergent wetlands would represent 0.05 and 0.4 percent of those wetland types on the east side of Lynn Canal (see *Wetlands Technical Report* for further information on wetland impacts of the build alternatives).

Alternatives 2 and 2C would be on the shoreline at locations north of Sherman Point. As a result, these alternatives would result in the loss of 1 acre of beach bar and 21 acres of rocky shore. The Katzehin ferry terminal for Alternative 2 would also result in the loss of four acres of rocky shore.

4.2.2.2 Marine Mammals

Construction Activities – Humpback whales use Berners Bay (Marston *et al*., 2002; USFWS, 2003), and are present there most frequently during the spring when they enter the bay to feed on spawning herring and eulachon. They are present in Lynn Canal north of Sherman Point and in Taiya Inlet. It is unlikely that they would come within ¼ mile of the bridge construction sites across the Lace and Antler rivers in Berners Bay and the Katzehin River because the river channels are narrow and shallow. At the Katzehin ferry terminal site, construction monitors would be used to minimize impacts to marine mammals. It is likely that whales would perceive active construction areas from a distance and avoid the area if noise levels were bothersome. Avoidance of particular areas would probably only last as long as the noise continued.

Impacts to the minke whale would likely be similar to the humpback whale but based on their low numbers in Lynn Canal and the construction monitoring referenced above, effects on the population in Lynn Canal would be negligible. Other species such as harbor porpoise, Dall's porpoise, and killer whales, are also likely to be affected by underwater noise from construction such as pile driving and blasting activity on land. However, these wide-ranging and fast-moving species occur in low numbers in the project area and any disturbances would be short-term; therefore, the species should not be affected at the population level.

Hundreds of harbor seals are known to haulout on sandbars within Berners Bay and at the Katzehin River delta, especially during late April and early May when spawning eulachon congregate in these waters (Marston *et al*. 2002 and USFWS, 2003). Harbor seals have been observed hauled out on the west side of Taiya Inlet at the base of Halutu Ridge (ADNR, 2002). They also occasionally haul out on exposed rocks at low tide along the mainland and islands of Lynn Canal. Harbor seals may avoid hauling out close to the Lace, Antler, and Katzehin rivers and rocky beaches north of Sherman Point where the alignment is adjacent to the beach during construction. Construction would not be scheduled within a mile of these locations during the April/May high use period to reduce potential impacts to harbor seals. The haulouts on the west side of Taiya Inlet are more than a mile from the alignment for Alternatives 2 and 2C. Seals hauled out on the west side of Taiya Inlet are probably habituated to a fair amount of noise from marine traffic and would not likely be disturbed by construction activities across the inlet.

Sea otters would react to loud underwater construction noise by avoidance, similar to the harbor seal. Construction activities in nearshore habitats associated with Alternatives 2 and 2C would be short-term and unlikely to have adverse impacts on the small sea otter population in Lynn Canal.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Loss of habitat for marine mammals would include the shoreline areas filled for the Katzehin ferry terminal under Alternative 2 and for highway slopes for both Alternative 2 and 2C. Total area of fills on beach bars and rocky shores under Alternative 2 would be approximately 26 acres (Table 4-1). Because it does not include the Katzehin ferry terminal, the area of beach bar and rocky shore filled by Alternative 2C would total 22 acres. Fill for the highway embankment at any one location would be less than 2.2 acres. None of the areas filled by Alternatives 2 and 2C are identified haulouts for marine mammals.

The alignment for Alternatives 2 and 2C is more than a mile away from beaches and sand bars known to be used by harbor seals in Berners Bay. Therefore, traffic noise would not impact harbor seals in this location. The highway alignment would be immediately adjacent to the beach at a number of locations north of Sherman Point. It is likely that harbor seals would avoid hauling out in these locations. The alignment is especially close to the shore along Taiya Inlet; however, this shoreline is very steep and there are very few places where seals could haul out even at low tide. Seals may habituate to traffic noise at the Katzehin River or may choose to use areas further down stream from the proposed bridge. Operation of the Katzehin ferry terminal north of the river under Alternative 2 is not likely to cause disturbance to harbor seals because of the distance between this terminal and seal haulouts.

Under Alternative 2 there would be 63 shuttle ferry round trips/week during the summer between the proposed Katzehin ferry terminal and Haines. For Alternative 2C, shuttle ferry trips between Haines and Skagway would increase to 42 round trips/week during the summer. This would increase the risk of collisions with humpback whales and minke whales in Chilkoot Inlet under Alternative 2 and Chilkoot and Taiya inlets under Alternative 2C. Based on annecdotal information, it appears that there are fewer humpback whales at the northern end of Lynn Canal than at the southern end, and few minke whales use the Canal. Because marine mammal collisions with vessels are rare (particularly for ferries) and whale densities in Chilkoot and Taiya inlets appear to be low, the increased risk of collisions associated with Alternatives 2 and 2C would not be high enough to adversely affect marine mammals in Lynn Canal.

4.2.2.3 Marine Birds

Construction Activities – Great blue herons are present in small numbers in Berners Bay and are also likely to nest in the Katzehin River delta area. Construction activities could cause great blue herons to avoid nesting near the alignment for Alternatives 2 and 2C in these areas.

Alternatives 2 through 2C would cross potential nesting habitat for marbled murrelets from Echo Cove to Skagway. Construction activities could disturb breeding birds near the highway alignment. To minimize impacts to nesting birds, no clearing would be done in habitats favored for nesting by these birds during the nesting season.

The alignment for Alternatives 2 and 2C run along the beach at many locations north of Sherman Point in Lynn Canal and in the Taiya Inlet. Construction activities could flush harlequin ducks and Kittlitz's murrelets feeding or resting nearshore in these areas, and they may temporarily stop the use of these areas near active construction sites.

As indicated in Section 4.2.1.3, construction associated with Alternatives 2 and 2C would be at least ½ mile from any known trumpeter swan nest sites in the Berners Bay area. Therefore, construction of these alternatives would not be likely to impact trumpeter swans.

Habitat Loss and Effects of Maintenance and Vehicle Operation – The type of nesting and feeding habitat preferred by great blue herons is abundant in Berners Bay or the Katzehin River delta. Because the highway corridor is relatively narrow, the direct loss of habitat across these river valleys is small compared to the available habitat. The 78 acres of forested wetland removed in the Berners Bay area represents about 1.6 percent of this wetland type in that area (6,232 acres). In the Katzehin River area, Alternatives 2 and 2C would remove 1.3 acres, or about 0.3 percent, of the forested wetland that could be used by great blue herons for nesting and feeding (488 acres). Disturbance from vehicle traffic would likely displace herons from an additional "avoidance zone" around the highway that would probably vary in size with traffic volume and season. Great blue herons have habituated to human presence and vehicle traffic in many urban areas, including Juneau, so they would be likely to habituate to normal maintenance and vehicle traffic along the highway. For these reasons, Alternatives 2 and 2C would not affect the population of great blue herons on the east side of Lynn Canal.

Alternatives 2 and 2C would result in the loss of potential nest trees for marbled murrelets in old-growth forests. However, the direct loss of old-growth forest due to Alternatives 2 and 2C would be less than one percent of the old-growth forest in the project area. Disturbance from vehicle traffic would likely displace murrelets from nesting near the highway and would thus increase the effective loss of habitat. Given the abundance of potential nesting habitat in the area, this relatively small habitat loss would not limit reproductive success of the local murrelet population.

Highway traffic noise could disturb harlequin ducks in nearshore resting and feeding areas where Alternatives 2 and 2C run along the shoreline north of Sherman Point. Because these ducks nest inland along the banks of swift-running rivers and streams, the only potential direct impacts on nesting habitat would be in the relatively small areas where the highway alignment of Alternatives 2 and 2C cross streams. For this reason, Alternatives 2 and 2C would not result in population level effects to this species.

Marine birds and waterfowl feeding or resting along the shuttle ferry route in Chilkoot Inlet would fly or swim away from approaching ferries and resume their normal behavior in another location. A shuttle ferry would cross between Katzehin and Haines about every 45 minutes during day time hours in the summer. Such short-term displacements would cost birds a small amount of energy and time but would be unlikely to affect their survival.

4.2.2.4 Terrestrial Mammals

Construction Activities – Wolf dens are generally located within 100 feet of fresh water. Alternatives 2 and 2C would cross the larger rivers on the east side of Lynn Canal (Lace, Antler, and Katzehin rivers) in estuarine areas where the water is brackish and wolf dens would not be expected. For smaller streams, particularly those with beaver activity, there is the potential for the alignment to be in the vicinity of dens, and construction could result in the abandonment or destruction of some den sites. DOT&PF would conduct pre-construction wolf den surveys within 600 feet of the project construction limits in any areas that consultation with resource agencies identify as having high potential for wolf dens. If wolf dens are identified during these surveys, DOT&PF would conduct further agency consultations to determine appropriate measures to minimize impacts.

Construction of either Alternative 2 or 2C would likely require at least one temporary construction camp. Areas considered for camps would likely contains some old-growth forest and old-growth forest wetlands that provide habitat for brown and black bears which could be attracted to human garbage and food supplies at the camp, resulting in some of these animals being shot in defense of life or property. Best management practices and control measures would be taken to minimize the potential for this to occur.

The highway would transect the territories of river otters and martens in the drainages of Sawmill and Slate creeks and the Lace and Antler rivers in Berners Bay, Dayehas Creek, Katzehin River, and Kasidaya Creek, and the old-growth wetlands between Slate Creek and Comet. Construction activities near streams would temporarily disrupt the natural movement patterns of these species.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Approximately 97 percent of the terrestrial vegetation that would be removed for Alternatives 2 and 2C is forest, including 382 acres (61 percent of total) classified as old-growth forest. Numerous species rely on habitat characteristics of old-growth forests, including all of the species considered in this analysis. The direct loss of habitat resulting from Alternatives 2 and 2C would have a small effect on terrestrial mammals because this loss would amount to about 0.8 percent of these habitats available in the project study area.

The largest impact of direct habitat removal associated with Alternatives 2 and 2C would be on the small (100 to 150 animals) moose population in Berners Bay. These moose spend the spring, summer, and fall in the upper valleys of the Lace, Berners, Antler, and Gilkey rivers and move to the coastal area of these drainages to avoid heavy snows in winter. Alternatives 2 and 2C would result in the loss of about 24 acres of winter habitat for these moose. There is about 30,000 acres of winter habitat in the Berners Bay area. Therefore, Alternatives 2 and 2C would result in the loss of about 0.08 percent of this habitat (Figure 3-3).

There is moderate to high quality habitat for black bear along most of the coastal fringe of the east side of Lynn Canal from Echo Cove to Skagway (Figure A-3, Attachment A). This means black bears would have to cross the highway or go under highway bridges from higher elevation denning sites to access estuarine emergent wetlands and meadows below the highway/bridges to feed on grass and sedges during the spring over much of the length of the highway for Alternatives 2 and 2C. Because black bears are highly adaptable and often learn to coexist near human development, a highway is not likely to result in a substantial barrier to the movement of this species in the project study area. One exception may be where steep cuts or embankments at some locations between Comet Landing and Skagway could create a physical barrier to black bear movement.

Brown bears also move seasonally between higher elevation den sites and lower elevation foraging habitat that includes rivers and estuarine wetland areas. Brown bears use the wetland areas between the mouths of the Lace and Antler rivers in Berners Bay for foraging in the spring and summer (Christensen and Van Dyke, 2004). Because the highway under Alternatives 2 and 2C would separate higher elevation habitats from beach fringe and estuary habitats that contain important food resources, such as new vegetation growth in the spring, the effective loss of habitat could cause brown bears to be displaced from habitat areas surrounding the highway in the Lace and Antler river estuaries, the Sweeney Creek drainage near Comet Landing, and the Dabeyas Creek, Katzehin River, and Kasidaya Creek drainages (Schoen *et al.*, 1993). The habitat capability modeling conducted in 1997 predicted that a highway along the alignments for Alternatives 2 and 2C would decrease brown bear habitat capability by 28 percent compared to present conditions, primarily because of habitat fragmentation (Table A-2, Attachment A). This impact could be reduced to an extent by adapting bridges to function as wildlife underpasses or by brown bears adapting to the presence of a highway. Based on corridors used for spring and summer foraging in the Berners Bay area identified by Christensen and Van Dyke (2004), specific locations for wildlife underpasses in this area have been identified and would be developed during design if Alternative 2 or 2C were selected for the project.

Martens and river otters have relatively small home ranges and appear to cross roads on a regular basis. Therefore, habitat fragmentation would not be an issue for these species in most locations along Alternatives 2 and 2C except in the area of Gran Point and Met Point.

Gran and Met points are important haulouts for Steller sea lions as discussed in the *Steller Sea Lion Technical Report*. To discourage people from accessing them, the design for Alternatives 2 and 2C would include cut banks, retaining walls, and screening structures, where necessary, within approximately 3,000 feet of each location. These barriers could inhibit the movement of martens and river otters in these two areas although there would be culverts these animals could use to cross the highway. Although a highway could impact individual animals, it would not have population-level effects on martens and river otters in the project study area because the areas around Gran and Met points have low habitat value for these species, and these areas are a small portion of their range.

Wolves are known to be present in the Lace, Antler, and Katzehin River valleys (USFS, 2001; N. Barten, personal communication, 2003). Although wolves could continue to access the estuarine areas of these rivers by crossing the highway or traveling along the floodplain under the bridges, they have an aversion to human presence and may abandon portions of their range if there is too much human activity in that area (Dave Person, personal communication, 2004).

Any crossings of the highway would place wildlife in danger of collisions with vehicles. Vehicle collisions would become a source of bear mortality for Alternatives 2 and 2C because the highway for these alternatives crosses moderate to high quality habitat for this species over much of its length. Collisions are most likely to occur during spring and summer when traffic numbers are higher and bears frequent the coastal fringe.

The habitat capability modeling for the project in 1997 indicated that Alternatives 2 and 2C would decrease habitat capability for black bear on the east side of Lynn Canal by about seven percent compared with current conditions (Table A-3, Attachment A). Some of this decrease would be due to increased mortality from vehicle collisions; however, the largest potential effect would be increased access for hunters (see *Indirect and Cumulative Impact Technical Report*).

River otters and marten will cross roads when they encounter them. Otters are killed on an infrequent but regular basis by vehicles in the Juneau area (Barten, 2001a). Therefore, river otter and marten mortality from vehicle collisions is likely along Alternatives 2 and 2C, particularly in high quality habitat areas from Echo Cove to Comet Landing and in the vicinity of Dayehas Creek, Kasidaya Creek, and the Katzehin River.

Because most of the deer in the project area are south of Echo Cove, mortality from vehicle collisions, particularly in winter when deer use roads to escape deep snow, would be limited primarily to the Echo Cove – Sawmill Cove section of the highway for Alternatives 2 and 2C. Deer populations in this area are at low densities. Currently there is very minimal winter traffic on the Glacier Highway near Echo Cove because the state does not maintain this section of the highway during winter. There would be an increase in winter traffic volume if either Alternative 2 or 2C were constructed with a probable increase in deer mortality from vehicle collisions. As indicated in Section 4.2.1.3, based on current levels of deer mortality along Glacier Highway between Auke Bay and Echo Cove, the number of deer killed by vehicle collisions with Alternatives 2 and 2C is unlikely to have population-level effects.

The highway alignment for Alternatives 2 and 2C would pass through approximately 2.5 miles of moose winter habitat at the north end of Berners Bay. Average winter ADT for Alternative 2 is predicted to be 240 and 430 vehicles in 2008 and 2038, respectively. Under Alternative 2C, average winter ADT is predicted to be 190 and 340 vehicles in 2008 and 2038, respectively. Because the highway would be located in areas where there have been no roads and no acclimation to traffic, moose may be particularly susceptible to vehicle collisions in the first few years of highway operation. DOT&PF would post warning signs cautioning motorists to help minimize the vehicle collision mortality on this population.

The moose population around Berners Bay is approximately 100 to 150 animals and is subject to a highly popular but very limited permit-only hunt (Barten, 2001b). The number of moose that would be killed by vehicles each year with Alternatives 2 and 2C is likely to fluctuate with weather conditions and the density of moose near the highway. This new source of mortality would probably include cows with calves and pregnant cows and could have local population-level effects. ADF&G would have to include vehicle collision mortality in their management of the Berners Bay herd.

Mountain goat winter habitat at lower elevations could be affected by noise and disturbance associated with vehicle traffic on the highway. Avalanche control activities also have the potential to stress wintering goats. Available winter habitat could be reduced in certain areas by continuing disturbance. If disturbance displaces goats from high-quality winter habitat, it could potentially reduce carrying capacity and have local population effects. Summer habitat is generally at higher elevations and is not expected to be adversely affected.

4.2.2.5 Terrestrial Birds

Construction Activities – To comply with the Migratory Bird Treaty Act, clearing activities would be avoided during the nesting season (late spring to early summer) in old-growth forest areas where migratory birds including the olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler are likely to nest. Construction noise could decrease the chances of reproductive success for the season of nesting birds near construction sites. Because the amount of nesting habitat that would be directly affected by highway construction would represent a small fraction of the potential habitat available in the project area, construction activities would not have long-term adverse affects on their reproductive success of any resident or migratory bird species.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – The loss of 615 acres of forest habitat with Alternatives 2 and 2C, as well as the corresponding reduction in habitat caused by the forest edge created by the highway corridor, would reduce the available habitat on the east side of Lynn Canal for the terrestrial birds considered in this analysis by less than one percent of the potential habitat available in the project area. This would not have population-level effects on any species.

4.2.2.6 Amphibians

Construction Activities – Alternatives 2 and 2C would result in the loss of approximately 88 acres of marsh and forested wetlands that are inhabited by frogs and toads. Because these species cannot move rapidly enough to avoid construction equipment, individual amphibians present in the construction area would be lost.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Since amphibians have rather small home ranges and do not appear to travel far from their natal areas (NatureServe, 2003), potential habitat loss and fragmentation would only affect amphibians that lived near the highway corridor. Amphibian populations are not distributed evenly across wetland habitats but are more localized (Carstensen *et al*., 2003). This means that direct habitat loss from Alternatives 2 and 2C could have a greater impact on amphibians than implied by the small percentage (0.8 percent) of wetland acreage affected by these alternatives. However, because the direct habitat loss would be small, it is not likely that it would impact regional population levels of amphibians.

4.2.3 Alternative 2A – East Lynn Canal Highway with Berners Bay Shuttle

This alternative includes a highway from Echo Cove to Sawmill Cove, a shuttle ferry across Berners Bay between Sawmill Cove and Slate Cove, and a highway along the east side of Lynn Canal from Slate Cove to Skagway. Shuttle ferry service would be provided between Haines and a new ferry terminal north of the Katzehin River. Mainline AMHS ferry service would stop at

Auke Bay. This alternative eliminates the section of highway around Berners Bay between Sawmill and Slate coves.

4.2.3.1 Overall Habitat Loss

For Alternative 2A, a total of approximately 534 acres of terrestrial habitat would be permanently lost to the highway and ferry terminals (Table 4-1), 87 percent of which is located in the coastal fringe. Impacts to forest habitat include a loss of 294 acres of old-growth forest and 230 acres of other forest consisting of timber stands with smaller diameter trees and/or low board foot volume. Loss of non-forested habitat includes 9 acres of shrub, open meadow, and muskeg communities along major rivers. The loss of this terrestrial habitat represents about 0.7 percent of the 76,279 acres of old-growth forest on the east side of Lynn Canal.

Approximately 71 acres of wetlands would be lost under Alternative 2A, 62 acres of which would be forested wetlands (also included in the old-growth forest category total), 1 acre of scrub-shrub, 3 acres of palustrine emergent, and 5 acres of estuarine emergent wetlands. The location of these wetlands is provided in Figures 4-1 through 4-5. Wetlands lost as a result of Alternative 2A would occur primarily between Slate Creek and Sherman Point on the east side of Lynn Canal (Figures 4-2 and 4-3). The loss of wetlands from Alternative 2A represents about 0.9 percent of the forested wetlands and salt marsh, 0.05 percent of the scrub-shrub, and 0.2 percent of the palustrine emergent wetlands present in the study area on the east side of Lynn Canal.

Alternative 2A would result in the loss of 2 acres of beach bar and 27 acres of rocky shore habitat. This habitat loss would occur where the highway comes to the shoreline north of Sherman Point and at the ferry terminals at Sawmill Cove, Slate Cove, and Katzehin.

4.2.3.2 Marine Mammals

Construction Activities – Humpback whales use Berners Bay primarily in the spring when they feed on spawning herring and eulachon, and they are present in Lynn Canal from Sherman Point north and in Taiya Inlet. It is unlikely that they would come within ¼ mile of the Slate Cove ferry terminal or the bridge construction site across the Katzehin River. At the Sawmill Cove and Katzehin ferry terminal sites, construction monitors would be used to minimize impacts to marine mammals. It is likely that whales would perceive active construction areas from a distance and avoid the area if noise levels were bothersome. Avoidance of particular areas would probably only last as long as the noise continued.

The potential for impacts to the minke whale would be similar to those for the humpback whale but based on their low numbers in Lynn Canal and the construction monitoring referenced above, effects on the population are expected to be negligible. Other species such as harbor porpoise, Dall's porpoise, and killer whales, would also be expected to be affected by underwater noise from construction such as pile driving and blasting. These wide-ranging and fast-moving species occur in low numbers in the project area and any disturbances would be short-term and not affect the species at the population level.

Hundreds of harbor seals are known to haulout on sandbars within Berners Bay and at the Katzehin River delta, especially during late April and early May when spawning eulachon congregate in these waters (Marston *et al.*, 2002 and USFWS, 2003). Harbor seals have also been observed hauled out on the west side of Taiya Inlet at the base of Halutu Ridge (ADNR, 2002). They also occasionally haul out on exposed rocks at low tide along the mainland shoreline and islands of Lynn Canal, but there is no documented long-term use of particular rocky shores as haulouts. Harbor seals may avoid haulouts close to Sawmill Cove and Slate

Cove in Berners Bay, the Katzehin River, and rocky beaches north of Sherman Point where the alignment is adjacent to the beach during construction. Construction would be scheduled to avoid activity within a mile of identified haulouts during the peak April/May use period. The haulouts on the west side of Taiya Inlet are more than a mile from the Alternative 2A alignment. Seals hauled out on the west side of that inlet are probably habituated to a fair amount of noise from marine traffic and would not likely be disturbed by construction activities across the inlet.

Sea otters, which only occur in the project study area in very low numbers, would react to loud underwater construction noise by avoidance, similar to the harbor seal. Construction impacts from Alternative 2A are unlikely to have long-term effects on the sea otter population in Lynn Canal.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Loss of habitat for marine mammals would include the shoreline areas filled for the Sawmill Cove, Slate Cove, and Katzehin ferry terminals and for highway slopes. Total area of marine fills would be approximately 29 acres (Table 4-1); fill at any one location would be less than 2.2 acres. None of the areas filled by Alternative 2A are identified haulouts for marine mammals.

The Sawmill Cove and Slate Cove ferry terminals are over a mile away from beaches and sand bars in Berners Bay used as haulouts by harbor seals. Therefore, traffic noise would not impact harbor seals in these locations. However, harbor seals are common throughout Berners Bay during the spring herring and eulachon runs. Ferry traffic across Berners Bay at this time may cause temporary disturbance of seals in the water or their prey. The highway alignment would be immediately adjacent to the beach at a number of locations north of Sherman Point. It is possible that harbor seals would avoid hauling out in these locations when traffic was present. The alignment is especially close to the shore along Taiya Inlet; however, this shoreline is very steep and there are very few places where seals could haul out even at low tide. Seals may habituate to traffic noise at the Katzehin River or may choose to use areas further down stream from the proposed bridge. Operation of the Katzehin ferry terminal north of the river is not likely to cause disturbance to harbor seals because of the distance between this terminal and seal haulouts.

Under Alternative 2A there would be 63 round trips/week between the proposed Katzehin ferry terminal and Haines during the summer. This would increase the risk of collisions with humpback whales, harbor seals, and minke whales in the Chilkoot Inlet. Based on anecdotal information, it appears that there are fewer humpback whales at the northern end of Lynn Canal than at the southern end, and few minke whales use the Canal. Because marine mammal collisions with marine vessels (particularly ferries) are rare, and whale densities appear to be low in Chilkoot Inlet, the increased risk of collisions associated with Alternative 2A is not likely to be high enough to adversely affect marine mammals in Lynn Canal.

Alternative 2A would have 20 shuttle ferry trips per day across Berners Bay in the summer and 8 trips per day in the winter. The summer schedule would begin in May, with vessels crossing the bay every half hour for roughly 12 hour/day. As indicated in Section 3.3.3.11, some humpback whales (as many as five observed) enter Berners Bay to feed on euchalon in May. Noise created by the shuttle ferries could discourage some humpback whales from entering the Bay, and this ferry traffic would increase the potential for collisions with whales during this month. Based on the number of trips across Berners Bay and the use of the bay by humpback whales, Alternative 2A may affect this species.

Harbor seals also congregate in Berners Bay during the herring and eulachon runs. Disturbance from shuttle ferries could potentially displace some feeding seals during this period.

Sea otters are sensitive to noise and would likely avoid ferry traffic associated with Alternative 2A.

4.2.3.3 Marine Birds

Construction Activities – Great blue heron are likely to nest in the Katzehin River delta area. Construction activities could cause herons to avoid nesting near the highway alignment for Alternative 2A.

Alternative 2A would cross potential nesting habitat for marbled murrelets from Echo Cove to Sawmill Cove and Slate Cove to Skagway. Construction activities could disturb breeding birds near the highway alignment. To minimize impacts to nesting birds, clearing would not be done in nesting habitat for migratory birds during the nesting season.

The alignment for Alternative 2A runs along the beach at many locations north of Sherman Point in Lynn Canal and in the Taiya Inlet. Construction activities could flush harlequin ducks and Kittlitz's murrelets feeding or resting nearshore in these areas, and they may temporarily stop the use of these areas near active construction sites.

Alternative 2A would have no transportation facilities in the drainages of the major rivers at the north end of Berners Bay. Therefore, this alternative is unlikely to impact trumpeter swans.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – The type of nesting and feeding habitat preferred by great blue herons is abundant in the Katzehin River delta so the 1.3 acres of forested wetland removed in this area by Alternative 2A represents only a small percentage (0.3 percent) of the available forested wetlands that could be used by great blue herons for nesting and feeding (488 acres). Disturbance from vehicle traffic would likely displace herons from an additional "avoidance zone" around the highway that would probably vary in size with traffic volume and season. Great blue herons have habituated to human presence and vehicle traffic in many urban areas, including Juneau, so they would be likely to habituate to normal maintenance and vehicle traffic along the highway. For these reasons, Alternative 2A would not affect the population of great blue herons on the east side of Lynn Canal.

Alternative 2A would result in the loss of potential nest trees for marbled murrelets in old-growth forests. However, the direct loss of old-growth forest due to the project alternatives would be less than one percent of the old-growth forest in the study area. Disturbance from vehicle traffic would likely displace murrelets from nesting near the highway and would thus increase the effective loss of habitat. Given the abundance of potential nesting habitat in the area, this relatively small habitat loss would not limit reproductive success of the local murrelet population.

Highway traffic noise could disturb harlequin ducks in nearshore resting and feeding areas where the highway alignment is at the shoreline north of Sherman Point. Because these ducks nest inland along the banks of swift-running rivers and streams, it is not anticipated that their nesting habitat would be effected because the areas where the highway alignments cross streams and rivers are at their mouths and not inland. For this reason, Alternative 2A would not result in population level effects to this species.

Waterfowl and other marine birds such as harlequin ducks and marbled murrelets concentrate and rest in the Slate Cove area, and to a lesser extent at Sawmill Cove. These birds could be disturbed by the shuttle ferries crossing Berners Bay between Sawmill and Slate coves up to every half hour in the summer. Huffman (1999) noted that after repeated disturbance events, the number of birds in an area would decrease and subsequent disturbances resulted in greater proportions of birds leaving the area. Birds generally returned to an area after a 10 to 35 minute period of no disturbance. The degree of tolerance to disturbance from vessel traffic varies greatly depending on species, tide, flock characteristics, location and season (Davidson and Rothwell 1993; Mori *et al*., 2001; Keopff and Dietrich, 1986 in Hockin *et al*., 1992).

When waterfowl flush or take flight when disturbed, they often circle several times before landing (Huffman, 1999). Flying is a high-energy activity for waterfowl (Korschgen and Dalhrgen, 1992), and frequent flying due to disturbance from shuttle ferries across Berners Bay may take away from the energy reserves of some birds that would normally be used for reproduction or to complete migration.

Marine birds and waterfowl feeding or resting along the shuttle ferry route in Chilkoot Inlet would fly or swim away from approaching ferries and resume their normal behavior in another location. A shuttle ferry would cross between Katzehin and Haines about every 45 minutes during day time hours in the summer. Such short-term displacements would cost birds a small amount of energy and time but would be unlikely to affect reproductive success or survival.

4.2.3.4 Terrestrial Mammals

Construction Activities – Wolf dens are generally located within 100 feet of fresh water. Alternative 2A would cross the Katzehin River estuary where the water is brackish and wolf dens would not be expected. For smaller streams, particularly those with beaver activity, there is the potential for the alignment to be in the vicinity of dens, and construction could result in the abandonment or destruction of some den sites. DOT&PF would conduct pre-construction wolf den surveys within 600 feet of the project construction limits in any areas that consultation with resource agencies identify as having high potential for wolf dens. If wolf dens are identified during these surveys, DOT&PF would conduct further agency consultations to determine appropriate measures to minimize impacts.

Construction of Alternative 2A would likely require at least one temporary construction camp that would probably be set up at Comet Landing. The Comet landing area contains old-growth forest and old-growth forest wetlands that provide habitat for brown and black bears which could be attracted to human garbage and food supplies at the camp, resulting in some of these animals being shot in defense of life or property. Best management practices and control measures would be taken to minimize the potential for this to occur.

The highway would transect the territories of river otters and martens in the drainages of Dayehas Creek, Katzehin River, and Kasidaya Creek, and the old-growth wetlands between Slate Creek and Comet. Construction activities near streams would temporarily disrupt the natural movement patterns of these species.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Approximately 98 percent of the terrestrial vegetation that would be removed for Alternative 2A is forest, including 294 acres (55 percent of total) classified as old-growth forest. Numerous species rely on habitat characteristics of old-growth forests, including martens, brown bears, black bears, mountain goats, and wolves. The direct loss of habitat resulting from Alternative 2A would have a small effect on terrestrial mammals because this loss would amount to less than one percent (about 0.7 percent) of these habitats available in the project study area.

There is moderate to high quality habitat for black bear along most of the coastal fringe of the east side of Lynn Canal from Echo Cove to Skagway (Figure A-3, Attachment A). This means black bears would have to cross the highway or pass under highway bridges from higher elevation denning sites to access estuarine emergent wetlands and meadows below the highway/bridges to feed on grass and sedges during the spring over much of the length of the highway for Alternative 2A. Because black bears are highly adaptable and often learn to coexist near human development, a highway is not likely to result in a substantial barrier to the movement of this species in the project study area. An exception may be at some locations between Comet Landing and Skagway where steep cuts could create a physical barrier to black bear movement.

Brown bears also move seasonally between higher elevation den sites and lower elevation foraging habitat that includes rivers and estuarine wetland areas. Because the highway under Alternative 2A would separate higher elevation habitats from beach fringe and estuary habitats at the mouths of streams and rivers (e.g., Sweeney Creek, Dayehas Creek, Katzehin River, and Kasidaya Creek), the effective loss of habitat could cause some brown bears to be displaced from habitat areas surrounding the highway in these drainages (Schoen *et al.*, 1993). The habitat capability modeling conducted in 1997 predicted that a highway along the alignment for Alternative 2A would decrease brown bear habitat capability by 17 percent compared to present conditions, primarily because of habitat fragmentation. This impact would be reduced to the extent bears are willing to use bridges as wildlife underpasses or cross the highway.

Martens and river otters have relatively small home ranges and appear to cross roads on a regular basis. Therefore, habitat fragmentation would not be an issue for these species in most locations along Alternatives 2A except in the area of Gran Point and Met Point.

Gran and Met points are important haulouts for Steller sea lions. To discourage people from accessing them, the design for Alternatives 2 and 2C would include cut banks, retaining walls, and screening structures, where necessary, within approximately 3,000 feet of each location. These barriers could inhibit the movement of martens and river otters in these two areas although there would be culverts these animals could use to cross the highway. Although a highway could impact individual animals, it would not have population-level effects on martens and river otters in the project study area because the areas around Gran and Met points have low habitat value for these species, and these areas are a small portion of their range.

Wolves are known to be present in the Katzehin River valley (USFS, 2001; N. Barten, personal communication, 2003). Wolves could continue to access the Katzehin estuary by crossing the highway or traveling along the floodplain under the bridges. However, wolves have an aversion to human presence and may abandon portions of their range if there is too much human activity in that area (Dave Person, personal communication, 2004).

Any crossings of the highway would place wildlife in danger of collisions with vehicles. Vehicle collisions would become a source of bear mortality for Alternative 2A because the highway for this alternative crosses moderate to high quality habitat for this species over much of its length. Collisions are most likely to occur during spring and summer when traffic numbers are higher and bears frequent the coastal fringe.

Vehicle collisions would cause black bear mortality; however, the principal impact of Alternative 2A to black bear would be increased access to the region for hunters (see *Indirect and Cumulative Impact Technical Report*). The habitat capability modeling for the project in 1997 indicated that Alternative 2A would decrease habitat capability for black bear on the east side of Lynn Canal by about five percent compared with current conditions.

River otters and marten will cross roads when they encounter them. Otters are killed on an infrequent but regular basis by vehicles in the Juneau area (Barten, 2001a). Therefore, river otter and marten mortality from vehicle collisions is likely along Alternative 2A, particularly in high quality habitat areas from Echo Cove to Sawmill Cove and in the vicinity of Dayehas Creek, Kasidaya Creek, and the Katzehin River.

Because most of the deer in the project area are south of Echo Cove, mortality from vehicle collisions would be limited primarily to the Echo Cove – Sawmill Cove section of the highway for Alternative 2A, and mortality would be highest in the winter when deer use roads to escape deep snow. Deer populations in this area are at low densities. Currently there is very minimal winter traffic on the Glacier Highway near Echo Cove because the state does not maintain this section of the highway during winter. There would be an increase in winter traffic volume if Alternative 2A is constructed with a probable increase in deer mortality from vehicle collisions. As indicated in Section 4.2.1.3, based on current levels of deer mortality along Glacier Highway between Auke Bay and Echo Cove, the number of deer killed by vehicle collisions with Alternative 2A is not likely to be high enough to have population-level effects.

Alternative 2A would not pass through any winter moose habitat, but the alignment from the Slate Cove Ferry Terminal to the Independence Lake area does pass through moose non-winter habitat (Figure 3-3). Therefore, this alternative could have direct impacts to the Berners Bay moose population due to increased mortality from vehicle collisions.

Mountain goat winter habitat at lower elevations could be affected by noise and disturbance associated with vehicle traffic on the highway. Avalanche control activities in mountainous areas also have the potential to stress wintering goats. Available winter habitat could be reduced in certain areas by continuing disturbance. If disturbance displaces goats from high-quality winter habitat, it could potentially reduce carrying capacity and have local population effects. Goat summer habitat is generally at higher elevations and would not be adversely affected.

4.2.3.5 Terrestrial Birds

Construction Activities – To comply with the Migratory Bird Treaty Act, clearing activities would be avoided during the nesting season (late spring to early summer) in old-growth forest areas where migratory birds including the olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler are likely to nest. Construction noise could decrease the chances of reproductive success for the season of nesting birds near construction sites. Because much of the project study area provides nesting habitat for resident and migratory birds that inhabit the region, displacement by project construction activities would not have population-level effects on any species.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – The loss of 524 acres of forest habitat with Alternative 2A, as well as the corresponding reduction in habitat caused by the forest edge created by the highway corridor, would reduce the available habitat on the east side of Lynn Canal for the terrestrial birds considered in this analysis by about 0.7 percent. This would likely not have population-level effects on any species considered.

4.2.3.6 Amphibians

Construction Activities – Alternative 2A would result in the loss of approximately 66 acres of marsh and forested wetlands that are inhabited by frogs and toads. Because these species cannot move rapidly enough to avoid construction equipment, individual amphibians present in the construction area would be lost.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Since amphibians have rather small home ranges and do not appear to travel far from their natal areas (NatureServe, 2003), potential habitat loss and fragmentation would only affect amphibians that lived near the highway corridor. There are 6,720 acres of forested wetlands, 2,134 acres of scrub-shrub wetlands, and 1,812 acres of palustrine emergent wetlands on the east side of Lynn Canal. Alternative 2A would result in the permanent loss of about 0.6 percent of the available wetland habitat on the east side of Lynn Canal. Amphibian populations are not distributed evenly across wetland habitats but are more localized (Carstensen *et al.*, 2003). This means that direct habitat loss from Alternative 2A could have a greater impact on amphibians than implied by the small percentage of wetland acreage affected by this alternative. However, because the direct habitat loss would be small, it is not likely that it would impact regional population levels of amphibians.

4.2.4 Alternative 2B – East Lynn Canal Highway to Katzehin, Shuttles to Haines and Skagway

This alternative consists of a highway from Echo Cove around Berners Bay and the east shore of Lynn Canal to a ferry terminal north of the Katzehin River, with shuttle ferry service between Katzehin, Haines, and Skagway. Mainline AMHS ferry service would end at Auke Bay. This alternative would eliminate the section of highway along Taiya Inlet but would increase ferry traffic across Chilkoot Inlet between Haines and the Katzehin ferry terminal.

4.2.4.1 Overall Habitat Loss

Alternative 2B would result in the permanent loss of 456 acres of terrestrial habitat (Table 4-1). Of this total, approximately 314 acres is classified as old-growth forest. A total of 128 acres of other forest consisting of small trees or lower tree density would be lost with Alternative 2B. Loss of non-forested habitat includes 13 acres of shrub, open meadow, and muskeg communities along major rivers.

Approximately 93 acres of wetlands would also be lost, 80 acres of which would be forested wetlands and are included in the old-growth forest category totals (Table 4-1). Other wetlands filled under Alternative 2B would include 7 acres of palustrine emergent wetlands, 1 acre of palustrine scrub-shrub wetlands, and 5 acres of estuarine emergent wetlands. Wetlands lost as a result of Alternative 2B would occur primarily between Slate Creek and Sherman Point on the east side of Lynn Canal (Figures 4-2 and 4-3).

Approximately 1 acre of beach bar and 25 acres of rocky shore habitat would be lost with Alternative 2B. This loss would occur at the Katzehin ferry terminal and locations where the highway comes to the shoreline north of Sherman Point.

4.2.4.2 Marine Mammals

Construction Activities – Humpback whales use Berners Bay (Marston *et al*., 2002 and USFWS, 2003), and are present there most frequently during the spring when they enter the bay to feed on spawning herring and eulachon. They are present in Lynn Canal north of Sherman Point. It is unlikely that they would come within ¼ mile of the bridge construction sites across the Lace and Antler rivers in Berners Bay and the Katzehin River proposed for Alternative 2B. At the Katzehin ferry terminal site, construction monitors would be used to minimize impacts to marine mammals. It is likely that whales would perceive active construction areas from a distance and avoid the area if noise levels were bothersome. Avoidance of particular areas would probably only last as long as the noise continued.

Impacts to the minke whale would likely be similar to the humpback whale but based on their low numbers in Lynn Canal and the construction monitoring referenced above, effects on the population in Lynn Canal would be negligible. Other species such as harbor porpoise, Dall's porpoise, and killer whales, are also likely to be affected by underwater noise from construction such as pile driving and blasting. However, these wide-ranging and fast-moving species occur in low numbers in the project area and any disturbances would be short-term, and not affect the species at the population level.

Hundreds of harbor seals are known to haulout on sandbars within Berners Bay and at the Katzehin River delta, especially during late April and early May when spawning eulachon congregate in these waters (Marston *et al.*, 2002 and USFWS, 2003). They also occasionally haul out on exposed rocks at low tide along the mainland and islands of Lynn Canal. Harbor seals may avoid hauling out close to the Lace, Antler, and Katzehin rivers and rocky beaches north of Sherman Point where the alignment is adjacent to the beach during construction. Construction would be scheduled to avoid activity within a mile of identified seal haulouts in Berners Bay and at the Katzehin River during the peak April/May use period.

Sea otters, which only occur in the project study area in very low numbers, would react to loud underwater construction noise by avoidance, similar to the harbor seal. Construction impacts from Alternative 2B are unlikely to have long-term effects on the sea otter population in Lynn Canal.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Loss of habitat for marine mammals would include the shoreline areas filled for highway slopes for Alternative 2B. Total area of fills on beach bars and rocky shores under Alternative 2 would be approximately 26 acres (Table 4-1). Fill for the highway embankment at any one location would be less than 2.2 acres. None of the areas filled by Alternative 2B are identified haulouts for marine mammals.

The alignment for Alternative 2B is more than a mile away from beaches and sand bars in Berners Bay known to be used by harbor seals to haulout. Therefore, traffic noise would not impact harbor seals in this location. The highway alignment would be immediately adjacent to the beach at a number of locations north of Sherman Point. It is possible that harbor seals would avoid hauling out in these locations. Seals may habituate to traffic noise at the Katzehin River or may choose to use areas further down stream from the proposed bridge. Operation of the Katzehin ferry terminal north of the river under Alternative 2B is not likely to cause disturbance to harbor seals because of the distance between this terminal and seal haulouts.

Under Alternative 2B there would be 56 shuttle ferry round trips/week during the summer between the proposed Katzehin ferry terminal and Haines and 42 round trips/week between the proposed Katzehin ferry terminal and Skagway. This would increase the risk of collisions with humpback whales and minke whales in Chilkoot and Taiya inlets. Based on anecdotal information, it appears that there are fewer humpback whales at the northern end of Lynn Canal than at the southern end, and few minke whales use the Canal. Because marine mammal collisions with vessels are rare (particularly ferries), and whale densities appear to be low in Chilkoot Inlet, the increased risk of collisions associated with Alternative 2B is not likely to be high enough to adversely affect marine mammals in Lynn Canal.

4.2.4.3 Marine Birds

Construction Activities – Great blue herons are present in small numbers in Berners Bay and are also likely to nest in the Katzehin River delta area. Construction activities could cause great blue herons to avoid nesting near the alignment for Alternative 2B in these areas.

Alternative 2B would cross potential nesting habitat for marbled murrelets from Echo Cove to the Katzehin ferry terminal. Construction activities could disturb breeding birds near the highway alignment. To minimize impacts to nesting birds, clearing would not be done in nesting habitat for migratory birds during the nesting season.

The alignment for Alternative 2B runs along the beach at many locations north of Sherman Point in Lynn Canal. Construction activities could flush harlequin ducks and Kittlitz's murrelets feeding or resting nearshore in these areas, and they may temporarily stop the use of these areas near active construction sites.

As indicated in Section 4.2.1.3, construction associated with Alternative 2B would be at least ½ mile from any known trumpeter swan nest sites in the Berners Bay area. Therefore, construction of this alternative would not be likely to impact trumpeter swans.

Habitat Loss and Effects of Maintenance and Vehicle Operation – The type of nesting and feeding habitat preferred by great blue herons is abundant in Berners Bay and the Katzehin River delta. Because the highway corridor is relatively narrow, the direct loss of habitat across these river valleys is small compared to the available habitat. Disturbance from vehicle traffic would likely displace herons from an additional "avoidance zone" around the highway that would probably vary in size with traffic volume and season. The 78 acres of forested wetland removed in the Berners Bay area represents about 1.6 percent of this wetland type in that area (6,232 acres). In the Katzehin River area, Alternative 2B would remove 1.3 acres, or about 0.3 percent, of the forested wetland that could be used by great blue herons for nesting and feeding (488 acres). Great blue herons have habituated to human presence and vehicle traffic in many urban areas, including Juneau, so they would be likely to habituate to normal maintenance and vehicle traffic along the highway. For these reasons, Alternative 2B would not affect the population of great blue herons on the east side of Lynn Canal.

Alternative 2B would result in the loss of potential nest trees for marbled murrelets in old-growth forests. However, the direct loss of old-growth forest due to the project alternatives would be less than one percent of the old-growth forest in the study area. Disturbance from vehicle traffic would likely displace murrelets from nesting near the highway and would thus increase the effective loss of habitat. Given the abundance of potential nesting habitat in the area, this relatively small habitat loss would probably not limit reproductive success of the local murrelet population.

Highway traffic noise could disturb harlequin ducks in nearshore resting and feeding areas where Alternative 2B runs along the beach north of Sherman Point. Potential direct impacts on nesting habitat would be in the relatively small areas where the highway alignment crosses streams.

Marine birds and waterfowl feeding or resting along the shuttle ferry route in Chilkoot Inlet would fly or swim away from approaching ferries and resume their normal behavior in another location. A shuttle ferry would cross between Katzehin and Haines about every 45 minutes during day time hours in the summer. Such short-term displacements would cost birds a small amount of energy and time but would be unlikely to affect reproductive success or survival.

4.2.4.4 Terrestrial Mammals

Construction Activities – Wolf dens are generally located within 100 feet of fresh water. Alternative 2B would cross the larger rivers on the east side of Lynn Canal (Lace, Antler, and Katzehin rivers) in estuarine areas where the water is brackish and wolf dens would not be expected. For smaller streams, particularly those with beaver activity, there is the potential for the alignment to be in the vicinity of dens, and construction could result in the abandonment or destruction of some den sites. DOT&PF would conduct pre-construction wolf den surveys within 600 feet of the project construction limits in any areas that consultation with resource agencies identify as having high potential for wolf dens. If wolf dens are identified during these surveys, DOT&PF would conduct further agency consultations to determine appropriate measures to minimize impacts.

Construction of Alternative 2B would likely require at least one temporary construction camp that would probably be set up at Comet Landing. The Comet landing area contains old-growth forest and old-growth forest wetlands that provide habitat for brown and black bears which could be attracted to human garbage and food supplies at the camp, resulting in some of these animals being shot in defense of life or property. Best management practices and control measures would be taken to minimize the potential for this to occur.

The highway would transect the territories of river otters and martens in the drainages of Sawmill and Slate creeks and the Lace and Antler rivers in Berners Bay, and Katzehin River, and the old-growth wetlands between Slate Creek and Comet. Construction activities near streams would temporarily disrupt the natural movement patterns of these species.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Approximately 97 percent of the terrestrial vegetation that would be removed for Alternatives 2B is forest, including 314 acres (71 percent of total) classified as old-growth forest. Numerous species rely on habitat characteristics of old-growth forests, including martens, brown bears, black bears, mountain goats, and wolves. The direct loss of habitat resulting from Alternative 2B would have a small effect on terrestrial mammals because this loss would amount to less than one percent (about 0.6 percent) of the available habitat.

The largest impact of direct habitat removal associated with Alternative 2B would be on the small (100 to 150 animals) moose population in Berners Bay. These moose spend the spring, summer, and fall in the upper valleys of the Lace, Berners, Antler, and Gilkey rivers and move to the coastal area of these drainages to avoid heavy snows in winter. Alternative 2B would result in the loss of about 24 acres of winter habitat for these moose. There is about 30,000 acres of winter habitat in the Berners Bay area. Therefore, Alternative 2B would result in the loss of less than one percent (about 0.08 percent) of this habitat (Figure 3-3).

There is moderate to high quality habitat for black bear along most of the coastal fringe of the east side of Lynn Canal from Echo Cove to the Katzehin ferry terminal (Figure A-3, Attachment A). This means black bears would have to cross the highway or pass under highway bridges from higher elevation denning sites to access estuarine emergent wetlands and meadows below the highway/bridges to feed on grass and sedges during the spring over much of the length of the highway for Alternative 2B. Because black bears are highly adaptable and often learn to coexist near human development, a highway is not likely to result in a substantial barrier to the movement of this species in the project study area. An exception may be at some locations between Comet Landing and Katzehin where steep cuts or embankments could create a physical barrier to black bear movement.

Brown bears also move seasonally between higher elevation den sites and lower elevation foraging habitat that includes rivers and estuarine wetland areas such as the wetland areas between the mouths of the Lace and Antler rivers in Berners Bay (Christensen and Van Dyke, 2004). Because the highway under Alternative 2B would separate higher elevation habitats from beach fringe and estuary habitats and these areas often contain important food resources (Schoen *et al.*, 1993), such as new vegetation growth in the spring, the effective loss of habitat could cause brown bears to be displaced from habitat areas surrounding the highway in the Lace and Antler river estuaries, the Sweeney Creek drainage near Comet Landing, and the Katzehin River drainages. The habitat capability modeling conducted in 1997 predicted that a highway along the alignment for Alternative 2B would decrease brown bear habitat capability by 26 percent compared to present conditions, primarily because of habitat fragmentation (Table A-

2, Attachment A). This impact could be reduced to an extent by adapting bridges to function as wildlife underpasses or by brown bears adapting to the presence of a highway. Based on corridors used for spring and summer foraging in the Berners Bay area identified by Christensen and Van Dyke (2004), specific locations for wildlife underpasses in this area have been identified and would be developed during design if Alternative 2B was selected for the project.

Martens and river otters have relatively small home ranges and appear to cross roads on a regular basis. Therefore, habitat fragmentation would not be an issue for these species in most locations along Alternative 2B except in the area of Gran Point and Met Point where highway design would include cut banks, retaining walls, and screening structures, where necessary, within approximately 3,000 feet of each location to discourage people from leaving the roadway. These barriers could inhibit the movement of martens and river otters in these two areas although there would be culverts these animals could use to cross the highway. Although a highway could impact individual animals, its physical presence would not have population-level effects on martens and river otters in the project study area because the areas around Gran and Met points have low habitat value for these species, and these areas are a small portion of their range.

Wolves are known to be present in the Lace, Antler, and Katzehin River valleys (USFS, 2001; N. Barten, personal communication, 2003). Wolves could continue to access the estuarine areas of these rivers by crossing the highway or traveling along the floodplain under the bridges. However, wolves have an aversion to human presence and may abandon portions of their range if there is too much human activity in that area (Dave Person, personal communication, 2004).

Any crossings of the highway would place wildlife in danger of collisions with vehicles. Vehicle collisions would become a source of bear mortality for Alternative 2B because the highway crosses moderate to high quality habitat for this species over much of its length. Collisions are most likely to occur during spring and summer when traffic numbers are higher and there is greater use of the coastal fringe by bears.

The habitat capability modeling for the project in 1997 indicated that Alternative 2B would decrease habitat capability for black bear on the east side of Lynn Canal by about six percent compared with current conditions. Some of this decrease would be due to increased mortality from vehicle collisions; however, the largest potential effect would be increased access for hunters (see *Indirect and Cumulative Impact Technical Report*).

River otters and marten will cross roads when they encounter them. Otters are killed on an infrequent but regular basis by vehicles in the Juneau area (Barten, 2001a). Therefore, river otter and marten mortality from vehicle collisions is likely along Alternative 2B, particularly in high quality habitat areas from Echo Cove to Comet Landing and in the vicinity of the Katzehin River.

Because most of the deer in the project area are south of Echo Cove, mortality from vehicle collisions would be limited primarily to the Echo Cove – Sawmill Cove section of the highway for Alternative 2B. Deer mortality would be highest in the winter when deer use roads to escape deep snow. Deer populations in this area are at low densities. Currently there is very minimal winter traffic on the Glacier Highway near Echo Cove because the state does not maintain this section of the highway during winter. There would be an increase in winter traffic volume if Alternative 2B is constructed with a probable increase in deer mortality from vehicle collisions. As indicated in Section 4.2.1.3, the number of deer killed by vehicle collisions with Alternative 2B is not likely to have population-level effects.

The highway alignment for Alternative 2B would pass through approximately 2.5 miles of moose winter habitat at the north end of Berners Bay. Average winter ADT for Alternative 2B is predicted to be 180 and 310 vehicles in 2008 and 2038, respectively. Because the highway would be located in areas where there have been no roads and no acclimation to traffic, moose may be particularly susceptible to vehicle collisions in the first few years of highway operation. DOT&PF would post warning signs cautioning motorists to help minimize the vehicle collision mortality on this population.

The moose population around Berners Bay is approximately 100 to 150 animals and is subject to a highly popular but very limited permit-only hunt (Barten, 2001b). The number of moose that would be killed by vehicles each year with Alternative 2B is likely to fluctuate with weather conditions and the density of moose near the highway. This new source of mortality would probably include cows with calves and pregnant cows and could have local population-level effects. ADF&G would have to include vehicle collision mortality in their management of the Berners Bay herd.

Mountain goat winter habitat at lower elevations could be affected by noise and disturbance associated with vehicle traffic on the highway. Avalanche control activities in mountainous areas also have the potential to stress wintering goats. Available winter habitat could be reduced in certain areas by continuing disturbance. If disturbance displaces goats from high-quality winter habitat, it could potentially reduce carrying capacity and have local population effects. Goat summer habitat is generally at higher elevations and would not be adversely affected. Alternative 2B would not affect goat habitat between the Katzehin River and Skagway.

4.2.4.5 Terrestrial Birds

Construction Activities – To comply with the Migratory Bird Treaty Act, clearing activities would be avoided during the nesting season (late spring to early summer) in old-growth forest areas where migratory birds including the olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler are likely to nest. Construction noise could decrease the chances of reproductive success for the season of nesting birds near construction sites. Because the amount of nesting habitat that would be directly affected by highway construction would represent a small fraction of the potential habitat available in the project area, construction activities would not have long-term adverse affects on their reproductive success of any resident or migratory bird species.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – The loss of 442 acres of forest habitat with Alternative 2B, as well as the corresponding reduction in habitat caused by the forest edge created by the highway corridor, would reduce the available habitat on the east side of Lynn Canal for the terrestrial birds considered in this analysis by a small fraction of the potential habitat available in the project area (about 0.6 percent). This would not have population-level effects on any species.

4.2.4.6 Amphibians

Construction Activities – Alternative 2B would result in the direct loss of approximately 88 acres of marsh and forested wetlands that are inhabited by frogs and toads. Because these species cannot move rapidly enough to avoid construction equipment, individual amphibians present in the construction area would be lost.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Since amphibians have rather small home ranges and do not appear to travel far from their natal areas (NatureServe, 2003), potential habitat loss and fragmentation would only affect amphibians that lived near the highway corridor. Amphibian populations are not distributed evenly across wetland habitats but are localized (Carstensen *et al.*, 2003). This means that direct habitat loss from Alternative 2B could have a greater impact on amphibians than implied by the small percentage (0.8 percent) of wetland acreage affected by this alternative. However, because the direct habitat loss would be small, it is not likely that it would impact regional population levels of amphibians.

4.2.5 Alternative 3 – West Lynn Canal Highway

This alternative would extend Glacier Highway from Echo Cove to a new ferry terminal in Sawmill Cove. Shuttle ferry service would be provided across Lynn Canal to William Henry Bay, to a new highway along the west side of Lynn Canal to Haines. Bridges would be built across the Chilkat River/Inlet in the vicinity of Pyramid Harbor. Mainline AMHS ferry service would stop at Auke Bay.

4.2.5.1 Overall Habitat Loss

Under Alternative 3, approximately 423 acres of terrestrial habitat would be lost, including 314 acres of old-growth forest and 95 acres of other forest. Approximately 79 percent of this habitat loss would be in the beach or estuary fringe (Table 4-1). A total of 14 acres of non-forest habitat would be lost in the vicinity of the major rivers crossed by Alternative 3, including shrub-scrub, meadows, and muskeg. The loss of this terrestrial habitat represents about 0.6 percent of the 74,470 acres of old-growth forest in the WAAs affected by the West Lynn Canal Highway alignment.

Approximately 36 acres of wetlands would also be lost, 31 acres of which would be forested wetlands (included in the old-growth forest category total of Table 4-1). Other wetlands filled under Alternative 3 would include 2 acres of palustrine emergent wetlands, 1 acre of palustrine scrub-shrub wetlands, and 2 acres of estuarine emergent wetlands. Of the total wetland impact resulting from Alternative 3, 10 acres of forested wetlands and one acre of palustrine scrub-shrub wetlands would be on the east side of Lynn Cannal between Echo Cove and the Sawmill Cove terminal. Of the 21 acres of wetlands lost with Alternative 3 between William Henry Bay and Davidson Glacier, most are located just north of the Sullivan River (Figures 4-1 through 4-5).

There is a total of approximately 2,440 acres of wetlands on the west side of Lynn Canal. Approximately 1,037 acres are forested wetlands, 760 acres are scrub-shrub wetlands, 340 acres are palustrine emergent wetlands, and 393 acres are estuarine emergent wetlands. The West Lynn Canal Highway would remove about 1.3 percent of the forested wetlands, 0.1 percent of the scrub-shrub wetlands, 0.06 percent of the palustrine emergent wetlands, and 0.05 percent of the salt marsh in the project study area along the West Lynn Canal Highway alignment.

Alternative 3 would result in the loss of five acres of beach bar and seven acres of rocky shore habitat. This loss would occur at the Sawmill Cove and William Henry Bay ferry terminals and at locations where the highway comes to the shore between William Henry Bay and Haines.

4.2.5.2 Marine Mammals

Construction Activities – Humpback whales use Berners Bay (Marston *et al.*, 2002 and USFWS, 2003), and are present there most frequently during the spring when they enter the bay to feed on spawning herring and eulachon. They are present in Lynn Canal north of William Henry Bay. It is unlikely that they would come within ¼ mile of the bridge construction site across the Chilkat River/Inlet. At the Sawmill Cove and William Henry Bay ferry terminal sites proposed for Alternative 3, construction monitors would be used to minimize impacts to marine mammals. It is likely that whales would perceive active construction areas from a distance and avoid the area if noise levels were bothersome. Avoidance of particular areas would probably only last as long as the noise continued.

Impacts to the minke whale would likely be similar to the humpback whale but based on their low numbers in Lynn Canal and the construction monitoring referenced above, effects on the population in Lynn Canal would be negligible. Other species such as harbor porpoise, Dall's porpoise, and killer whales, are also likely to be affected by underwater noise from construction such as pile driving and blasting activity on land. However, these wide-ranging and fast-moving species occur in low numbers in the project area and any disturbances would be short-term and not affect the species at the population level.

Harbor seals are known to haulout on sandbars within Berners Bay and on beaches near the Sullivan River, Davidson Glacier delta, and Pyramid Island (USFWS, 2003). They also occasionally haul out on exposed rocks at low tide along the mainland and islands of Lynn Canal. The alignment for Alternative 3 does not approach the shore in the Sullivan River and Davidson Glacier areas and the haulouts would be buffered from construction activity by forested lands. Therefore, these haulouts would not be impacted by construction of the West Lynn Canal Highway. Construction of the bridges across the intertidal reach of Chilkat River/Inlet immediately north of Pyramid Island would involve pile-driving and substantial rock fill that would likely cause harbor seals to avoid Pyramid Island. Construction would not be scheduled during the high use period at Pyramid Island to minimize impacts on harbor seals.

Sea otters, which only occur in the project study area in very low numbers, would react to loud underwater construction noise by avoidance, similar to the harbor seal. Construction impacts from Alternative 2B are unlikely to have long-term effects on the sea otter population in Lynn Canal.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Loss of habitat for marine mammals would include the shoreline areas filled for the Sawmill Cove and William Henry Bay ferry terminals and for highway slopes. The total area of marine fills would be approximately 12 acres (Table 4-1); fill at any one location would be less than 2.2 acres. None of the areas filled by Alternative 3 are identified haulouts for marine mammals.

The Sawmill Cove ferry terminal is over a mile away from beaches and sand bars in Berners Bay identified as haulouts by harbor seals. Therefore, traffic noise would not impact harbor seals in these locations. The highway across the Chilkat River/Inlet would be immediately north of Pyramid Island. Highway traffic in this area could lead to harbor seals abandoning this island as a haulout.

Alternative 3 would include a shuttle ferry between the proposed Sawmill Cove and William Henry Bay ferry terminals that would have 84 round trips/week during the summer. Shuttle ferry trips between Haines and Skagway would also increase to 42 round trips/week in the summer. This would increase the risk of collisions with humpback whales, harbor seals, and minke whales in Lynn Canal, Chilkoot Inlet, and Taiya Inlet. Whale collisions with vessels (particularly ferries) are rare and whale densities are low along the shuttle ferry routes; therefore, the increased risk of collisions associated with Alternative 3 would not adversely affect whales in Lynn Canal. Fast-moving and maneuverable species such as the harbor seal, killer whale, harbor porpoise, and Dall's porpoise can readily avoid motor vessels and would not be impacted by the ferry traffic associated with Alternative 3.

Sea otters are sensitive to noise and would likely avoid ferry traffic associated with Alternative 3. Because of the low numbers of sea otters in Lynn Canal, increase ferry traffic in Lynn Canal, Chilkoot Inlet, and Taiya Inlet is not likely to impact this species.

4.2.5.3 Marine Birds

Based on general habitat preferences, waterfowl and other marine species are likely to be concentrated in relatively shallow and protected bays and at the mouths of streams and rivers along the west side of Lynn Canal. These areas include William Henry Bay, the Endicott River, the strait on the west side of Sullivan Island, the Davidson Glacier delta, and Pyramid Harbor.

Construction Activities – Great blue heron are likely to be present in small numbers at river and stream outlets all along the Alternative 3 alignment, and particularly at the Sullivan and Endicott rivers. Construction activities could cause great blue herons to avoid nesting near the alignment.

Alternative 3 would cross potential nesting habitat for marbled murrelets from Echo Cove to Sawmill Cove and William Henry Bay to the Chilkat River/Inlet. Construction activities could disturb breeding birds near the highway alignment. To comply with the Migratory Bird Treaty and minimize impacts to nesting birds, clearing would not be done in nesting habitat for migratory birds during the nesting season.

The alignment for Alternative 3 is at the shoreline at three locations between William Henry Bay and Davidson Glacier. Construction activities at these locations could flush harlequin ducks and Kittlitz's murrelets, and they may temporarily stop the use of these areas near active construction sites.

Trumpeter swans do not nest near the Alternative 3 alignment. They would not be affected by construction of a West Lynn Canal Highway.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – The type of nesting and feeding habitat preferred by great blue herons is abundant in the deltas of the Sullivan and Endicott rivers. Because the highway corridor is relatively narrow, the direct loss of habitat across these river valleys is small compared to the available habitat. Disturbance from vehicle traffic would likely displace herons from an additional "avoidance zone" around the highway that would vary in size with traffic volume and season. The 19 acres of forested wetlands removed along the deltas of the Sullivan and Endicott rivers represent about 1.8 percent of this wetland type (1,037 acres) in those areas (see *Wetlands Technical Report* for further information on wetlands impacts). Great blue herons have habituated to human presence and vehicle traffic in many urban areas, including Juneau, so they would be likely to habituate to normal maintenance and vehicle traffic along the highway. For these reasons, Alternative 3 would not affect the population of great blue herons on the west side of Lynn Canal.

Alternative 3 would result in the loss of potential nest trees for marbled murrelets, particularly where the highway is at the shoreline between William Henry Bay and Davidson Glacier. However, the direct loss of old-growth forest due to Alternative 3 would be less than one percent of the old-growth forest in the project area. Disturbance from vehicle traffic would likely displace murrelets from nesting near the highway and would thus increase the effective loss of habitat. Given the abundance of alternative nesting habitat in the project area, this relatively small habitat loss would probably not limit reproductive success of the local murrelet population.

Highway traffic noise could disturb harlequin ducks in nearshore resting and feeding areas where the highway alignment is at the shoreline between William Henry Bay and Davidson Glacier and the bridge crossing the Chilkat River/Inlet. Because these ducks nest inland along the banks of swift-running rivers and streams, nesting habitat could be impacted by the highway. There are a number of streams along the alignment, all of which would be crossed perpendicularly; therefore, only a small amount of habitat would be impacted. For this reason, Alternative 3 would not result in population level effects to this species.

Alternative 3 would include shuttle ferry traffic between the proposed Sawmill Cove and William Henry Bay terminals and between Haines and Skagway. Marine birds such as harlequin ducks or marbled murrelets feeding or resting along the shuttle ferry route in Lynn Canal and Taiya Inlet would fly or swim away from approaching ferries and resume their normal behavior in another location. About two shuttle ferries an hour would cross between Sawmill Cove and William Henry Bay during day time hours in the summer. Less than one ferry an hour would travel on the Taiya Inlet between Haines and Skagway during the summer. Such short-term displacements would cost birds a small amount of energy and time but would be unlikely to affect reproductive success or survival.

4.2.5.4 Terrestrial Mammals

Construction Activities – Wolf dens are generally located within 100 feet of fresh water. There is the potential for wolf dens to be present along the alignment in the vicinity of streams and rivers crossed by Alternative 3, particularly those with beaver activity. Construction could result in the abandonment or destruction of some den sites. DOT&PF would conduct pre-construction wolf den surveys within 600 feet of the project construction limits in any areas that consultation with resource agencies identify as having high potential for wolf dens. If wolf dens are identified during these surveys, DOT&PF would conduct further agency consultations to determine appropriate measures to minimize impacts.

Construction of Alternative 3 would likely require at least one temporary construction camp that would probably be located at William Henry Bay. This area contains old-growth forest and forested wetlands that provide moderate-quality habitat for brown bear and high-quality habitat for black bear. Bears could be attracted to human garbage and food supplies at the camp, resulting in some of these animals being shot in defense of life or property. Best management practices and control measures would be taken to minimize the potential for this to occur.

The highway would transect the territories of river otters and martens in the larger river and stream valleys in the project area, particularly the Sullivan and Endicott rivers. Construction activities near streams and beaches would temporarily disrupt the natural movement patterns of river otters.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Approximately 97 percent of the terrestrial vegetation removed for the highway on the Alternative 3 alignment is forest, including 314 acres (74 percent of total) classified as old-growth forest. Numerous species rely on habitat characteristics of old-growth forests, including martens, brown bears, black bears, and wolves.

Moose distribution is more widespread on the west side of Lynn Canal than on the east side. St. James Bay, William Henry Bay, the Endicott River Valley, and the southern part of the Chilkat River Valley all have populations that are connected with larger herds in Glacier Bay and the Chilkat River Valley (Hessing, 2002). Alternative 3 crosses about six miles of moose winter habitat in the vicinity of the Sullivan and Endicott rivers and the Chilkat Valley area (Figure 3-3). The West Lynn Canal Highway would result in the loss of about 58 acres of this habitat, which represents about 0.6 percent of the roughly 10,000 acres of winter moose habitat on the west side of the Canal north of William Henry Bay.

The highway would offer a corridor for moose movement. This would probably not cause a major change in moose distribution since there is already a natural migration of moose between the Chilkat River Valley, the Chilkat Range, and the larger river valleys along the west side alignment (Hessing, 2002). Moose are more likely to use the highway corridor during winter when the cleared roadway provides relief from deep snows during winters of heavy snowfall.

There is moderate to high quality habitat for black bear along most of the coastal fringe on the west side of Lynn Canal from William Henry Bay to the Chilkat River/Inlet. This means that bears would have to cross the highway or pass under highway bridges from higher elevation denning sites to access estuarine emergent wetlands and meadows below the highway/bridges during the spring and summer. Because black bears are highly adaptable and often learn to coexist near human development, habitat fragmentation would not result in a substantial effect on black bear populations in the project study area. The habitat capability model results for the 1997 Draft EIS predicted that the West Lynn Canal Highway would decrease black bear habitat capability by two percent compared to present conditions.

Brown bears also move seasonally between higher elevation den sites and lower elevation foraging habitat that includes rivers and estuarine wetland areas. Because the West Lynn Canal Highway would separate higher elevation habitats from beach fringe and estuary habitats and because these latter areas often contain important resources for brown bears, the effective loss of habitat could reduce reproductive success or survival of some bears (Schoen *et al*., 1993). The habitat capability modeling constructed in 1997 predicted that a highway along the west side of Lynn Canal would decrease brown bear habitat capability by 23 percent compared to present conditions, primarily because of habitat fragmentation. The habitat capacity modeling conducted in 1997 predicted that a highway along the west side of Lynn Canal would decrease brown bear habitat capability by 23 percent compared to present conditions, primarily because of habitat fragmentation. This impact could be reduced to an extent if bears are willing to use bridges as wildlife underpasses or adapt to the presence of a highway.

Martens have relatively small home ranges and appear to cross roads on a regular basis. Therefore, habitat fragmentation would not be an issue for these species along the West Lynn Canal Highway.

Wolves could continue to access estuarine areas by crossing the highway or traveling along the floodplain under highway bridges. However, wolves have an aversion to human presence and may abandon portions of their range if there is too much human activity in that area (Dave Person, personal communication, 2004).

Sitka black-tailed deer use a variety of habitat types (USFS, 1997), and their populations appear to be limited by heavy snow conditions and the quality of winter habitat. Based mostly on lack of hunter success and lack of high quality winter habitat, the deer population is considered to be very small on the west side of Lynn Canal north of William Henry Bay (Barten, 2001b). Deer readily cross roads and habitat fragmentation would not be an issue.

Any crossings of the highway would place wildlife in danger of collisions with vehicles. Vehicle collisions would become a source of bear mortality for Alternative 3 because the highway for this alternative crosses moderate and high quality habitat for this species over much of its length. Collisions are most likely to occur during spring and summer when traffic numbers are higher and there is greater use of the coastal fringe by bears.

Vehicle collisions would cause black bear mortality. However, the principal impact of Alternative 3 to black bear would be increased access to the region for hunters, as discussed in the *Indirect and Cumulative Impact Technical Report*.

River otters and martens will cross roads when they encounter them. Otters are killed on an infrequent but regular basis by vehicles in the Juneau area (Barten, 2001a). Therefore, river otter and marten mortality from vehicle collisions is likely along Alternative 3, particularly in the vicinity of the Sullivan, Endicott, and Chilkat rivers.

Sitka black-tailed deer are susceptible to vehicle collision mortality during winter as they move toward the beach and use the highway to escape deep snow conditions. Most of the deer on the west side of Lynn Canal are south of William Henry Bay. On the east side of the Canal, most deer are south of Echo Cove. Because deer populations in the project area are at low densities, vehicle collisions are likely to be uncommon.

The West Lynn Canal Highway would pass through a total of about six miles of moose winter habitat in the vicinity of the Endicott and Sullivan rivers and the Chilkat River Valley. Average winter ADT is predicted to be 140 vehicles in 2008 and 250 vehicles in 2038 under Alternative 3. Because the highway would be located in areas where there have been no roads and no acclimation to traffic, moose may be particularly susceptible to vehicle collisions in the first few years of highway operation. DOT&PF would post warning signs cautioning motorists to help minimize the vehicle collision mortality on this population.

The number of moose that would be killed by vehicles each year with Alternative 3 is likely to fluctuate with weather conditions and the density of moose near the highway. ADF&G may have to consider this new source of mortality in their management plans for the moose herds on the west side of Lynn Canal.

Mountain goat winter habitat at lower elevations could be affected by noise and disturbance associated with vehicle traffic on the highway. Avalanche control activities in mountainous areas also have the potential to stress wintering goats. Most avalanche control on this alternative would be done by howitzer fire. Available winter habitat could be reduced in certain areas by continuing disturbance from traffic. If disturbance displaces goats from high-quality winter habitat, it could potentially reduce carrying capacity and have local population effects. Goat summer habitat is generally at higher elevations and would not be adversely affected. Alternative 3 would not be expected to affect goat winter habitat on the east side of Lynn Canal except for those goats that winter near the shore in WAA 2514 (Echo Cove to Sawmill Cove).

4.2.5.5 Terrestrial Birds

Construction Activities – To comply with the Migratory Bird Treaty Act, clearing activities would be avoided during the nesting season (late spring to early summer) in old-growth forest areas where migratory birds including the olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler are likely to nest. Construction noise could decrease the chances of reproductive success for the season of nesting birds near construction sites. Because the amount of nesting habitat that would be directly affected by highway construction would represent a small fraction of the potential habitat available in the project area, construction activities would not have long-term adverse affects on their reproductive success of any resident or migratory bird species.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – The loss of 409 acres of forest habitat with Alternative 3, as well as the corresponding reduction in habitat value caused by edge effects, would reduce the available habitat on the west side of Lynn Canal for the terrestrial birds considered in this analysis by a very small percentage (about 0.5 percent) of available habitat in the project area.

4.2.5.6 Amphibians

Construction Activities – Alternative 3 would result in the loss of approximately 34 acres of marsh and forested wetlands that are inhabited by frogs and toads. Because these species cannot move rapidly enough to avoid construction equipment, individual amphibians present in the construction area would be lost.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Since amphibians have rather small home ranges and do not appear to travel far from their natal areas (NatureServe, 2003), potential habitat loss and fragmentation would only affect amphibians that lived near the highway corridor. Amphibian populations are not distributed evenly across wetland habitats but are highly localized (Carstensen, 2003). This means that the direct habitat loss from Alternative 3 could Have a greater impact on amphibians than implied by the small percentage (1.7 percent) of wetland acreage affected by this alternative. However, because the direct habitat loss would be small, it is not likely that it would impact regional population levels of amphibians.

4.2.6 Alternatives 4A through 4D

These four alternatives address improved ferry service in Lynn Canal by increasing the number and frequency of shuttles operating between Juneau and Haines/Skagway. All four alternatives would include construction of a new double-stern berth at the Auke Bay ferry terminal. Alternatives 4A and 4B would use FVF shuttles while Alternatives 4C and 4D would use conventional monohull vessels. Alternatives 4B and 4D would provide shuttle service to Haines and Skagway from a new terminal at Sawmill Cove in the summer. Alternatives 4A and 4C would continue to provide this service from Auke Bay year round. AMHS mainline ferries would continue to serve Haines and Skagway under all four alternatives.

4.2.6.1 Overall Habitat Loss

Alternatives 4A and 4C would not impact terrestrial habitat. Alternatives 4B and 4D would result in the loss of 55 acres of terrestrial habitat including 53 acres of old-growth forest habitat and 2 acres of grassland/meadow habitat. Approximately 91 percent of this habitat is located in the coastal fringe (Table 4-1). Approximately 11 acres of wetlands, primarily forested wetlands (10 acres), would also be lost and are included in the total for the old-growth forest category. Other wetlands filled under Alternatives 4B and 4D would include less than 0.1 acre of palustrine emergent wetland and less than 1 acre of palustrine scrub-shrub wetland. Approximately two acres of beach bar habitat would be lost with the ferry terminal at Sawmill Cove. All habitat impacts for these two alternatives would occur between Echo Cove and Sawmill Cove.

4.2.6.2 Marine Mammals

Construction Activities – Alternatives 4A through 4D would require reconstruction of the west end of the Auke Bay ferry terminal to create a double-stern berth. Alternatives 4B and 4D would also require construction of a new ferry terminal at Sawmill Cove in Berners Bay. Modification of the Auke Bay terminal and construction of the Sawmill Cove terminal would require pile driving. Harbor seals, killer whales, humpback whales, minke whales, harbor porpoises, and Dall's porpoises may come within ¼ mile of these terminal sites and would be disturbed by underwater noise associated with pile driving. To reduce potential underwater noise from construction, in-water pile driving would be conducted using vibratory hammers where possible, which greatly reduces generated noise. Monitors would be on site during pile driving at the terminals to watch for the presence and/or disturbance of marine mammals.

Habitat Loss and Effects of Maintenance and Marine Vessel Traffic – Alternatives 4A and 4C would not result in the loss of any habitat for marine mammals. Alternatives 4B and 4D would result in the loss of two acres of beach bar habitat at the Sawmill Cove ferry terminal. This area is not an identified haulout site for any marine mammals.

The alignment for the highway from Echo Cove to Sawmill Cove for Alternatives 4B and 4D is more than a mile away from beaches and sand bars in Berners Bay. Therefore, traffic noise would not impact harbor seals in that bay.

Alternatives 4A through 4D would augment mainline ferry service in Lynn Canal with shuttle ferries between Auke Bay (Alternatives 4A and 4C) or, in the summer, between Sawmill Cove (Alternatives 4B and 4D) and Haines and Skagway. This increase in ferry traffic would increase the potential for collisions with marine mammals. Of possibly more importance to the risk of collisions is the proposed use of FVFs for Alternatives 4A and 4B. FVFs would operate at a minimum speed of 30 knots compared to the minimum speed of a conventional monohull vessel of 15 knots. Laist *et al*. (2001) evaluated available data on collisions between ships and whales and found evidence for a correlation between increased ship speed and increased collisions between ships and whales. Therefore, the use of FVFs for Alternatives 4A and 4B may proportionately increase the risk of collisions between ferries and marine mammals. There have been no reports of existing AMHS ferries striking humpback whales or any other marine mammals (Angliss and Lodge, 2003). FVFs would have special operational procedures to reduce the risk of collisions with marine mammals similar to the procedures developed for the *M/V Fairweather*. Given the low incidence of collisions with the current marine vessel traffic, the incremental increase in risk with Alternatives 4B and 4D would not be likely to adversely affect humpback whales.

Minke whales are likely to be affected by increased ferry traffic and FVFs in a similar manner to humpbacks. Fast-moving and maneuverable species such as harbor seals, harbor porpoise, Dall's porpoise, and killer whales would not be expected to be affected by any increased ferry traffic or FVFs in Lynn Canal. Sea otters would not be affected by increased ferry traffic associated with Alternatives 4A through 4D because their population in Lynn Canal is low and they are associated primarily with nearshore habitats.

Concern for harbor seals is focused on disturbance at haulouts. Alternatives 4A and 4C would use existing dock facilities and ferry routes that do not travel near seal haulouts and would thus have no impacts on seals. Alternatives 4B and 4D would use a new ferry terminal at Sawmill Cove. Harbor seals have been documented to use this area for feeding (USFWS, 1003), but the main haulouts in Berners Bay are on sandbars near the major rivers and would not be affected by operation of the ferry terminal. Operations of new ferries would result in some potential avoidance of the areas near the ferry terminals and some disturbance to individual seals in open water. This level of disturbance would not have population-level effects on seals.

4.2.6.3 Marine Birds

Construction Activities – Great blue herons are present in small numbers in Berners Bay and could nest in the vicinity of streams such as Sawmill Creek. Construction activities would be approximately 1,500 feet from the estuary and are unlikely to affect great blue heron nesting.

The highway for Alternatives 4B and 4D would cross potential nesting habitat for marbled murrelets for about five miles from Echo Cove to Sawmill Cove. Construction activities could disturb breeding birds near the highway alignment. To minimize impacts to nesting birds, clearing would not be done in nesting habitat for migratory birds during the nesting season.

As indicated in Section 4.2.1.3, Alternatives 4B and 4D would not impact trumpeter swans in the Berners Bay area.

Habitat Loss and Effects of Maintenance and Marine Vessel Traffic – As indicated above, Alternatives 4A through 4D would augment mainline ferry service in Lynn Canal with shuttle ferries between Auke Bay (Alternatives 4A and 4C) or, in the summer, between Sawmill Cove (Alternatives 4B and 4D) and Haines and Skagway. Round trips in Lynn Canal from Auke Bay or Sawmill Cove to Haines or Skagway in the summer would increase from an average of 2.3 per day with Alternative 4C to 6.3 per day with Alternative 4B. Marine birds and waterfowl feeding or resting along the ferry route in Lynn Canal and Berners Bay would fly or swim away from approaching ferries and resume their normal behavior in another location. A maximum of about one shuttle ferry an hour would travel Lynn Canal during day time hours in the summer. Such short-term displacements would cost birds a small amount of energy and time but would be unlikely to affect reproductive success or survival.

4.2.6.4 Terrestrial Mammals

Alternatives 4A and 4C would have no impact on terrestrial mammals because these alternatives would use existing transportation facilities in Lynn Canal and construction would be limited to modification of the Auke Bay ferry terminal. The impacts for Alternatives 4B and 4D are discussed below.

Construction Activities – Wolf dens are generally located within 100 feet of fresh water. There is the potential that the Alternative 4B and 4D highway alignment could be in the vicinity of dens where it crosses streams including Sawmill and Cascade creeks, and construction could result in the abandonment or destruction of some den sites. DOT&PF would conduct pre-construction wolf den surveys within 600 feet of the project construction limits in any areas that consultation with resource agencies identify as having high potential for wolf dens. If wolf dens are identified during these surveys, DOT&PF would conduct further agency consultations to determine appropriate measures to minimize impacts.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – As indicated in Table 4-1, approximately 96 percent of the terrestrial vegetation removed for the highway under Alternatives 4B and 4D is old-growth forest, most of which (38 acres) is in the coastal fringe. Numerous species rely on habitat characteristics of old-growth forests, including martens, brown and black bears, mountain goats, and wolves. The direct loss of habitat resulting from Alternatives 4B and 4D would have a very small effect on terrestrial mammals because this loss would amount to about 0.07 percent of these habitats available in the project study area.

The highway for Alternatives 4B and 4D cross moderate to high quality habitat for black bears. This means that bears would have to cross the highway from higher elevation denning sites to access habitat near the coast. Because black bears are highly adaptable and often learn to coexist near human development, a highway is not likely to result in a substantial barrier to the movement of this species in the area of these alternatives.

Brown bears also move seasonally between higher elevation den sites and lower estuarine wetland areas. The highway would cross moderate quality brown bear habitat. Because the highway under Alternatives 4B and 4D would separate higher elevation habitats from beach fringe and the estuary habitat at Sawmill Creek and these areas often contain important food resources, such as new vegetation growth in the spring, the effective loss of habitat could cause some of the brown bears in the region between Echo Cove and Sawmill Cove to be displaced from habitat areas surrounding the highway (Schoen *et al.*, 1993). The habitat capability modeling for the project in 1997 indicated that Alternatives 4B and 4D would decrease habitat capability on the east side of Lynn Canal by about four percent compared to present conditions, mostly due to habitat fragmentation. This represents a 28 percent reduction in habitat capability in the WAA crossed by the highway. This impact could be reduced to an extent by adapting the Sawmill Creek bridge to function as a wildlife underpass or by brown bears adapting to the presence of a highway.

Martens and river otters have relatively small home ranges and appear to cross roads on a regular basis. Therefore, habitat fragmentation would not be an issue for these species.

Because the highway alignment for Alternatives 4B and 4D is at lower elevations, access to beaches and riparian areas along the corridor may be restricted for wolves. Habitat fragmentation would likely decrease their use of some estuarine areas. Wolves could continue to access the area by crossing the highway; however, they have an aversion to human presence and may abandon portions of their range if there is too much human activity in that area (Dave Person, personal communication, 2004).

Any crossings of the highway would place wildlife in danger of collisions with vehicles. Vehicle collisions may become a source of bear mortality for Alternatives 4B and 4D because the highway for these alternatives crosses moderate to high quality habitat for this species over its five mile length. Collisions are most likely to occur during spring and summer when traffic numbers are higher and coastal fringe habitat is frequented by bears.

The habitat capability modeling for the project in 1997 indicated that Alternatives 4B and 4D would decrease black bear habitat capability on the east side of Lynn Canal by about one percent compared to current conditions. This represents approximately seven percent of the habitat capability of the WAA crossed by the highway. Some of this decrease would be due to increased mortality from vehicle collisions; however, the largest potential effect would be increased access for hunters (see *Indirect and Cumulative Impact Technical Report*).

River otters and martens will cross roads when they encounter them. Otters are killed on an infrequent but regular basis by vehicles in the Juneau area (Barten, 2001a). Therefore, river otter and marten mortality from vehicle collisions is likely along the five miles of highway for Alternatives 4B and 4D, particularly in the Sawmill Creek area.

Sitka black-tailed deer are susceptible to vehicle collision mortality during winter as they move toward the beach and use the highway to escape deep snow conditions. Because deer populations in the project area are at low densities, vehicle collisions are likely to be uncommon under Alternatives 4B and 4D.

The highway for Alternatives 4B and 4D would not cross moose habitat. Therefore, there would be no impacts to moose.

4.2.6.5 Terrestrial Birds

Alternatives 4A and 4C would have no impact on terrestrial birds because these alternatives would use existing transportation facilities in Lynn Canal and construction would be limited to modification of the Auke Bay ferry terminal. The impacts for Alternatives 4B and 4D are discussed below.

Construction Activities – To comply with the Migratory Bird Treaty Act, clearing activities would be avoided during the nesting season in (late spring to early summer) old-growth forest areas where migratory birds including the olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler are likely to nest. Construction noise could decrease the chances of reproductive success for the season of nesting birds near construction sites.

Because much of the project study area provides nesting habitat for resident and migratory birds that inhabit the region, construction activities along the highway from Echo Cove to Sawmill Cove would not have population-level effects on any species.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – The loss of 53 acres of forest habitat with Alternatives 4B and 4D, as well as the corresponding reduction in habitat caused by the forest edge created by the highway corridor, would reduce the available habitat on the east side of Lynn Canal for the terrestrial birds considered in this analysis by about 0.07 percent. This would not have population-level effects on any species.

4.2.6.6 Amphibians

Alternatives 4A and 4C would have no impact on amphibians because these alternatives would use existing transportation facilities in Lynn Canal and construction would be limited to modification of the Auke Bay ferry terminal. The impacts for Alternatives 4B and 4D are discussed below.

Construction Activities – Alternatives 4B and 4D would result in the loss of approximately 11 acres of forested wetlands and scrub-shrub wetlands that are inhabited by frogs and toads. Because these species cannot move rapidly enough to avoid construction equipment, individual amphibians present in the construction area would be lost.

Habitat Loss and Effects of Maintenance and Vehicle Traffic – Since amphibians have rather small home ranges and do not appear to travel far from their natal areas (NatureServe, 2003), potential habitat loss and fragmentation would only affect amphibians that lived near the highway corridor. Amphibian populations are not distributed evenly across wetland habitats but are localized (Carstensen *et al*., 2003). This means that the direct habitat loss from Alternatives 4B and 4D could Have a greater impact on amphibians than implied by the small percentage (0.05 percent) of wetland acreage affected by these alternatives. However, because the direct habitat loss would be small, it is not likely that it would impact regional population levels of amphibians.

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FIGURES

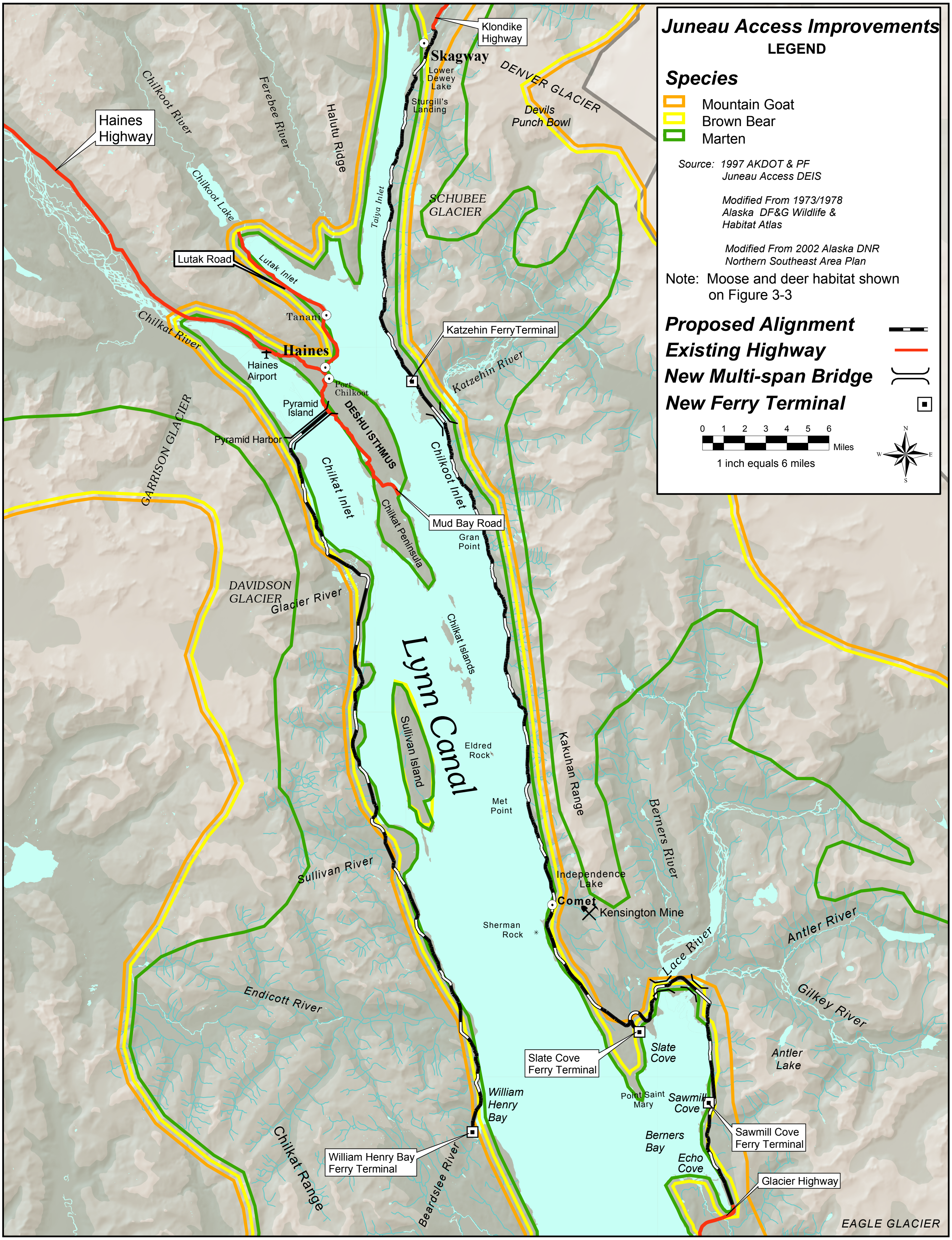

Figure 3-1
Mountain Goat, Brown Bear and Marten Habitat in Lynn Canal

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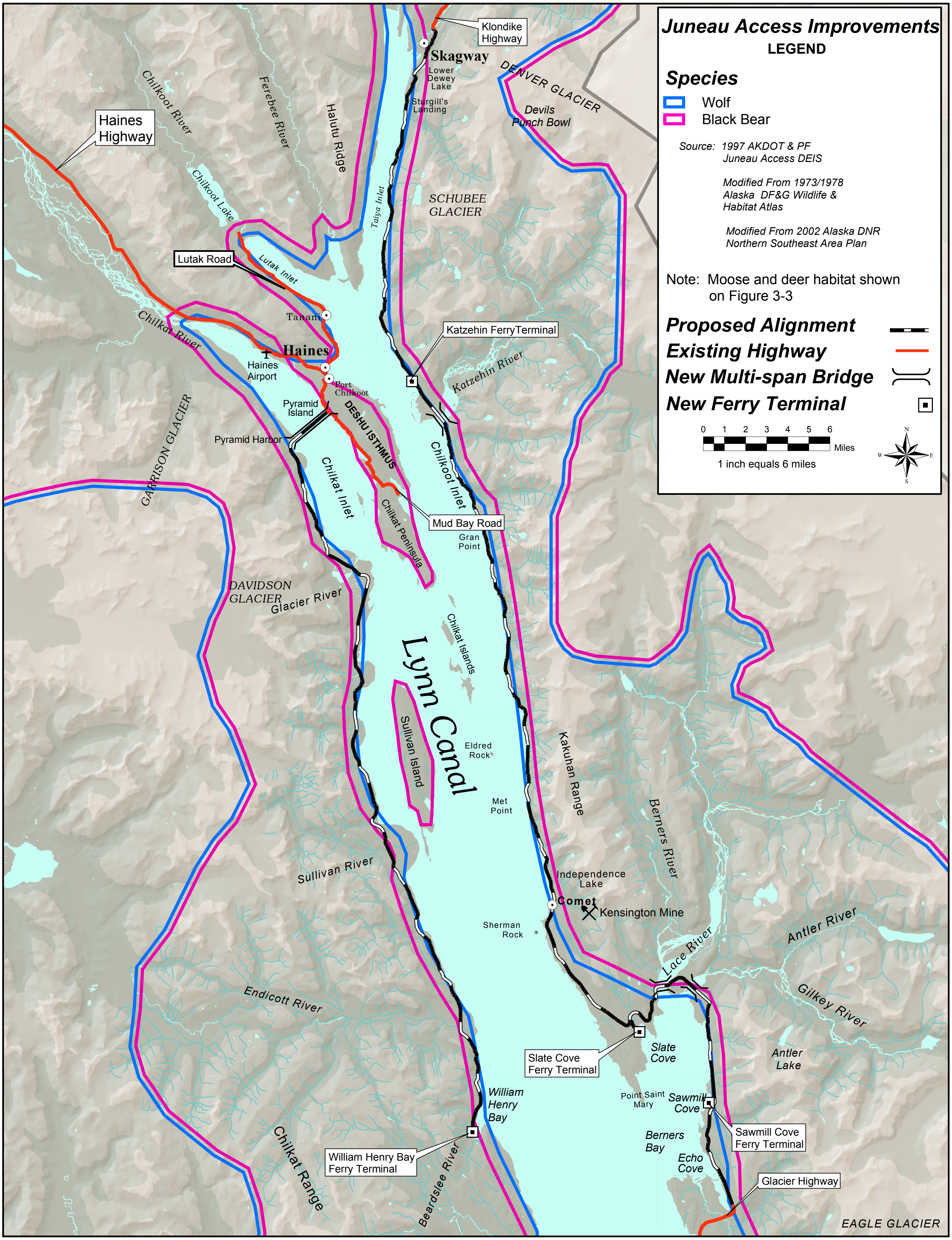

Figure 3-2
Wolf and Black Bear Habitat in Lynn Canal

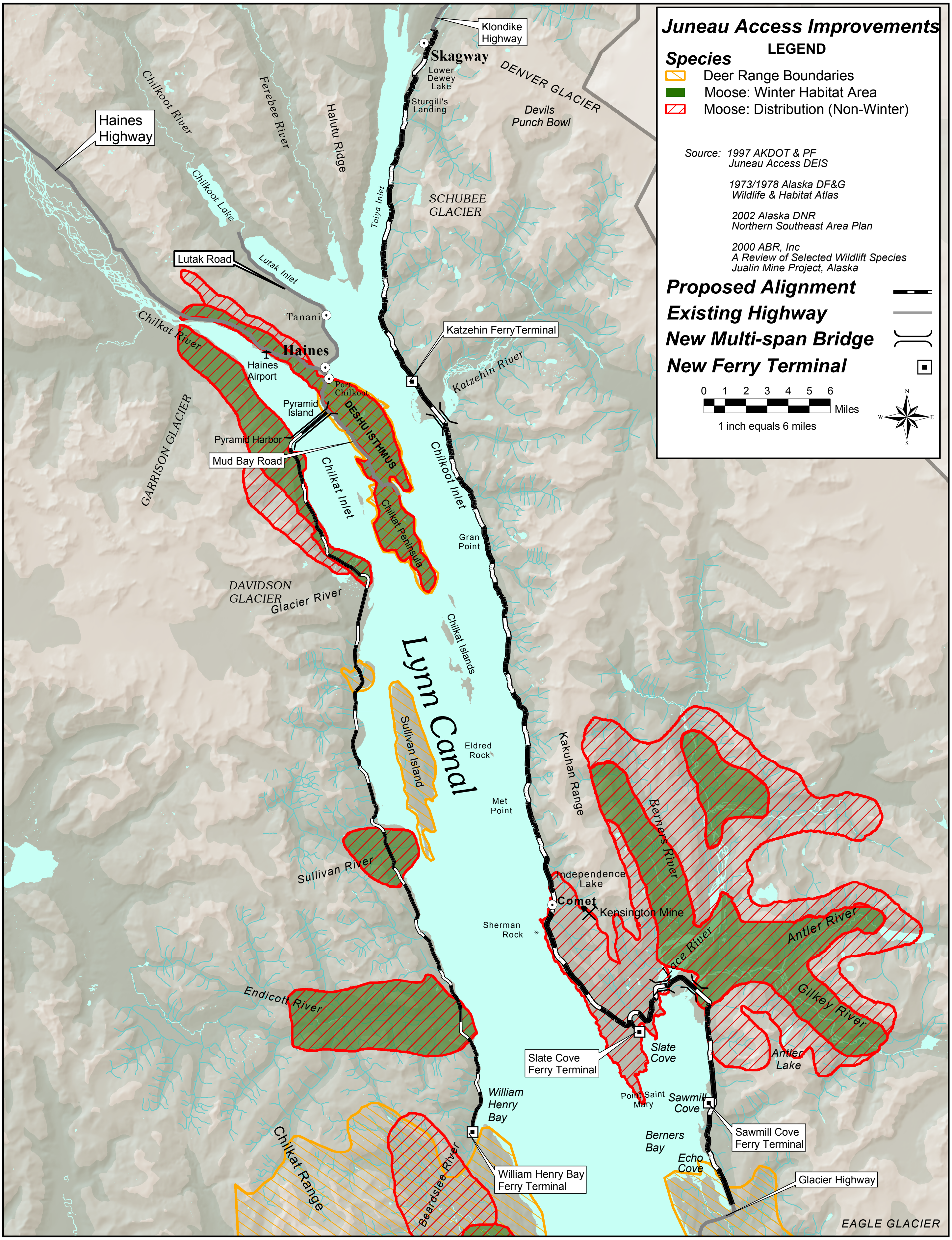

Figure 3-3
Moose and Deer Habitat in Lynn Canal

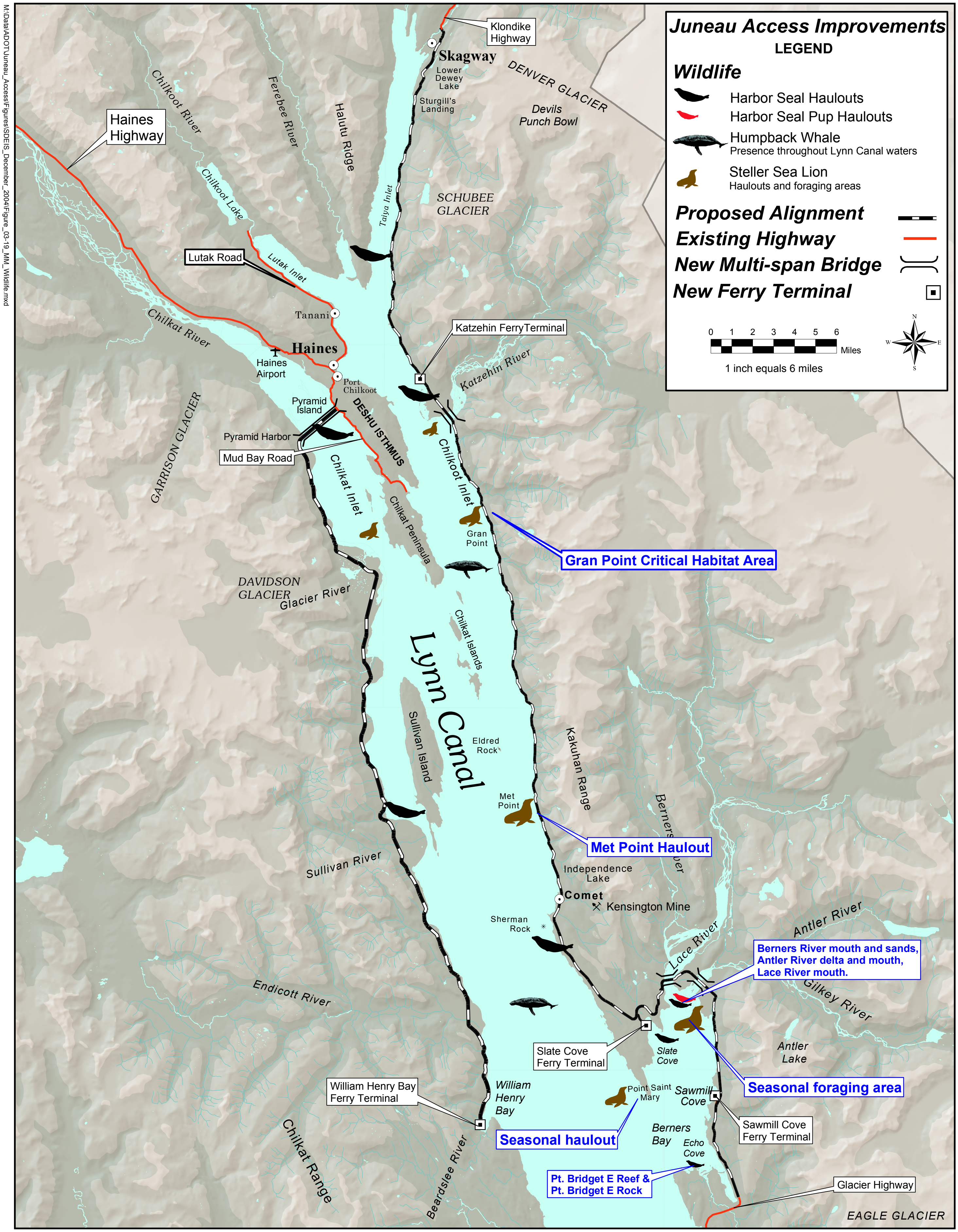

Figure 3-4
Marine Mammal Concentrations in Lynn Canal

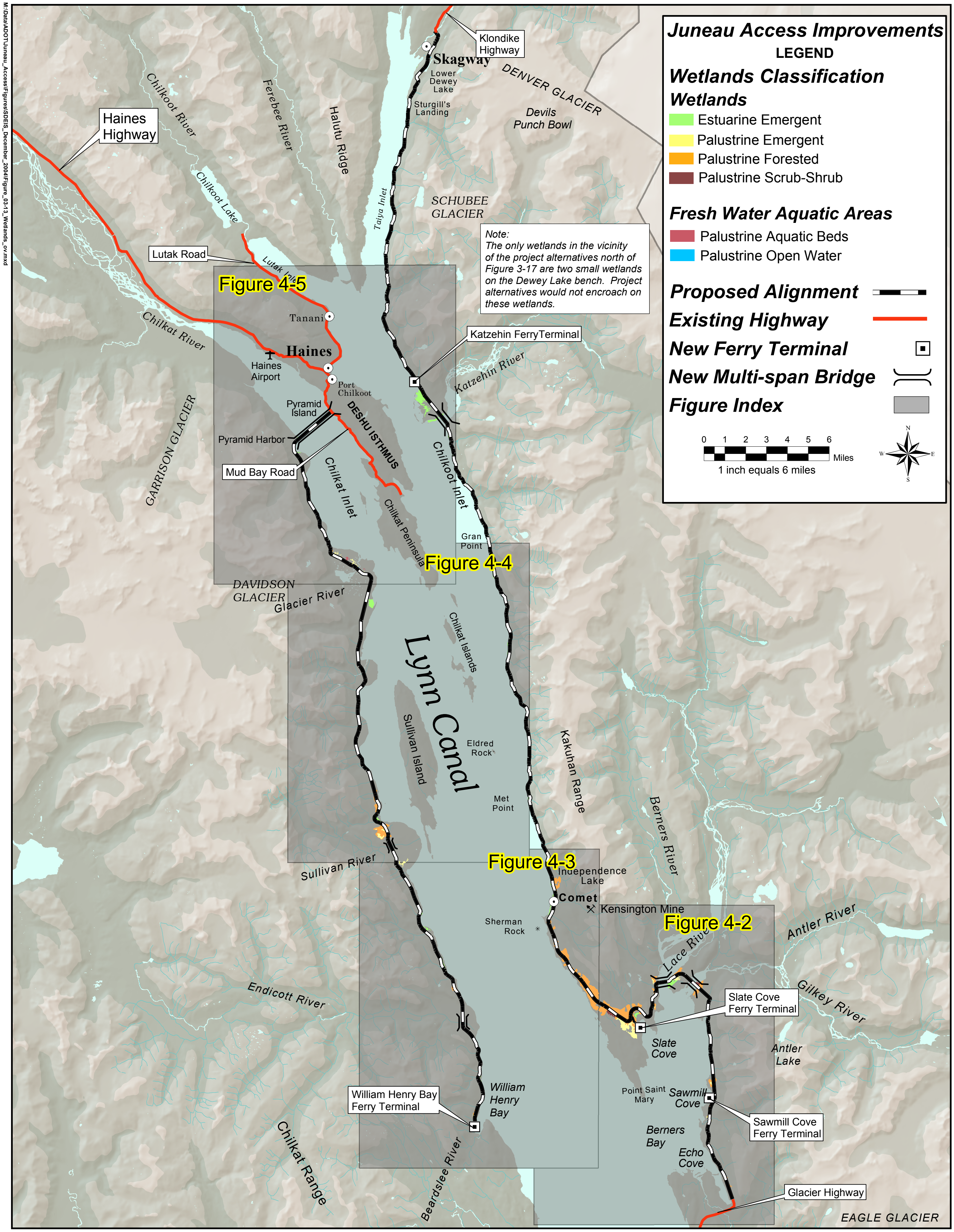

Figure 4-1
Wetlands Classifications Figure Index

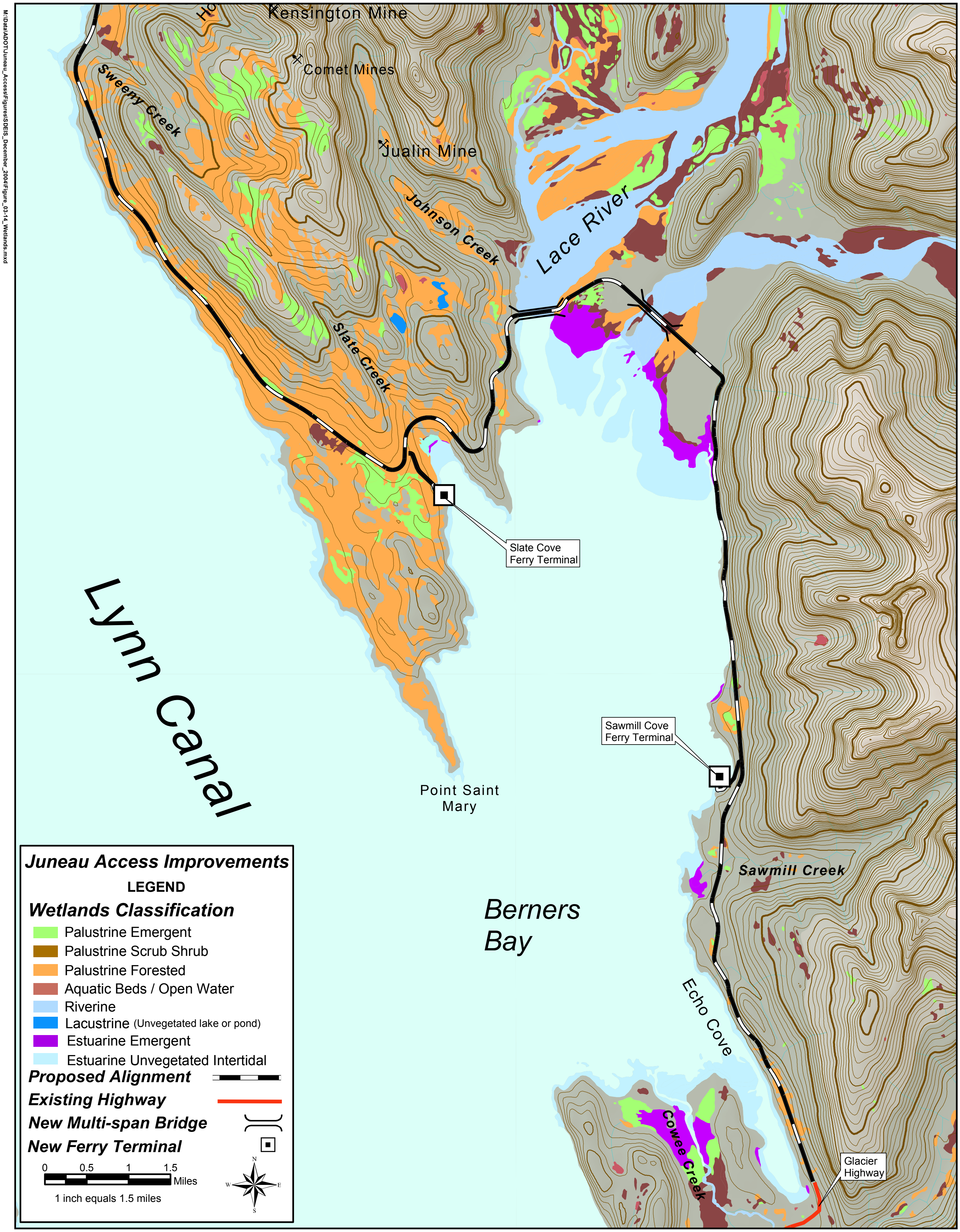

Figure 4-2
Wetlands Classifications for Berners Bay Area

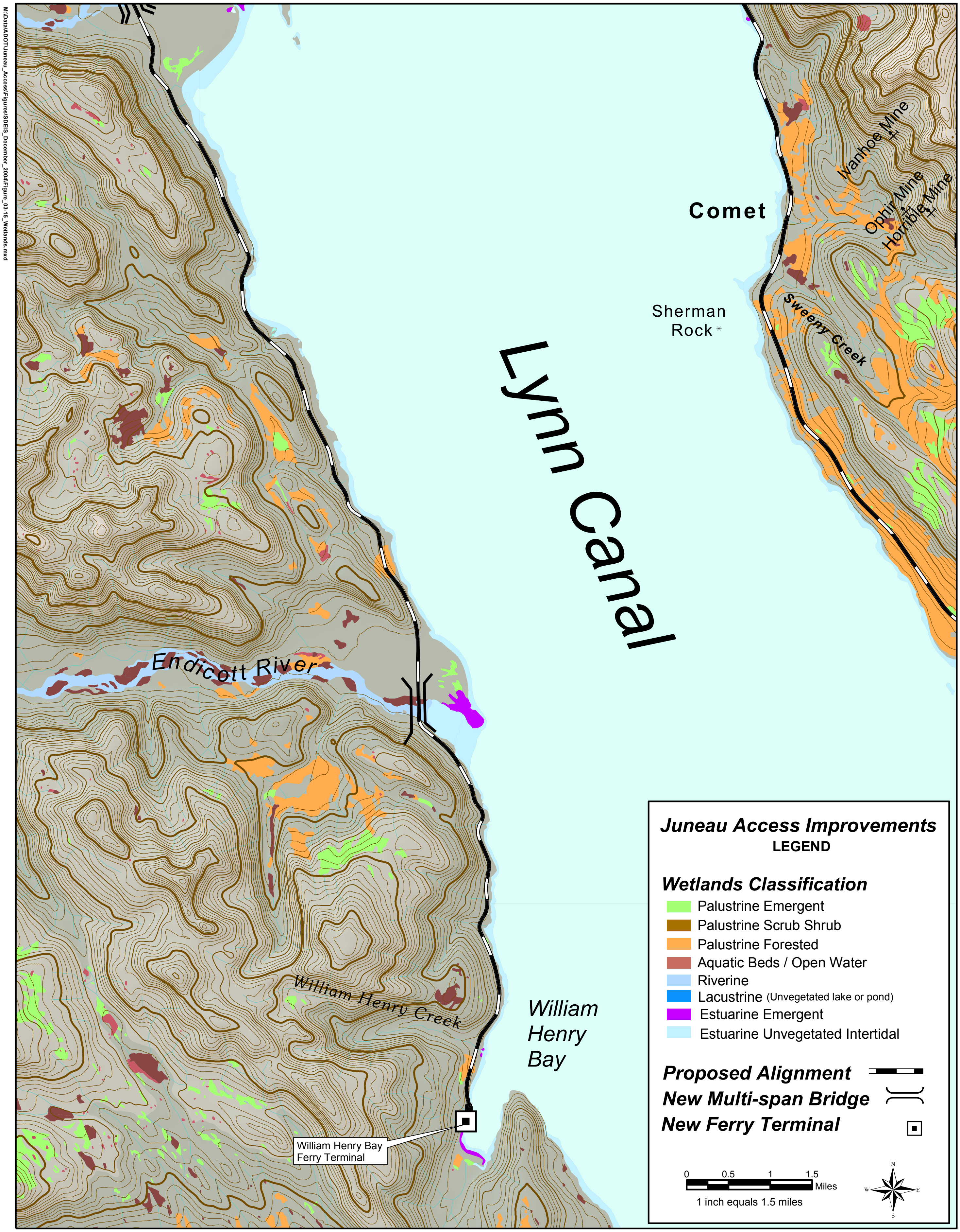

Figure 4-3
Wetlands Classifications for William Henry Bay Area and Comet Area

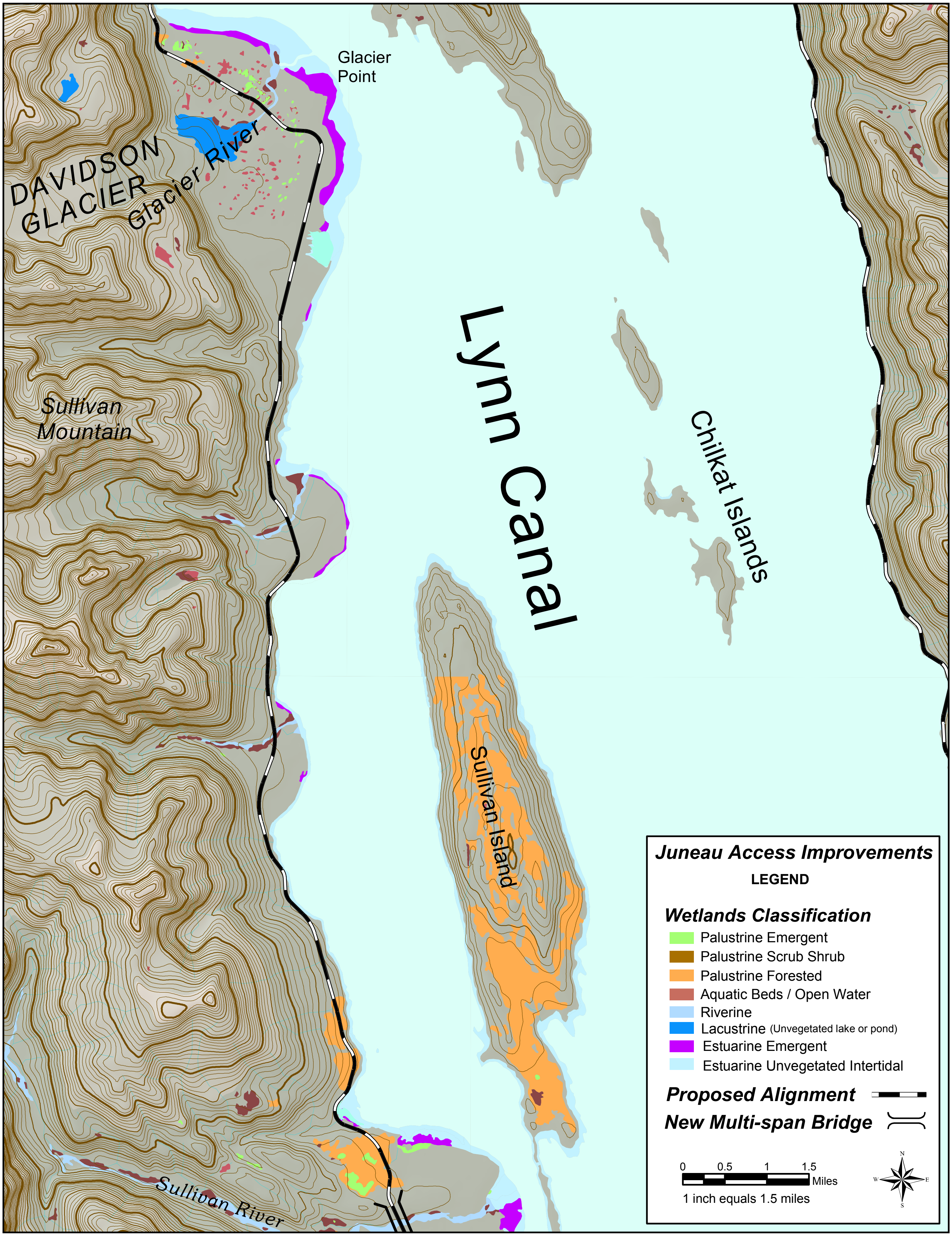

Figure 4-4
Wetlands Classifications for Sullivan River Area

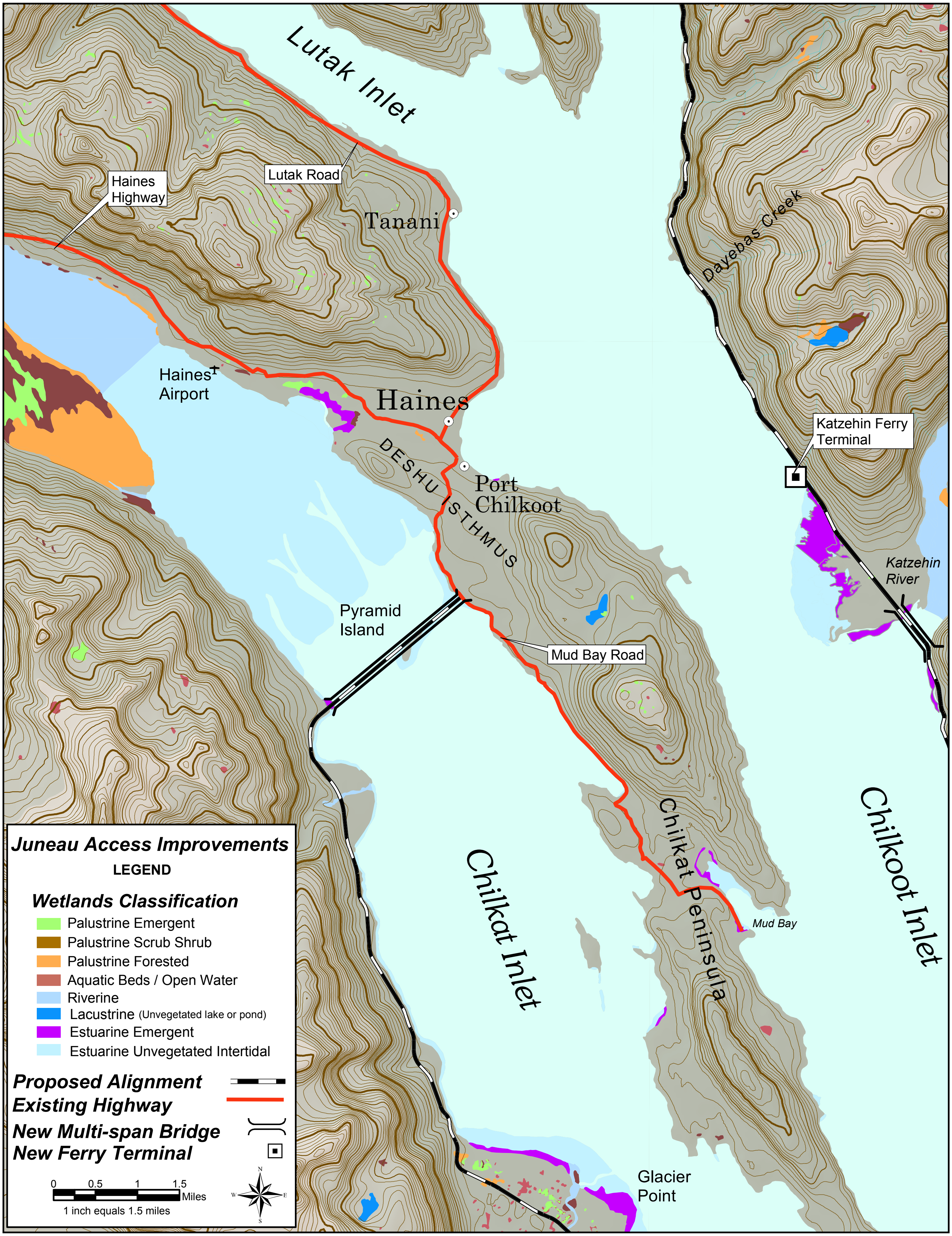

Figure 4-5
Wetlands Classifications for Haines Area

ATTACHMENT A

THIS INFORMATION IS TAKEN FROM THE *WILDLIFE TECHNICAL REPORT FOR JUNEAU ACCESS DEIS*, JANUARY 1997; PREPARED BY DAMES & MOORE, INC.

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Table A-1
Habitat Capability of Project Area WAAs for Brown Bear, Black Bear, Marten, and Mountain Goat

Route/WAA	Number of Animals			
	Brown Bear	Black Bear	Marten	Mountain Goat
East Lynn Canal Route				
2514	14	54	45	78
2409	7	26	22	23
2413	20	52	14	130
2411	15	72	26	180
2410	8	27	17	52
2408	8	26	17	32
4408	18	66	40	304
4407	9	34	16	133
Total	**99**	**358**	**197**	**932**
West Lynn Canal Route				
2514	14	54	45	78
2304	18	68	52	12
2203	23	88	44	83
2202	9	33	22	65
4302	27	28	26	47
Total	**91**	**271**	**189**	**285**

Source: 1997 DEIS Wildlife Tech Report

Table A-2
Reductions in Habitat Capability for the Brown Bear Resulting From the Juneau Access Project

Route/WAAs	Current Habitat Capability	Reductions in Habitat Capability			
		Construction Impacts[1]	Operational Impacts[2]	Total Impacts	Percent Reduction
Alternative 2, East Lynn Canal Route					
2514	14	< 0.1	4	4	28%
2409	7	< 1	3	4	57%
2413	20	0	3	3	15%
2411	15	0	4	4	27%
2410	8	< 0.1	2	2	25%
2408	8	< 1	4	5	63%
4408	18	< 1	5	5	28%
4407	9	< 1	3	3	37%
Total	**99**	**1**	**28**	**29**	**29%**
Alternative 3, West Lynn Canal Route					
2514	14	< 0.1	4	4	28%
2304	18	< 0.1	4	4	22%
2203	23	< 0.1	2	2	9%
2202	9	< 1	4	4	44%
4302	27	< 1	7	7	26%
Total	**91**	**< 1**	**21**	**21**	**23%**
Alternative 43, AMHS Improvements3					
2514	14	< 0.1	4	4	28%
Total	**14**	**< 0.1**	**4**	**4**	**28%**

Notes: [1] Construction impacts = 100% reduction in habitat capability within proposed cut and fill lines
[2] Operational impacts = 60% reduction in habitat capability within 1 mile of proposed road and 30% reduction within 5 miles of road
[3] Impact estimates for Alternative 4 are for construction of the road from Echo Cove to Sawmill Creek for the Berners Bay Shuttle Ferry under Options B and C

Source: 1997 DEIS Wildlife Tech Report

Table A-3
Reductions in Habitat Capability for the Black Bear Resulting from the Juneau Access Project

Route/WAAs	Current Habitat Capability	Reductions in Habitat Capability			
		Construction Impacts[1]	Operational Impacts[2]	Total Impacts	Percent Reduction
Alternative 2, East Lynn Canal Route					
2514	54	< 1	3	4	7%
2409	26	< 1	5	5	19%
2413	52	0	1	1	2%
2411	72	0	1	1	1%
2410	27	< 0.1	1	1	4%
2408	26	< 1	5	5	19%
4408	66	< 1	5	6	9%
4407	34	< 1	4	4	12%
Total	**357**	**1**	**25**	**26**	**7%**
Alternative 3, West Lynn Canal Route					
2514	54	< 1	3	4	7%
2304	68	< 1	3	3	4%
2203	88	< 0.1	2	2	2%
2202	33	< 1	4	5	15%
4302	28	< 1	2	3	11%
Total	**271**	**1**	**15**	**16**	**2%**
Alternative 4, AMHS Improvements3					
2514	54	< 1	3	4	7%
Total	**54**	**< 1**	**3**	**4**	**7%**

Notes: [1] Construction impacts = 100% reduction in habitat capability within proposed cut and fill lines
[2] Operational impacts = 20% reduction in habitat capability within 2 miles of proposed road

Source: 1997 DEIS Wildlife Tech Report

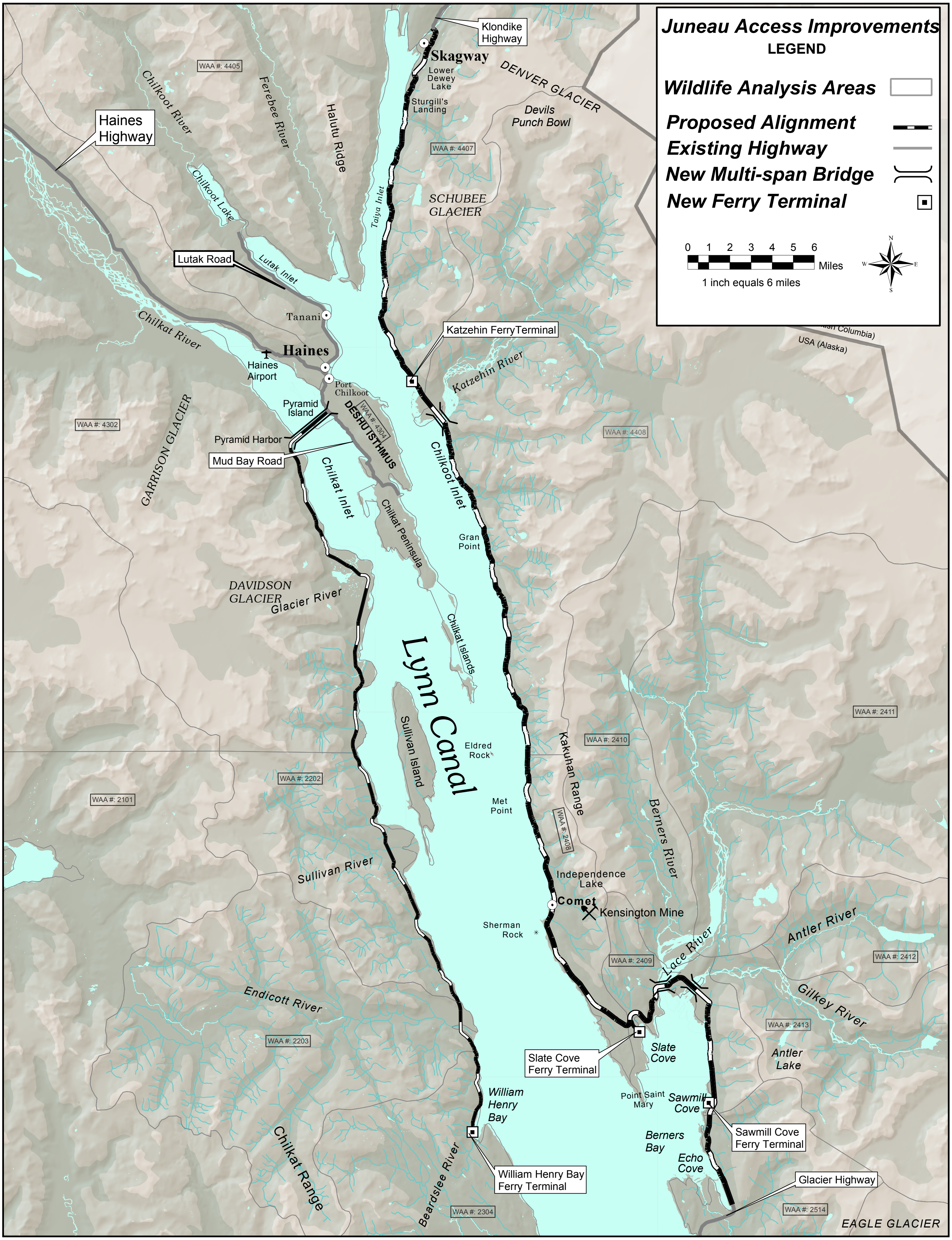


Figure A-1
Wildlife Analysis Areas

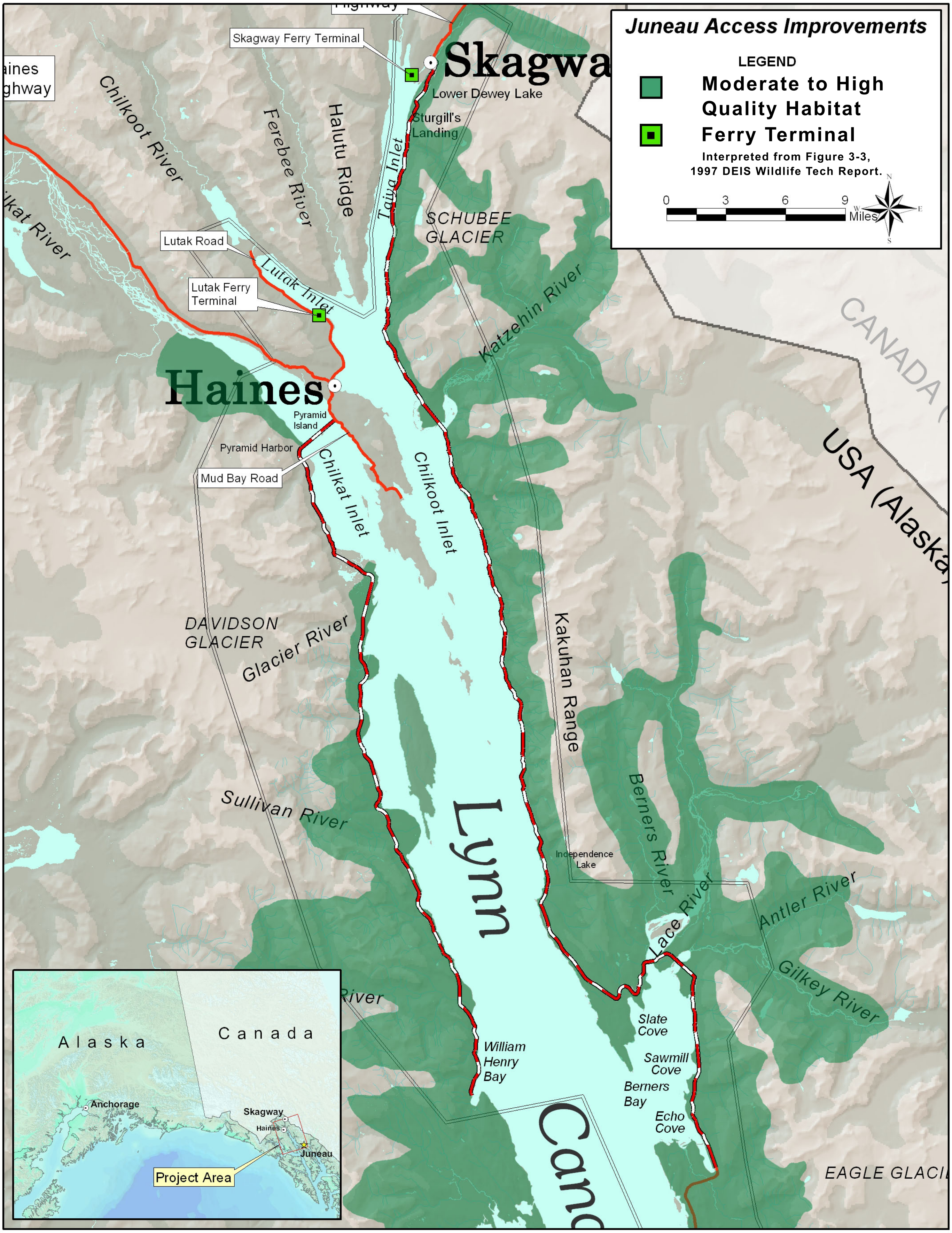


Figure A-2
Habitat Suitability for Brown Bear
Juneau Access Road

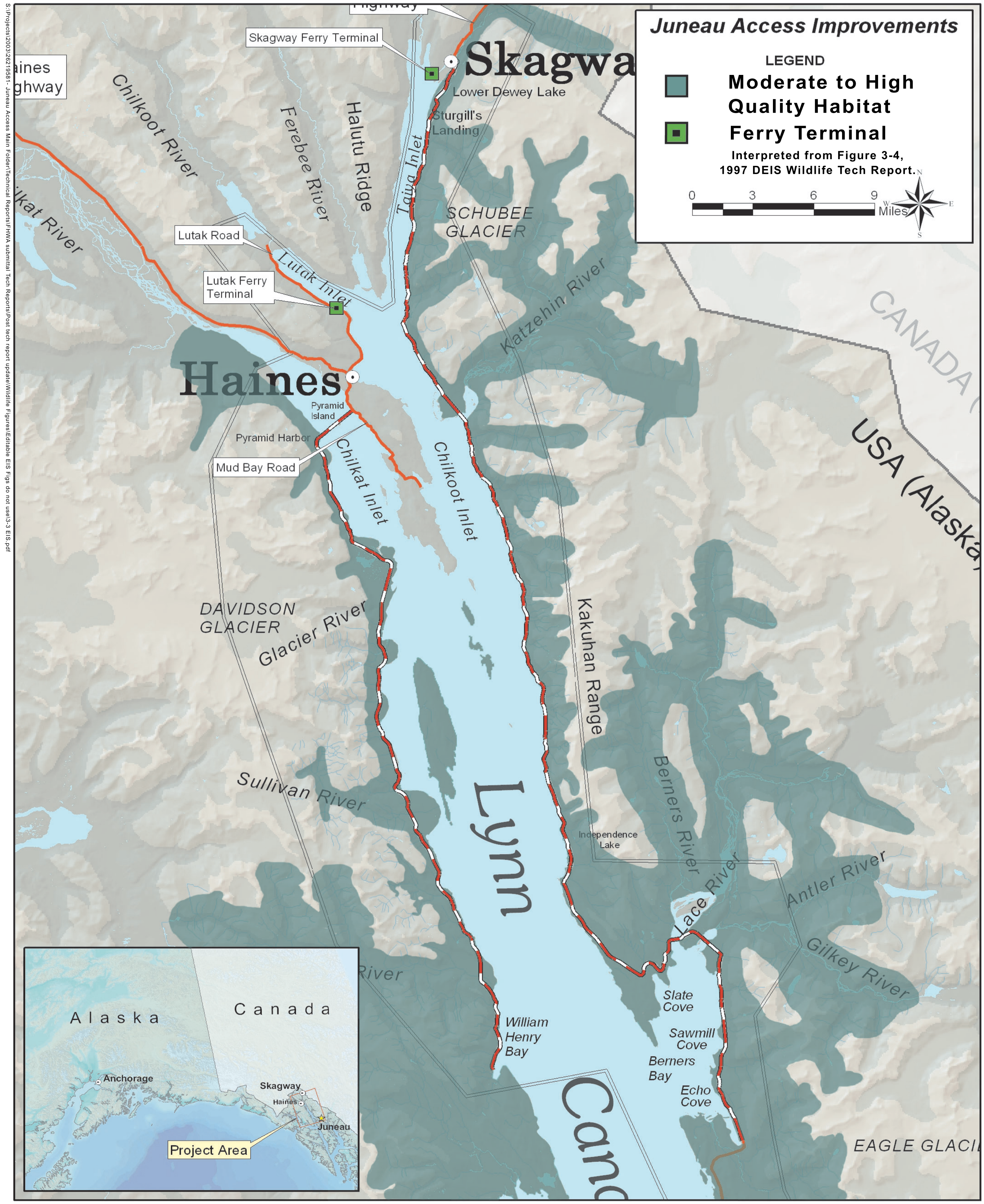


Figure A-3
Habitat Suitability for Black Bear
Juneau Access Road

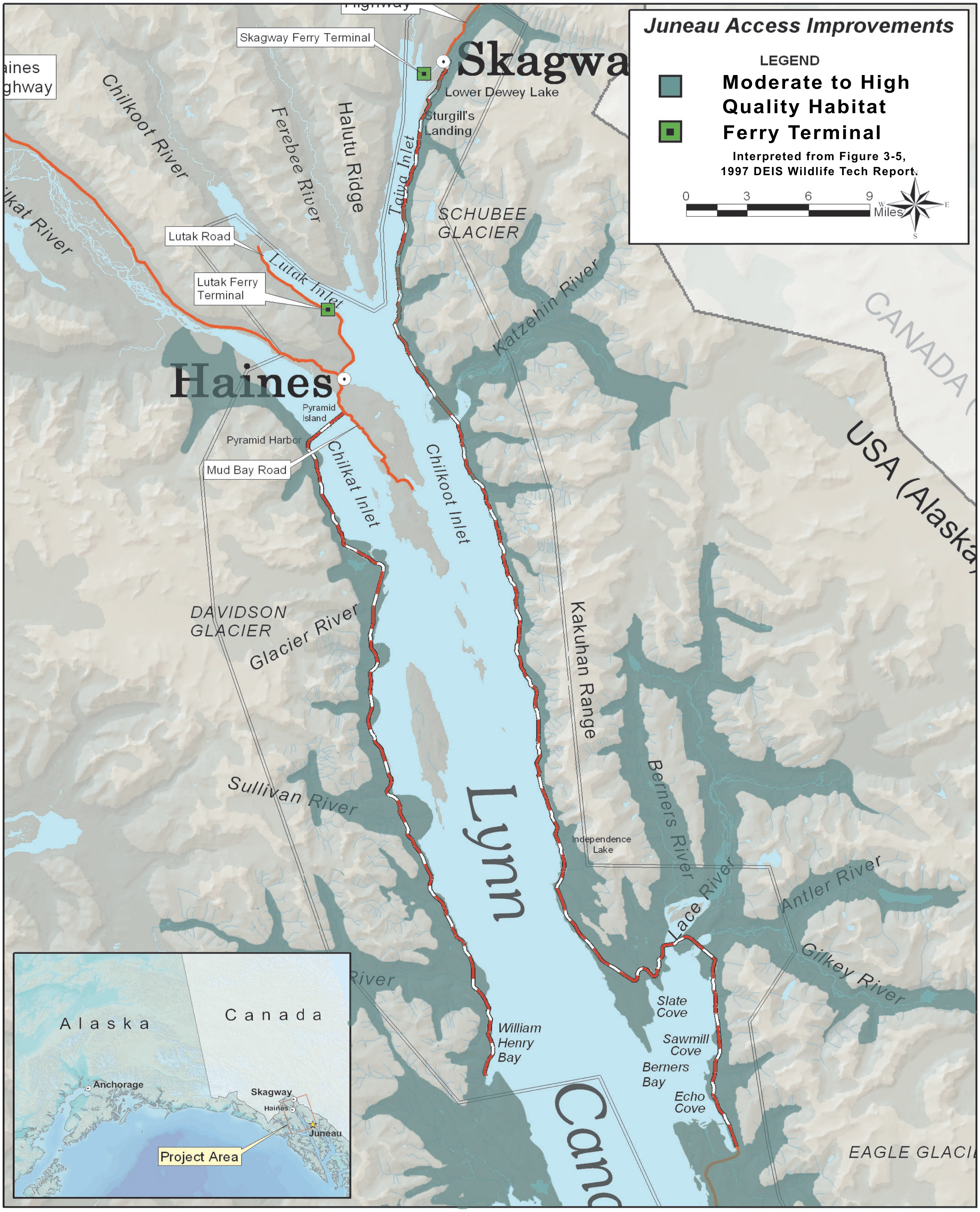
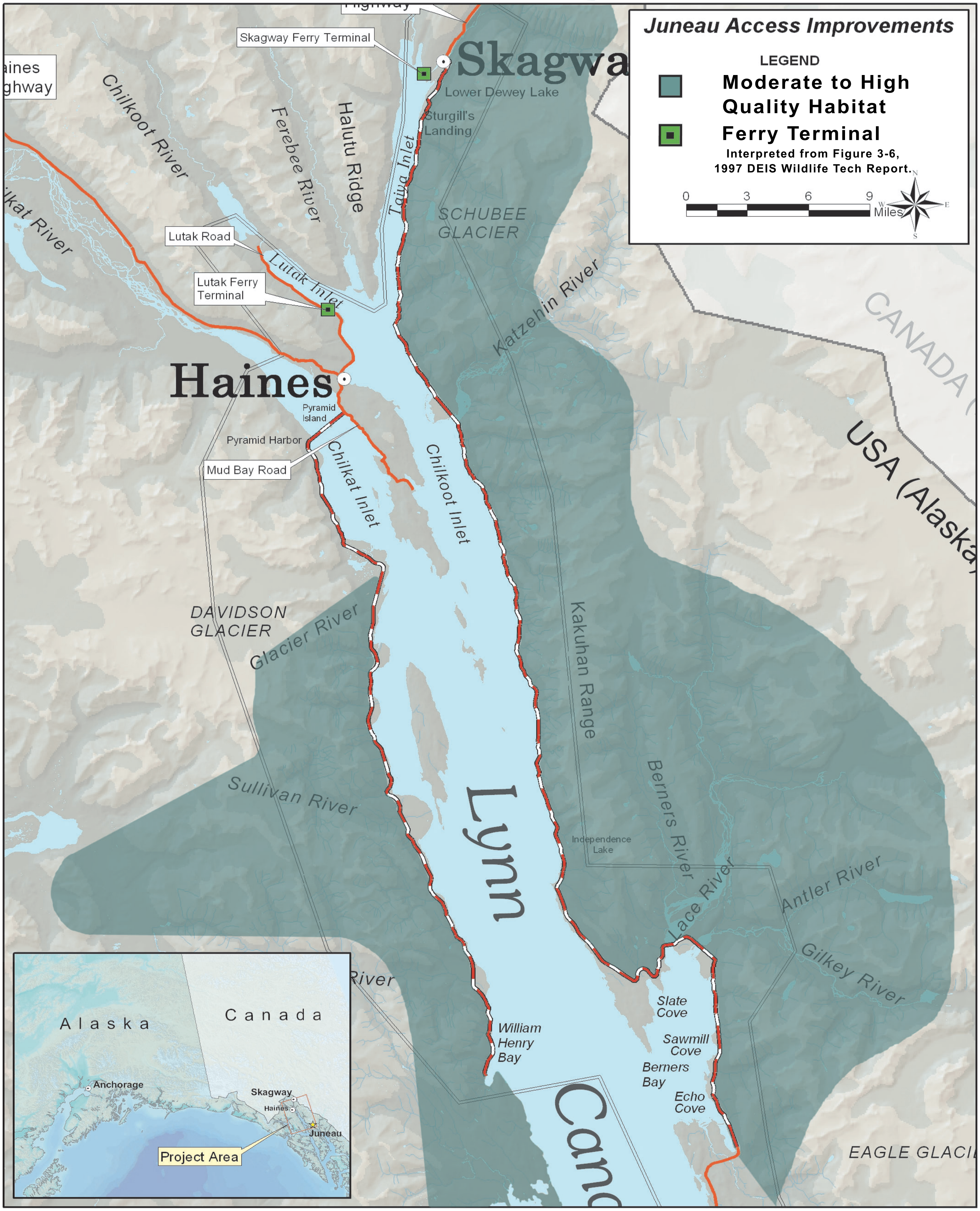


Figure A-4
Habitat Suitability for Marten
Juneau Access Road



Note: Mountain Goat Habitat extends north of the Davidson Glacier, however, the 1997 Wildlife Technical Report did not contain habitat data from non-USFS land.

Figure A-5
Habitat Suitability for Mountain Goat
Juneau Access Road