U.S. Fish & Wildlife Service

Izembek

National Wildlife Refuge
Land Exchange/Road Corridor

Final Environmental Impact Statement

Chapter 3.2 Affected Environment: Biological Environment

U.S. Fish and Wildlife Service Mission Statement

The Mission of the U.S. Fish & Wildlife Service is working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people.

Refuge System Mission Statement

The Mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

—National Wildlife Refuge System Improvement Act of 1997

On the Cover: Izembek National Wildlife Refuge, 2007

Photo from the NCTC Image Library

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

3.0 AFFECTED ENVIRONMENT

3.2 Biological Environment

3.2.1 Vegetation

All of the proposed exchange parcels are located on the Alaska Peninsula and on Sitkinak Island on the southern tip of the Kodiak Island Archipelago. The following description of the vegetation in the proposed land exchange areas is based on several studies of vegetation in the southern part of the Alaska Peninsula, focused primarily on the Izembek National Wildlife Refuge, and presented in the 2003 EIS. Similar detailed descriptions of vegetative communities are not available for the proposed exchange parcels adjacent to the refuge or for Sitkinak Island. The *Multi-Resolution Land Characteristics Consortium: National Land Cover Database* (National Land Cover Database) (USGS 2010a) provides a high level comparison and is the only data set available that can be used to compare the vegetative cover of the various parcels.

3.2.1.1 Landscape Setting

Tundra environments dominate the Alaska Peninsula. Forests are absent except in isolated drainages, for example, on the Pacific side of the peninsula, where riparian spruce/poplar forests occur occasionally. Willow and alder-dominated shrub lands are prevalent, especially on mountain slopes and in protected riparian sites. Tundra on the Alaska Peninsula ranges from wet phases (low shrub, sedge, grass, and herb dominated, sometimes with standing water), to moist heathlands, to dry alpine areas (dominated by dwarf shrubs and herbs) (USACE 2003).

Extensive areas of barren ground also are present, consisting mostly of open rock in the mountains, but also gravelly areas in the lowlands, beaches, and tidal flats and areas of volcanic ash. Marine influenced vegetation types include algae, lowland grass meadows, salt-tolerant strand vegetation associated with beaches, and estuarine areas (USACE 2003).

3.2.1.2 Ecoregions

The proposed land exchange parcels and related project sites of the alternatives are within the following broad ecoregions described by Gallant et al. (1995): (1) Bristol Bay–Nushagak Lowlands; and (2) Alaska Peninsula Mountains. The Sitkinak parcel, within the Alaska Maritime National Wildlife Refuge, is also within the Alaska Peninsula Mountains ecoregion.

The area around the City of Cold Bay, the western shore of Cold Bay, Kinzarof Lagoon, and around the northern half of Cold Bay is in the Bristol Bay-Nushagak Lowlands. Gently rolling and flat tundra terrain with numerous lakes and ponds and wide, gradually sloping drainages characterize this area. The dominant vegetation is upland moist heath tundra alternating with more poorly drained wetlands in depressions (USACE 2003). Frosty Peak is in the Alaska Peninsula Mountains ecoregion.

The southern end of the state lands northeast of Izembek National Wildlife Refuge and the southern portion of the King Cove Corporation selected lands parcel are in the Alaska Peninsula Mountains ecoregion. This area includes the City of King Cove and is dominated by mountainous terrain with numerous high energy streams that form distinct drainage channels and drain directly into the ocean. The vegetation in this area reflects the diverse topography, ranging from dry alpine tundra, moist montane meadows and poorly drained sedge and scrub fens, to tall alder thickets on slopes and riparian corridors. Coastal saline-influenced areas also are diverse, with dense, wet sedge meadows, well-drained meadows on beach berms (grasses and forbs), partially vegetated tidal flats, and extensive intertidal seagrass beds (USACE 2003).

3.2.1.3 Land Cover Types

Two levels of vegetation mapping and analyses are provided. The first level uses the National Land Cover Database (USGS 2010a) for a high level comparison of vegetation on all of the land exchange parcels. The National Land Cover Database is the best data available for comparison of the proposed land exchange parcels.

The second level of mapping consists of a more detailed classification of land cover types along the proposed road corridor routes. With the second level of mapping, vegetation within the proposed corridors was classified using the system identified in the 2003 EIS.

Existing data do not support the creation of a complete cross-referencing of the land cover types between the 2003 EIS and the National Land Cover Database for all the land exchange parcels. By viewing aerial photographs of areas where the detailed vegetation typing was done for the 2003 EIS and comparing the National Land Cover Database mapping, an approximate cross reference for those areas was completed. It is important to note that the National Land Cover Database does not distinguish between wetland and upland. The approximate cross reference is given in Table 3.2-1 below.

Table 3.2-1 Vegetation and Land Cover Type Cross Reference

National Land Cover Database Cover Type	2003 EIS Land Cover Types
Perennial Ice/Snow	None
Open Water	Lakes and Ponds (Lp)
Barren Land	None
Dwarf Shrub	Upland Moist Dwarf Scrub/Upland Moist Meadow (Umds/Umm)
Shrub/Scrub	Lowland Wet Low Sedge/Scrub (Lwlss)
Emergent Herbaceous Wetland	Montane Moist Meadow (Mmm); Lacustrine Margin Meadow (Lmm)
Sedge/Herbaceous	Lowland Wet Sedge Meadow (Lwsm)

Sources: USGS 2010a; USACE 2003

The approximate acreage of existing National Land Cover Database land cover types for each of the exchange parcels is given in Table 3.2-2. The acreages are only approximate because the resolution of the data is from 30-meter pixels and the projections for overlays had to be adjusted.

Table 3.2-2 National Land Cover Database Land Cover Types (Approximate Acres)

Parcel	Perennial Ice/Snow	Open Water	Barren Land	Dwarf Shrub	Shrub/ Scrub	Emergent Herb. Wetland	Grassland/ Herb.	Developed/ Low Intensity
Alternative 2 (Southern Road Alignment) 400-foot corridor	0	24	5	700	0	154	63	4
Alternative 3 (Central Road Alignment) 400-foot corridor	0	30	5	816	0	112	81	6
Sitkinak Island	0	165	90	465	1	94	768	20
State Lands	1,077	401	1,043	31,388	0	4,992	2,986	0
Mortensens Lagoon	0	343	182	5,152	8	879	1,507	21
Kinzarof Lagoon	0	194	62	1,281	0	366	697	0
King Cove Corporation Selected Lands	395	207	220	2,891	0	703	1,007	0

Source: (USGS 2010a)

The approximate acreage of the 2003 EIS land cover types for a 400-foot wide analysis area of each of the 2 road corridors are displayed in Table 3.2-3.

Table 3.2-3 2003 EIS Land Cover Type (Approximate Acres)

2003 EIS Land Cover Types	Alternative 2 (Southern Road Alignment)	Alternative 3 (Central Road Alignment)
Upland Moist Dwarf Scrub/Upland Moist Meadow (Umds/Umm)	835	967
Lowland Wet Low Sedge/Scrub (Lwlss)	74	43
Lowland Wet Sedge Meadow (Lwsm)	10	6
Lakes and Ponds (Lp)	24	30
Lacustrine Margin Meadow (Lmm)	0	0.4

Source: USACE 2003

3.2.1.4 Rare Plants

Alaska Natural Heritage Program data show 4 rare plant locations within the vicinity of the areas proposed for exchange (ANHP 2010).

Three rare plant locations are documented in the vicinity of the Izembek National Wildlife Refuge. The plants are Bering Sea dock (*Rumex beringensis*), leathery grapefern (*Botrychium robustum*), and upswept moonwort (*Botrychium ascendens*).

Bering Sea dock is known to be found in fewer than 30 locations in Alaska and less than 50 worldwide. It is endemic to southern Alaska and eastern Chukotka in Russia, with a recent report from the Yukon Territory. In the Izembek National Wildlife Refuge, it is common in open heaths and lakeshores. Leathery grapefern grows in lakeshore meadows in the Izembek National Wildlife Refuge. The leathery grapefern site is an eastern range extension from Unimak Island (Talbot, Talbot, and Schofield 2006). Upswept moonwort grows in mesic meadows and sandy sites near sea level in Alaska. This species is now known to be widespread in western North

America, but it is not common anywhere and almost all populations are small (Lipkin and Murray 1997). In the Izembek National Wildlife Refuge, this species grows in heaths (Talbot, Talbot, and Schofield 2006).

None of these known plant sites is within the areas under consideration for exchange in the Izembek National Wildlife Refuge. However, specific rare plant surveys on the exchange parcels have not been conducted, so these species potentially could exist within the lands proposed for exchange.

A known rare plant site is present at Cape Sitkinak near Sitkinak Island. The plant is serrulate surf-grass (*Phyllospadix serrulatus*), a marine vascular plant. This species grows attached to rocks in the upper tidal or subtidal zones. No habitat for this species is likely on the Sitkinak Island exchange areas.

3.2.1.5 Cultural Plants

Culturally important plants are discussed in the Subsistence Section 3.3.7.

3.2.1.6 Invasive Plants

Invasive species are nonnative to the ecosystem under consideration, and whose introduction causes or is likely to cause economic or environmental harm, or harm to human health. Nonnative species become invasive in a new environment when the natural predators, diseases, or other biological mechanisms that kept the species in check within its former habitat are missing in its new environment. Lacking this ecological balance, an invading species can effectively change the biodiversity of an area. This can often affect local economies.

Invasive species are unlikely to be widespread on any of the proposed exchange land areas. Some of the parcels are remote and rarely visited by people. The known existing invasive species and the highest potential for the spread of invasive species exists near developed areas, such as lands adjacent to road systems and areas of former military activity.

The Sitkinak Island areas have the highest likelihood for the presence of invasive species due to the presence of the former Coast Guard station. In addition, cattle are present on the island and may have access to the exchange parcel. Grazing can encourage invasive species establishment.

The Izembek National Wildlife Refuge and Alaska Peninsula National Wildlife Refuge lands off the existing road and trail system and the state lands currently have a very low potential for many invasive species. No records for invasive plants were found during a query of the Alaska Exotic Plant Information Clearinghouse database (AKEPIC 2011). Non-native species have been reported in the Cold Bay area, including mouse-ear chickweed (*Cerastium fontanum*), Canada thistle (*Cirsium arvense*), orchardgrass (*Dactylis glomerata*), ox-eye daisy (*Leucanthemum vulgare*), creeping buttercup (*Ranunculus repens*), sheep sorrel (*Rumex acetosella*), common chickweed (*Stellaria media*), common dandelion (*Taraxacum officinale*), orange hawkweed (*Hieracium aurantiacum*), and white clover (*Trifolium repens*). Most of these species are considered invasive, but do not appear to have spread to surrounding terrain (Talbot, Talbot, and Schofield 2006). However, these species can easily travel by vehicle, animals (domestic and wild), humans, and recreational vehicles and gear. Likely sites to find these species are along the road and trail system, areas with more human traffic because of nearby roads and airstrips, and areas adjacent to former military sites.

The King Cove Corporation lands near Mortensens Lagoon likely have more human traffic because of the nearby roads and an old airstrip. Former military activity at this site also contributes to the likelihood that these lands may have invasive species present.

3.2.1.7 Proposed Land Exchange Parcel and Project Site Summaries

Road Corridors

The Izembek National Wildlife Refuge area proposed for exchange is on the isthmus between Kinzarof Lagoon and Izembek Lagoon. Roughly, the eastern half of the isthmus has more herbaceous-dominated wetlands than moist dwarf shrub-dominated upland. On the western half, the proportion of upland moist dwarf shrub habitat is much higher.

The herbaceous-dominated wetlands are a mix of lowland wet sedge meadow and lowland wet low sedge/scrub. The upland areas tend to be dominated by ericaceous shrubs and dwarf willows. These upland types include upland moist dwarf scrub, upland moist low scrub, and upland moist meadow.

The area also includes the lake/pond land cover type. The prevalence of ponds and lakes is highest about midway between Izembek and Kinzarof lagoons.

The adjacent Izembek Lagoon contains one of the largest eelgrass (*Zostera marina*) beds in the world and the largest in North America (Service 1998c) and is a Ramsar-designated Wetland of International Importance. (Discussion on the Ramsar designation is provided in Section 3.2.2.2, Wetlands). The adjacent Kinzarof Lagoon also contains eelgrass. However, no eelgrass beds are within the proposed exchange areas.

No active roads or development are in the parcels proposed for exchange. However, prior to the area becoming a national wildlife refuge, the area had more active use, and some former primitive roads and trails are used by animals, and people as evidenced by off-road vehicle tracks. In addition, since 2006, after the partial completion of the road along the east side of Cold Bay, numerous all-terrain vehicle tracks have been observed and documented (Sowl 2011f) extending out from the Northeast Terminal site and approximately 4 miles inland from the coast. This recent all-terrain vehicle use has been concentrated on wet or moist graminoid areas, likely due to ease of travel on these cover types. Multiple tracks indicating frequent passages are concentrated within the Izembek Wilderness along the east side of Kinzarof Lagoon and extending to the northeast into the Joshua Green River watershed.

The Izembek National Wildlife Refuge flora is of considerable phytogeographic (geographic distribution of plant species) interest because it occurs along the southern margin of the Bering Land Bridge at the eastern end of the Aleutian Islands; this region functions as an important bridge for dispersal. A total of 339 native plant species have been identified within the refuge boundaries (Talbot, Talbot, and Schofield 2006). A list of Izembek National Wildlife Refuge plants is contained in Appendix D of the *Izembek National Wildlife Refuge Comprehensive Conservation Plan* (Service 1985a).

The species data for the Izembek National Wildlife Refuge has been analyzed in published reports that categorized vascular plant distribution patterns from a circumpolar, North American, and Alaskan perspective. The native flora of the Izembek National Wildlife Refuge primarily includes species of circumpolar (38 percent), eastern Asian (23 percent), Eurasian (18 percent), and North American (13 percent) distribution. The most important longitudinal distributional classes in North America consist of transcontinental (62 percent) and extreme western species (31 percent). The flora of Izembek National Wildlife Refuge is primarily made up of boreal species and lacks many of the species considered to be Arctic (Talbot, Talbot, and Schofield 2006).

While this data shows the unique nature of the vegetation in the Izembek National Wildlife Refuge as a whole, it does not specifically consider the species in the road corridors. In addition, no comparable information is available for any of the other exchange parcels.

Sitkinak Island

The Sitkinak Island lands consist of 2 disjunct areas. One is a peninsula that borders the northeastern end of Sitkinak Lagoon (USGS 1986). This peninsula contains marine intertidal habitat along the edge (Service 2010i). The interior of the peninsula is dominated by herbaceous community types, both upland and wetland.

The larger area on Sitkinak Island occupies fairly level terrain, which is largely wetland (Service 2010i), consisting of lowland wet low sedge/scrub. The parcel also contains upland moist low scrub and meadow land cover types. In addition, the lake/pond land cover type is represented in this parcel by Mark Lake. Emergent herbaceous wetlands are likely present along the edge of the lake.

State Lands

The large tracts of state land northeast of the Izembek National Wildlife Refuge are diverse in land cover types relative to the other exchange parcels. Elevations range from sea level at the north to approximately 2,000 feet at the south. Perennial snow and ice is present at the highest elevations.

Lakes and ponds are scattered throughout the northern half of the area, but the area as a whole has a high percentage of its cover mapped as dwarf shrub. North Creek runs along the southeastern edge and part of the Cathedral River is just inside the north boundary.

Due to the size and scale of these lands, they likely contain most of the vegetation types listed in Table 3.2-1, with the exception of some of the tidal land cover types and the developed land cover type. The most widespread vegetation cover appears to be dwarf shrub tundra.

Mortensens Lagoon

The parcel near Mortensens Lagoon is diverse in vegetation types with extensive areas of upland moist dwarf shrub. It includes large areas of wetlands and several ponds and small lakes. Lacustrine margin meadows are likely along the edges of some of these lakes.

Kinzarof Lagoon

The Kinzarof Lagoon parcel appears to be dominated by moist dwarf shrub-dominated upland. Some wet sedge meadow and lowland wet low sedge/scrub occur, along with a few ponds. Recent all-terrain vehicle activity, along the east and southeast segments of this parcel, has left tracks through mostly grasslands and emergent herbaceous wetlands (Sowl 2011f).

King Cove Corporation Selected Lands

The selected parcel southeast of Kinzarof Lagoon contains moist dwarf shrub-dominated upland, wet sedge meadow, and lowland wet low sedge/scrub at the lower elevations, along with a few ponds. Perennial snow and ice is present at the highest elevations at the southern end of the parcel. Recent all-terrain vehicle activity along the northwest portion of this parcel has left tracks through mostly grasslands and emergent herbaceous wetlands within this portion of the Izembek Wilderness (Sowl 2011f).

Northeast Terminal Site

The moderately sloping beach at the Northeast Terminal site is dominated by cobble mixed with rounded gravel and shell hash at the top of the intertidal zone. The area upland of the intertidal zone contains some beach rye grass. No kelp beds or seagrass have been documented in the immediate vicinity of the terminal site (USACE 2003).

Lenard Harbor Ferry Terminal Site

Lenard Harbor is situated in southeastern Cold Bay. It is about 6 miles long and averages about 1.2 miles wide. Expansive sand flats at the base of the Delta Creek drainage dominate the head of Lenard Harbor, and 2 other flats occur along the south shores. The beach at the Lenard Harbor terminal site features complex rocky habitat and is moderately sloping. A gravelly vegetated bench drops to a boulder and cobble beach in the western portion of the area, and very large boulders transition to smaller boulders and cobble in the eastern portion of the area. Seagrass patches occur in the head of the harbor, and likely occur elsewhere in Lenard Harbor where suitable substrata are available, but none were observed at the terminal site (USACE 2003).

Cold Bay Dock Site

The Cold Bay dock vicinity is dominated by boulders descending abruptly to a cobble boulder bottom mixed with mud. Brown kelp and mussels are attached to the pilings at the existing dock, and kelps *Laminaria* and *Alaria* occur around the dock site. This habitat may provide some shelter for fish (USACE 2003).

Cross Wind Cove Site

The Cross Wind Cove area is a broadly arcing, very gentle sloping sand beach with some small cobble patches. Cross Wind Cove is bounded by a high bluff running south from the head of the cove, which drops abruptly to a narrow band of beach rye grass and other forbs/meadow species. Some small patches of *Fucus*, *Ulva*, and ephemeral brown and green algae occur on cobble patches in the intertidal and shallow subtidal zone at Cross Wind Cove. Thin seagrass patches appear at above the +1 mean lower low water tide level, and dense patches and contiguous seagrass beds begin at about -3 mean lower low water tide line (Ridgway, dive survey cited in USACE 2003).

3.2.2 Wetlands

This section describes the wetlands and water resources of the Izembek National Wildlife Refuge along the proposed corridors and the wetland resources of the other parcels associated with the proposed land exchange. Figure 3.2-1 shows the locations of the proposed corridors and exchange parcels where wetlands were analyzed. In addition, wetland identification at the 4 sites associated with Alternatives 4 and 5 (Northeast Terminal, Lenard Harbor Ferry Terminal, Cold Bay dock, and Cross Wind Cove) are discussed.

Kinzarof Lagoon is also identified on Figure 3.2-1; Kinzarof Lagoon will be added to the Izembek State Game Refuge if the Secretary of the Interior determines a land exchange is in the public interest. Wetland resources of Kinzarof Lagoon have not been displayed on the figures within this section because that parcel is not part of the proposed federal/state/corporation land exchange, and the entirety of that map unit is "Open Water" (submerged lands).

The wetland descriptions contained within this section have not been verified on-site. Wetland boundaries displayed in this section should be considered preliminary, for planning purposes only. Therefore, these wetland boundaries are not intended to meet the requirements established by the Corps for Section 404 of the *Clean Water Act* (Section 404) permit applications.

3.2.2.1 Regulatory Setting

Wetlands are defined by the U.S. Environmental Protection Agency (EPA) and the Corps as:

> …those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions…(33 CFR 328.3(b)).

Figure 3.2-1 Location Wetland Map

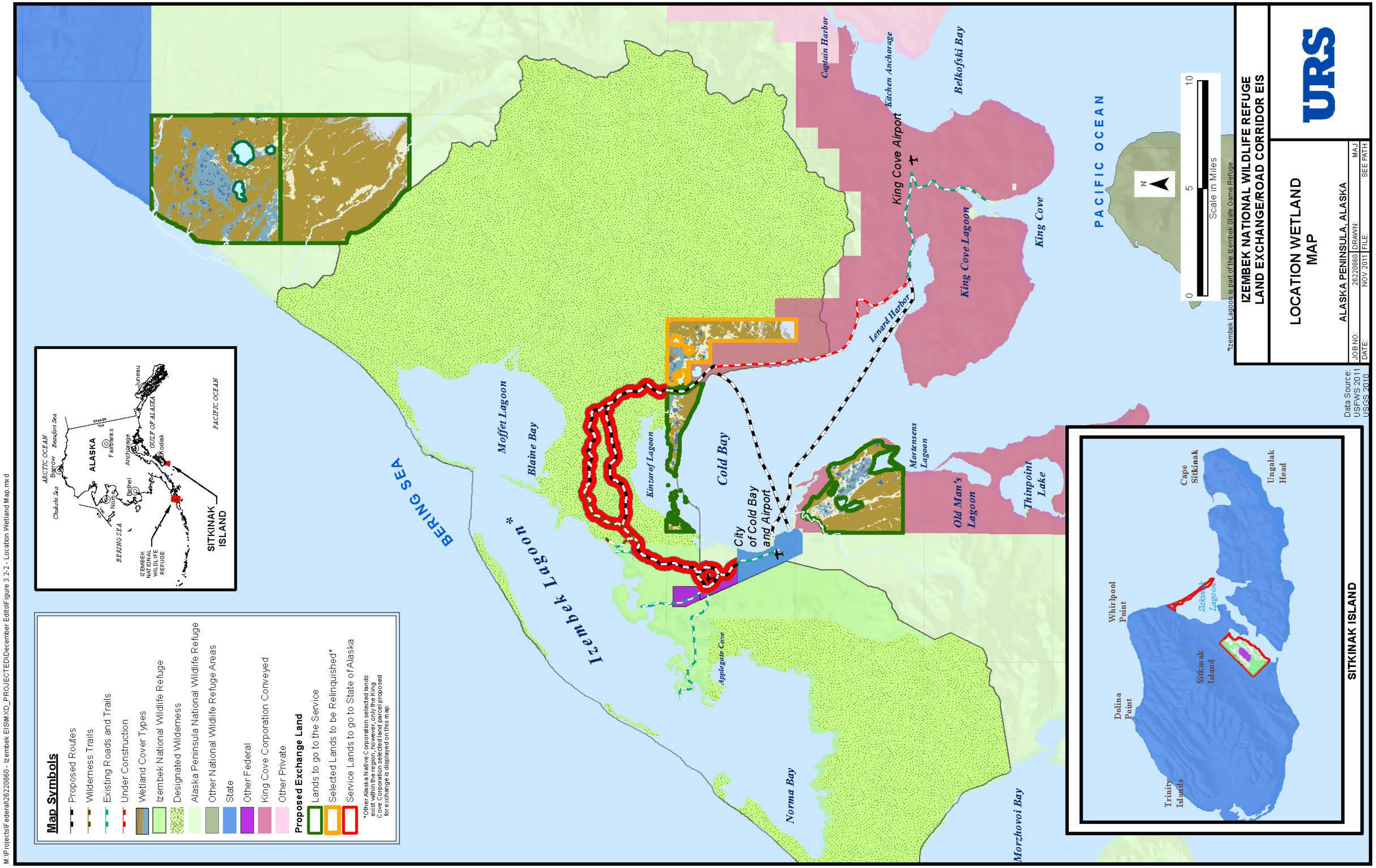


Table 3.2-4 summarizes the relevant wetland regulations and Executive Orders.

Table 3.2-4 Wetland Laws, Regulations, and Executive Orders

Agency	Authority	Description
U.S. Environmental Protection Agency	Section 404, *Clean Water Act* (33 USC 1251 *et seq.*) – Discharge of Fill Material to Waters of the U.S.	EPA and the Corps jointly administer this program, which ensures that no discharge of dredged or fill material be permitted if there is a practicable alternative that would be less damaging to aquatic resources or if significant degradation would occur to the nation's waters. EPA provides oversight by reviewing and commenting on Section 404 permit applications received by the Corps for compliance with Section 404(b)(1) guidelines and other statutes and authorities within its jurisdiction (40 CFR 230).
U.S. Army Corps of Engineers	Section 404, *Clean Water Act* (33 USC 1251 *et seq.*) – Discharge of Fill Material to Waters of the U.S.	The Corps is responsible for day-to-day Section 404 administration and permit review. To comply with Section 404, applicants must demonstrate how impacts to waters of the U.S. are to be mitigated. Mitigation is a sequential process of avoidance, minimization, and compensation.
U.S. Army Corps of Engineers	Section 10, *Rivers and Harbors Act* (33 USC 404) – Navigable Waters of U.S. Dredge Permit	Section 10 requires authorization from the Corps for the construction of any structure in or over any navigable water of the U.S., the excavation/dredging or deposition of material in this water, or any obstruction or alteration in navigable waters.
All Federal Agencies	Executive Order 11990, Protection of Wetlands	Executive Order 11990 is intended to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands." To meet these objectives, federal agencies in planning their actions are required to consider alternatives to wetland sites and limit potential damage if an activity affecting wetlands cannot be avoided.
National Marine Fisheries Service	Public Law 104–297 *Sustainable Fisheries Act*	The *Sustainable Fisheries Act* recognizes wetlands that are hydrologically connected to waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity, as Essential Fish Habitat.

Note: Other federal, state, and local water resource regulations would also apply to the project.

3.2.2.2 Wetlands of International Importance

The Ramsar Convention promotes wetland conservation throughout the world. It is an intergovernmental treaty with a stated mission of "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world" (RAMSAR Convention 2010). The treaty was adopted in the Iranian city of Ramsar in 1971 and the Convention's member countries cover all geographic regions of the world. The U.S. Senate ratified the convention upon recommendation by President Ronald Reagan in 1986 (HeinOnline1986).

The Izembek area was the first site to be designated in North America as a Wetland of International Importance, meeting 6 of the 8 scientific criteria needed to qualify (only 1 criterion is needed for designation). The specific significant criteria that were met were: Volume of waterfowl use; Diversity of waterfowl; Major flyway populations; Outstanding example of wetland types (largest eelgrass beds in North America); Scientific Research (long-term); and Practicality of conservation and management (Service 1986c).

The Izembek Ramsar site (as displayed on Figure 3.2-2) includes 416,193 acres, synonymous with the boundary of the Izembek National Wildlife Refuge (Ramsar 1986, 2010) including private lands, and about 95,300 acres of tidelands and coastal lagoons owned by the State of Alaska. Habitat types include intertidal wetlands, coastal lagoons, wet meadows, marshes, and tundra plain with scattered freshwater lakes and ponds (Service 1986c). The site supports some of the most extensive eelgrass beds in the world. Hundreds of thousands of water birds from the high arctic to the Pacific Ocean depend upon this area for food during their long migrations. The streams and lagoons of this area also provide a primary nursery ground for the rich fishery resource of the Bering Sea. The designation recognizes exceptional wetlands values, but does not establish a regulatory authority over land owners (Ramsar Convention 2010).

3.2.2.3 Wetland Resources

Three levels of wetland resource identification and analyses are provided for the project.

National Land Cover Database

The first level of wetland resource identification uses the National Land Cover Database (USGS 2010a) for a high level comparison of vegetative cover types on the state lands and the King Cove Corporation proposed land exchange parcels adjacent to Mortensens Lagoon, adjacent to Kinzarof Lagoon, and selected lands on the east side of Cold Bay. These are shown in Figures 3.2-3, 3.2-4, and 3.2-5.

Figure 3.2-2 Wetlands of International Importance

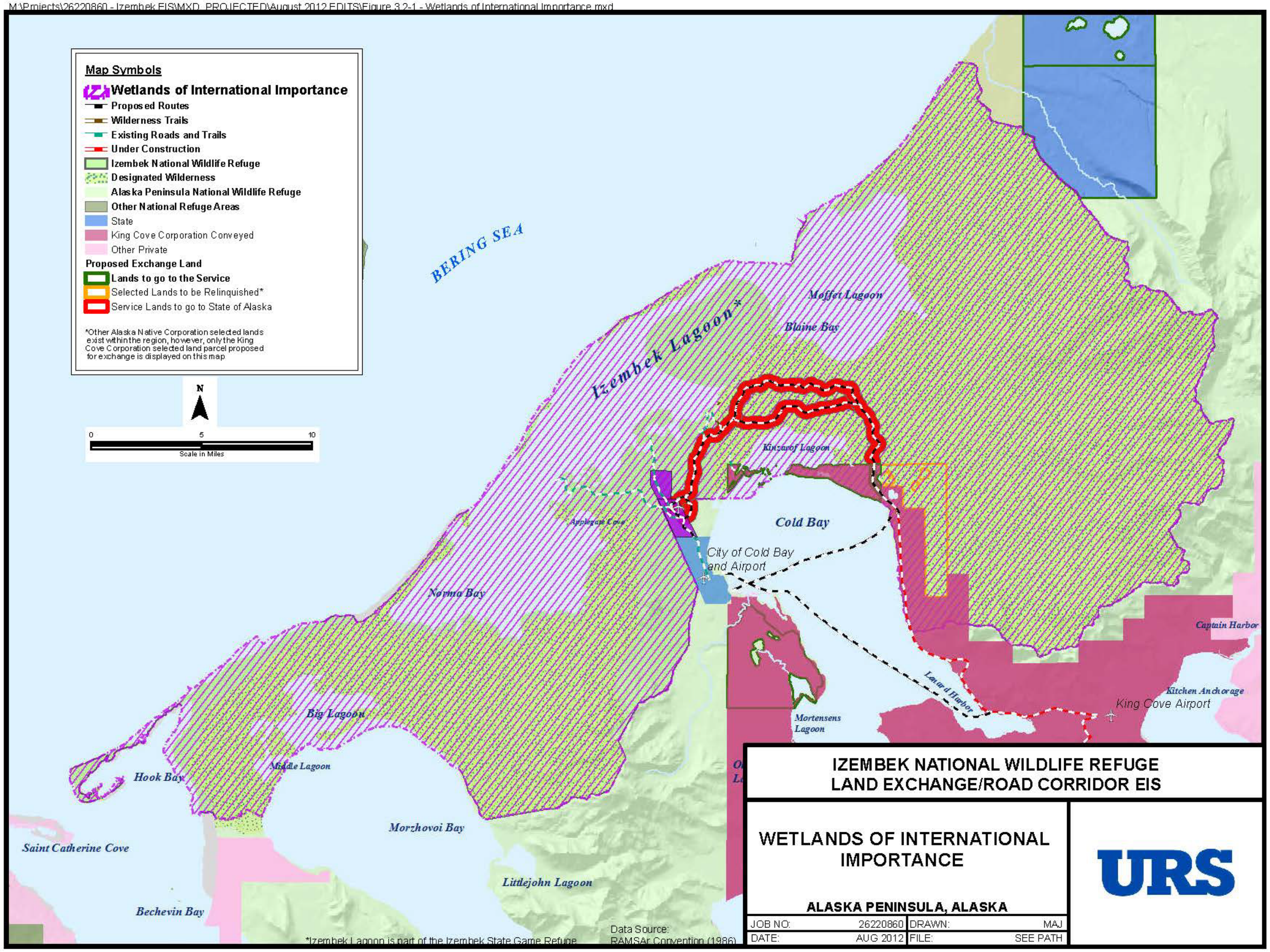


Figure 3.2-3 Land Cover of the State Parcel

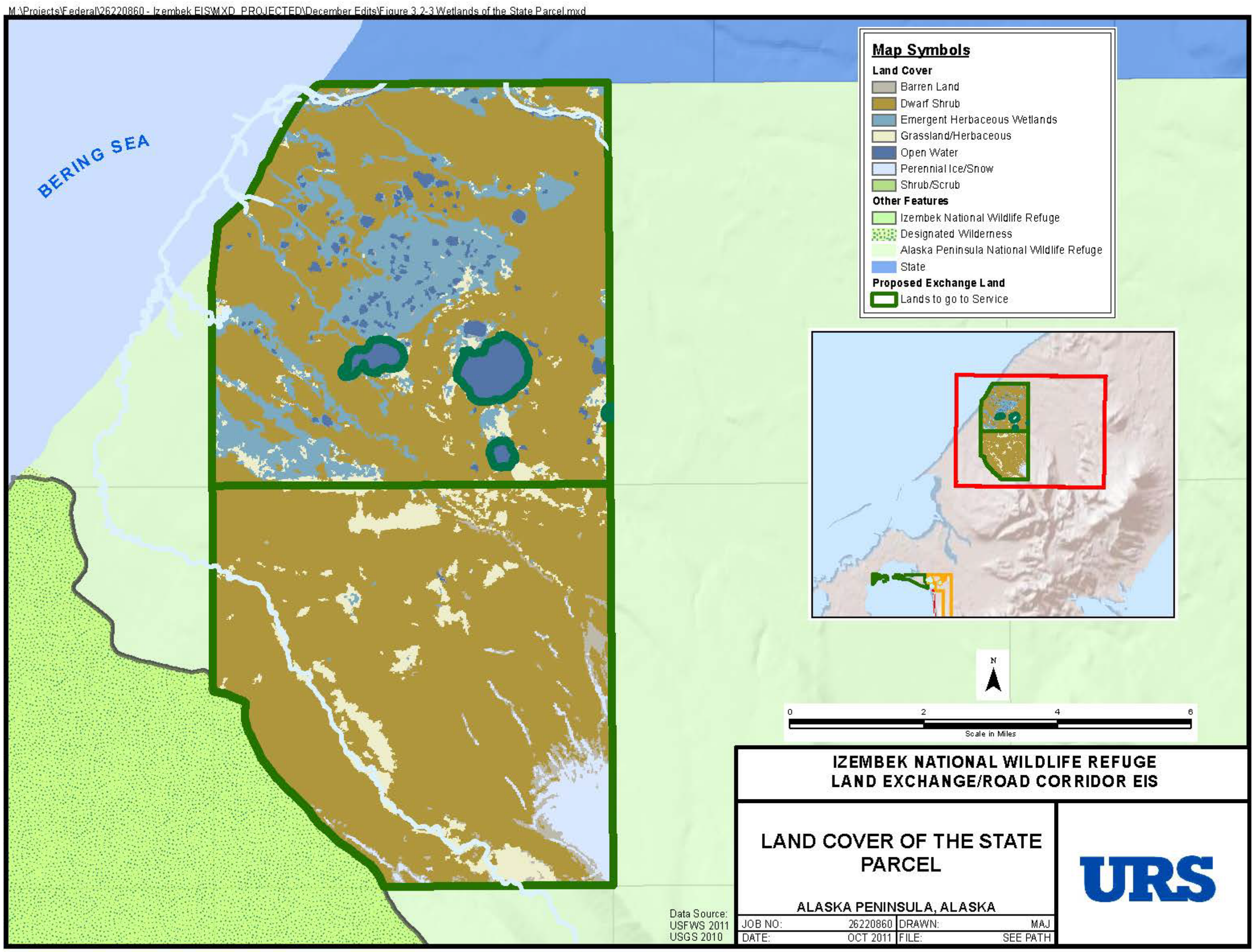


Figure 3.2-4 Land Cover of the Kinzarof Parcel and King Cove Corporation Selected Lands

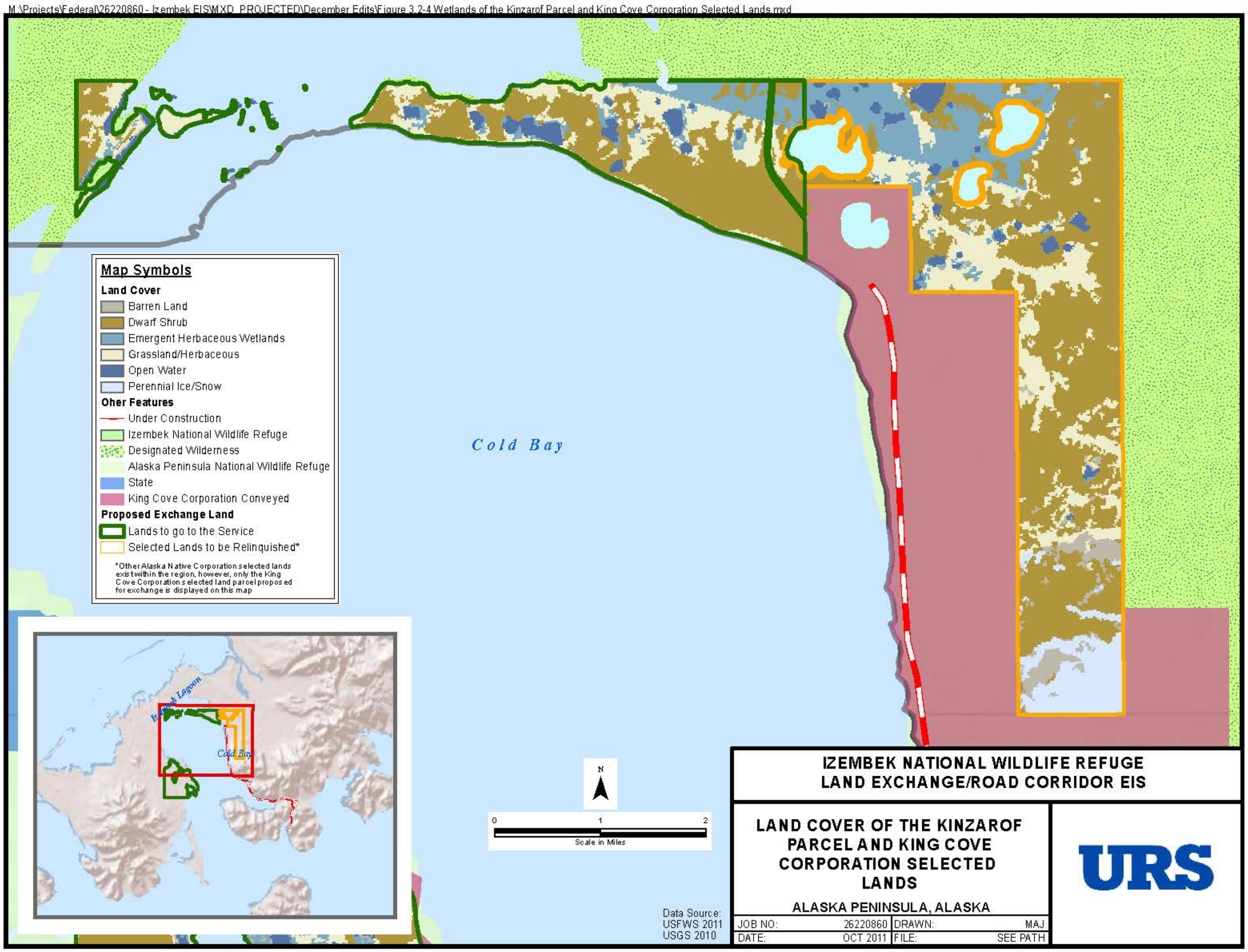
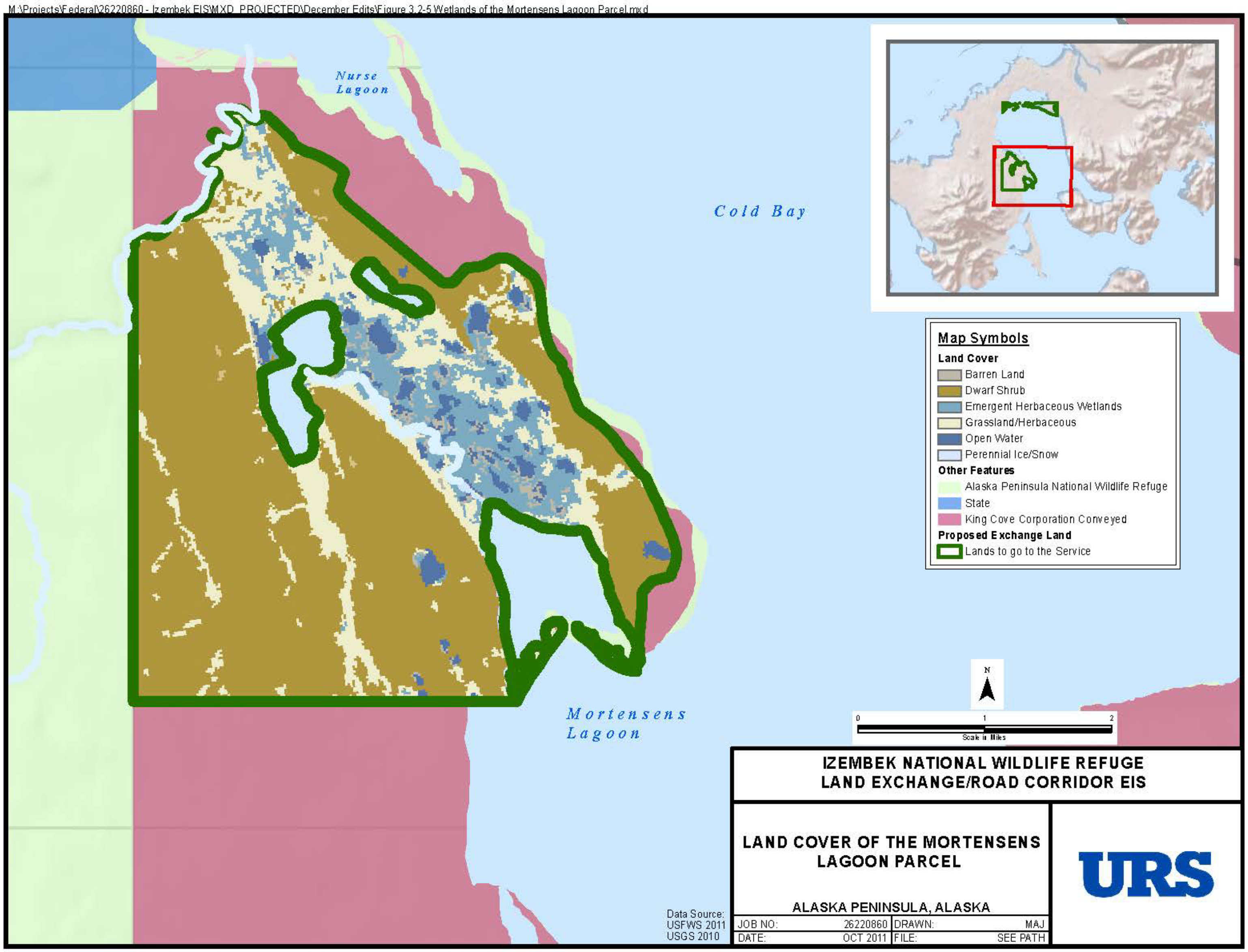


Figure 3.2-5 Land Cover of the Mortensens Lagoon Parcel



As the National Land Cover Database (USGS 2010a) maps are generated from low resolution raster data, only general conclusions can be reached and general comparisons made through this analysis. The land cover data displayed on the maps has a resolution of 30 square meters (98.4 square feet). The raster dataset resolution, however, was resampled to 5 meters to convert to a more accurate vector dataset for the acreage calculations presented in Table 3.2-5.

The primary land cover types displayed on these maps include "Barren Land," "Dwarf Shrub," "Emergent Herbaceous Wetlands," "Grassland/Herbaceous," "Open Water," and "Perennial Ice/Snow." The following paragraphs are a general description of the relationship between the National Land Cover Database maps and the more descriptive vegetation cover types presented on Table 3-18 of the 2003 EIS.

Barren land displayed on the National Land Cover Database maps represent not only alpine barrens such as dry rocky ridge tops and well drained slopes nearly devoid of vegetation (upland), but also some lacustrine margin meadows along the edges of ponds and lakes, that when seasonally drawn down, expose mud and gravel (wetland). Therefore, considering landscape position, barren lands indicated on the Mortensens Lagoon parcel, the Kinzarof Lagoon parcel, and the northern township of the state lands will be considered predominantly lacustrine margin wetlands for parcel comparison purposes. Barren land indicated on the southern township of the state lands and on the King Cove Corporation selected lands will be considered to be predominantly alpine barrens (uplands) due to topography and elevations of those sites.

Dwarf shrub represents primarily alpine dry dwarf scrub (upland), alpine moist dwarf scrub (upland), montane moist tall shrub (upland), upland moist dwarf scrub (upland), and upland moist low scrub (upland). Although these areas likely contain some sites with alpine moist dwarf scrub (wetland) and montane wet low scrub (wetland), the dwarf scrub label on these maps will be considered to be predominantly uplands for parcel comparison purposes.

Emergent herbaceous wetlands represents primarily lowland wet low scrub, lowland wet low sedge/scrub, and lowland wet sedge meadow (all wetlands), and grassland/herbaceous represents montane wet low sedge/scrub (wetland), montane wet meadow (wetland), montane wet herbs (wetland), along with montane moist meadow (upland). Although these well drained montane moist meadow areas are a dominant land cover type within some alluvial fans and on several valley floors within the mountain and valley bottom ecosystem, they are indistinguishable from wetland cover types on the National Land Cover Database maps and will therefore be grouped with wetland sites for this analysis. Many of these areas however, do contain rivers and streams that are not depicted on the maps, due to map resolution, therefore minimizing the error introduced by considering montane moist meadow areas as wetland. Open water on the National Land Cover Database maps represent the numerous lakes and ponds located on the parcels.

Table 3.2-5 contains a generalized comparison of wetlands understood to exist on each of the proposed land exchange parcels, based upon this high level comparison as presented in the previous paragraphs. Note that the acreages for the land cover type "open water" does not include the acreages of the navigable waters that will be retained by the state.

Table 3.2-5 Estimated Acres of Wetland by Parcel

Land Cover Types	Sitkinak Parcel [2]	State Lands (South Township)[1]	State Lands (North Township)[1]	King Cove Corporation Lands near Mortensens Lagoon[1]	King Cove Corporation Lands near Kinzarof Lagoon[1]	King Cove Corporation Selected Lands[1]
Barren Land (Lacustrine Margin)	-	-	102	187	62	-
Estuarine and Marine Wetlands	30	-	-	-	-	-
Emergent Herbaceous Wetlands	785	29	4,918	880	307	703
Grassland/Herbaceous		1,775	1,195	1,535	639	1,007
Open Water	165	4	548	318	227	207
Total Wetlands	980	1,808	6,763	2,920	1,235	1,917
Parcel Size	1,619	41,887		8,092	2,604	5,430
Percent Wetlands	60%	21%		36%	47%	35%

[1] USGS 2010a
[2] National Wetlands Inventory

National Wetland Inventory

The second level of wetland resource identification and analysis consists of the National Wetland Inventory maps of the Sitkinak Island parcel (Figure 3.2-6) (Service 2011). This map includes 30 acres of estuarine and marine wetland, 785 acres of freshwater emergent wetland, 159 acres of lake, and 6 acres of freshwater pond (Table 3.2-5) on this 1,619 acre parcel.

Detailed Classification of Land Cover Types

The third level of wetland resource identification and analyses consists of a more detailed classification of land cover types, including wetlands, along the proposed road corridor routes through the isthmus area, Alternative 2 (southern road alignment) (Figure 3.2-7) and Alternative 3 (central road alignment) (Figure 3.2-8). A 400-foot corridor was established for the purpose of analysis along the proposed road routes.

Figure 3.2-6 National Wetlands Inventory Map Sitkinak Parcel

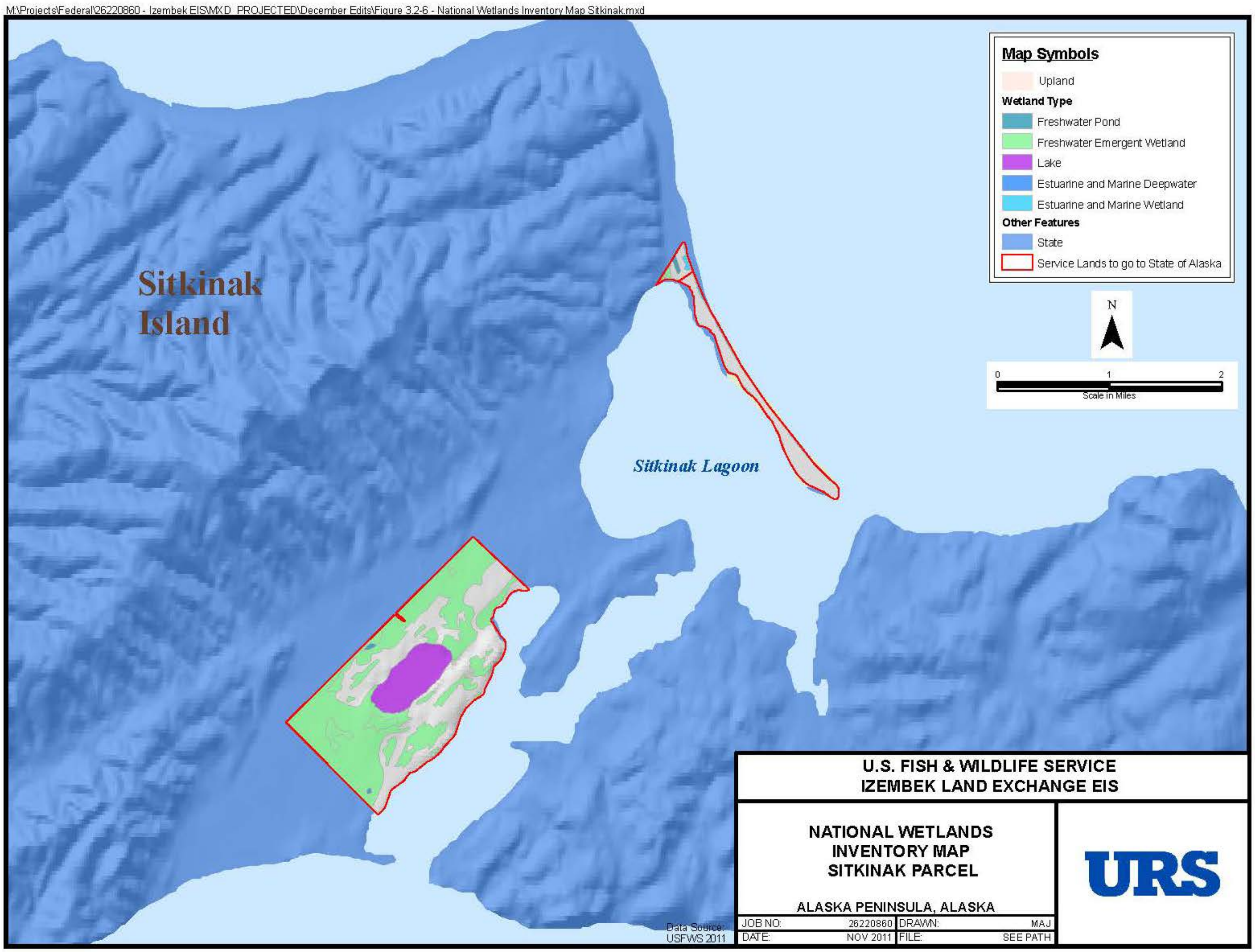


Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook, page 1

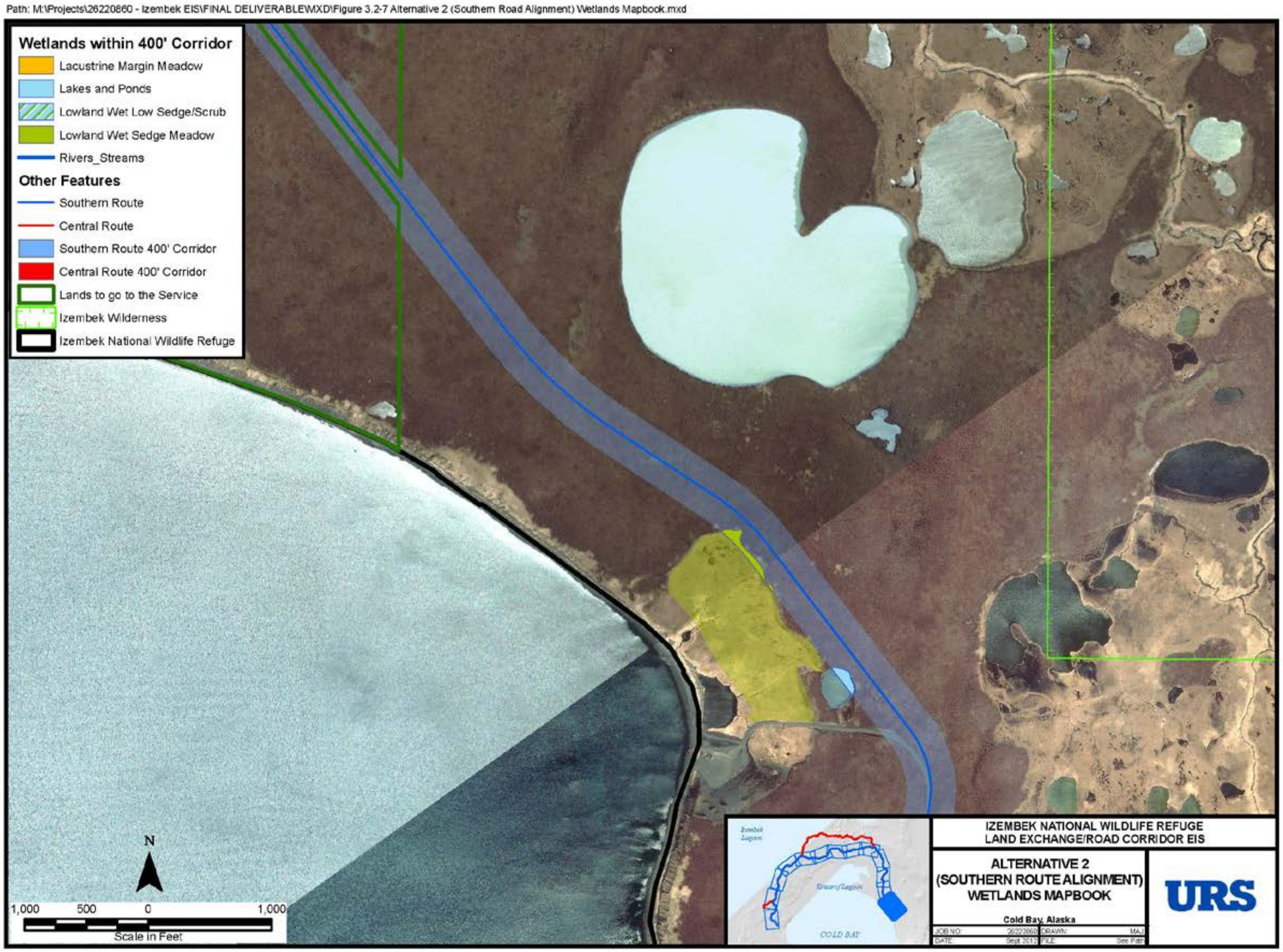


Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook, page 2

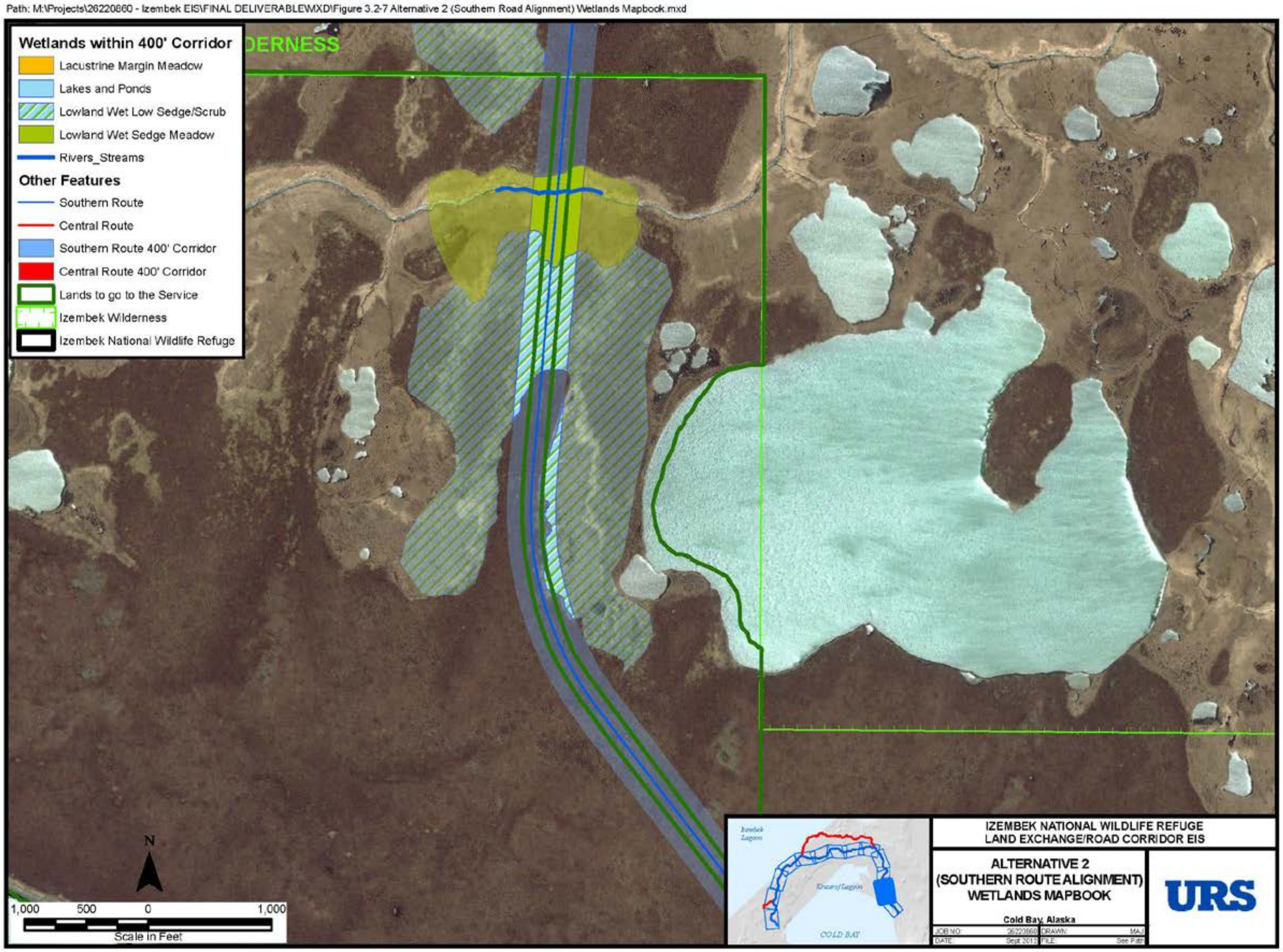


Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook, page 3

Path: M:\Projects\26220860 - Izembek EIS\FINAL DELIVERABLE\MXD\Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook.mxd

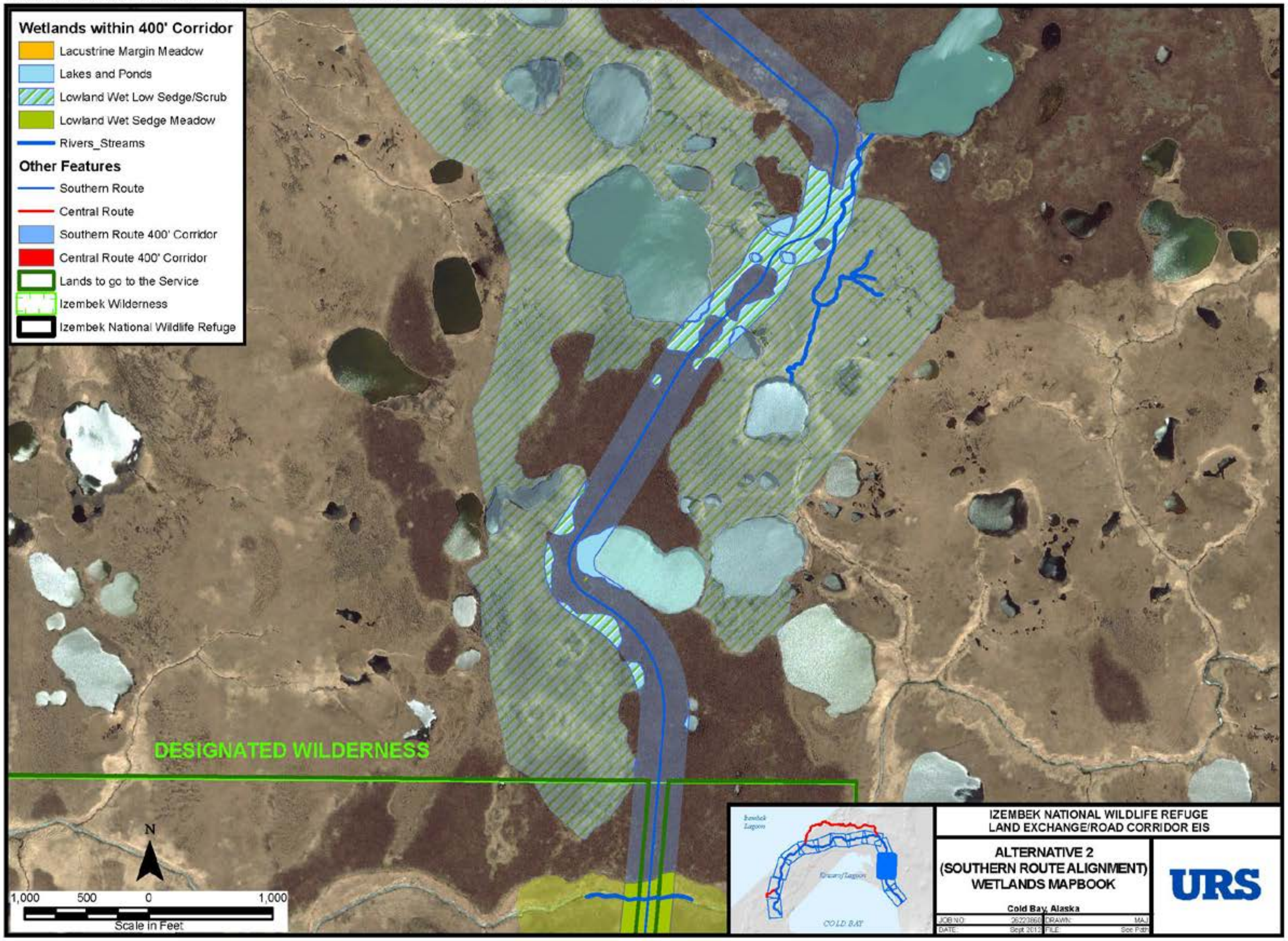


Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook, page 4

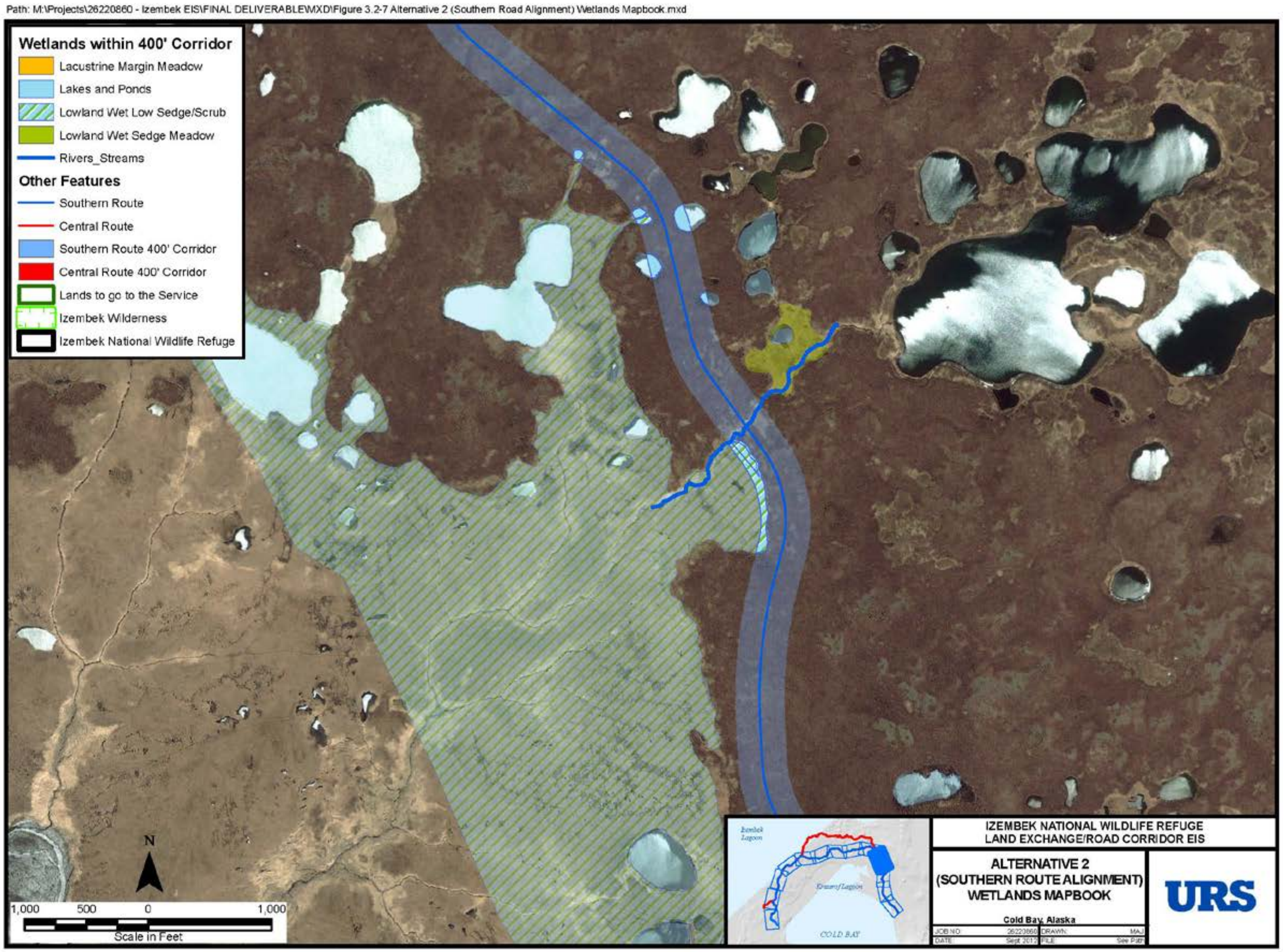


Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook, page 5

Path: M:\Projects\26220860 - Izembek EIS\FINAL DELIVERABLE\MXD\Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook.mxd

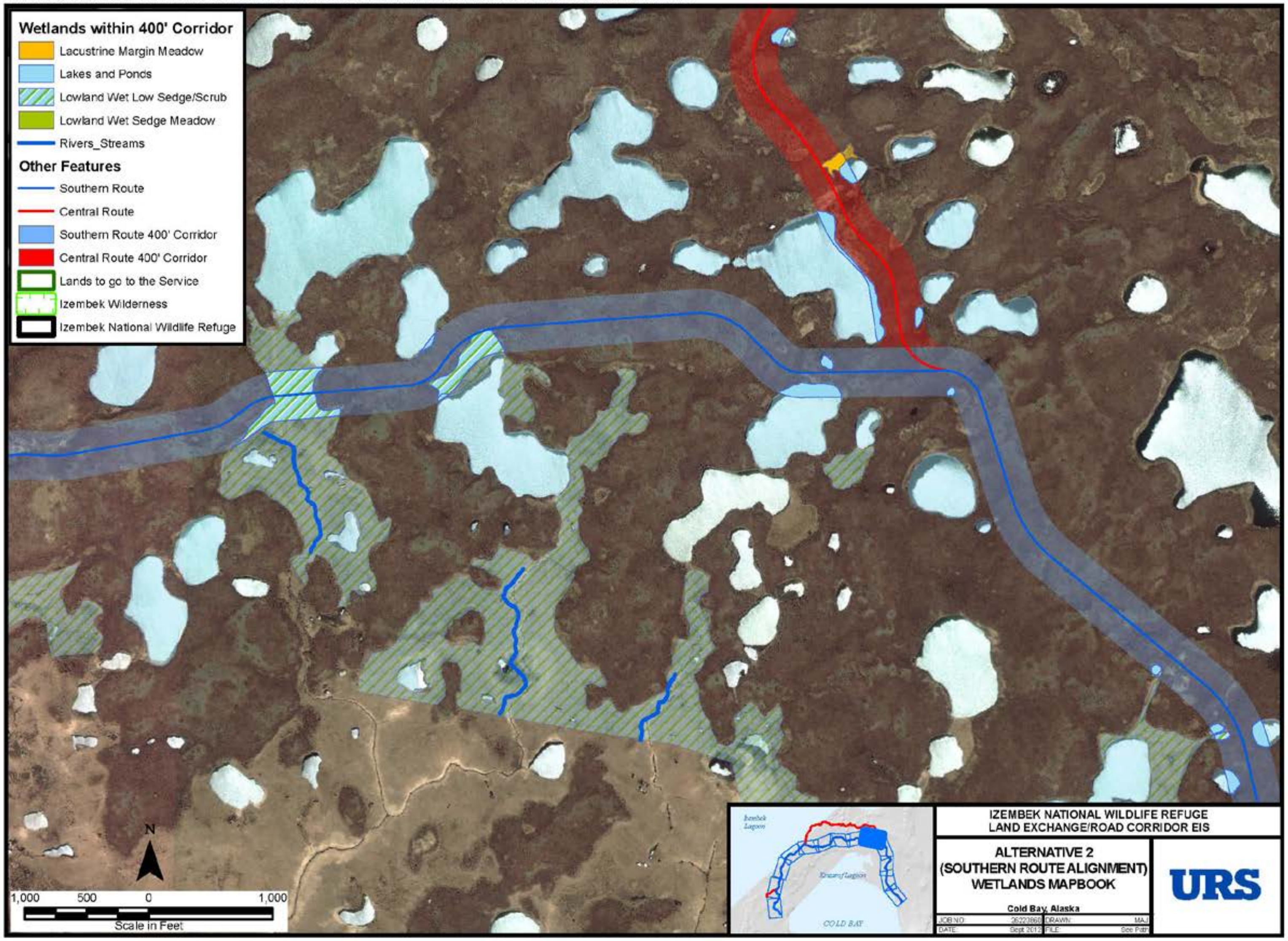


Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook, page 6

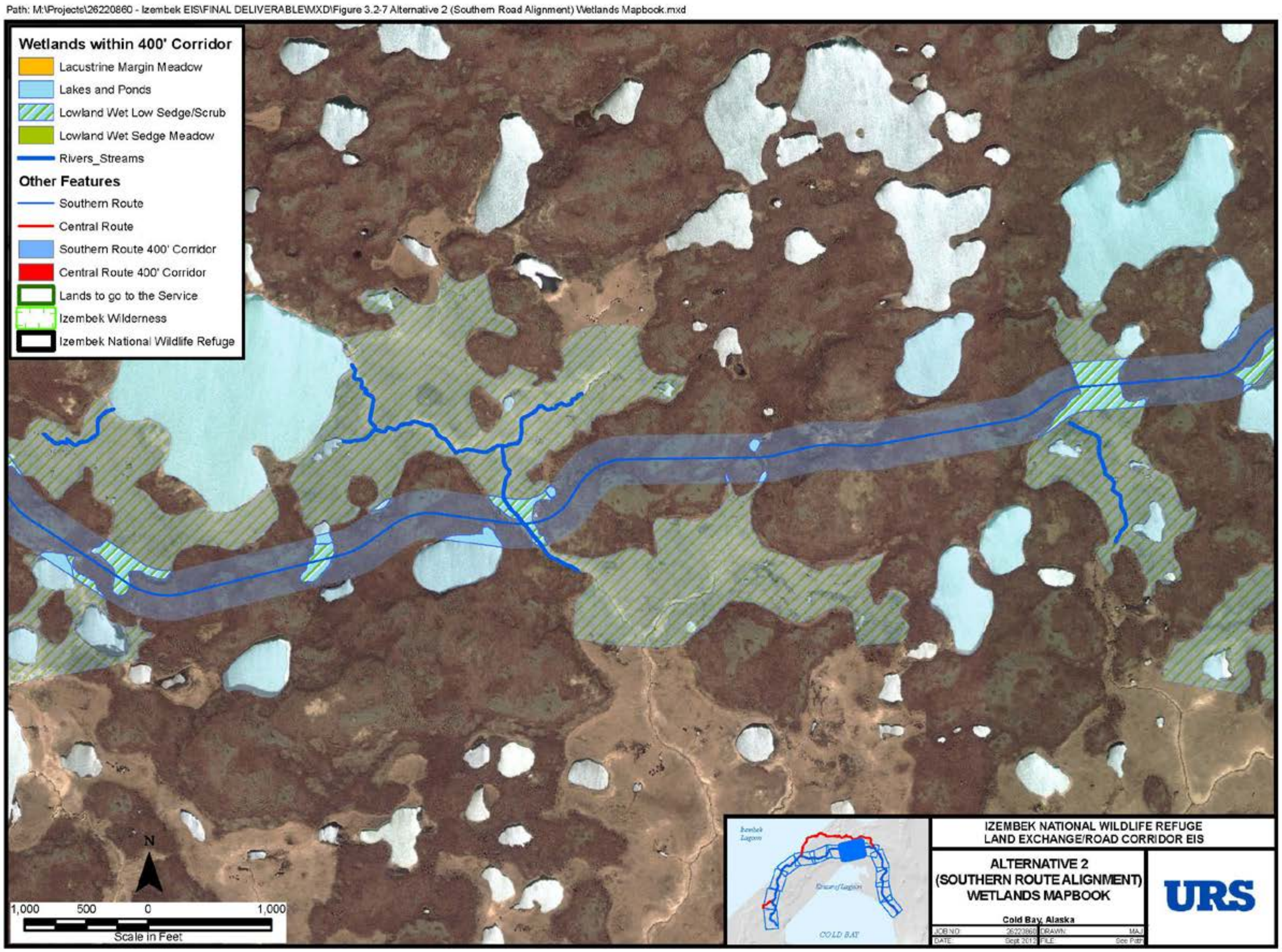


Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook, page 7

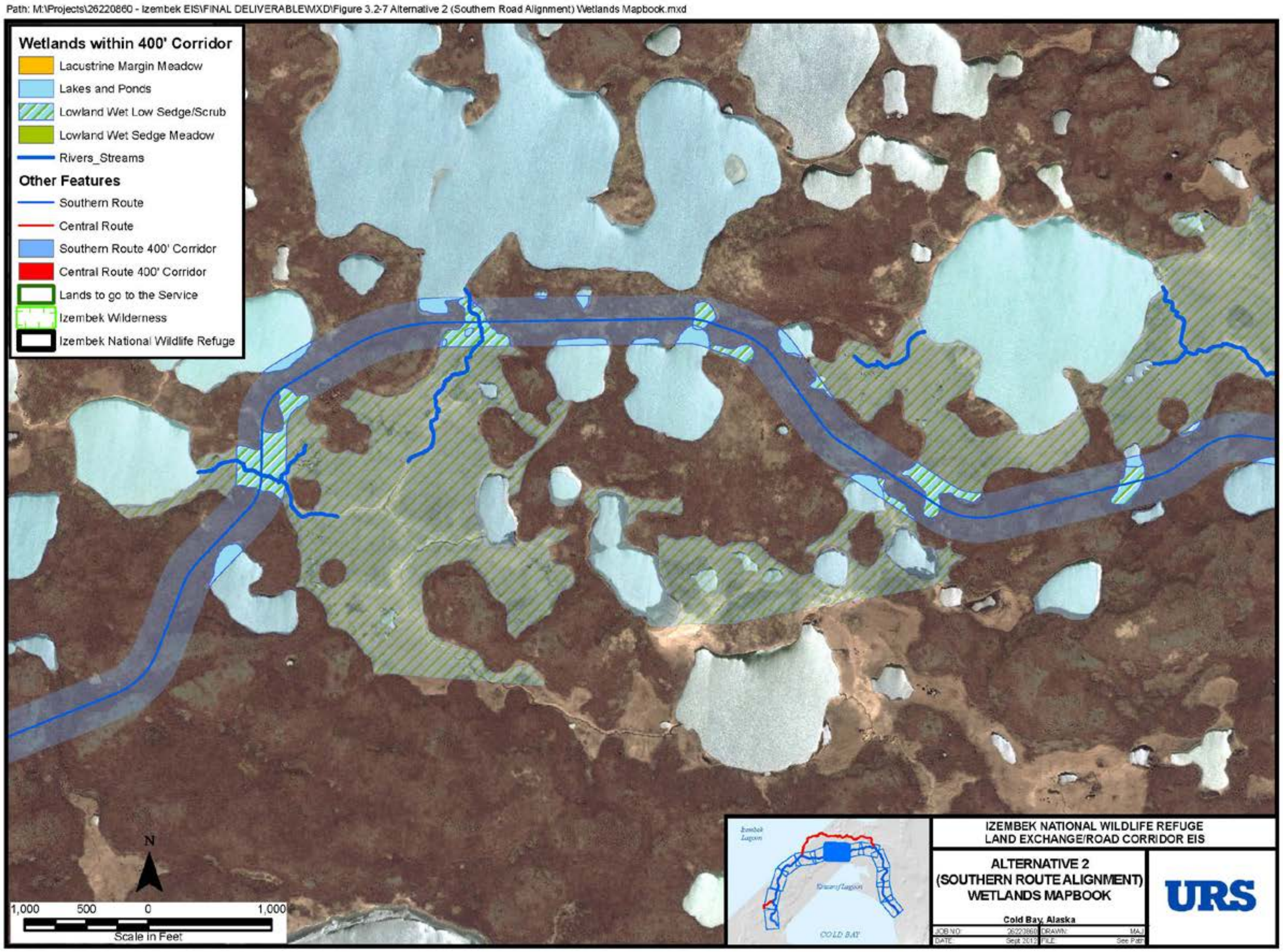


Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook, page 8

Path: M:\Projects\26220860 - Izembek EIS\FINAL DELIVERABLE\MXD\Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook.mxd

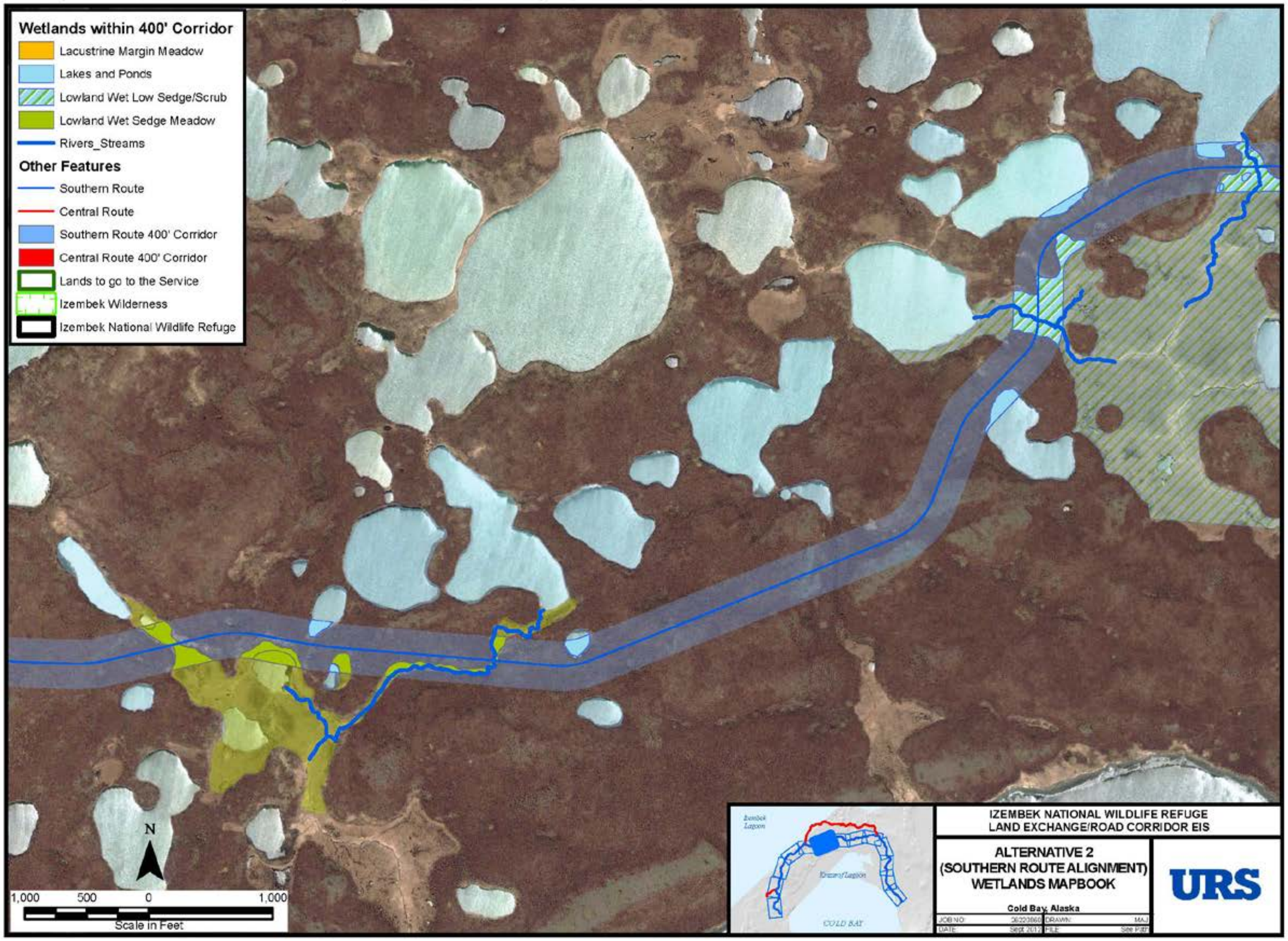


Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook, page 9

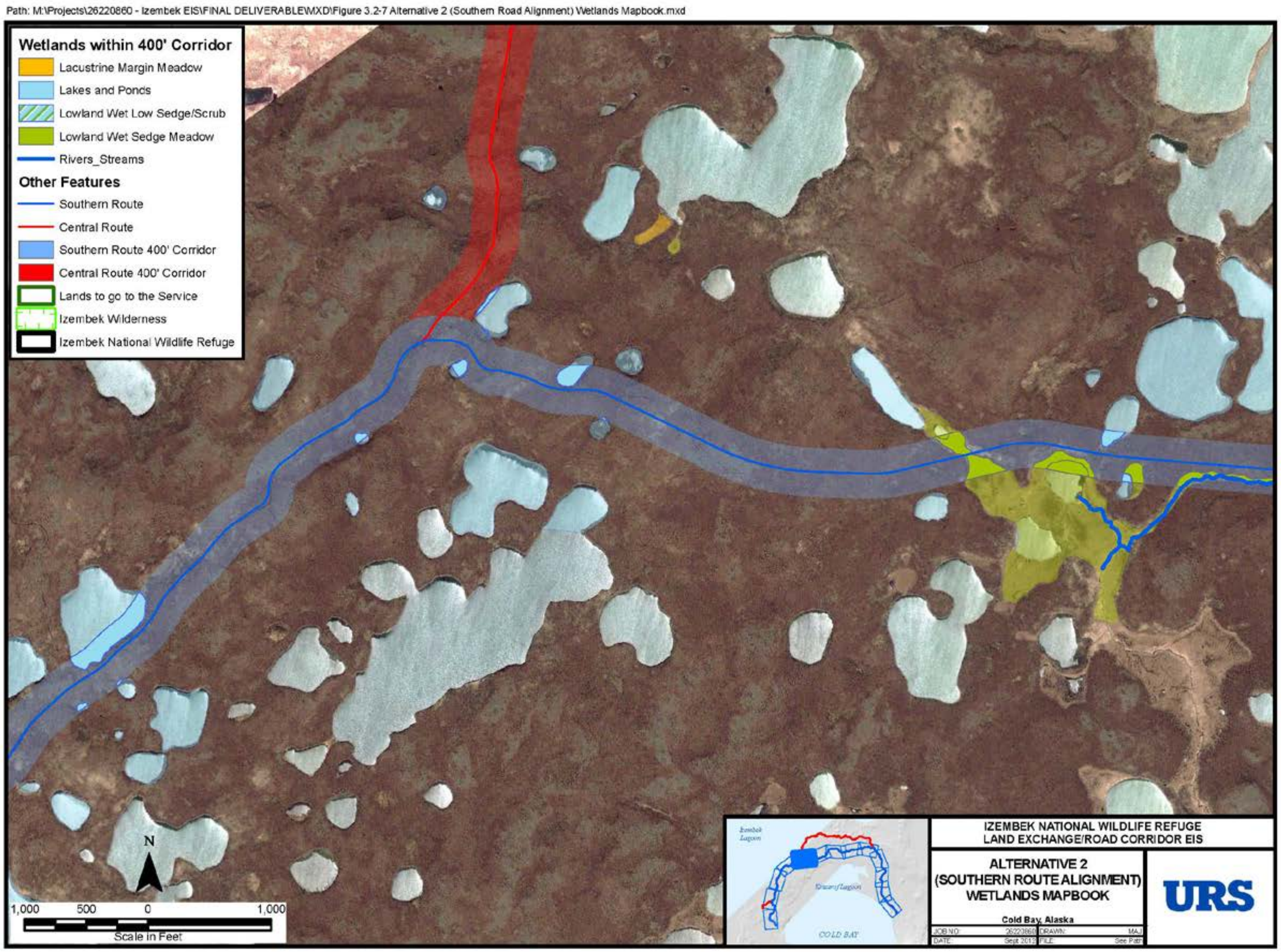


Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook, page 10

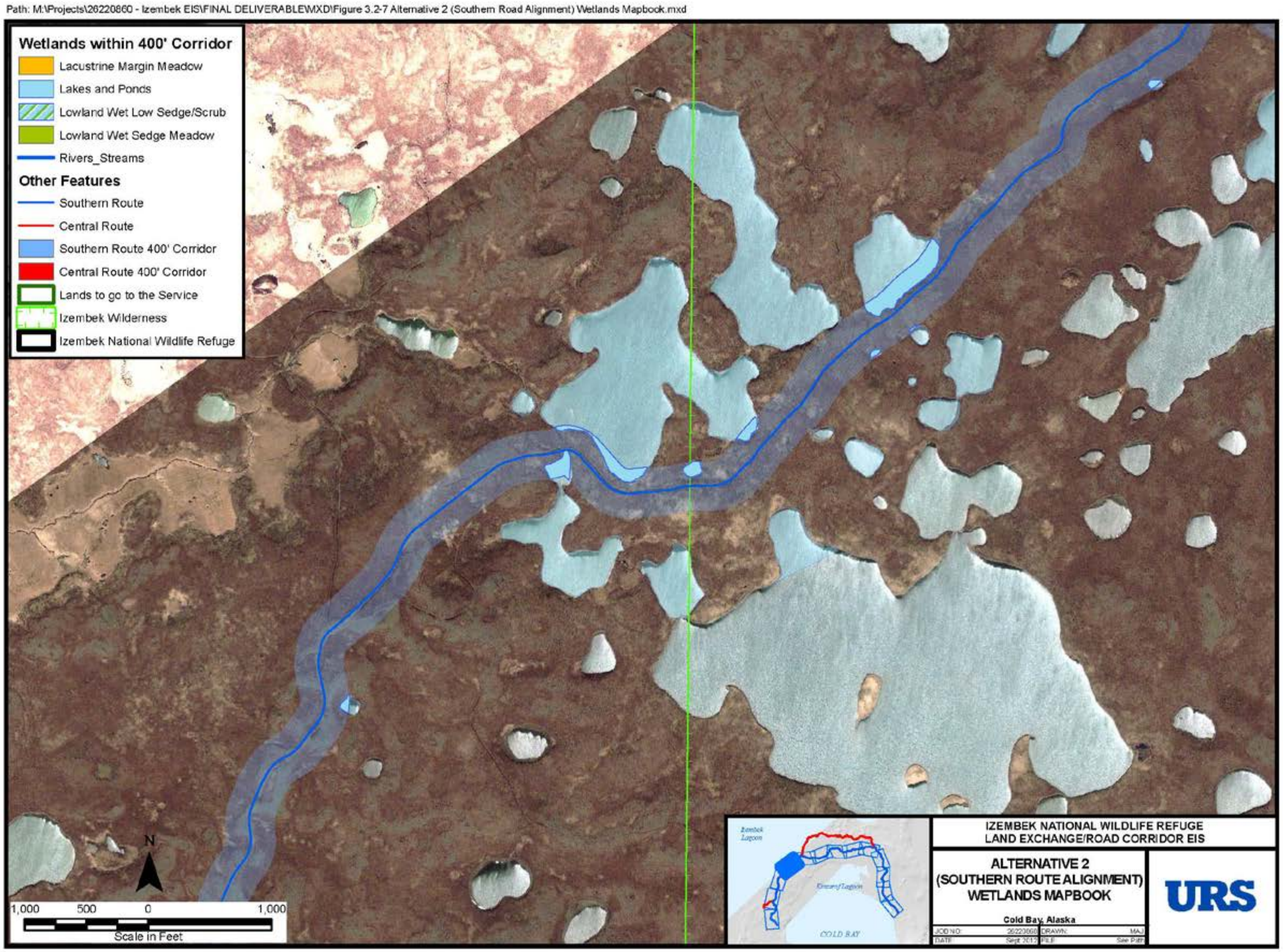


Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook, page 11

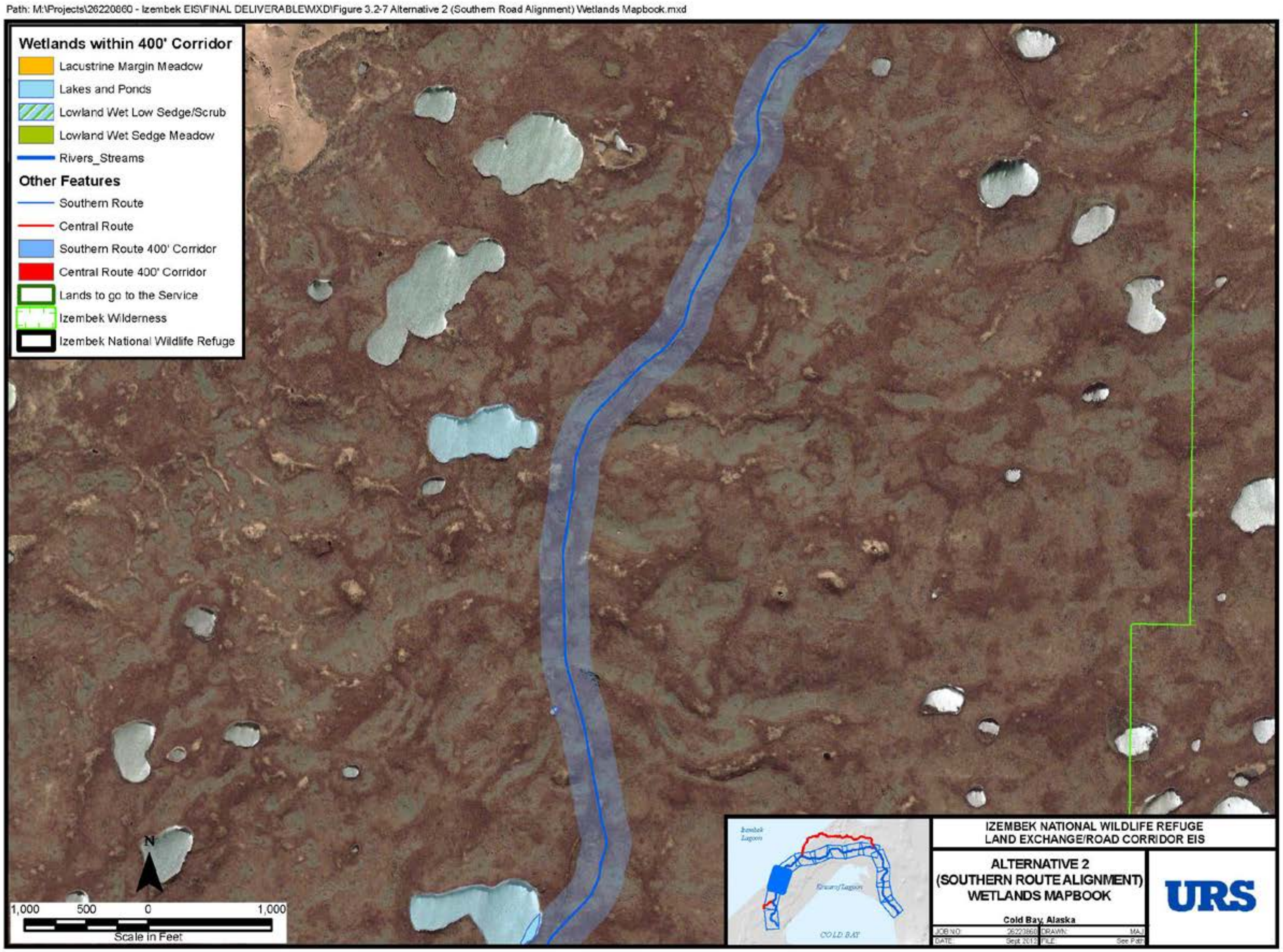


Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook, page 12

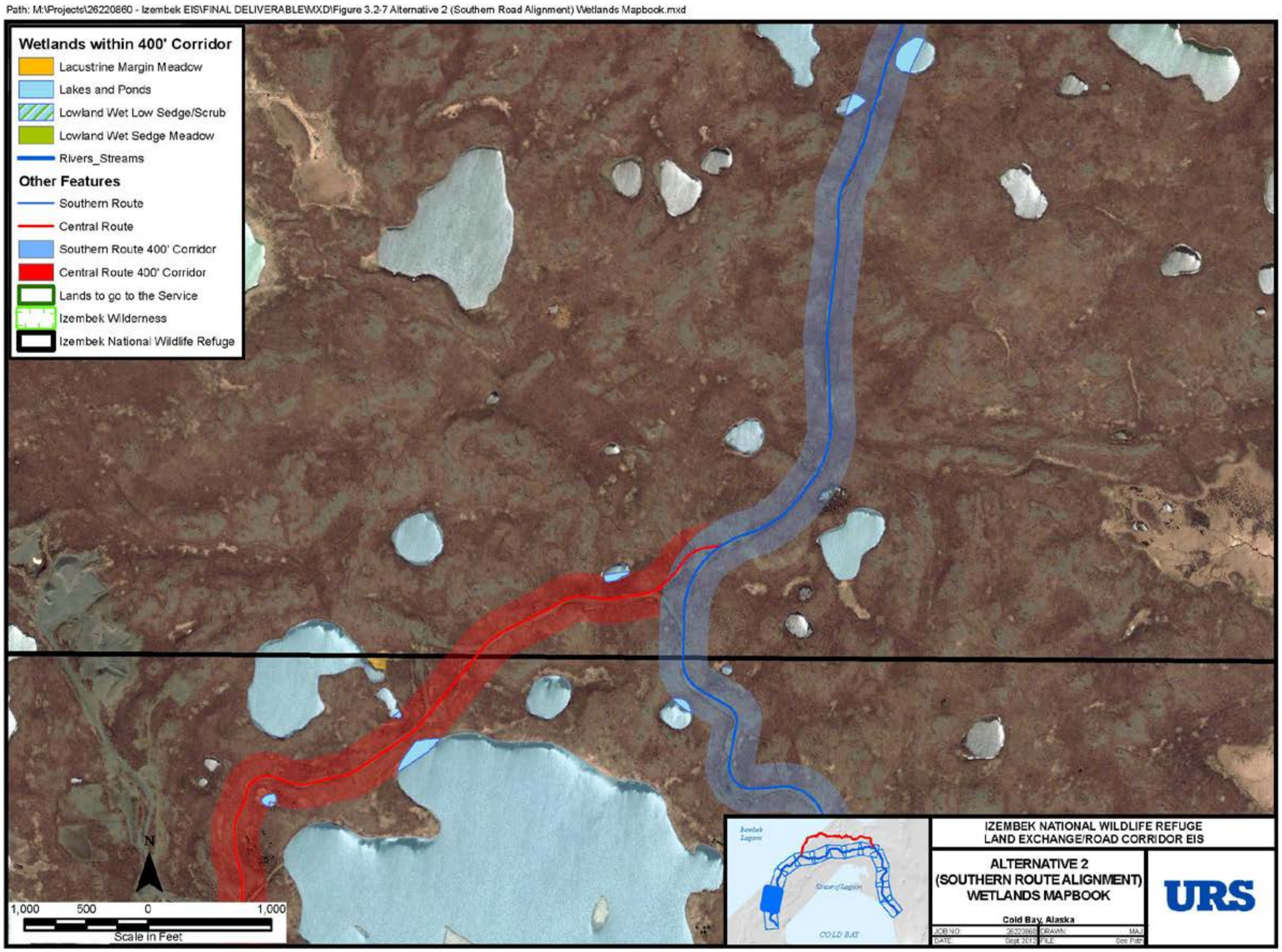


Figure 3.2-7 Alternative 2 (Southern Road Alignment) Wetlands Mapbook, page 13

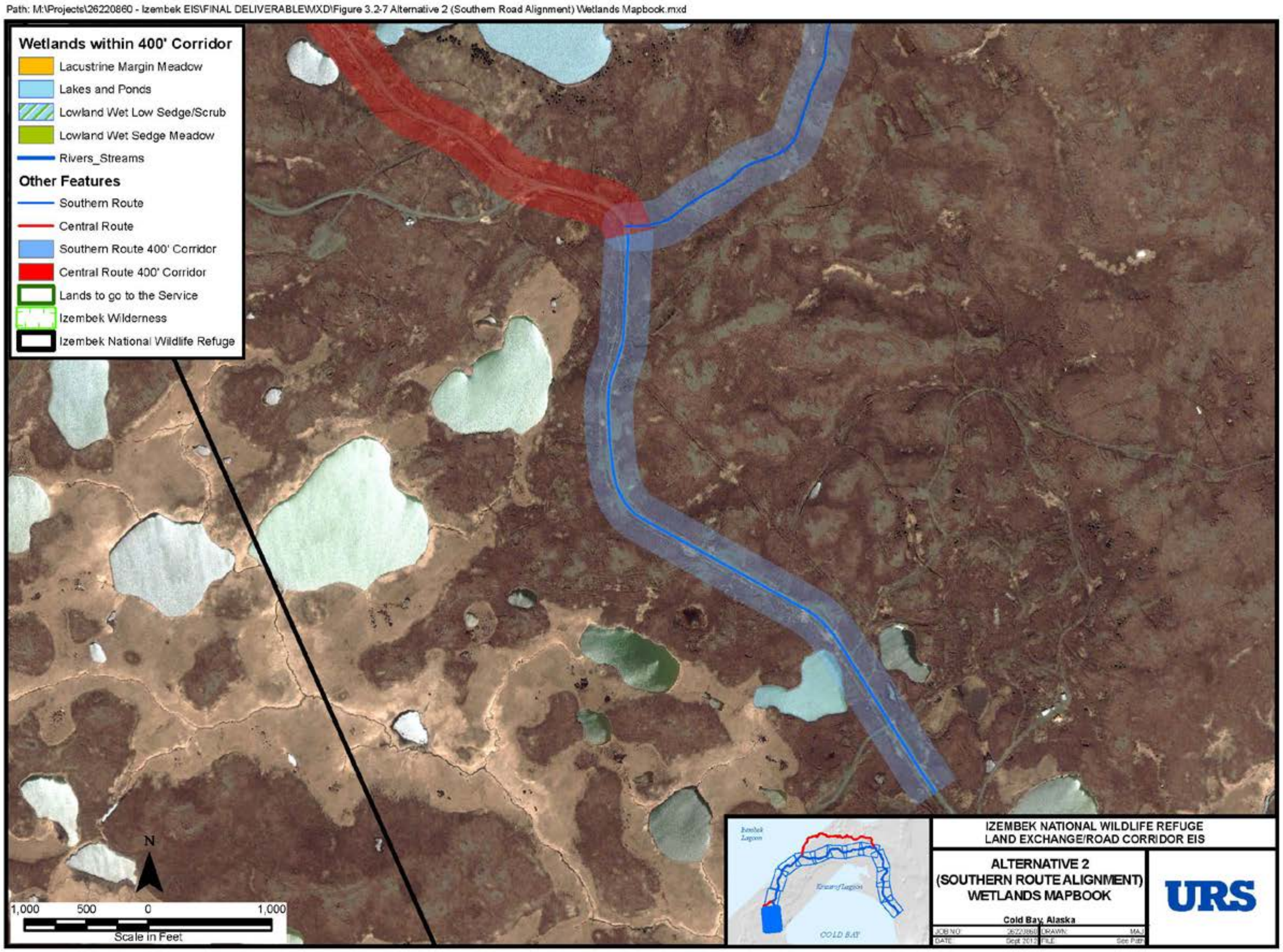


Figure 3.2-8 Alternative 3 (Central Road Alignment) Wetlands Mapbook, page 1

Path: M:\Projects\Federal\26220860 - Izembek EIS\MXD_PROJECTED\December Edits\Figure 3.2-7 Central Route Wetlands Mapbook.mxd

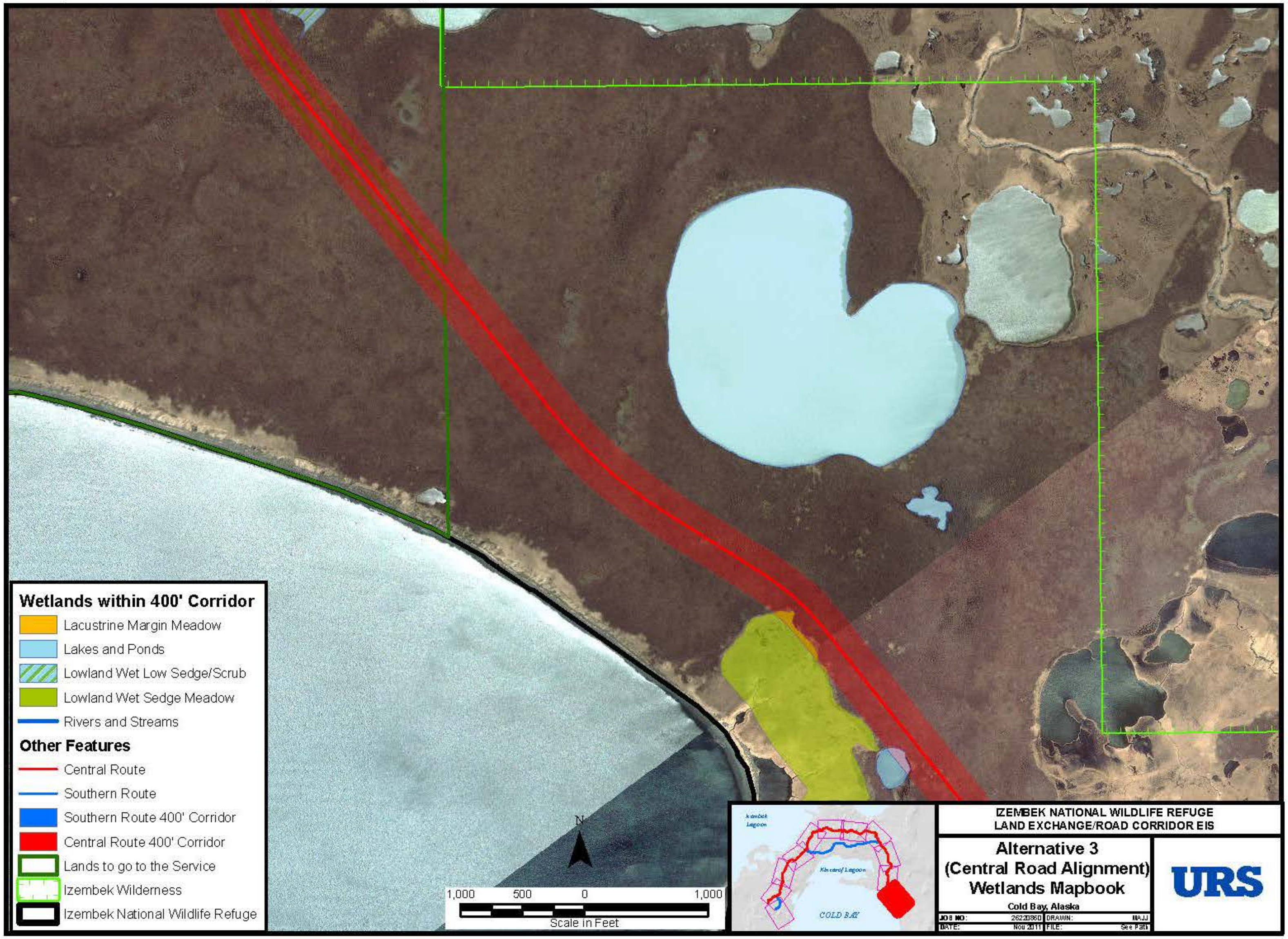


Figure 3.2-8 Alternative 3 (Central Road Alignment) Wetlands Mapbook, page 2

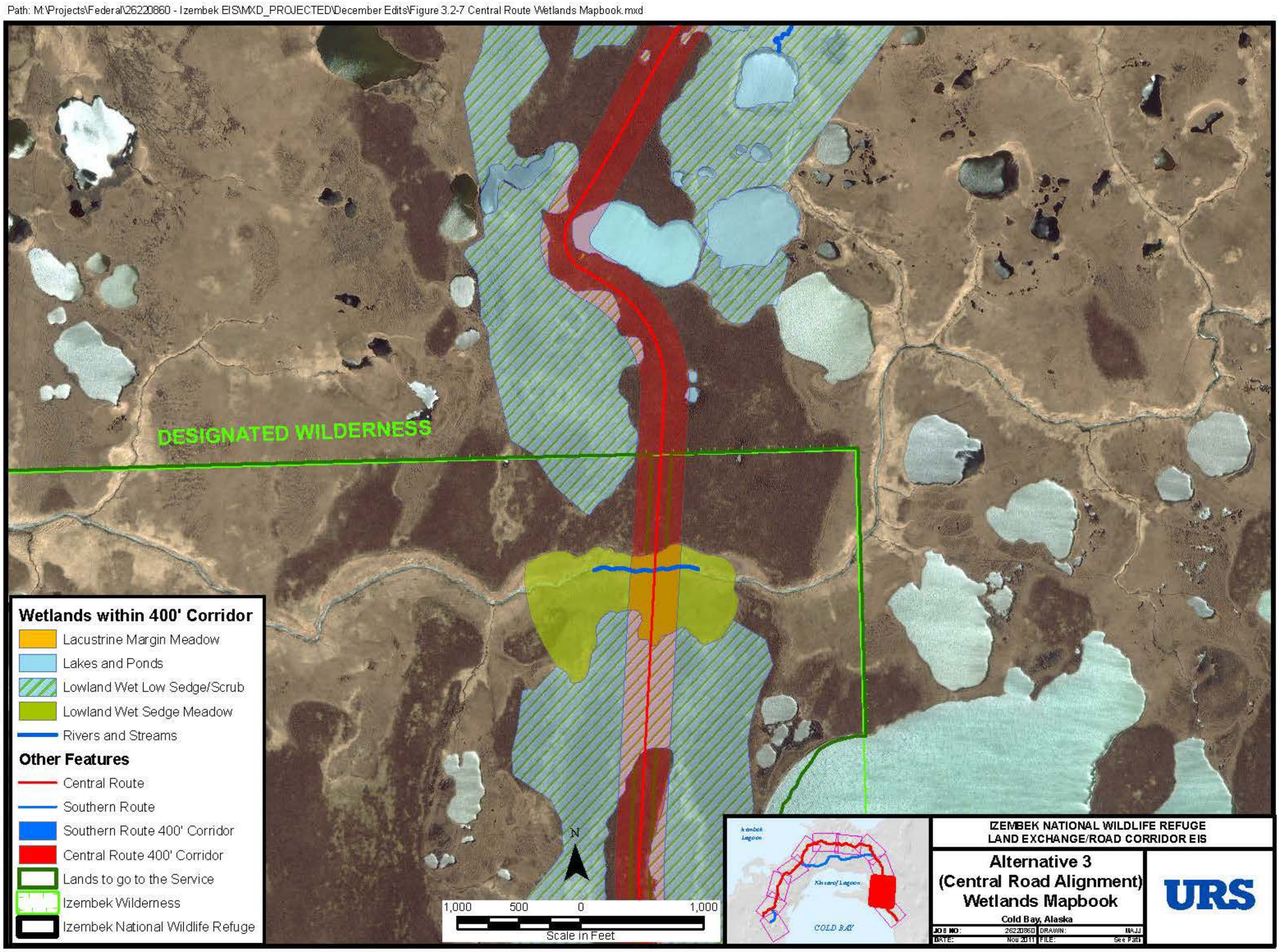


Figure 3.2-8 Alternative 3 (Central Road Alignment) Wetlands Mapbook, page 3

Path: M:\Projects\Federal\26220860 - Izembek EIS\MXD_PROJECTED\December Edits\Figure 3.2-7 Central Route Wetlands Mapbook.mxd

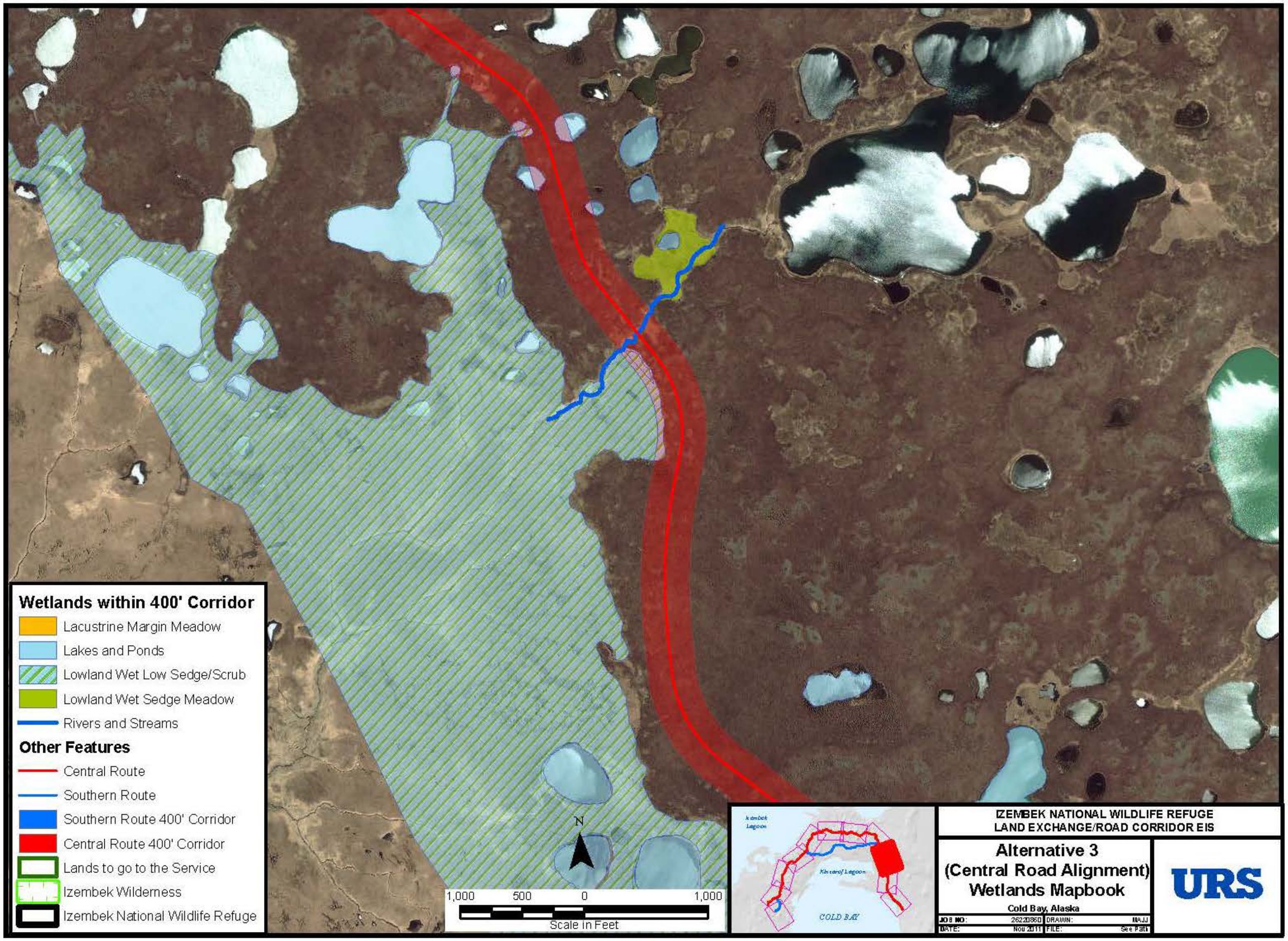


Figure 3.2-8 Alternative 3 (Central Road Alignment) Wetlands Mapbook, page 4

Path: M:\Projects\Federal\26220860 - Izembek EIS\MXD_PROJECTED\December Edits\Figure 3.2-7 Central Route Wetlands Mapbook.mxd

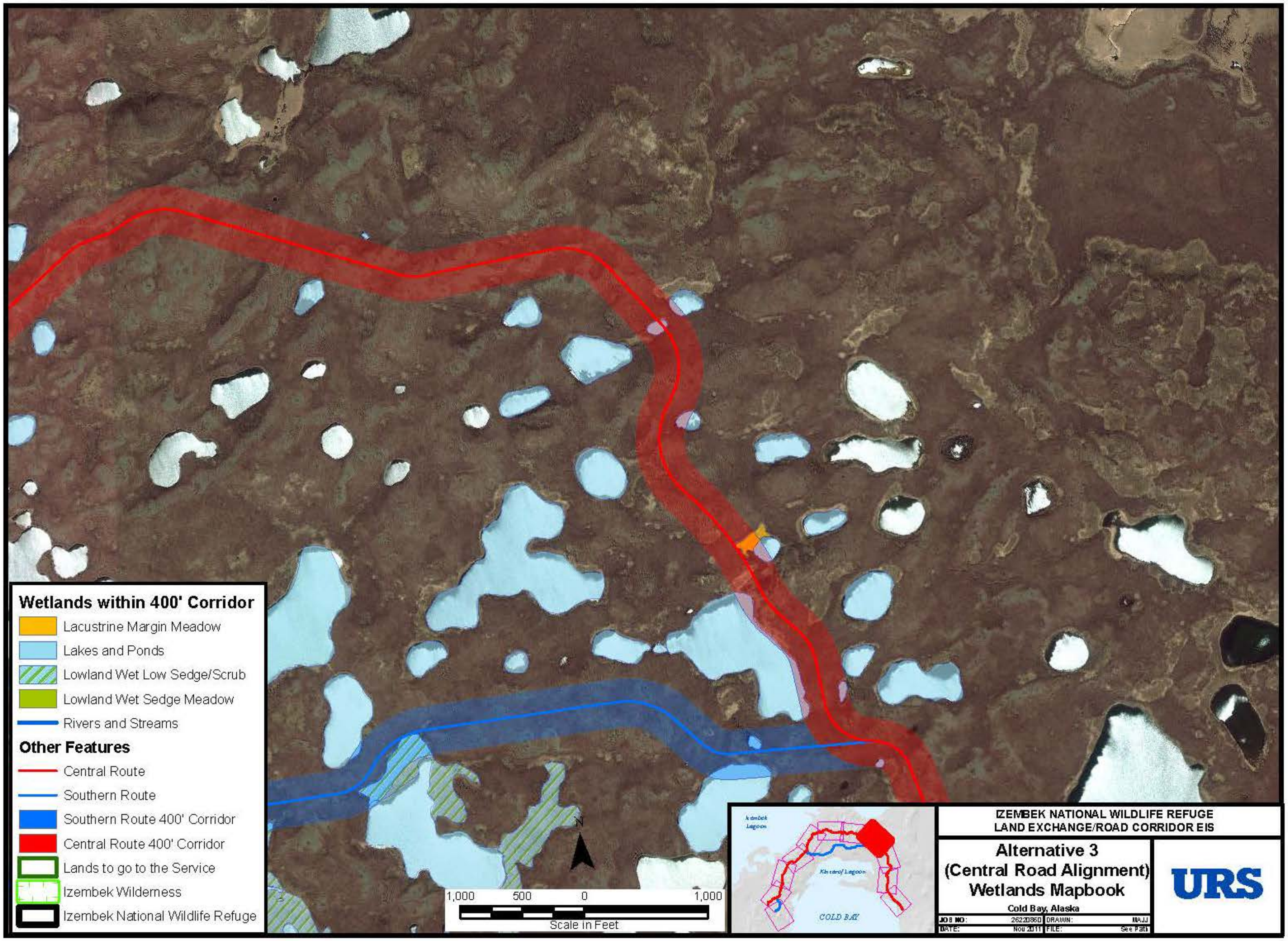


Figure 3.2-8 Alternative 3 (Central Road Alignment) Wetlands Mapbook, page 5

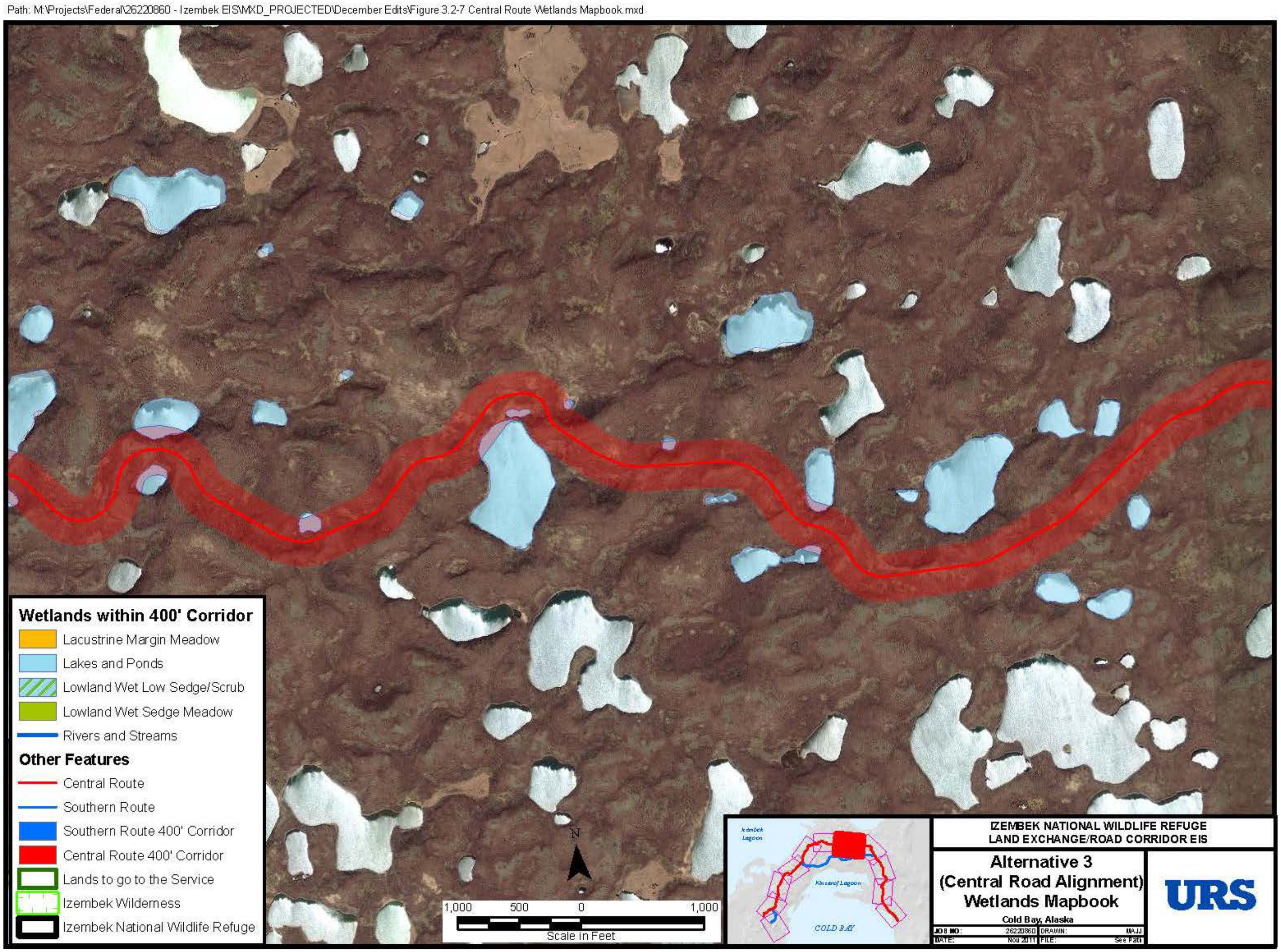


Figure 3.2-8 Alternative 3 (Central Road Alignment) Wetlands Mapbook, page 6

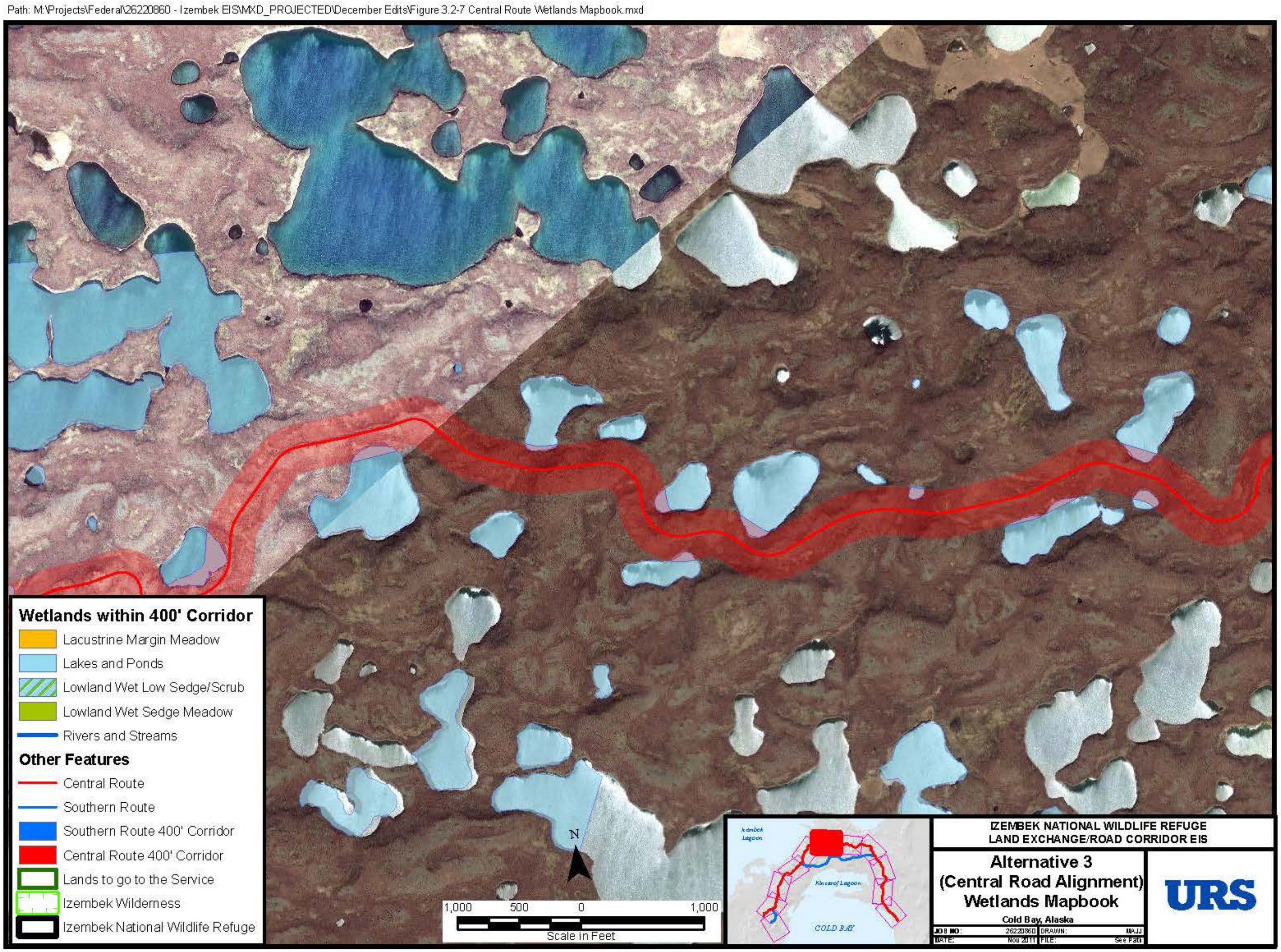


Figure 3.2-8 Alternative 3 (Central Road Alignment) Wetlands Mapbook, page 7

Path: M:\Projects\Federal\26220860 - Izembek EIS\MXD_PROJECTED\December Edits\Figure 3.2-7 Central Route Wetlands Mapbook.mxd

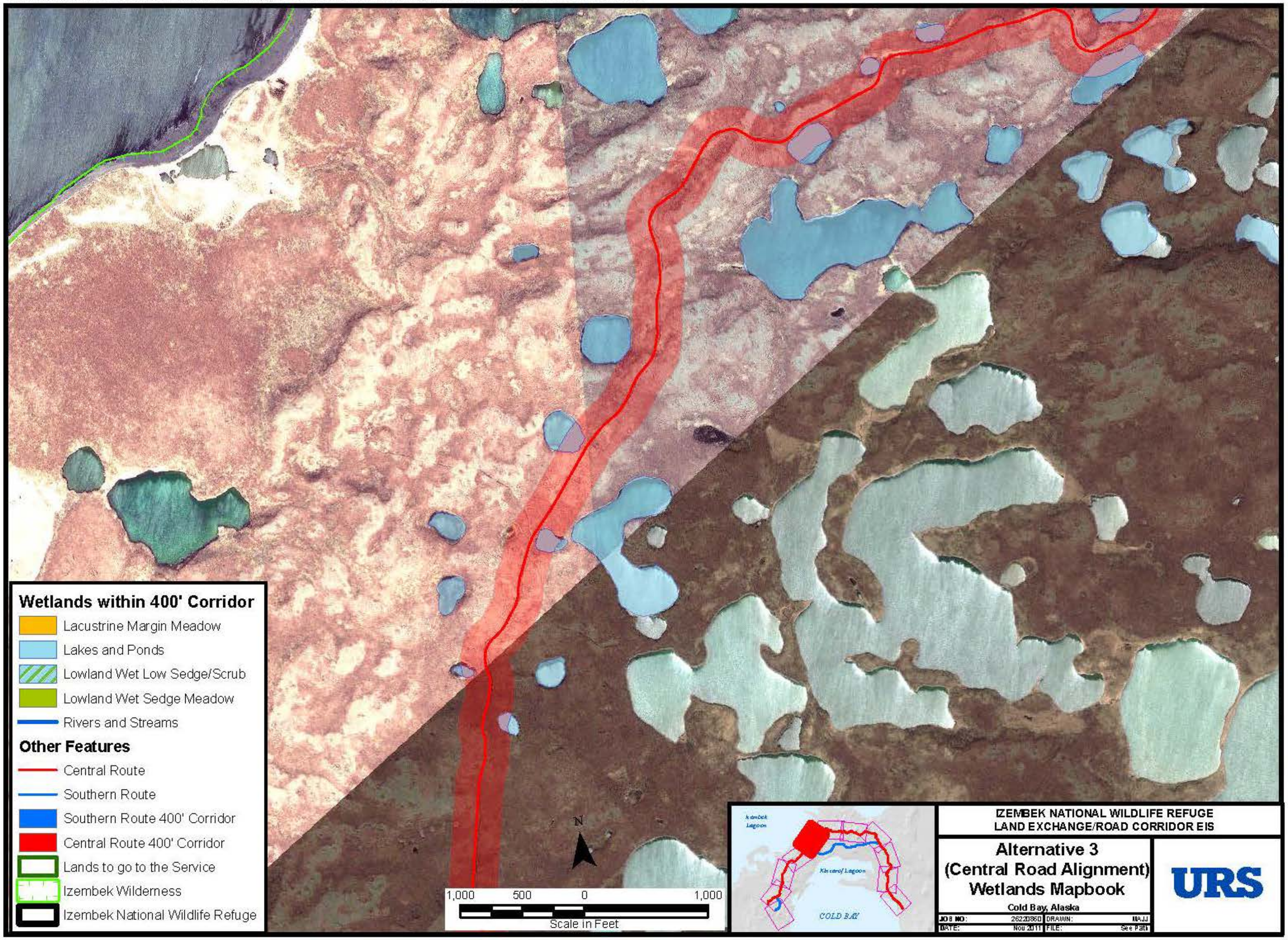


Figure 3.2-8 Alternative 3 (Central Road Alignment) Wetlands Mapbook, page 8

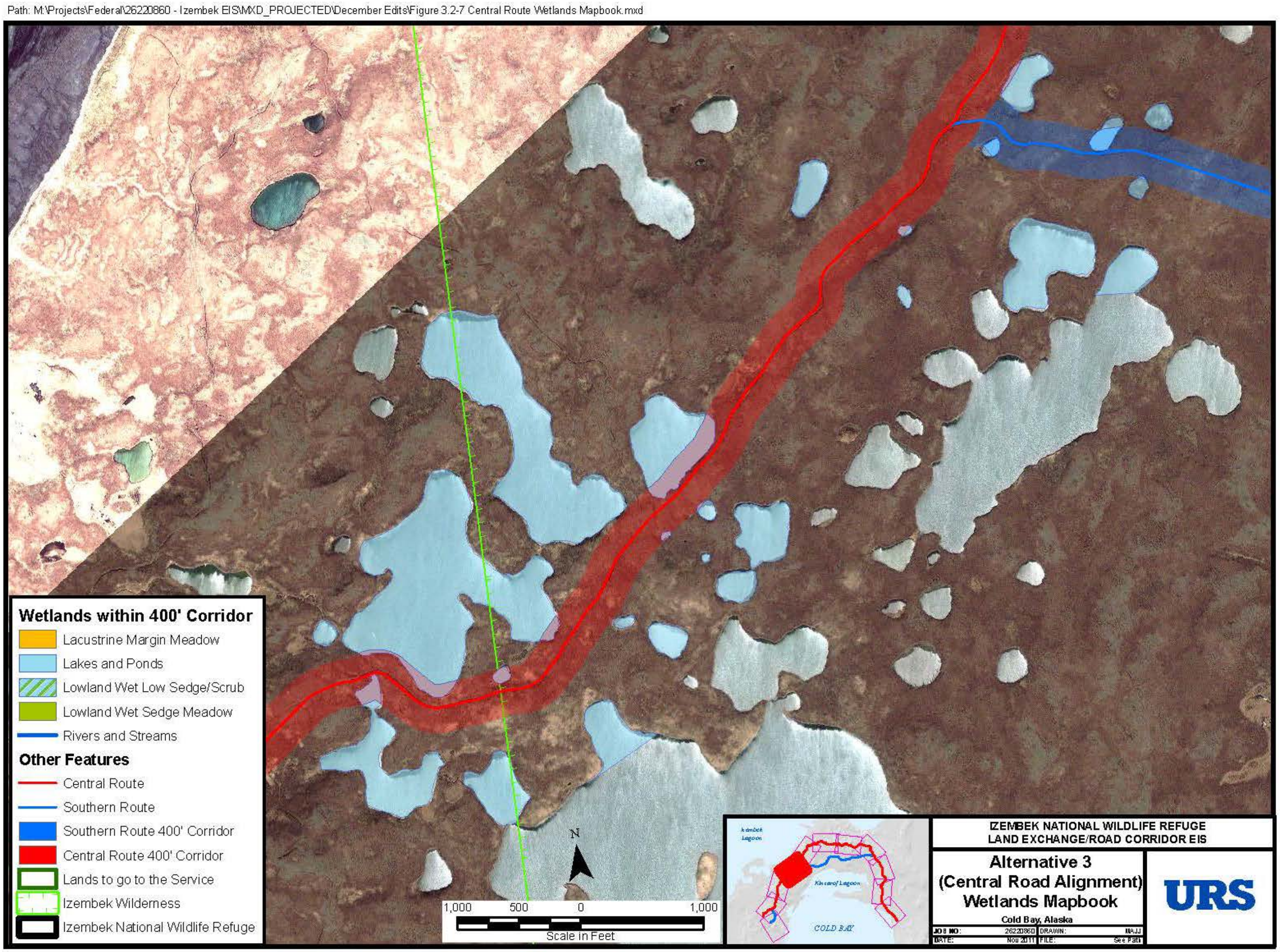


Figure 3.2-8 Alternative 3 (Central Road Alignment) Wetlands Mapbook, page 9

Path: M:\Projects\Federal\26220860 - Izembek EIS\MXD_PROJECTED\December Edits\Figure 3.2-7 Central Route Wetlands Mapbook.mxd

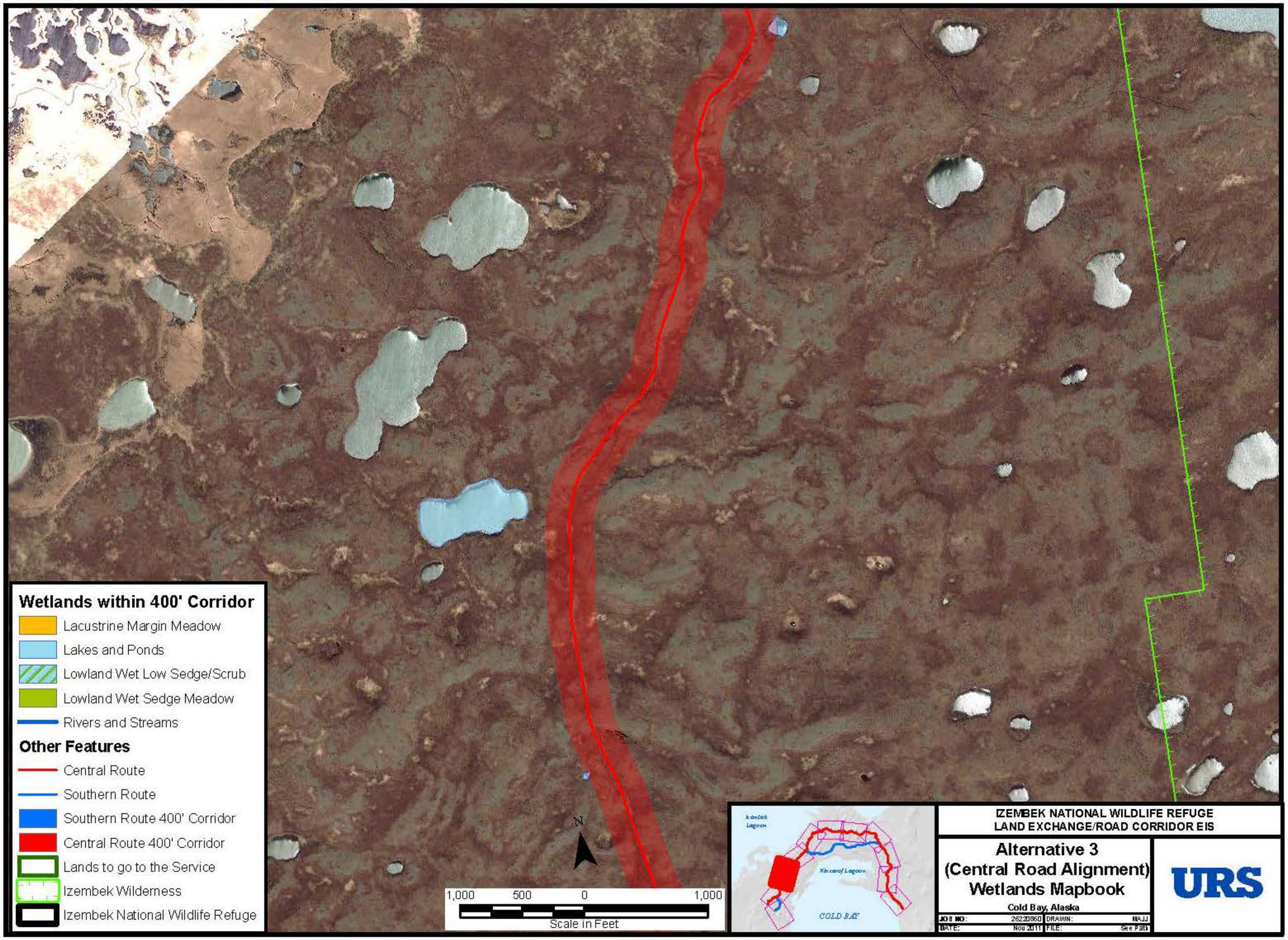


Figure 3.2-8 Alternative 3 (Central Road Alignment) Wetlands Mapbook, page 10

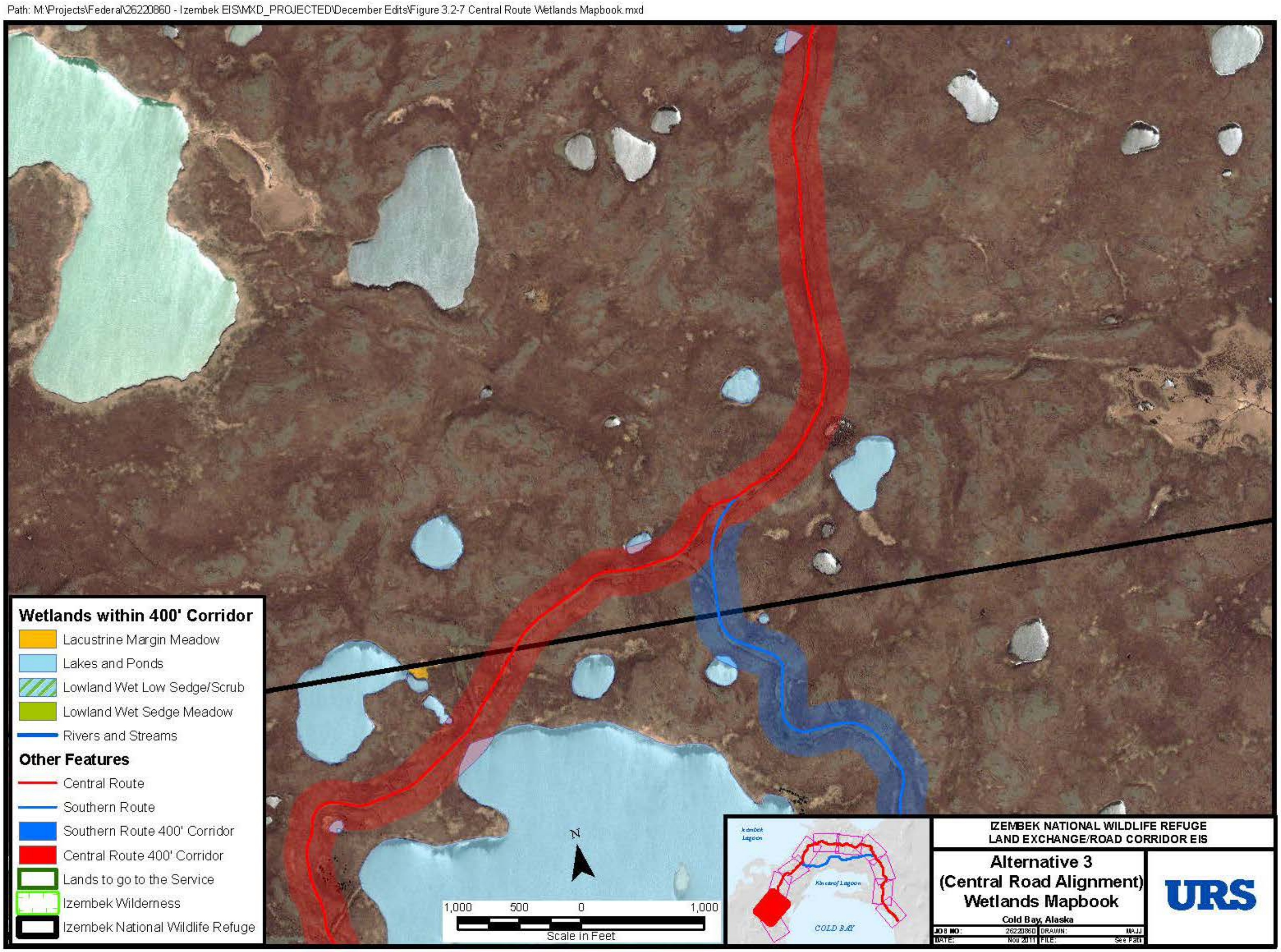
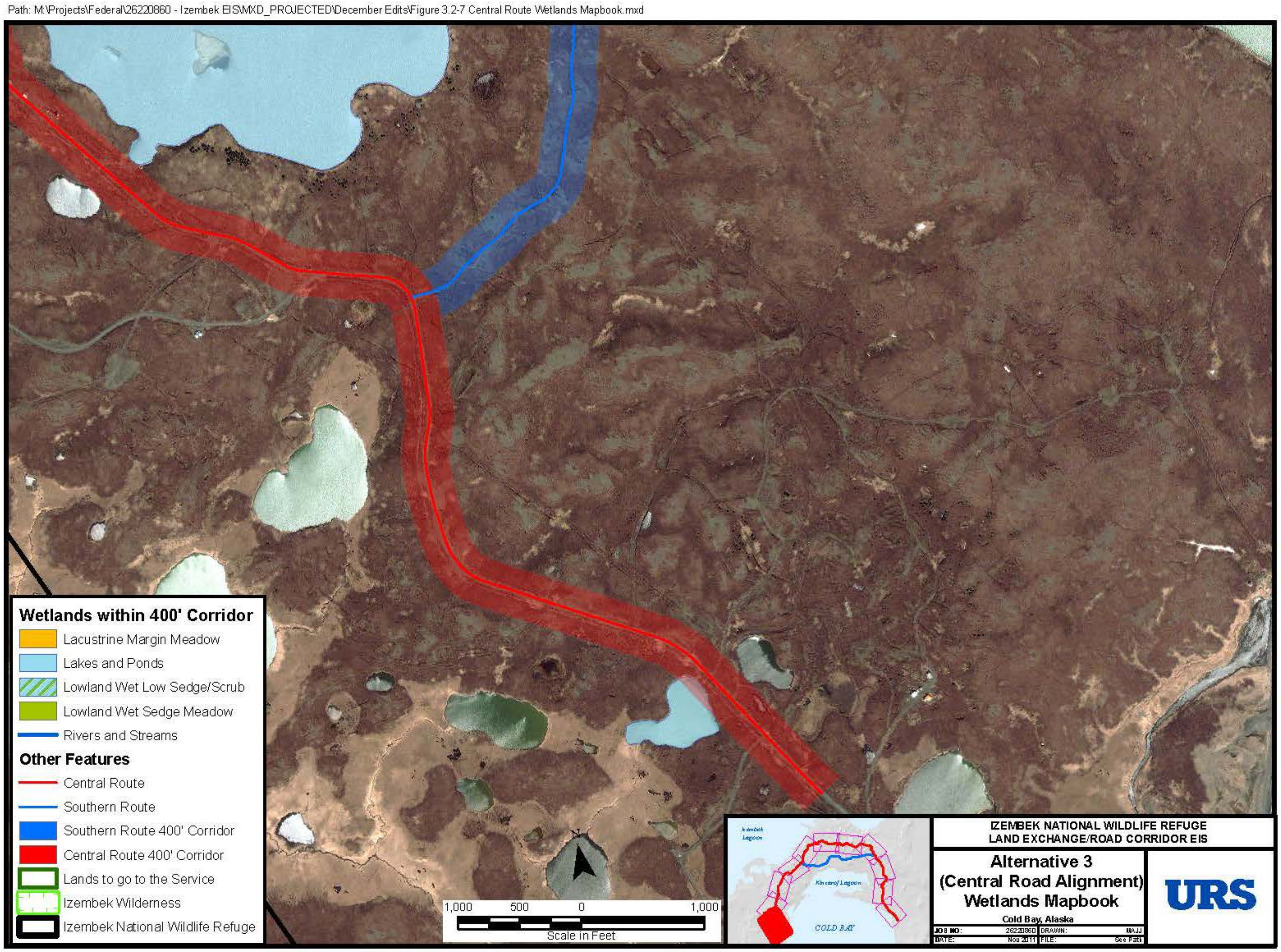


Figure 3.2-8 Alternative 3 (Central Road Alignment) Wetlands Mapbook, page 11



Wetlands within the proposed corridors were classified using the wetland classification system identified in the 2003 EIS. This system includes a broad classification of vegetation and land cover types that correlate to National Wetland Inventory classifications (Cowardin et al. 1979) and wetland system types (HDR 1999) based on the ecosystem in which they are located. The analysis started with available geographic information system layers for the proposed road routes and vegetation/wetland types from the 2003 EIS (HDR 2002a, b). The analyses of route segments that did not have existing wetland delineations were mapped through aerial photography interpretation using 1995 color and 1987 black and white stereo imagery from AeroMetric.[1] USGS topographic maps and 2009 AeroMetric aerial photography were also used as references. The wetland/upland boundaries are displayed on the 2009 aerial photography (Figure 3.2-7 and Figure 3.2-8) The analysis provides estimated acreages of each wetland type found within a 400-foot wide corridor centered along the proposed road routes (Table 3.2-6) The corridor routes begin on the east side near the Northeast Terminal site on King Cove Corporation lands, pass through wilderness and non-wilderness lands of the Izembek National Wildlife Refuge and end at the boundary with state lands north of the community of Cold Bay. Table 3.2-6 summarizes the wetlands that occur within each land management category.

3.2.2.4 Systems and Functions

As described in the 2003 EIS, the wetland types in the project areas can be classified according to the type of ecosystems they occur within. The general ecosystem types are beach system; tundra system, which includes the Kinzarof Lagoon marsh system; and the mountain and valley-bottom system. Wetlands within the beach system include the areas adjacent to the Northeast Terminal and the Lenard Harbor terminal sites identified in Alternative 4 and 5. Wetlands within the road corridors, the lands adjacent to Kinzarof Lagoon, the lowlands of the lands adjacent to Mortensens Lagoon, and the northern township of the State parcel, are considered tundra system wetlands. Mountain and valley-bottom system wetlands include most wetlands identified within the southern township of the State parcel and higher elevations of the lands adjacent to Mortensens Lagoon.

Wetland functions were evaluated as part of the 2003 EIS using a functional assessment method similar to a system used on other transportation projects throughout Alaska, developed by the Corps New England District (USACE 1999; EPA 2001b). The description of the wetland types and potential functions of each wetland type below are excerpts and summations from the 2003 EIS with edits where necessary to focus on the proposed land exchange parcels of this EIS. These wetland system descriptions are also applicable to the Sitkinak Island parcel.

[1] AeroMetric King Cove flight, 10-30-95, 1”=2000’, image numbers 5-5, 5-6, 5-7, 5-8, 6-3, 6-9, 7-2, and 7-3; and Cold Bay flight 7-26-87, 1”=3000’, image numbers 3-16 and 3-17.

Table 3.2-6 Wetland Areas along the Proposed Izembek Road Corridors (400 feet)

Code	Vegetation Type[2]	HDR Wetland Type[1]	NWI Class [3]	Wetland Acres Alternative 2 (Southern Road)			Wetland Acres Alternative 3 (Central Road)		
				Corporation Lands	Refuge Wilderness	Refuge Non-Wilderness	Corporation Lands	Refuge Wilderness	Refuge Non-Wilderness
Mmm	Montane Moist Meadow	N/A	Upland	N/A	N/A	N/A	N/A	N/A	N/A
Umds/ Umm	Upland Moist Dwarf Scrub/ Upland Moist Meadow	N/A	Upland	N/A	N/A	N/A	N/A	N/A	N/A
Lwlss	Lowland Wet Low Sedge/Scrub	Depressions	PEM1B, PEM1C, PEM/SS1B, PEM1/SS1/3B	12.8	38.9	0	12.8	32.3	0
				Total Lwlss acres 51.7			Total Lwlss acres 45.1		
Rs	Rivers and Streams	Not included in 1999 study	R3UBH, R4USC	413.4	4,144.8	0	413.4	1,376.3	0
				Total Rs linear feet 4,558.2			Total Rs linear feet 1,789.7		
Lwsm	Lowland Wet Sedge Meadow	Sedge Marshes	PEM1C, PEM1F	6.0	4.7	0	6.0	0.7	0
				Total Lwsm acres 10.7			Total Lwsm acres 6.7		
Lp	Lakes and Ponds	Depressions	PUBH	0	21.7	2.1	0	27.8	2.7
				Total Lp acres 23.8			Total Lp acres 30.5		
Lmm	Lacustrine Margin Meadow	Depressions	PUS/EM1C	0	0	0	0	0.4	0
				Total Lmm acres 0			Total Lmm acres 0.4		
Wetland Totals				**86.2 acres and 4,558.2 linear feet of stream**			**82.7 acres and 1789.7 linear feet of stream**		

[1] HDR 2002a,b
[2] USACE 2003
[3] Cowardin, et al. 1979

Beach System

Wetland types classified within the beach system include intertidal habitats and coastal sedge marshes. These types of wetlands are found near the Northeast Terminal and the Lenard Harbor Ferry Terminal sites, the temporary barge landing sites, and along the Sitkinak Lagoon spit. The beach system occurs just above sea level. It includes steep gravelly beaches, sandbars that parallel the shore and extend above the elevation of high tide, and low elevation areas between the sandbars that drain slowly and consequently support wetlands. The uplands on these beaches bear a grass and forb plant community. On shorelines flooded at high tides, but protected from wave action, mud flats and saline tolerant grass meadow communities have developed. These wetlands are shallowly flooded or saturated and are strongly dominated by robust Lyngbye sedge *(Carex lyngbaei).*

Primary Functions of Beach System Wetlands

Coastal sedge marshes have a high potential for surface water storage. However, since these wetlands are at the mouth of the watershed, little downstream habitat benefits from ameliorated peak discharges. Coastal sedge marshes may function in sediment stabilization along lakeshores and stream channel banks, since dense sedge roots and leaves serve to bind and shelter the sediments against the erosive forces of wind-generated waves and higher and faster stream flows.

High primary productivity, exemplified by dense, sedge vegetation, is found in these wetlands. Rates of decomposition and associated nutrient cycling may be somewhat slow as shown by the accumulation of organic matter beneath new sedge growth. However, the coastal sedge marshes likely export substantial amounts of organic carbon directly into streams and adjacent lakes.

By providing a diverse environment of wetland, open water, and upland areas within close proximity to each other, coastal sedge marshes have substantial fish and wildlife use. The variety of habitat types allows wildlife to exist without having to expend extra energy traveling long distances to feed or rest. Passerines and waterfowl may use the diverse habitat for resting and cover, nesting, and feeding. Small fish, including juvenile salmonids could use the plants and vertical stream banks for feeding and cover. It is likely that these wetlands provide mammal habitat for feeding, cover, and travel corridors. Coastal sedge marshes may support a great diversity and abundance of fish and wildlife, since it is an element of a diverse shoreline complex.

Tundra System

Wetland types classified for the tundra system include depressions, Kinzarof marshes, and low sedge fens. The Kinzarof marsh system is directly adjacent to, and draining into, the southeast, east, and northeast portions of Kinzarof Lagoon. The system consists of depression wetlands with similar functions to those found on other tundra segments of the study area, and a sedge marsh, found along the south side of the lagoon. The vegetation of the Kinzarof area marshes is dominated by sedges, with a minor component of shrubs and other herbs, and abundant mosses: *Eriophorum angustifolium, Carex pluriflora, Eriophorum russeolum, Carex lyngbyei, Trichophorum caespitosum, Equisetum arvense, Vaccinium uliginosum, Empetrum nigrum, Polygonum bistorta*, *Salix reticulata,* and *Comarum palustre*. Aerial photography shows that ponds of many sizes are interspersed throughout the marsh. Some of the marsh grounds show a pattern of alternating ponds and hummocks. The soil throughout the marsh appears to be saturated to the surface; much of the marsh is shallowly flooded for all or part of the growing season. Several streams, with an apparently shallow gradient, drain these wetlands and run into Kinzarof Lagoon. The streams appear to be incised into the marsh surface; it is unknown whether any of the adjacent marshes or small ponds are accessible to fish.

Rolling tundra area surrounds Kinzarof marshes, and stretches southward along Cold Bay through the Mortensens Lagoon parcel. Several types of wetlands were observed in some of the large depressions in this rolling terrain. Lakes and ponds/potholes are numerous in the area. Sometimes at the upper margins of these depressions are very hummocky wetlands. Between the hummocks is mud supporting a sparse growth of grasses, sedges, or rushes. The hummocks are uplands, while the mud hollows are wetlands. Downslope of this community type, or occupying the upper margin of the large depressions, is a hummocky willow-dominated community. These sites generally show evidence of past standing water between the hummocks. Sedge meadows occur in the lower part of large depressions within the heath tundra. Extensive sedge meadows of this type also occur at the transition between the tundra and mountainous areas.

Primary Functions of Tundra System Wetlands

There is little indication the Kinzarof marshes either discharge or recharge groundwater. These wetlands may serve slightly to moderate the flows in streams running into Kinzarof Lagoon. Their continually saturated condition would not allow them to absorb water, but the dense vegetation and hummocky microtopography might slow runoff. The wetland vegetation would promote sediment deposition during overbank flow conditions. The marsh vegetation would bind stream banks and the shoreline against erosive high flows and waves, reducing bank erosion and resulting turbidity and sedimentation. These wetlands likely have moderately high primary productivity. Because there appears to be abundant surface water, which flows into streams or directly into the lagoon, these wetlands likely export organic materials that support the lagoon ecosystem, including the migrating, staging, and wintering waterfowl and migrating shorebirds for which Kinzarof Lagoon is known. Because of the abundance of surface water, the complex interspersion of open water and vegetation, and proximity to Kinzarof Lagoon, these wetlands likely support different, and more water dependent, wildlife from that using other sedge meadows further removed from Izembek and Kinzarof lagoons. Some waterfowl that use Kinzarof Lagoon also feed on land, and the proximity of these wetlands to Kinzarof Lagoon might make them more attractive to birds. The wetland vegetation would provide some cover and would contribute detritus and invertebrates to the streams that support fish.

The rolling tundra area stores early summer overland surface water flow within the depressions, and it is likely that the depressions function to recharge ground water, which may support lower elevation wetlands and stream systems. The tundra system does not function in reducing flood peaks or in bank stabilization or retention, since it is not associated with streams.

Nutrient and element cycling is moderate in the tundra system because water table decline through the season could allow various elements to be reduced and later oxidized. The ponds function in food web support, since birds may consume detritus-nourished invertebrates there, and food webs could be supported offsite through transient bird populations.

Although the tundra wetland system provides little direct fish support, the interspersion of habitat types including open water and depressions within a matrix of heath tundra allows the tundra system to function importantly in providing habitat for terrestrial mammals. Songbirds, ptarmigan, waterfowl, terns, and shorebirds also use the wetland system.

Mountain and Valley-Bottom System

Wetland types classified for the mountain and valley-bottom system includes seeps and herbaceous meadows, low sedge fens, and sedge marshes. Wetlands are most prominent at, and just above, the toes of the mountain slopes in this system, but they can also occur higher on some slopes.

Seeps often occur immediately below a break in slope, generally some distance above the toe of the mountain slope. Seep areas are characterized by standing water with herb vegetation. This type of wetland is generally small and quickly grades downslope into the herb meadows. Herb meadows are saturated to the surface and usually located on a slope. These wetlands may be associated with ground water discharge or are located at the toe of a slope that receives runoff from upslope.

Low sedge meadows are found on lower mountain slopes or on benches part way up the slope and are extensive along the south margin of the tundra system at the transition to the mountainous area. Different from herb meadows, low sedge meadows are flatter. This wetland type is watered by overland flow from farther upslope, or sometimes apparently by groundwater discharge. Sedges, forbs, willows, and mosses, including sphagnum, dominate these wetlands.

Tall sedge marshes exist on parts of the valley floor and contain creek channels. Water enters the marshes by draining downslope, and possibly also across the valley floor. The creeks potentially overflow during flood events. The sedges in these marshes are up to about 2 feet tall. These marshes are saturated to the surface or shallowly flooded.

Primary Functions of Mountain and Valley-Bottom Wetlands

Seeps and Herbaceous Meadows. These wetland types, located on the valley side slopes, function importantly as a drainage path for ground water discharge. It is likely that the area has little capacity to store additional water or control high flows because the soil is saturated, it has a steep slope, and it lacks depressions or microtopographic roughness. Dense vegetation and roots within the meadows stabilize sediments and channels by binding the substrate.

Since these wetlands have both groundwater and surface water sources, it is likely they are nutrient-rich. Primary production is substantial and apparent by dense growth of herbaceous species. The complex of open herbaceous meadows and surrounding upland shrubs provides habitat diversity important to many animals including songbirds and mammals.

Low Sedge Fens. Similar to the herbaceous meadow wetlands, low sedge fens are located on valley side slopes that are flatter. Because of the lower gradient, ground water discharge, sediment stabilization, and nutrient cycling do not appear to be important functions of this wetland type. However, this wetland type may function slightly more in surface water storage. Low sedge fens are a prominent habitat type throughout the mountainous part of the study area, where they create complex habitat diversity when interspersed with the other wetland and upland habitats.

Sedge Marsh. This wetland type typically includes a small meandering creek. This wetland type may function well in floodwater storage and will also likely bind sediments during high flow events. The valley bottom sedge marshes have high primary production. Detritus and resulting organic carbon are likely transferred into adjacent streams and could be washed to downstream systems.

The complex of habitat types included in the valley bottoms provides habitat diversity important to wildlife populations. Plants adjacent to valley bottom streams provide cover and substrate for invertebrates and fish species. The wetlands also provide habitat for wildlife species like bears and smaller mammals feeding on numerous fish species, including salmon.

3.2.2.5 Wetland Functions and Values

Wetland functions are defined as the normal or characteristic activities that take place in wetland ecosystems or simply the things that wetlands do (Smith et al. 1995). As described by Smith et al., wetlands perform a wide variety of functions in a hierarchy from simple to complex as a result of their physical, chemical, and biological attributes. The wetland functions listed on Table 3.2-7 are modifications of functions described in *A Hydrogeomorphic Classification for Wetlands* (Brinson 1993).

The value of a specific wetland is related to the goods and services provided to other resources and the human environment. Therefore, the value of a specific wetland's function depends greatly upon the wetland's location relative to lakes and streams, groundwater resources, and fish and wildlife populations, etc. For example, wetlands adjacent and upslope from water bodies designated as Essential Fish Habitat would be considered to have high value for their ability to promote sediment deposition during overbank flow conditions, or to bind stream banks and the shoreline against erosive high flows and waves, reducing bank erosion and resulting turbidity and sedimentation. Whereas similar wetlands farther removed from water bodies would be considered to have lesser value. Wetlands with abundant surface water strategically interspersed with open water and areas with adequate vegetative cover would be considered to have high value for numerous waterfowl and water bird species, while similar wetlands, with the same vegetation, soil and hydrologic characteristics, in isolated locations would be considered to have lesser value.

The wetlands of Izembek National Wildlife Refuge and the proposed exchange parcels are currently in their natural undisturbed state, and therefore, are considered to be currently at maximum functional capacity.

The beach system wetland functions previously occurred at the sites associated with Alternative 4 (Hovercraft from Northeast Terminal to Cross Wind Cove) and Alternative 5 (Lenard Harbor Ferry). These sites have been developed (filled), and most of the wetlands are no longer present; therefore, very few beach system wetland functions occur at these locations. Some beach system wetland functions, however, continue to exist adjacent to the existing Lenard Harbor site and in the vicinity of the Cold Bay dock. Beach system wetlands also exist along the Sitkinak Lagoon spit.

Mountain and valley-bottom system wetlands and their functions are not associated with the construction areas of proposed alternatives. Therefore, mountain and valley-bottom system wetlands and their functions are not identified in these tables.

Table 3.2-7 Wetland Functions Associated with Alternatives 2 and 3

Wetland Functions	Lowland Wet Low Sedge/Scrub	Lowland Wet Sedge Meadow	Lacustrine Margin Meadow	Lakes and Ponds (Depressions)	Rivers and Stream Systems
Hydrologic Functions					
Short-Term Storage of Surface Water			X		X
Long-Term Storage of Surface Water	X	X		X	
Storage of Subsurface Water				X	
Moderation of Groundwater Flow or Discharge				X	
Moderation of Surface Water Flows into Streams	X	X			
Dissipation of Energy	X	X	X		X
Biogeochemical Functions					
Cycling of Nutrients	X	X	X	X	
Removal of Elements and Compounds	X	X	X		
Retention of Particulates	X	X	X	X	X
Export of Organic Carbon	X	X	X		
Habitat Functions					
Maintenance of Habitat for Wildlife Dispersion	X	X	X	X	
Maintenance of Plant Communities for Wildlife Habitat Cover	X	X	X		X
Maintenance of Plant Communities for Wildlife Habitat Feeding	X	X	X		X
Maintenance of Fish Habitat through Distribution of Detritus into Streams					X

3.2.2.6 Proposed Land Exchange Parcel and Project Site Summaries

Road Corridor

Vegetation and land cover types along the 2003 conceptual road corridor were mapped for the 2003 EIS. Additional wetland mapping was completed, through aerial photo interpretation, along the alternative routes for the current land exchange proposal (Figure 3.2-7 and 3.2-8). Habitats described in this area (Service 2006b) include dwarf shrub tundra, low sedge-dwarf shrub meadows, gravel ridge tops, lakes/ponds, and streams. Dominant plants consist of crowberry, lowbush cranberry, bluejoint grass, cotton grass, and dwarf willows. The specific wetland vegetation communities identified within these 400-foot wide corridors along the proposed routes include lowland wet low sedge/scrub, lowland wet sedge meadow, lacustrine margin meadow, and lakes and ponds. Acreages of each community can be seen in Table 3.2-5. Functions typically performed by these tundra system wetlands are discussed above in Section 3.2.2.4 (Systems and Functions). These wetlands are considered to have very high value for their hydrologic, biogeochemical, and habitat functions due to their strategic location in proximity to both Izembek and Kinzarof lagoons. These wetlands likely support different, and more water dependent, wildlife than wetlands further removed from Izembek and Kinzarof lagoons. Some waterfowl that use the lagoons also feed on land, and the location of these wetlands in relation to the lagoons might make them more attractive to birds. The wetland vegetation provides some cover and contributes detritus and invertebrates to the streams identified as Essential Fish Habitat. The designation of this area as a Wetland of International Importance by the Ramsar Convention also supports their recognition as very high value wetlands.

Sitkinak Island

As part of the National Wetlands Inventory, the Service has mapped wetlands across many areas of the U.S. through interpretation of high altitude aerial photographs. Sitkinak Island is the only land involved in the proposed land exchange that has National Wetlands Inventory mapping. The mapping indicates that extensive areas of freshwater emergent wetlands occur on the larger Sitkinak Island parcel and marine intertidal wetlands occur along the perimeter of the smaller peninsula parcel (Figure 3.2-6,). Although not indicated on the mapping, lacustrine margin meadows are likely present along the edge of Mark Lake. This site contains tundra system wetlands discussed in Section 3.2.2.4. Although most of the wetlands at this site maintain their maximum functional capacity, they would be considered to have moderate value because of their isolated location in relation to Essential Fish Habitat, high density waterbird and waterfowl habitat, and domestic water supplies.

State Lands

The 2 townships owned by the State of Alaska are bounded by the North Creek Unit of the Alaska Peninsula National Wildlife Refuge to the west, Izembek National Wildlife Refuge and the Pavlof Unit of the Alaska Peninsula National Wildlife Refuge to the south, and the Pavlof Unit of the Alaska Peninsula National Wildlife Refuge to the east.

The general vegetation and land cover types of these parcels include shrub tundra, low sedge-dwarf shrub meadows, lakes/ponds, streams/river, and alder/willow shrub thickets. Dominant plants consist of crowberry, lowbush cranberry, bluejoint grass, cotton grass, and dwarf willows.

Thickets of alder grow on the lower slopes of the mountains and along waterway margins, while sparse growths of willow shrubs are more widespread (Service n.d. a).

The northern township has considerable tundra system wetlands with at least 4 lakes, numerous ponds, and wet marshes. It also includes short segments of the Cathedral River and several small drainages. The transfer would exclude the largest lakes on the northern parcel and streams determined navigable through federal administrative or judicial proceedings. The southern block includes more upland habitat and slopes up to 2,000 feet in elevation on the north side of Aghileen Pinnacles. Mountain and valley system wetlands occur within this landscape. The parcel includes a segment of North Creek and several other small drainages (Service n.d. a). The value of the wetlands on this parcel would be considered high because of their relation to Essential Fish Habitat and other waterfowl habitats. However, this value is somewhat less than wetlands that are in closer proximity to Izembek and Kinzarof lagoons, which are used more extensively by migratory birds and designated as Internationally Important Wetlands.

Mortensens Lagoon

The parcel around Mortensens Lagoon contains numerous vegetation types with extensive areas of upland moist dwarf scrub. It includes large areas of wetland and several ponds and small lakes. Lacustrine margin meadows are likely along the edges of some of these lakes. Tundra system wetlands predominate throughout the lower elevations between Russell Creek and Mortensens Lagoon. Some mountain and valley system wetlands occur within the drainages to the southwest. The value of the wetlands on this parcel would be considered high because of their relation to Essential Fish Habitat and other waterfowl habitats. However, this value is somewhat less than wetlands that are in closer proximity to Izembek and Kinzarof lagoons, which are used more extensively by migratory birds and designated as Internationally Important Wetlands.

Kinzarof Lagoon

The parcels south of the Kinzarof Lagoon appear to be dominated by tundra system wetlands and moist dwarf shrub-dominated upland. The wet sedge meadow and lowland wet low sedge/scrub wetlands, along with a few ponds, provide typical tundra system wetland functions discussed in Section 3.2.2.4. These wetlands are considered to have very high value for their hydrologic, biogeochemical, and habitat functions due to their strategic location near Kinzarof Lagoon. Because of their proximity to both Izembek and Kinzarof lagoons, these wetlands likely support different, and more water dependent, wildlife from wetlands further removed the lagoons. Some waterfowl that use the lagoons also feed on land, and the proximity of these wetlands to the lagoons might make them more attractive to birds. The wetland vegetation provides some cover and contributes detritus and invertebrates to the streams identified as Essential Fish Habitat. The designation of this area as a Wetland of International Importance by the Ramsar Convention also supports recognition that this parcel contains high value wetlands.

King Cove Corporation Selected Lands

The King Cove Corporation selected lands contain predominantly moist dwarf shrub-dominated uplands with mountain and valley system wetlands throughout the southern portion with some significant amounts of tundra system wetlands consisting of lowland wet low sedge/scrub in the northern portion of the parcel along with several large lakes. The tundra system wetlands located on the northern portion of this parcel are considered to have very high value for their hydrologic, biogeochemical, and habitat functions due to their strategic location near Kinzarof Lagoon. Because of their proximity to both Izembek and Kinzarof lagoons, these wetlands likely support different, and more water dependent, wildlife from wetlands further removed from the lagoons. Similar to the Kinzarof parcel, some waterfowl that use Kinzarof Lagoon also feed on land, and the proximity of these wetlands to Kinzarof Lagoon might make them more attractive to birds. The wetland vegetation provides some cover and contributes detritus and invertebrates to the streams identified as Essential Fish Habitat. The mountain and valley system wetlands, although important for sediment retention and groundwater recharge, are considered to have lesser value because of their isolated location. The designation of this area as a Wetland of International Importance by the Ramsar Convention also supports recognition that the northern portion of this parcel contains high value wetlands.

Northeast Terminal Site

This developed site lies adjacent to a large segment of tundra system wetland consisting of lowland wet sedge meadow and open water pond to the north. As the site itself consists of deposited fill material in what was previously lowland wet sedge meadow, it does not meet wetland criteria. Some beach system wetlands exist along the intertidal zone.

Lenard Harbor Ferry Terminal Site

This site was developed on what was previously tall shrub plant and moist meadow communities (upland). The 50-to 100-foot wide beach area was initially mapped as coastal moist beach (wetland). Some beach system wetlands remain adjacent to the site.

Cold Bay Dock Site

Although wetland mapping was not completed in this area, the site likely contains marine intertidal wetlands along the shoreline.

Cross Wind Cove Site

This site was developed on what was previously primarily upland with a narrow band of seagrass habitat about +1 mean lower low water tide level. The site does not meet wetland criteria.

3.2.3 Fish, Aquatic Invertebrates and Essential Fish Habitat

A number of different habitat types support a variety of fish and aquatic invertebrate species within the project area, including marine, freshwater, and anadromous species. Marine habitats connect with both the Gulf of Alaska and in the Bering Sea. Cold Bay, Kinzarof Lagoon, and Sitkinak Lagoon near Sitkinak Island are Gulf of Alaska systems, while Izembek Lagoon is associated with the Bering Sea. Freshwater is found throughout the Alaska Peninsula and on Sitkinak Island. Anadromous fish use waters throughout the areas. Essential Fish Habitats recognized under the *Sustainable Fisheries Act* are described and identified in this section to assist in minimizing adverse impacts to species and aid in the identification of actions to conserve and enhance Essential Fish Habitat.

The 2003 EIS provides a comprehensive description of the distribution of marine fish and invertebrates, freshwater species, and anadromous habitats throughout the Cold Bay area, which is incorporated by reference and summarized below. For a more detailed description, the reader is encouraged to refer to that document. The discussion below also includes the species and habitats of Izembek Lagoon (Bering Sea) and the Sitkinak Island area.

Table 3.2-8 provides a list of marine fish and aquatic invertebrate species of the Cold Bay area, and Table 3.2-9 identifies the project area's freshwater species. Nomenclature is according to Nelson (1994).

3.2.3.1 Marine Fish and Invertebrates

<u>Habitat and Distribution</u>

Cold Bay/Kinzarof Lagoon/Izembek Lagoon Area

Demersal fish (bottom dwelling) and pelagic (water column) assemblages typical of Gulf of Alaska embayments occur in the Cold Bay area. Demersal species inhabiting the area include flathead sole, yellowfin sole, Alaska plaice, wry mouths, and eelpouts. Cold Bay also supports halibut, although they likely do not use the area for spawning, instead preferring deeper offshore waters. The National Marine Fisheries Service has identified the deep basin near Lenard Harbor as important halibut habitat (USACE 2003).

Pelagic fish species that are most abundant in Cold Bay include walleye pollock, Pacific cod, Pacific salmon, and herring. A herring spawning area was identified in southern Lenard Harbor in a rocky area dominated by brown algae, *Fucus* sp., intertidally and canopy kelps subtidally. It is considered the most consistently used herring spawning area in all of Cold Bay (ADF&G 2001). Skates and sharks inhabit the deeper reaches of the bay, but have not been formally surveyed or identified.

Cold Bay supports 8 species of crab, including 2 hermit crab species, lyre crab, decorator crab, North Pacific toad crab, Tanner crab, Dungeness crab, and red king crab. Red king crab and Tanner crab are concentrated in the eastern portion of Cold Bay and in Lenard Harbor, while Dungeness crabs primarily inhabit the seagrass fringes at the head of Cold Bay and the vegetated waters at the head of Lenard Harbor.

Shrimp species in the area include the deep water crangon shrimps, argid shrimp, and the commercially valuable northern or pink shrimp. Trawl surveys indicate shrimp are concentrated in northeastern Cold Bay. Gastropods within the study area such as octopus, whelks, *Natica* snails, periwinkles, and many types of clams thrive in mud, sand, gravel, and cobble habitats from the intertidal zone to the deep basin in Cold Bay (USACE 2003). Shallow bivalve communities, including pink neck clams, butter clams, and razor clams are found on sand-mud-gravel beaches throughout Cold Bay, with high concentrations distributed in the shallower sections along the northern margin of Cold Bay, at the head of Lenard Harbor, and outside of Mortensens Lagoon.

Other invertebrates in Cold Bay such as tunicates, jellyfish, sea anemone, seastars, and sea urchins are distributed in various depths and habitats throughout the study area. Dense populations of polychaete and other worms occur in the mud substrata in the 120-foot to 300-foot depths in central Cold Bay, and in the deeper basin.

Eelgrass beds serve an important ecological function in the Cold Bay and Izembek Lagoon ecosystems and are susceptible to degradation through human activities. Commercial species such as Pacific cod, rockfish, Pacific salmon, other forage fishes, and juvenile king and Dungeness crab use seagrass beds for cover and reproductive associations such as mating and mass spawning. These beds, composed primarily of the marine seed plant *Zostera* sp. and some patches of *Phyllospadix* sp., are the most widespread vegetated marine habitat in the Cold Bay area. Sheltered, shallow areas with a mud, sand, or combination mud-sand substrate are where these beds are typically found, with most of the seagrass beds in the area located in Izembek Lagoon and in the northern portion of Cold Bay and Kinzarof Lagoon (USACE 2003).

Sitkinak Island

The waters off the Trinity Islands are popular commercial fishing grounds for the Kodiak groundfish fleet due to their rich marine resources. Fish and invertebrates found in the area are typical of the Central Gulf, and are similar to those found in Cold Bay and listed in Table 3.2-8.

The waters surrounding Sitkinak Island are not open to commercial harvest of king crab, but do support sport fishing and a commercial harvest of Dungeness crab. Herring use the area for rearing habitat. Sitkinak Lagoon is characterized by large estuarine wetland areas and low gradient sand and gravel intertidal areas, and is known to drain 3 anadromous streams with populations of chum and pink salmon (ADNR 2004a).

Species Composition

Over 100 species of marine fish and invertebrates have been identified in the Cold Bay area over the years, including Cold Bay to the south, off the Gulf of Alaska, and Izembek Lagoon to the north, in the eastern Bering Sea. The Izembek National Wildlife Refuge has documented 46 species of fish within its boundaries (Taylor and Sowl 2008), while the 2008 and 2009 Alaska Department of Fish and Game trawl surveys of Cold Bay identified more than 50 species of fish and invertebrates (Spalinger 2009, 2010a); they are shown in Table 3.2-8. Although the marine environments adjacent to Sitkinak Island will likely support many of these same species, a species list for Sitkinak Island is not available. The most abundant species caught in the trawl surveys were yellowfin sole, starry flounder, Tanner crab, rock sole, and flathead sole. Abundance was based on trawl effort, and no attempts were made to estimate population densities (Spalinger 2010b). A list of marine fish and invertebrates found in Izembek Lagoon by Peter McRoy and his graduate students can be found Appendix G in Sowl 2004.

Table 3.2-8 Cold Bay Area Marine Fish and Invertebrate Species List

Common Name	Scientific Name	Source (See Notes)
Arctic lamprey	*Lampetra japonica*	(1)
Pacific lamprey	*Lampetra tridentada*	(1)
Pacific herring	*Clupea harengus pallasi*	(1)
Pink salmon (humpback salmon)	*Oncorhynchus gorbuscha*	(1)
Chum salmon (dog salmon)	*Oncorhynchus keta*	(1)
Coho salmon (silver salmon)	*Oncorhynchus kisutch*	(1)
Sockeye salmon (red salmon)	*Oncorhynchus nerka*	(1)
Rainbow trout (steelhead)	*Oncorhynchus mykiss*	(1)
Chinook salmon (king salmon)	*Oncorhynchus tshawytscha*	(1)
Arctic char	*Salvelinus aplinus*	(1)
Dolly varden	*Salvelinus malma*	(1)
Eulachon	*Thaleichthys pacificus*	(1), (2)
Surf smelt	*Hypomesus pretiosus*	(1)
Capelin	*Mallotus villosus*	(1)
Arctic smelt	*Osmerus dentex*	(1)
Rainbow smelt	*Osmerus mordax*	(1)
Saffron cod	*Eleginus gracilus*	(1)
Pacific cod	*Gadus macrocephalus*	(1), (2)
Walleye Pollock	*Theragra chalcogramma*	(1), (2)
Masked greenling	*Hexagrammos octogrammus*	(1)
White-spotted greenling	*Hexagrammos stelleri*	(1)
Rock greenling	*Hexagrammos superciliosus*	(1)
Coast range sculpin	*Cottus aleuticus*	(1)
Slimy sculpin	*Cottus cognatus*	(1)
Sharpnose sculpin	*Clinocottus acuticeps*	(1)
Padded sculpin	*Artedius fenestralis*	(1)
Crested sculpin	*Blepsias cirrhosus*	(1)
Arctic staghorn sculpin	*Gymnocanthus tricuspis*	(1)
Red Irish lord	*Hemilepidotus hemilepidotus*	(1)
Yellow Irish lord	*Hemilepidotus jordani*	(1), (2)
Northern sculpin	*Icelinus borealis*	(1)
Pacific staghorn sculpin	*Leptocottus armatus*	(1)
Great sculpin	*Myoxocephalus polyacanthocephalus*	(1), (2)
Arctic sculpin	*Myoxocephalus scorpoides*	(1)
Warthead sculpin	*Myoxocephalus niger*	(1)
Brightbelly sculpin	*Microcottus stellaris*	(1)
Spinyhead sculpin	*Dasycottus setiger*	(2)
Plain sculpin	*Myoxocephalus jaok*	(2)
Threespine stickleback	*Gasterosteus aculeatus*	(1)

Common Name	Scientific Name	Source (See Notes)
Ninespine stickleback	*Pungitius pungitius*	(1)
Pacific sand lance	*Ammodytes hexapterus*	(1)
Sturgeon poacher	*Podothecus accipenserinus*	(1), (2)
Bering poacher	*Occella dodecaedron*	(1)
Tubenose poacher	*Pallasina barbota*	(1)
Ribbon snailfish	*Liparis cyclopus*	(1)
Crested gunnel	*Pholis laeta*	(1)
Prickleback	*Lumpenus mackeyi*	(1)
Slender eelblenny	*Lumpenus fabricii*	(2)
Snake prickleback	*Lumpenus sagitta*	(2)
Pacific halibut	*Hippoglossus stenolepis*	(1), (2)
Butter sole	*Isopsetta isolepis*	(1), (2)
Yellowfin sole	*Limanda aspersa*	(1), (2)
Longhead dab	*Limanda proboscidea*	(1)
Arctic flounder	*Liopsetta glacialis*	(1)
Starry flounder	*Platichthys stellatus*	(1), (2)
Flathead sole	*Hippoglossoides elassodon*	(2)
Rock sole unidentified.	*Lepidopsetta* sp.	(1), (2)
Northern rock sole	*Lepidopsetta polyxystra*	(2)
Alaska plaice	*Pleuronectes quadrituberculatus*	(2)
Arrowtooth flounder	*Atheresthes stomias*	(2)
Big skate	*Raja binoculata*	(2)
Spiny dogfish shark	*Squalus acanthius*	(2)
Dwarf wrymouth	*Lyconectes aleutensis*	(2)
Giant wrymouth	*Cryptacanthodes giganteus*	(2)
Pacific sandfish	*Trichodon trichodon*	(2)
Wattled eelpout	*Lycodes palearis*	(2)
Shortfin eelpout	*Lycodes brevipes*	(2)

Notes:
(1) Taylor and Sowl 2008
(2) Spalinger 2009, 2010a
Nomenclature according to Nelson 1994

Although only a limited amount of commercial fishing occurs in Cold Bay (Spalinger 2010b), many species of commercial value use the area for spawning and rearing. These include Pacific cod, Pacific herring, Pacific halibut, walleye pollock, yellowfin sole, arrowtooth flounder, flathead sole, northern rock sole, and rockfish. Commercially important invertebrates primarily consist of king crab and Tanner crab, and to a lesser degree weathervane scallops and northern shrimp. Important subsistence species include sockeye (red) and coho (silver) salmon.

Conservation Concerns

The conservation concerns of waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity are discussed under Essential Fish Habitat (Section 3.2.3.4).

Project Site Summaries

The following sites, associated with the proposed action and alternatives presented in Chapter 2, have the following marine fish and invertebrates that may be affected by project implementation.

Northeast Terminal Site

The site has a moderately sloping beach dominated by cobble mixed with round gravel and shell hash at the top of the intertidal zone. Windrows of kelp such as *Laminaria*, *Alaria* and *Desmarestia*, and other flotsam line the upper intertidal zone. Periwinkles, hermit crabs, and low density barnacles and mussels occur in the cobble gravel and mud (Ridgway, cited in USACE 2003).

Lenard Harbor Ferry Terminal Site

Within the rocky intertidal zone of the Lenard Harbor site is a very dense band of blue mussels, barnacles, and a band of *fucus* and *odonthalia* seaweed. Chitons, limpets, periwinkles, and several snail species and red and green algae are abundant in the intertidal zone. Sculpins, clams, and seastars have been observed in the shallow subtidal community. Herring spawning habitat lies on the south side of Lenard Harbor, across from the terminal site, about 1 mile to the southeast (USACE 2003).

Cold Bay Dock Site

Brown kelp, barnacles, anemones, and mussels are attached to the dock pilings and kelps are around the dock site. This habitat may provide some shelter for fish.

Cross Wind Cove

The sandy beach of Cross Wind Cove is inhabited by high density bivalves such as pinkneck clams, cockles, and steamer and razor clams. Sand dollars, amphipods, and polychaete worms are abundant in the granular sand environment. It is likely that the bivalve-polchaete worm-sand habitat at the site is foraging habitat for juvenile sole and other Essential Fish Habitat species, discussed below. The seagrass habitat at Cross Wind Cove likely serves as shelter for emergent salmon fry, crab, and marine fishes (USACE 2003).

3.2.3.2 Freshwater Fish

Cold Bay/Izembek Lagoon Area, (Road Corridor, Mortensens Lagoon, Kinzarof Lagoon and King Cove Corporation Selected Lands)

Habitat and Distribution

As discussed in Section 3.1.4, hundreds of freshwater ponds, lakes, small streams, and creeks throughout the area provide aquatic habitat for freshwater fish and invertebrates. The quality and quantity of habitat varies considerably among systems; some provide pools and high quality spawning gravels with rich vegetated riparian banks, while others are steep, narrow mountain streams providing little more than passage to higher elevation ponds and lakes. Open lakes, defined as having stream connections to salt water, exhibit greater species diversity than closed lakes, defined as being landlocked. Tundra streams exhibit greater species diversity than upland streams. Tundra streams are defined as originating from lakes or springs in low coastal wetlands.

These streams generally have a lower gradient, more stable banks, and exhibit less fluctuation in flows than the upland streams, which originate on the steep slopes of the Aleutian Range (Adams, Mahoney, and Lanigan 1993).

Construction Water Sources

Quantities of water would be needed for embankment compaction and dust control (Alternatives 2 and 3). The road material should remain moist due to typically wet weather in the project area; therefore, water requirements would be relatively low. Water sources include 3 lakes and 1 creek. The creek water source would be at stream system # 283-34-10700, located approximately 2 miles north of the Northeast Terminal. Intake would be limited to 600 gallons per minute. Source lakes include a 128-acre lake midway along the southern alternative that is connected to system stream #283-34-10500, a 33-acre lake on the western side of Alternatives 2 and 3 that is not connected to any anadromous streams, and Blinn Lake (150 acres, not connected to anadromous streams) at the western terminus of Alternatives 2 and 3. Locations and preliminary estimates of quantities are shown in Appendix E.

Species Composition

Sixteen fish species have been found to inhabit freshwater habitats during some portion of their life cycle in the Cold Bay area (Adams, Mahoney, and Lanigan 1993; USACE 2003; Dion 2005; Hildreth and Dion 2006). They are shown in Table 3.2-9. In general, data on freshwater fishes and their particular habitat requirements are not well described for the area and population sizes have not been estimated.

Table 3.2-9 Fish Species Documented in the Freshwater Habitats of Izembek National Wildlife Refuge and Alaska Peninsula National Wildlife Refuge, near Cold Bay, AK

Common Name	Scientific Name
Pink salmon (humpback salmon)	*Oncorhynchus gorbuscha*
Chum salmon (dog salmon)	*Oncorhynchus keta*
Coho salmon (silver salmon)	*Oncorhynchus kisutch*
Sockeye salmon (red salmon)	*Oncorhynchus nerka*
Rainbow trout (steelhead)	*Oncorhynchus mykiss*
Chinook salmon (king salmon)	*Oncorhynchus tshawytscha*
Arctic char	*Salvelinus aplinus*
Dolly Varden	*Salvelinus malma*
Coast range sculpin	*Cottus aleuticus*
Fourhorn sculpin	*Myoxocephalus quadricornis*
Threespine stickleback	*Gasterosteus aculeatus*
Ninespine stickleback	*Pungitius pungitius*
Bering cisco	*Coregonus laurettae*
Whitefish	*Coregonus spp.*
Starry flounder	*Platichthys stellatus*
Arctic lamprey	*Lampetra japonica*

Sources: Adams, Mahoney, and Lanigan 1993; USACE 2003; Dion 2005; Hildreth and Dion 2006
Nomenclature according to Nelson 1994.

Species occurrence through sampling generally reflects the geographic range reported in the literature; however, the fourhorn sculpin and ninespine stickleback (Adams, Mahoney, and Lanigan 1993) were sighted in the Alaska Peninsula, and were reported as range extensions for those species. Lake trout, rainbow trout (steelhead), fourhorn sculpin, and ninespine stickleback are all at the western limits of their known ranges in Alaska. Similarly, whitefish (unidentified sp.) and Bering cisco have been reported in Mortensens Creek (Dion 2005; Hildreth and Dion 2006). Both are range extensions that suggest these species could be present in other water bodies to the east, making them potentially present within the proposed project areas.

Freshwater invertebrates in the study area, such as crustaceans and gastropods, are typical of those found in similar habitats along the Alaska Peninsula (Spalinger 2009, 2010a).

Conservation Concerns

The conservation concerns of waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity are discussed under Essential Fish Habitat (Section 3.2.3.4).

Sitkinak Island

Habitat and Distribution

Limited information exists regarding the specific freshwater fish resources existing on Sitkinak Island. The island is characterized predominately by mountainous terrain vegetated with tall grasses, while the southwest part of the island is flat with wet tundra type vegetation such as sedges and grasses. The proposed exchange parcel includes a long spit and adjacent flatlands bordering Sitkinak Lagoon, much of which is likely not ideal fish habitat.

Species Composition

Apart from salmon, discussed in the next section (3.2.3.3), freshwater species are unknown on the Sitkinak parcel (ADNR 2004a).

State Lands

Habitat and Distribution

Limited data exists for North Creek and the Cathedral River, the 2 systems draining the State parcel. The parcel is immediately adjacent to Izembek Lagoon, and both streams offer very similar habitat to streams in the Cold Bay/Izembek Lagoon area. Therefore, the freshwater species to be found in the area are likely similar to those found in the Cold Bay/ Izembek Lagoon area.

Species Composition

Freshwater invertebrates in the study area, such as crustaceans and gastropods, are presumed to be typical of those found in similar habitats along the Alaska Peninsula.

3.2.3.3 Anadromous Fish

Cold Bay/Izembek Lagoon

All 5 species of Pacific salmon are found throughout the project area: sockeye, coho, chum (dog), pink (humpy) and Chinook (king) (Cornum, Whitton, and Plumb 2004; Service 2010d; Whitton, Davis, and Kohn 1998; Johnson and Blanche 2010). Sockeye, chum, and coho are the most abundant, while Chinook are found only in a few specific locations; however, species abundance varies considerably both spatially and geographically. Streams in close proximity often display dramatically different run compositions by species in the same years, and the same stream often displays a great deal of variation in run composition from year to year.

For example, Mortensens Creek, which drains into Mortensens Lagoon south of Cold Bay, had tremendous variation in the number of sockeye escapement between 2001 and 2005, with only 4,268 fish passing in 2001 and a high of 21,783 fish passing through in 2005. Coho runs in the same creek remained relatively steady during that period, varying between escapements of 4,162 fish in 2001 and 6,406 fish in 2005. The escapement of pink and chum salmon were extremely small in comparison (less than 100) (Whitton 2002, 2003; Cornum, Whitton, and Auth 2004; Dion 2005; Hildreth and Dion 2006). In contrast, Frosty Creek, less than 9 miles (15 kilometers) west of Mortensens Creek, displayed large returns of chum salmon during the same years (30,000 to 40,000 fish), with small returns of sockeye, pink, and Chinook (Cornum, Whitton, and Plumb 2004).

In general, salmon returns begin sometime in June and finish well into October or later, although the vast majority of fish return between late July and mid-September (Morsell 1999; Cornum, Whitton, and Plumb 2004; Dion 2005, 2006). While species tend to follow temporal trends and return in clusters, the distribution varies, with early and late returns for each species, in each system, each year. Typically, Chinook are the first to arrive, appearing in small numbers sometime in June. Sockeye and chum arrive next, peaking in large numbers in late July/early August, while pink salmon appear in late August, also in abundance. Coho are last to arrive, with moderate returns peaking in mid-September.

Spawning and rearing habitat varies by species, generally requiring gravel substrates where females dig nests, or redds. Eggs are released into the redds and then fertilized by males. The females then cover the fertilized eggs, and the adults die after spawning. The fry hatch during mid- to late winter, and emerge from the gravel in spring. Juveniles live in freshwater throughout the summer, with some releasing to the ocean during their first year and others spending up to 4 years in freshwater before going to sea. Typically, Chinook, coho, and sockeye salmon overwinter in freshwater, while chum and pink salmon do not.

Chum and pink salmon prefer to spawn in small streams and intertidal zones. Sockeye show a preference for freshwater systems connected to lakes. Chinook spawn in deeper, fast-moving water, and coho usually spawn in small streams. The variety of stream systems in the area represent ample habitat for all stages of all species, although the scarcity of larger systems is a likely reason for the small number of Chinook salmon. For a detailed description of salmon habitat and distribution throughout the project area, refer to Essential Fish Habitat (Section 3.2.3.4) below.

In addition to salmon, other salmonid species found throughout the project area are Dolly Varden, Arctic char, and steelhead trout (Service 1985a; Adams, Mahoney, and Lanigan 1993;

Service 2010f). A study by Adams, Mahoney, and Lanigan (1993) found Dolly Varden in more than 75 percent of the sampled streams and lakes within the Izembek National Wildlife Refuge, with other stream systems throughout the area demonstrating consistent returns, usually peaking in August (Cornum, Whitton, and Plumb 2004). The 1993 study found Arctic char strictly in closed lakes, suggesting resident populations. Anadromous populations of Arctic char are known to occur in Alaska, but it is unclear if any exist in the region (Morrow 1980). Dolly Varden and Arctic char exhibit very similar morphological characteristics and appear in similar habitats over similar ranges causing some disagreement over the taxonomic differences between the 2 species. In the Cold Bay area, they have been identified separately (Adams, Mahoney, and Lanigan 1993) and together (Service 2010f). They have been addressed together in this section, following the Service convention. Small populations of steelhead trout have been documented in tributaries of Moffet Bay and Cold Bay (Service 1985a), although no recent studies within the vicinity of the project area have recorded their presence.

Both subsistence and sport fishing occur throughout the area, mainly focusing on sockeye and coho salmon in road-accessible streams near the City of Cold Bay (Harthill and Keyse 2010).

Construction Water Sources

Water sources include stream system # 283-34-10700, located approximately 2 miles north of the Northeast Terminal. Intake would be limited to 600 gallons per minute. Source lakes include a 128-acre lake midway along the southern alternative that is connected to system stream #283-34-10500. Locations and preliminary estimates of quantities are shown in Appendix E.

Conservation Concerns

The conservation concerns of waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity are discussed under Essential Fish Habitat (Section 3.2.3.4).

Sitkinak Island

The project area on Sitkinak Island is on the Sitkinak Lagoon, a large tidal area cleaving the island into east and west portions. Both pink and chum salmon spawn in streams draining into the lagoon, including a single anadromous stream passing through the project area (ADF&G 2010c).

State Lands

Limited data exists for North Creek and the Cathedral River, the 2 systems draining the area. The parcel is northeast of Moffet and Izembek lagoons, and both streams offer very similar habitat to streams in the Cold Bay/Izembek Lagoon area. Both are known to be anadromous (Johnson and Blanche 2010), with all 5 Pacific salmon using the watercourses for spawning (ADF&G 2010c).

3.2.3.4 Essential Fish Habitat

Marine Waters

In 1996, the *Sustainable Fisheries Act* amended the *Magnuson-Stevens Fishery Conservation and Management Act* to require the description and identification of Essential Fish Habitat in fishery management plans; minimization of adverse impacts on Essential Fish Habitat; and identification of actions to conserve and enhance Essential Fish Habitat.

"Essential fish habitat" means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of Essential Fish Habitat, "waters" includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10).

The *Final EIS for Essential Fish Habitat Identification and Conservation in Alaska* (NMFS 2005) states that "National Marine Fisheries Service describes Essential Fish Habitat for almost all species primarily using broad geographic distributions based on specific samples from surveys and fisheries, which have not been linked with habitat characteristics. Furthermore, the National Marine Fisheries Service' ability to precisely define the habitat (and its location) of each life stage of each managed species in terms of its oceanographic (temperature, salinity, nutrient, current), trophic (presence of food, absence of predators), and physical (depth, substrate, latitude, and longitude) characteristics is very limited. Consequently, the information included in the habitat descriptions for each species and life stage is restricted primarily to their position in the water column (e.g., demersal, pelagic), broad biogeographic and bathymetric areas (e.g., 100 to 200 meter zone, south of the Pribilof Islands and throughout the Aleutian Islands) and occasional references to known bottom type associations."

Therefore, a general approach is taken due to the logistical difficulty and amount of uncertainty involved in identifying Essential Fish Habitat throughout all coastal waters. Despite those difficulties, the National Marine Fisheries Service has identified Cold Bay and Izembek Lagoon as Essential Fish Habitat for 9 marine taxa and 5 Pacific salmon, based on general distribution information provided in the fishery management plans (NPFMC 1990, 2006, 2009) and the *Final EIS for Essential Fish Habitat Identification and Conservation in Alaska* (NMFS 2005, 2010). These species are listed in Table 3.2-10.

Table 3.2-10 Fisheries Management Plan-Managed Species with Designated Essential Fish Habitat in Cold Bay, Izembek Lagoon, and Adjacent Tributary Waters

Scientific Name	Common Name	Life History Stage
Marine Species		
Gadus macrocephalus	Pacific cod	Not specified
Theragra chalcogramma	walleye pollock	Eggs, juvenile, adult
Limanda aspera	yellowfin sole	Not specified
Lepidopsetta bilineatus	rock sole	Not specified
Hippoglossoides elassodon	flathead sole	Not specified
Atheresthes stomias	arrowtooth flounder	Not specified
Pleurogrammus monopterygius	Atka mackerel	Not specified
Hemilepidotus jordani	yellow Irish lord	Not specified
Hemilepidotus hemilepidotus	red Irish lord	Not specified
Hemilepidotus papilio	butterfly sculpin	Not specified
Hemitripterus bolini	bigmouth sculpin	Not specified
Myoxocephalus polyacanthocephalus	great sculpin	Not specified
Myoxocephalus jaok	plain sculpin	Not specified
Anadromous Species		
Onchorynchus gorbuscha	pink salmon	Eggs, juvenile, adult
Onchorynchus keta	chum salmon	Eggs, juvenile, adult
Onchorynchus nerka	sockeye salmon	Eggs, juvenile, adult
Onchorynchus tsawytcha	Chinook salmon	Eggs, juvenile, adult
Onchorynchus kisutch	coho salmon	Eggs, juvenile, adult

Source: USACE 2003

Alaska Department of Fish and Game trawl survey data confirm that species for which Essential Fish Habitat has been identified are found within Cold Bay (Spalinger 2009, 2010a). In general, most adults of these species are in the basin or slope area, in substrata identified as mud, sand, and gravel, whereas juveniles likely rear in complex protective shallow water habitats such as rock piles, kelp, and seagrass beds (USACE 2003).

According to the *Gulf of Alaska Scallop Fishery Management Plan* (NPFMC 2006), the Cold Bay area is considered to be weathervane scallop habitat, which is supported by recent Alaska Department of Fish and Game trawl survey data (Spalinger 2009, 2010a). However, scallop Essential Fish Habitat has not been identified in the Cold Bay area, although a recent review of Essential Fish Habitat by the North Pacific Fisheries Management Council has determined that bays south of the Alaska Peninsula between Chignik and Unimak Pass should now be included in Essential Fish Habitat maps, and Essential Fish Habitat text should be modified to include inner shelf waters (less than 164 feet). These changes have not yet been implemented, but will incorporate the Cold Bay marine region upon adoption by the North Pacific Fisheries Management Council (NPFMC 2010).

In addition to the fishery management plan-managed species already discussed, both Tanner crab and king crab are known to inhabit Cold Bay and Izembek Lagoon, but have not yet had Essential Fish Habitat identified in those areas.

Comprehensive Essential Fish Habitat descriptions and habitat associations for each fishery management plan-managed species can be found in the appropriate fishery management plan:

- *Fishery Management Plan for Groundfish of the Gulf of Alaska* (NPFMC 2009)
- *Salmon Fisheries in the Exclusive Economic Zone off the Coast of Alaska* (NPFMC 1990);
- *Fishery Management Plan for the Scallop Fishery off Alaska* (NPFMC 2006)

Anadromous Waters

Anadromous streams and hydrologically connected wetlands are considered to be Essential Fish Habitat as they are part of "all waters necessary for fish spawning, rearing, breeding, feeding, and growth to maturity" (50 CFR 600.10). In addition, the Alaska Anadromous Fish Act requires that activities involving the construction of hydraulic projects that divert, obstruct, pollute, or change the natural flow or bed of a specified anadromous waterbody, obtain approval from the Alaska Department of Fish and Game, Division of Habitat. This includes all activities within or across a specified anadromous waterbody and all instream activities affecting a specified anadromous waterbody. Stream crossings must be done so as to have no negative impact on the fluvial morphology or fish abundance.

Using the Alaska Department of Fish and Game *Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes* (ADF&G 2010c), 12 anadromous fish streams were identified that are contained within or have a portion of their drainage area within 1 or more of the proposed land exchange parcels. These streams vary considerably hydrologically, and also vary in terms of the quality and quantity of anadromous fish habitat they provide. Most streams in the immediate project area are short and small lowland systems, draining mostly wetland areas. Some streams are steep gradient, high energy systems on mountain slopes, becoming braided, complex systems lower down.

Anadromous streams within the parcels proposed for exchange are shown on Figure 3.2-9. Anadromous streams and the salmon species associated with each stream system within the project area are shown in Table 3.2-11. Several other anadromous streams that are not associated with the proposed exchange parcels also exist within the Izembek National Wildlife Refuge and adjacent private lands. Those streams are not displayed on Table 3.2-11 or Figure 3.2-9.

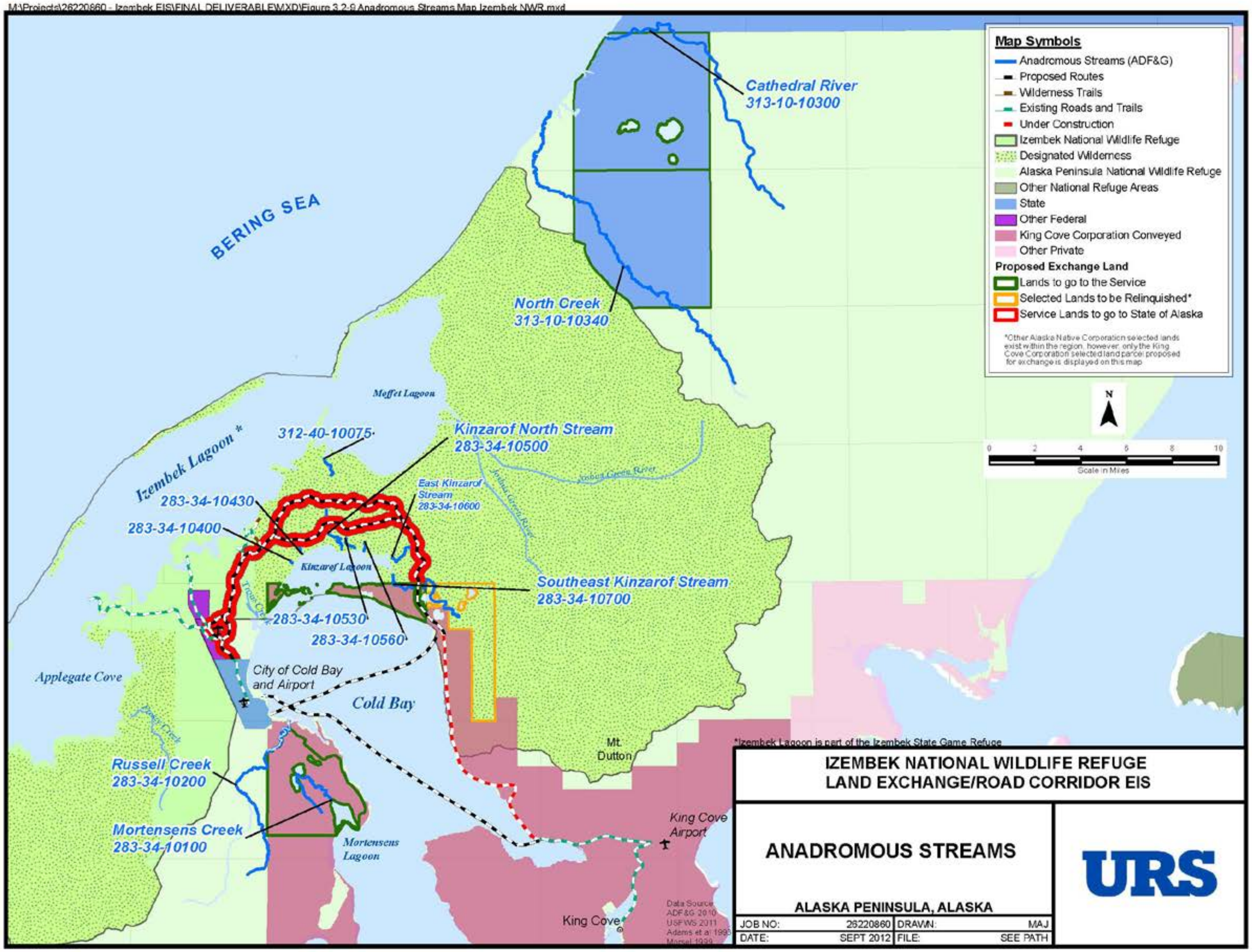
Table 3.2-11 Anadromous Streams and Associated Salmonid Species in the Cold Bay and Izembek Lagoon Area and State Lands

Stream Name	Anadromous Waters Catalog Number	Salmonid Species Present	Land Exchange Parcel
Unnamed Stream	283-34-10400	sockeye	Road Corridor
Unnamed Stream	283-34-10430	coho, sockeye	Road Corridor
Kinzarof North Stream	283-34-10500	chum, sockeye	Road Corridor
Unnamed Stream	283-34-10530	coho, sockeye	Road Corridor
Unnamed Stream	283-34-10560	coho, sockeye	Road Corridor
East Kinzarof Stream	283-34-10600	coho, sockeye	Road Corridor
Southeast Kinzarof Stream	283-34-10700	chum, coho, sockeye,	Kinzarof Lagoon
Unnamed Stream (Izembek Lagoon watershed)	312-40-10075	chum	Road Corridor
Mortensens Creek	283-34-10100	chum, coho, pink, sockeye	Mortensens Lagoon
Russell Creek	283-34-10200	chum, coho, sockeye, pink	Mortensens Lagoon
North Creek	313-10-10340	Chinook, chum, coho, pink, sockeye	State
Cathedral River	313-10-10300	Chinook, chum, coho, sockeye	State

Source: ADF&G 2010c; Adams, Mahoney, and Lanigan 1993; Morsell 1999; USACE 2003

Information about streams in the project area was gathered from the following primary sources: the 2003 EIS, Alaska Department of Fish and Game survey data, and the Alaska Department of Fish and Game *Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes – Southwestern Region* (Anadromous Waters Catalog) (ADF&G 2010c). Most anadromous streams flowing into Cold Bay, Lenard Harbor, and Kinzarof Lagoon were examined in 2 independent field surveys for the 2003 EIS, and the Alaska Department of Fish and Game surveys many streams in the project area annually for escapement estimates. Adams, Mahoney, and Lanigan (1993) surveyed stream systems along the west shore of Cold Bay, Whitton and Eaton (2001) surveyed the Joshua Green River, and Dion (2006) surveyed Red Salmon Creek. Their results and observations are incorporated in the stream and fish population descriptions. Finally, the Anadromous Waters Catalog (ADF&G 2010c) provided stream names, system numbers (indicated as AWC#), and information on salmon species present in each stream.

Figure 3.2-9 Anadromous Streams



The following twelve summaries describe stream system locations and salmon species inhabiting each system (see Figure 3.2-9). Nine systems that could be affected by the project drain into Cold Bay. One small stream that drains to the north into Izembek Lagoon was also placed on the list because a portion of its drainage area may intersect a road alternative, and 2 systems (North Creek and Cathedral River) drain into the Bering Sea from the State parcel).

- **Unnamed Stream (AWC# 283-34-10400):** A very short stream (less than 0.3 miles) draining a small lake, flowing southeast into northwestern Kinzarof Lagoon. The catalog indicates sockeye salmon are present in this creek.
- **Unnamed Stream (AWC# 283-34-10430):** A short stream flowing west, then south, with an outlet into northwestern Kinzarof Lagoon. The catalog indicates coho and sockeye salmon are present in this creek.
- **Kinzarof North Stream (AWC# 283-34-10500):** An average escapement of 300 sockeye and uncounted numbers of chum based on studies performed since 1993. Chums were observed spawning.
- **Unnamed Stream (AWC# 283-34-10530):** A short stream on the north shore of Kinzarof Lagoon, this system branches almost immediately upstream from the lagoon, with the longer branch flowing southeast and the shorter branch flowing southwest. The catalog indicates it is habitat for coho and sockeye salmon.
- **Unnamed Stream (AWC# 283-34-10560):** A short, unbranched stream on the north shore of Kinzarof Lagoon flowing south. The catalog indicates it is habitat for coho and sockeye salmon.
- **East Kinzarof Stream (AWC# 283-34-10600):** A small system flowing into northeastern Kinzarof Lagoon, an average of 50 sockeye has been observed in studies since 1993. The catalog indicates it is rearing habitat for coho and sockeye salmon.
- **Southeast Kinzarof Stream (AWC# 283-34-10700):** This is the major salmon producing system flowing into Kinzarof Lagoon. Average salmon escapement since 1993 has been 1,075 sockeye, 284 chum, and 800 coho. Sockeye and chum salmon were observed spawning in this system.
- **Unnamed Stream (AWC# 312-40-10075):** This stream runs approximately 1 mile north into western Moffett Lagoon. The catalog indicates it is rearing habitat for chum salmon.
- **Russell Creek (AWC# 283-34-10200):** Russell Creek is a large system draining the western portion of the Mortensens Lagoon parcel and emptying into Cold Bay south of the Cold Bay airport. The catalog indicates that spawning habitat exists for pinks, with chum, coho, sockeye present.
- **Mortensens Creek (AWC# 283-34-10100):** Mortensens Creek drains much of the southeast portion of the Mortensens Lagoon parcel. The system passes through 2 large lakes and empties into Mortensens Lagoon. The catalog identifies spawning habitat for coho, with chum, pinks and sockeye present. A high of 21,783 sockeye were documented passing through this stream in 2005. Coho runs in this stream remained relatively steady, varying between escapements of 4,162 fish in 2001 and 6,406 fish in 2005.

- **North Creek (AWC# 313-10-10340):** North Creek is a sprawling system draining a large portion of the State parcel through 4 main branches, draining into the Bering Sea. The southern fork flows northwest through a deep valley from the very base of the Aghileen Pinnacles, while the other forks drain the northern flanks of the Pinnacles massif. Very little escapement data is available, although the catalog indicates all branches contain Chinook, pink, chum, coho, and sockeye salmon.
- **Cathedral River (AWC# 313-10-10300):** The Cathedral River is a major river running along the northeast boundary of the State parcel. Very little escapement data is available, although the catalog indicates it contains Chinook, chum, coho, and sockeye salmon.

3.2.4 Birds

The Izembek National Wildlife Refuge and the Izembek State Game Refuge were created to conserve areas with outstanding wildlife habitat, especially those with value for migratory birds. One hundred eighty species (including recognized subspecies) of birds have been recorded on or adjacent to the 4 refuge units administered by Izembek National Wildlife Refuge (Table 3.2-12), including lands from Alaska Peninsula National Wildlife Refuge. These lands and waters are in a strategic location for waterfowl and shorebird migration routes, including birds migrating from the North American Pacific, East Asian-Australasian, and West Pacific Flyways (Service 1985b).

The close proximity of Izembek Lagoon and Cold Bay coastal wetlands, including Kinzarof Lagoon, plays an important role in why this area is so important; the tides and ice/sea conditions on the north and south sides of the Izembek isthmus are not synchronous, thereby allowing birds the opportunity to select the most beneficial habitat available as conditions deteriorate or improve on one side or the other. Although vegetative and habitat conditions are not the same on the Izembek Lagoon and Cold Bay sides of the isthmus, the availability of alternative foraging and resting areas adds great value for many species of waterfowl and shorebirds. The importance of the area to several particular species was recognized by the designation of the Izembek National Wildlife Refuge and the Izembek State Game Refuge as the one of the first Wetland of International Importance in the U.S. under the Ramsar Convention in 1986 and a globally Important Bird Area by the American Bird Conservancy in 2001.

The Izembek National Wildlife Refuge conducted a Biological Program Review in 2004 (Sowl 2004) which described the status of birds and their habitats on the 4 units of the Izembek National Wildlife Refuge and identified species of conservation concern. Sitkinak Island, within the Alaska Maritime National Wildlife Refuge, also contains intact habitat for numerous bird species, several of which are discussed in this section. However, inventories and studies of Sitkinak Island bird populations are very limited.

Table 3.2-12 Bird List for Izembek National Wildlife Refuge

Common Name	Scientific Name	Breeds	Spring	Summer	Fall	Winter
Greater White-fronted Goose	*Anser albifrons*		-	-	R	-
Emperor Goose	*Chen canagica*		C	-	C	C
Snow Goose (Lesser)	*Chen caerulescens*		-	-	R	-
Brant (Black)	*Branta bernicla nigricans*		C	R	C	U
Brant (Gray-bellied)	*Branta bernicla*		-	-	R	-
Cackling Goose	*Branta hutchinsii minima*		-	-	U	-
Cackling Goose (Taverner's)	*Branta hutchinsii taverneri*		-	-	C	-
Cackling Goose (Aleutian)	*Branta hutchinsii leucopareia*		R	-	-	-
Tundra Swan	*Cygnus columbianus*	B	C	C	C	U
Gadwall	*Anas strepera*	B	U	U	U	O
Eurasian Wigeon	*Anas penelope*		O	-	U	R
American Wigeon	*Anas americana*		U	R	U	O
Mallard	*Anas platyrhynchos*	B	C	C	C	U
Blue-winged Teal	*Anas discors*		-	-	O	-
Northern Shoveler	*Anas clypeata*		U	U	U	-
Northern Pintail	*Anas acuta*	B	C	U	C	U
Green-winged Teal (North American)	*Anas crecca carolinensis*	B	U	C	C	U
Green-winged Teal (Aleutian)	*Anas crecca nimia*	B	U	R	U	U
Canvasback	*Aythya valisineria*		-	-	O	-
Redhead	*Aythya americana*		O	-	O	-
Tufted Duck	*Aythya fuligula*		O	-	O	-
Greater Scaup	*Aythya marila*	B	C	C	C	U
Steller's Eider	*Polysticta stelleri*		C	O	C	C
King Eider	*Somateria spectabilis*		-	-	-	O
Common Eider	*Somateria mollissima*	B	U	O	C	C
Harlequin Duck	*Histrionicus histrionicus*	B	C	U	C	C
Surf Scoter	*Melanitta perspicillata*		O	O	O	O
White-winged Scoter	*Melanitta fusca*		U	U	U	C
Black Scoter	*Melanitta americana*	B	C	C	C	C
Long-tailed Duck	*Clangula hyemalis*		U	R	U	C
Bufflehead	*Bucephala albeola*		U	-	U	U
Common Goldeneye	*Bucephala clangula*		U	U	C	U
Barrow's Goldeneye	*Bucephala islandica*		O	-	-	O
Common Merganser	*Mergus merganser*		U	U	U	U
Red-breasted Merganser	*Mergus serrator*	B	C	U	C	C
Willow Ptarmigan	*Lagopus lagopus*	B	C	C	C	C
Rock Ptarmigan	*Lagopus muta*	B	U	U	U	U
Red-throated Loon	*Gavia stellata*	B	U	U	U	U

Common Name	Scientific Name	Breeds	Spring	Summer	Fall	Winter
Pacific Loon	*Gavia pacifica*		U	R	U	R
Common Loon	*Gavia immer*	B	U	U	U	U
Yellow-billed Loon	*Gavia adamsii*		R	-	R	R
Horned Grebe	*Podiceps auritus*		-	-	C	U
Red-necked Grebe	*Podiceps grisegena*	B	U	U	U	U
Northern Fulmar	*Fulmarus glacialis*		-	-	R	O
Short-tailed Shearwater	*Puffinus tenuirostris*		-	-	R	R
Fork-tailed Storm-Petrel	*Oceanodroma furcata*		-	-	U	R
Leach's Storm-Petrel	*Oceanodroma leucorhoa*		-	R	R	R
Double-crested Cormorant	*Phalacrocorax auritus*		R	R	R	R
Red-faced Cormorant	*Phalacrocorax urile*		R	R	R	R
Pelagic Cormorant	*Phalacrocorax pelagicus*	B	U	U	U	U
Osprey	*Pandion haliaetus*		O	-	O	-
Bald Eagle	*Haliaeetus leucocephalus*	B	C	U	C	C
Steller's Sea-Eagle	*Haliaeetus pelagicus*		O	O	O	O
Northern Harrier	*Circus cyaneus*		R	R	R	-
Rough-legged Hawk	*Buteo lagopus*	B	R	R	U	-
Golden Eagle	*Aquila chrysaetos*	B	R	R	R	R
American Kestrel	*Falco sparverius*		-	-	O	-
Merlin	*Falco columbarius*		-	-	R	O
Gyrfalcon	*Falco rusticolus*	B	U	U	C	U
Peregrine Falcon	*Falco peregrinus*		U	U	U	R
American Coot	*Fulica Americana*		O	-	O	-
Sandhill Crane	*Grus canadensis*	B	U	U	U	-
Black-bellied Plover	*Pluvialis squatarola*		-	-	R	-
Pacific Golden-Plover	*Pluvialis fulva*		U	O	C	-
Semipalmated Plover	*Charadrius semipalmatus*	B	C	C	U	-
Black Oystercatcher	*Haematopus bachmani*	B	R	R	R	R
Gray-tailed Tattler	*Tringa brevipes*		-	-	O	-
Wandering Tattler	*Tringa incana*		R	R	R	-
Greater Yellowlegs	*Tringa melanoleuca*		U	U	U	-
Lesser Yellowlegs	*Tringa flavipes*		R	R	R	-
Whimbrel	*Numenius phaeopus*		U	O	U	-
Bristle-thighed Curlew	*Numerius tahitiensis*		O	-	O	-
Bar-tailed Godwit	*Limosa lapponica*		R	-	R	-
Marbled Godwit	*Limosa fedoa*		O	-	O	-
Ruddy Turnstone	*Arenaria interpres*		C	U	C	U
Black Turnstone	*Arenaria melanocephala*		O	-	R	-
Sanderling	*Calidris alba*		-	O	C	U

Common Name	Scientific Name	Breeds	Spring	Summer	Fall	Winter
Semipalmated Sandpiper	*Calidris pusilla*		-	-	R	-
Western Sandpiper	*Calidris mauri*		U	C	C	-
Least Sandpiper	*Calidris minutilla*	B	C	C	U	-
Baird's Sandpiper	*Calidris bairdii*		-	-	R	-
Pectoral Sandpiper	*Calidris melanotos*		-	-	R	-
Sharp-tailed Sandpiper	*Calidris acuminata*		-	-	U	-
Rock Sandpiper	*Calidris ptilocnemis*	B	C	C	C	C
Dunlin	*Calidris alpina*	B	U	U	C	R
Short-billed Dowitcher	*Limnodromus griseus*	B	U	U	U	-
Long-billed Dowitcher	*Limnodromus scolopaceus*		R	O	R	-
Wilson's Snipe	*Gallinago delicata*	B	C	C	U	-
Red-necked Phalarope	*Phalaropus lobatus*	B	C	U	C	-
Red Phalarope	*Phalaropus fulicarius*		C	-	C	-
Black-legged Kittiwake	*Rissa tridactyla*	B	U	U	C	-
Sabine's Gull	*Xema sabini*		-	O	O	-
Mew Gull	*Larus canus*	B	C	C	C	R
Slaty-backed Gull	*Larus schistisagus*		-	-	O	-
Glaucous-winged Gull	*Larus glaucescens*	B	C	C	C	C
Glaucous Gull	*Larus hyperboreus*		O	O	O	O
Aleutian Tern	*Onychoprion aleuticus*	B	U	U	U	-
Arctic Tern	*Sterna paradisaea*	B	U	C	U	-
Pomarine Jaeger	*Stercorarius pomarinus*		-	O	O	-
Parasitic Jaeger	*Stercorarius parasiticus*	B	R	R	R	-
Long-tailed Jaeger	*Stercorarius longicaudus*		R	-	R	-
Common Murre	*Uria aalge*	B	U	U	U	U
Pigeon Guillemot	*Cepphus columba*	B	U	U	U	U
Marbled Murrelet	*Brachyramphus marmoratus*		-	-	R	R
Kittlitz's Murrelet	*Brachyramphus brevirostris*	B	O	O	O	-
Ancient Murrelet	*Synthliboramphus antiquus*		O	-	O	O
Cassin's Auklet	*Ptychoramphus aleuticus*		-	O	-	-
Parakeet Auklet	*Aethia psittacula*		O	-	O	-
Least Auklet	*Aethia pusilla*		-	-	-	O
Crested Auklet	*Aethia cristatella*		-	-	O	U
Horned Puffin	*Fratercula corniculata*	B	U	R	U	U
Tufted Puffin	*Fratercula cirrhata*		R	R	R	R
Snowy Owl	*Bubo scandiacus*		-	-	-	R
Short-eared Owl	*Asio flammeus*	B	R	R	R	R
Belted Kingfisher	*Megaceryle alcyon*		O	O	O	O
Northern Shrike	*Lanius excubitor*	B	U	U	U	U

Common Name	Scientific Name	Breeds	Spring	Summer	Fall	Winter
Black-billed Magpie	*Pica hudsonia*	B	C	C	C	C
Common Raven	*Corvus corax*	B	C	C	C	C
Tree Swallow	*Tachycineta bicolor*	B	U	U	U	-
Bank Swallow	*Riparia riparia*	B	-	C	U	-
Black-capped Chickadee	*Poecile atricapillus*		R	R	R	R
Winter Wren	*Troglodytes hiemalis*		R	R	R	R
American Dipper	*Cinclus mexicanus*	B	U	U	U	U
Gray-cheeked Thrush	*Catharus minimus*		-	O	O	-
Hermit Thrush	*Catharus guttatus*	B	-	U	R	-
American Robin	*Turdus migratorius*		O	-	O	-
American Pipit	*Anthus rubescens*	B	C	C	C	-
Lapland Longspur	*Calcarius lapponicus*	B	C	C	C	-
Snow Bunting	*Plectrophenax nivalis*	B	C	U	C	C
McKay's Bunting	*Plectrophenax hyperboreus*		-	-	-	R
Orange-crowned Warbler	*Oreothlypis celata*	B	-	B	R	-
Yellow Warbler	*Dendroica petechia*	B	-	C	U	-
Northern Waterthrush	*Parkesia noveboracensis*		-	-	O	-
Wilson's Warbler	*Wilsonia pusilla*	B	U	U	U	-
American Tree Sparrow	*Spizella arborea*		-	-	R	-
Savannah Sparrow	*Passerculus sandwichensis*	B	C	C	C	-
Fox Sparrow	*Passerella iliaca*	B	U	U	R	-
Song Sparrow	*Melospiza melodia*		R	R	R	R
White-crowned Sparrow	*Zonotrichia leucophrys*	B	-	R	-	-
Golden-crowned Sparrow	*Zonotrichia atricapilla*	B	U	C	U	-
Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*	B	C	U	C	C
Pine Grosbeak	*Pinicola enucleator*	B	R	R	R	-
Common Redpoll	*Acanthis flammea*	B	U	U	U	R
Hoary Redpoll	*Acanthis hornemanni*		-	-	U	-

All nomenclature and taxonomic order has been taken from the *Checklist of North American Birds* (American Ornithologists' Union 2010). The breeding status and seasonal abundance data have been taken from the *Izembek National Wildlife Refuge Bird List (Sowl 2011g).*

Key to abbreviations used:

B - breeds on Izembek National Wildlife Refuge

C - common: Species occurs repeatedly and is readily seen. Area hosts relatively large numbers.
U - uncommon: Species occurs regularly, but not readily seen or in relatively small numbers.
R - rare: Species occurs, or probably occurs, regularly, but in very small numbers and not often seen.
O - occasional: Species has been recorded only a few times, but irregular observations are likely to occur over time.

Table 3.2-13 Accidental Species: One-Time or Very Rare Appearances

Common Name	Scientific Name	Common Name	Scientific Name
Taiga Bean-Goose	*Anser fabalis*	Herring Gull	*Larus argentatus*
Barnacle Goose	*Branta leucopsis*	Common Cuckoo	*Cuculus canorus*
Spectacled Eider	*Somateria fischeri*	Alder Flycatcher	*Empidonax alnorum*
Smew	*Mergellus albellus*	Northwestern Crow	*Corvus caurinus*
Hooded Merganser	*Lophodytes cucullatus*	Horned Lark	*Eremophila alpestris*
Black-footed Albatross	*Phoebastria nigripes*	Violet-green Swallow	*Tachycineta thalassina*
Laysan Albatross	*Phoebastria immutabilis*	Barn Swallow	*Hirundo rustica*
Mottled Petrel	*Pterodroma inexpectata*	Red-breasted Nuthatch	*Sitta canadensis*
Sharp-shinned Hawk	*Accipiter striatus*	Golden-crowned Kinglet	*Regulus satrapa*
Northern Goshawk	*Accipiter gentilis*	Northern Wheatear	*Oenanthe oenanthe*
Lesser Sand-Plover	*Charadrius mongolus*	Swainson's Thrush	*Catharus ustulatus*
Red Knot	*Calidris canutus*	Varied Thrush	*Ixoreus naevius*
Spotted Redshank	*Tringa erythropus*	Eastern Yellow Wagtail	*Motacilla tschutschensis*
Common Greenshank	*Tringa nebularia*	Bohemian Waxwing	*Bombycilla garrulus*
Black-tailed Godwit	*Limosa limosa*	Yellow-rumped Warbler	*Dendroica coronata*
Hudsonian Godwit	*Limosa haemastica*	Dark-eyed Junco	*Junco hyemalis*
Red-legged Kittiwake	*Rissa brevirostris*	Rusty Blackbird	*Euphagus carolinus*
Ross' Gull	*Rhodostethia rosea*	Red Crossbill	*Loxia curvirostra*

The following sections identify the species that have been observed in the project area, their habitat preferences, seasonal distributions relative to the proposed land exchange parcels, and biological information pertinent to the analysis of potential environmental consequences in Chapter 4. Species of conservation concern will be treated separately in greater detail while other species will be treated as part of a species group with similar concerns. Three species of birds, Steller’s Eider, Kittlitz’s Murrelet, and Yellow-billed Loon, are described in Section 3.2.7, Threatened and Endangered Species.

3.2.4.1 Emperor Goose

Habitat Use and Distribution

Emperor Geese nest primarily in the Yukon-Kuskokwim Delta, but also have small nesting populations in other coastal areas of northwest Alaska and northeast Russia (Petersen, Schmutz, and Rockwell 1994). Most winter along the coast from Kodiak Island and the Alaska Peninsula to the eastern Aleutian Islands and concentrate in estuarine staging areas along the northwest side of the Alaska Peninsula during spring and fall migration (Petersen and Gill 1982; Hupp, Schmutz, and Ely 2008a). Izembek National Wildlife Refuge is an important staging area (Dau and Mallek 2009, Mallek and Dau 2009). If northern estuaries are still frozen during spring migration, nearly all Emperors will stop at Izembek Lagoon (Sowl 2004). In addition, several thousand Emperor Geese spend the winter in the various coastal lagoons and bays of Izembek National Wildlife Refuge (Sowl 2004). As is the case with other waterfowl, the close proximity of suitable habitats on both sides of the Izembek isthmus allows Emperor Geese to select the best alternative habitat based on ice conditions, weather, and tidal stage.

The timing and movement patterns of Emperor Geese have been studied through the use of color-coded and radio transmitter collars (Taylor and Sowl 2008). The length of time radio collared birds spent in fall staging areas averaged from 60 to 87 days, depending on the year but also on where each bird spent the winter, with birds that have the furthest to go spending the least amount of time in the staging areas (Hupp, Schmutz, and Ely 2008a). Use of Alaska Peninsula staging areas peaked in mid-September, remained steady through mid-November, and declined until all radio collared birds had departed by early January (Hupp, Schmutz, and Ely 2008a). Alaska Peninsula staging sites were used by over 90 percent of Emperor Geese during spring migration, with migrants from the most distant wintering sites tending to arrive earlier than birds from closer wintering sites. The duration of stays at staging sites was much less during spring than during fall migration. Geese that wintered in the Aleutians stayed for an average of 34 to 36 days while birds from Alaska Peninsula wintering sites stayed only 23 days on average, although there was greater variation in the length of stay among the Alaska Peninsula birds (Hupp, Schmutz, and Ely 2008a).

Emperor Geese forage heavily on eelgrass in the lagoons. They also eat mussels and other invertebrates on the beaches and tidal flats, and crowberries on the tundra uplands (Petersen 1983; Petersen, Schmutz, and Rockwell 1994, Hupp and Safine 2002). Figure 3.2-10 shows the distribution of Emperor Geese on Izembek National Wildlife Refuge. The land parcels considered in the EIS vary in their value to migratory and resident Emperor Geese. High use areas consist of the waters and adjacent coasts of Izembek, Kinzarof, and Mortensens lagoons. The Kinzarof Lagoon parcel also includes high use areas. Low density use areas include the road corridors, which serve as a flight corridor between the lagoons and have some upland foraging habitat, the Mortensens Lagoon parcel, and King Cove Corporation selected lands to the east of the Northeast Terminal site. The parcel on Sitkinak also serves as wintering habitat for Emperor Geese (Larned and Zwiefelhofer 2001). The other parcels receive little or no use by Emperor Geese.

Abundance and Population Trend

The population of Emperor Geese was estimated to be 150,000 birds in the fall during the late 1960s, but declined to about 60,000 birds by 1979, leading to the initiation of annual aerial surveys in the spring and fall at Alaska Peninsula staging areas to track the population (Pacific Flyway Council 2006a). Spring survey data indicate that the population declined to almost 40,000 birds by 1986, but recovered to over 70,000 birds by 1992 (Dau and Mallek 2009). The overall trend in spring surveys from 1981 to 2009 was an annual population decline of 0.12 percent (Dau and Mallek 2009, Figure 3.2-11); however, the population has been recovering in recent years. The overall trend over the past 10 years (2000 to 2009) has been for an annual population increase of 2.14 percent (Dau and Mallek 2009, Figure 3.2-11). The 2009 spring population estimate was 91,948 birds, which is the highest count since 1982 and is over 40 percent higher than the 2008 estimate. The current 3-year average population index is 78,144 (2007-2009), which is also the highest 3-year average since the early 1980s (Dau and Mallek 2009). The Pacific Flyway Management Plan for Emperor Geese established a population goal of 150,000 birds based on spring surveys (Pacific Flyway Council 2006a).

Figure 3.2-10 Distribution of Emperor Goose

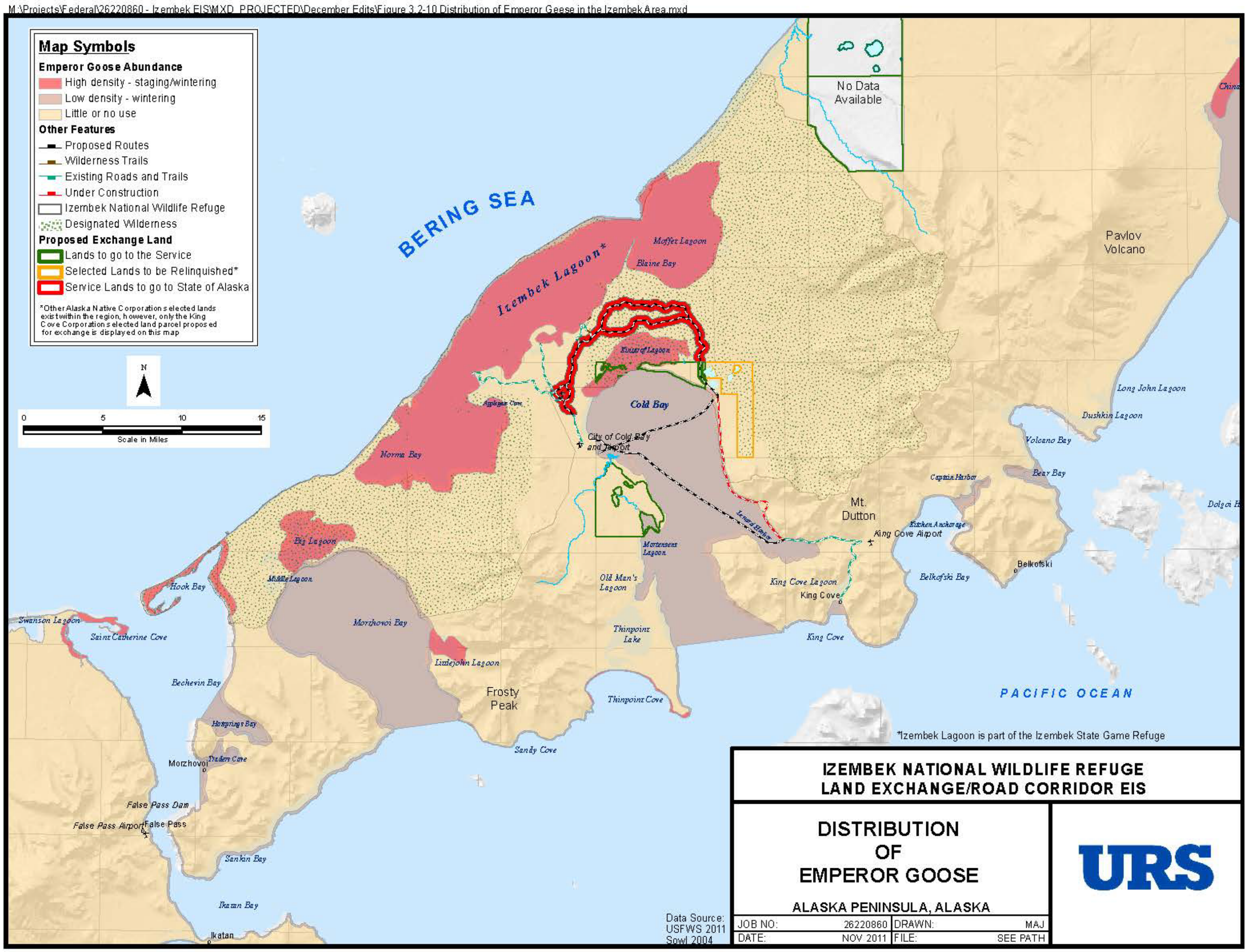


Figure 3.2-11 Population Trend of Emperor Goose based on Spring Aerial Surveys in Southwest Alaska (from Dau and Mallek 2009).

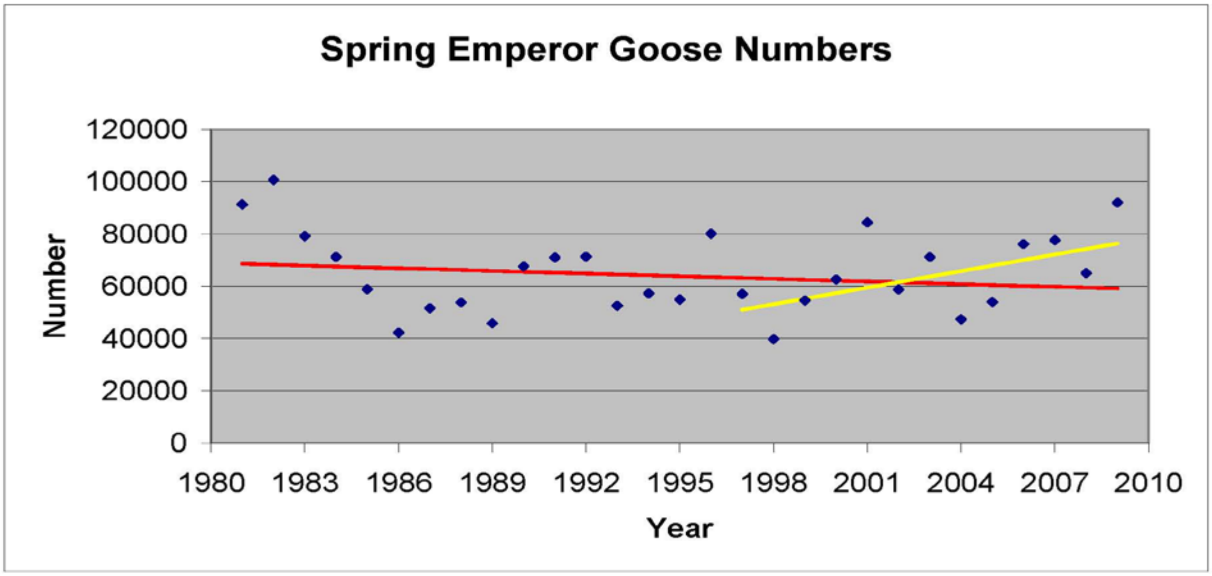


Figure 3. Spring emperor goose numbers 1981-2009 (blue). Trend information was derived from simple linear models. Twenty-nine year trend (1981-2009, red): mean = 65,147, slope = -76, p = 0.83, mean annual growth rate = -0.12%. Ten-year trend (2000-2009, yellow): mean = 68,872, slope = 1,477, p = 0.37, mean annual growth rate = 2.14%.

Conservation Concerns

The rapid decline of the Emperor Goose population led to a great deal of research into potential contributing factors. During the 1970s and early 1980s, when the population was declining, estimates of breeding success on the Yukon-Kuskokwim Delta remained relatively constant (Eisenhauer and Kirkpatrick 1977; Petersen 1987) but various data indicated juvenile and adult survival rates were very low, suggesting that mortality from predation and hunting pressure was too high to support a stable population (Pacific Flyway Council 2006a). Studies on survival rates of Emperor Geese indicate that both seasonal and annual survival rates of this species are low compared to other geese (Schmutz, Cantor, and Petersen 1994; Hupp, Schmutz, and Ely 2008b).

Based on a management goal of maintaining a minimum population level for hunting to be allowed (3-year running spring counts greater than 60,000 birds), the sport hunting bag limit for Emperor Geese was reduced in 1985 and the season was closed completely in 1986 (Pacific Flyway Council 2006a). Hunting seasons for Emperor Geese will not be considered for re-opening until the 3-year running average spring count is greater than 80,000 birds (Pacific Flyway Council 2006a).

Under the terms of the *Yukon-Kuskokwim Delta Goose Management Plan*, subsistence hunting of Emperor Geese was also closed in 1987 (Pacific Flyway Council 2006a). However, subsistence and sport harvest is very difficult to monitor in the many remote locations open to waterfowl hunting in Alaska and Emperor Geese continued to be harvested, either by accident, ignorance of the law, or other reasons (Wolfe and Paige 1995; Wentworth 2007a,b; Naves 2010a,b). Subsistence harvest data are likely underestimates because they are based on subjective household surveys and incomplete coverage in Alaska and Russia (Dau and Mallek 2009). In the early 1990s, statewide subsistence harvest of Emperor Geese was estimated to be greater than

4,500 birds per year (Wolfe and Paige 1995). From 1995 to 2000, the average annual subsistence harvest of Emperor Geese, including only those birds that were reported, was 3,200 birds per year statewide (AMBCC 2011). The most recent data available is for 2008; subsistence harvest of Emperor Geese was reported to total 1,599 birds, primarily in the Yukon-Kuskokwim Delta (Naves 2010b). The Alaska Migratory Bird Co-Management Council was established in October 2000 and consists of representatives from the Service, Alaska Department of Fish and Game, and Alaska Native organizations. Its purpose is to develop proposed regulations to manage subsistence harvests in Alaska.

Another likely contributing factor to the slow recovery of the Emperor Goose population is their relatively low reproductive potential; females do not breed until 3 or 4 years of age and more than $^{1}/_{3}$ of the females on the Yukon-Kuskokwim Delta do not nest in a given year (Petersen 1992). One of the conservation goals in the *Pacific Flyway Management Plan for the Emperor Goose* is to achieve fall juvenile/adult age ratios of greater than 20 percent (Pacific Flyway Council 2006a). The long-term average juvenile ratio (1985 to 2008 data) is 19 percent, indicating poor survival of fledged goslings (Dau and Mallek 2009). However, 2006 to 2008 data indicate the recent juvenile ratio has improved to 26 percent and this increase in productivity is likely contributing to the recent growth in the population (Dau and Mallek 2009).

In addition to hunting pressure, aircraft disturbance and chronic oil pollution are conservation concerns for Emperor Geese staging and wintering at Izembek National Wildlife Refuge (Sowl 2004). At Izembek Lagoon, Emperor Geese have been shown to flush when an aircraft is within 1 mile of the flock (Ward and Stehn 1989). Frequent disturbance by air traffic or any other source could distract geese from feeding or displace them to less favorable habitat. Repeated disturbance during critical time periods could reduce the energy available to geese for reproduction or survival. Emperor Geese are vulnerable to chronic and acute oil pollution because they feed along the tideline during the nonbreeding season. The presence of oil on beaches due to accidental spills and vessel sinkings has increased in the Aleutians as the number of vessels fishing in the North Pacific and Bering Sea has increased (Byrd et al. 1992, as cited in Sowl 2004). Large cargo vessels also transit the area and may release substantial amounts of fuel if they capsize, as did the M/V *Selendang Ayu* when it sank off Unalaska Island in 2004, spilling 337,000 gallons of bunker fuel and other petroleum products (NOAA 2004b).

3.2.4.2 Brant

Habitat Use and Distribution

Brant are small geese distributed in marine coastal areas of the northern hemisphere. Two subspecies are recognized in North America, but several subpopulations are also recognized because of distinct ranges and genetic differentiation (Reed et al. 1998). Brant that occur in the Izembek Lagoon area belong to the *nigricans* subspecies and are called Black Brant. Two management subunits of Black Brant are within the Pacific Flyway (Pacific Flyway Council 2002). The predominant form of Black Brant has dark plumage and breeds in Alaska, western Canada, and northeastern Russia. A smaller population of Western High Arctic Brant breeds on the Parry Islands in Canada's Northwest Territories and winters in Puget Sound (Reed, Davison, and Kraege 1989; Reed, Stehn, and Ward 1989). Because of its typically lighter plumage, the Western High Arctic Brant are called Gray-bellied Brant. There is some evidence of genetic separation, but the Gray-bellied Brant is still considered a color form of the Black Brant (Shields

1990). Both forms use the Izembek Lagoon area during spring and fall migrations (Reed, Stehn, and Ward 1989).

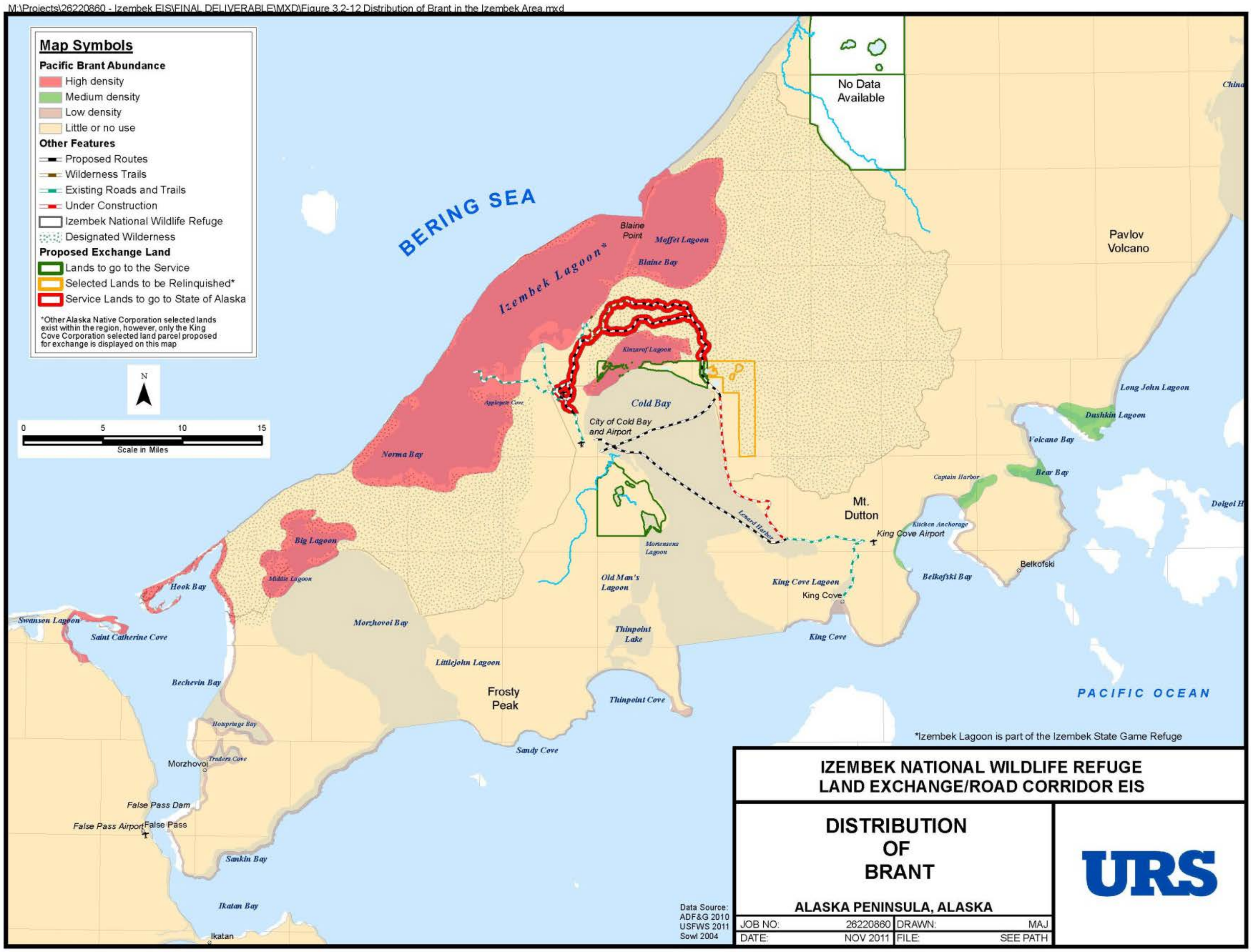
Izembek Lagoon and nearby coastal areas support almost all of the Pacific Flyway Brant during spring and fall migrations, where they feed on the extensive eelgrass beds and other marsh plants (Reed et al. 1998). The nutrient-rich eelgrass allows the Brant to replenish and build up energy reserves necessary for long migration flights and breeding efforts. Spring migrants begin to arrive at Izembek Lagoon in April and remain for up to 3 weeks. By mid-May, most Brant have departed for northerly breeding grounds (Sowl 2004). Fall migrants begin to arrive in mid-August and remain for up to 8 weeks. The concentration of Brant peaks in late September and most depart abruptly in late October or early November (Sowl 2004). The fall migrations of Gray-bellied and Black Brant at Izembek Lagoon overlap, but Gray-bellied primarily use the northern portion of Izembek Lagoon and adjacent parts of Moffet Bay while Black Brant are found throughout the remainder of the lagoon (Reed, Stehn, and Ward 1989).

Most of the Black Brant population migrates nonstop across the ocean to western Mexico, a flight of about 3,300 miles, during which they lose more than 30 percent of their body weight (Dau 1992). However, a relatively small part of the population remains to winter on Izembek Lagoon. Historically, over-wintering geese have numbered less than 10,000 birds (Sowl 2004). However, since 2001, the number of Brant wintering in the Izembek Lagoon has averaged nearly 20,000, with a peak in 2007 of 40,000, which represents nearly 30 percent of all Pacific Flyway Brant (Collins and Trost 2010). Gray-bellied Brant nesting in the Canadian Arctic have been tracked with radio transmitters into Izembek Lagoon during fall migration (CWSWC 2009), but it is not known if they comprise a portion of this wintering population (Taylor and Sowl 2008). Ward et al. (2009a) evaluated whether climate warming may be contributing to the increasing size of the over-wintering population at Izembek Lagoon. They found increased surface air temperatures since 1964, a 23 percent reduction in freezing degree days, and a 34 percent decline in the number of days when ice cover prevents birds from accessing food resources. They also found that the number of days of strong northwesterly winds in November, which provide tailwinds favorable to migration, is strongly influenced by the Pacific Decadal Oscillation and has generally declined over the years. Combined with the changes in availability of eelgrass, these changes in wind characteristics may be why more Brant are remaining at Izembek Lagoon and adjacent embayments over the winter (Ward et al. 2009a). Sedinger et al. (2011) examined the importance of wintering habitat quality on reproductive success of Brant in subsequent years and found that successful breeders were more likely to choose higher quality winter habitats that improved their reproductive success in the future.

Izembek Lagoon is the preferred winter habitat, but it is shallow and will often freeze, thereby becoming unavailable to Brant. Kinzarof Lagoon, Hook Bay, and other open areas on the Pacific side of the peninsula are also used by Brant in the winter, especially when Brant are displaced from Izembek Lagoon by ice or poor weather and tides (Sowl 2004, ADF&G 2010i).

The land parcels considered in the EIS vary in their value to migratory and resident Brant (Figure 3.2-12). High use areas consist of the waters and adjacent coasts of Izembek and Kinzarof lagoons. The Kinzarof Lagoon parcel also includes high use areas. The road corridors, Mortensens Lagoon parcel, and King Cove Corporation selected lands have little or no use by Brant, except for flyovers between Izembek and Kinzarof lagoons. The rest of the parcels receive little or no use by Brant.

Figure 3.2-12 Distribution of Brant



Abundance and Population Trend

Population surveys for Pacific Flyway Brant have been conducted on their winter grounds almost every year since 1936 (Collins and Trost 2010). Separate counts of Gray-bellied Brant in Puget Sound were initiated in 1953. Due to the substantial numbers of Brant over-wintering at Izembek Lagoon and adjacent embayments, surveys of the area have been conducted annually since 1986 and have been added to the totals for the flyway. Since 1986, the total abundance estimates for Pacific Flyway Brant have ranged from 98,500 birds (1987) to 152,000 birds (1997) with an average of about 123,000 birds (Collins and Trost 2010). The 2010 estimate was 144,000 birds, which is almost 18 percent higher than the average for the past 10 years. The counts for Gray-bellied Brant have ranged from 2,100 birds (1983) to 21,000 birds (1964) with an average of about 9,300 birds (1953-2010). The 2010 estimate was just over 6,000 birds. However, the 2009 survey found over 16,000 birds and the 2008 survey found 9,200 birds. The reason(s) for such large swings in survey results from year to year have not been determined (Collins and Trost 2010). The Pacific Flyway Council (2002) has established a population goal of 162,000 Pacific Flyway Brant (150,000 Black Brant and 12,000 Gray-bellied Brant), based on a 3-year average of these mid-winter aerial surveys.

Aerial fall surveys have been conducted annually at Izembek National Wildlife Refuge during peak staging of Brant to track annual trends in population size and distribution patterns within the refuge (Taylor and Sowl 2008). The surveyed area includes Izembek and Kinzarof lagoons; Big, Middle, and Little lagoons; Hook Bay; and St. Catherine Cove on Unimak Island. In cooperation with Service's Migratory Bird Management Office, the refuge attempts to complete 3 replicate counts of staging Brant between 25 September and 15 October, but weather determines how many surveys are completed each year. Between 1987 and 2003, the average number of Brant counted ranged from 106,500 birds per survey (2003) to 158,000 birds per survey (1997) (Taylor and Sowl 2008). These surveys include a large number of juvenile birds before they complete the rigorous long-distance fall migration and thus provide a different index of abundance than surveys conducted in mid-winter.

Conservation Concerns

Because of its strong dependence on certain food plants, especially eelgrass, and because some populations live in harsh environments, Brant are more vulnerable to periodic breeding failures and occasional heavy losses from starvation than are most other geese (Reed et al. 1998). Increasing human developments in coastal areas along the Pacific Flyway have resulted in loss of wetland habitats in Brant non-breeding areas and increases in disturbance (Reed et al. 1998).

Brant are sensitive to human disturbance, especially during migration when they need to recover energy (fat reserves) for breeding in spring and long migration flights in fall. Staging Brant are sensitive to the noise and visual disturbance of low flying aircraft, helicopters, and small boats, and such activity can cause interruption of feeding and displacement from feeding areas (Ward, Stehn, and Derksen 1994; Ward et al. 1999). Frid and Dill (2002) argue that behavioral responses of animals to disturbance are related to and carry the same type of potential impacts for survival and reproduction as responses to predation pressure. Frequent disturbance of staging Brant causes a reduction in body weight which could compromise migration readiness and survival rates (Ward, Stehn, and Derksen 1994).

Brant are an important resource for subsistence hunters in northwest Canada and western Alaska (spring and summer harvest). The *Migratory Bird Treaty Act* was amended in 1997 to allow for the spring and summer subsistence harvest of migratory birds in Alaska. The amended treaty allows permanent residents living within rural subsistence harvest areas, regardless of race, to harvest migratory birds; the migratory bird subsistence season for Izembek National Wildlife Refuge is April 2 – June 15 and July 16 – August 31 (Izembek and Moffet lagoons are further closed to Brant hunts from August 16-31) (AMBCC 2010). Sport harvest regulations along the Pacific Flyway have been conservative for many years and are designed to retain Brant on all key wintering areas along the Pacific coast (Pacific Flyway Council 2002).

Izembek Lagoon eelgrass beds are important habitat for migrating Pacific Flyway Brant. Kinzarof Lagoon and other coastal areas near Izembek are also important to the success of the growing numbers of Brant that spend the winter in the area (Ward et al. 2009a). Because of the relatively small size of these areas and their importance to essentially the entire populations of Black and Gray-bellied Brant, the risk of catastrophic damage to these habitats from oil spills, pollution, and natural disasters or large-scale changes in human land-use patterns are substantial conservation concerns. The Izembek National Wildlife Refuge and Izembek State Game Refuge were established to help minimize these risks to the ecosystem and the animals that depend on it (Sowl 2004).

3.2.4.3 Cackling Goose Subspecies

Habitat Use and Distribution

Cackling Goose was once considered to be several small subspecies of Canada Goose, but were officially split into their own species designation in 2004 (Banks et al. 2004). Three subspecies of Cackling Goose have been documented at Izembek National Wildlife Refuge; Taverner's Cackling Goose (*Branta hutchinsii taverneri*) is common, while the nominate Cackling Goose (*B.h. minima*) and Aleutian Cackling Goose (*B.h. leucopareia*) are uncommon and rare, respectively (Table 3.2-12). Many earlier publications concerning Izembek National Wildlife Refuge describe the presence and habits of Canada Geese, which should be assumed to refer to what is now known collectively as Cackling Goose, primarily Taverner's Cackling Goose. This account will use the common subspecies names described above to identify these different populations where appropriate.

Taverner's Cackling Geese and Cackling Geese use the Izembek isthmus area primarily as a staging area during fall migration, where they forage on eelgrass in Izembek, Kinzarof, and Big lagoons or move into the uplands to forage on crowberries or roost at high tide (Hupp and Safine 2002). Annual surveys in the fall indicate that numbers peak during mid to late October (Sowl 2004). It has been estimated that 95 percent of the birds that stage in the Izembek isthmus area are Taverner's Cackling Geese, but the proportion of Cackling Geese in the fall staging population appears to be increasing based on the ratio of Taverner's Cackling Geese and Cackling Geese taken by hunters in the fall (Sowl 2004). The number of Aleutian Cackling Geese that may use the area in the fall is unknown.

Spring observations of Cackling Geese at Izembek National Wildlife Refuge are rare and usually consist of single birds or small flocks. These birds are assumed to be Aleutian Cackling Geese because Taverner's Cackling Geese and Cackling Geese use a different route during spring migration (Sowl 2004). None of the 3 subspecies breed on the Izembek National Wildlife

Refuge. Taverner's Cackling Geese and Cackling Geese nest in wetlands of northwestern Alaska, especially in the Yukon-Kuskokwim Delta, and winter from Washington to California. Aleutian Cackling Geese, as befits their name, nest on fox-free islands along the Aleutian Islands and the Semidi Islands and winter in California and Oregon (Mowbray et al. 2002).

The rich eelgrass beds in Izembek and Kinzarof lagoons are crucial to these geese as they recover from the rigors of breeding and fatten up for their trans-oceanic flight to wintering grounds in the Pacific Northwest (Pacific Flyway Council 1994; Sowl 2004). Crowberries are also important food sources for geese and greatly influenced their distribution in upland areas (Hupp and Safine 2002).

Abundance and Population Trend

The taxonomy of Canada Goose has been unsettled for many years and similar subspecies have been counted together in many surveys over the years, making it difficult to develop distinct population estimates and manage for individual subspecies (Mowbray et al. 2002). The recent split of Canada and Cackling Goose is based on genetic differences and other factors, but the close morphological resemblance of some subspecies makes it impossible to separate them during aerial surveys where they occur together. Still, there are separate Pacific Flyway Management Plans for each subspecies; the plan for Taverner's Cackling Goose is currently a joint plan with Lesser Canada Goose (Pacific Flyway Council 1994) but Cackling Goose (Pacific Flyway Council 1999) and Aleutians Cackling Geese (Pacific Flyway Council 2006a) have their own management plans.

The mixing of Taverner's Cackling Goose with other subspecies in nesting and wintering areas has prevented a good estimate of the subspecies' population, although overall numbers of similar variations of subspecies have been relatively high and stable over the years (Pacific Flyway Council 1994). Perhaps the best population data come from fall surveys at Izembek National Wildlife Refuge, where most if not all Taverner's Cackling Geese stage during migration (Pacific Flyway Council 1994). Between 1975 and 2003, the mean number of Taverner's Cackling Geese and Cackling Geese counted during fall surveys at Izembek National Wildlife Refuge was 43,469 birds, with a range of annual counts from 20,918 (1977) to 69,885 (1994) (Sowl 2004).

Cackling Geese underwent a serious population decline from the late 1960s to the early 1980s, from 380,000 birds to about 25,000 birds, which led to a flyway-wide hunting closure in 1984 (Pacific Flyway Council 1999). Cackling Geese rebounded vigorously (to about 200,000 birds in 1997) and expanded their range until the hunting season was re-opened in 1994 (Pacific Flyway Council 1999). Annual waterfowl surveys in the Yukon-Kuskokwim Delta also provide an index of population trend. The number of coastal geese counted on aerial transects (mostly White-fronted and mixed subspecies of Cackling Geese) showed a steep declining trend from 1955 to 1984, when restricted harvest regulations were first applied, and an even steeper increasing trend from 1984 to the present (Mallek and Groves 2009).

Aleutian Cackling Geese declined dramatically in the early 1900s due to predation by introduced foxes on their nesting islands (Pacific Flyway Council 2006b). They were listed as endangered under the *Endangered Species Act* and the Service undertook a massive effort to eliminate the introduced foxes, which also destroyed other populations of seabirds. The Aleutian Cackling

Goose population grew rapidly until it was de-listed in 2001 and now numbers over 100,000 birds (Pacific Flyway Council 2006b).

Conservation Concerns

Hunting pressure and wetland habitat protection are the main conservation issues for Canada/Cackling Geese (Mowbray et al. 2002). The fact that hunters are usually not required to distinguish subspecies in the field or report harvests of each subspecies makes it difficult to track species-specific mortality levels (Pacific Flyway Council 1994). Taverner's Cackling Geese are an important sport hunting species in the Izembek isthmus area, comprising nearly 70 percent of the overall waterfowl harvest (Sowl 2004). The success of conservation efforts for some subspecies, such as Aleutian Cackling Geese, has led to serious conflicts with agricultural interests and some residential areas in their wintering grounds, where they may be considered pests (Mowbray et al. 2002).

3.2.4.4 Tundra Swan

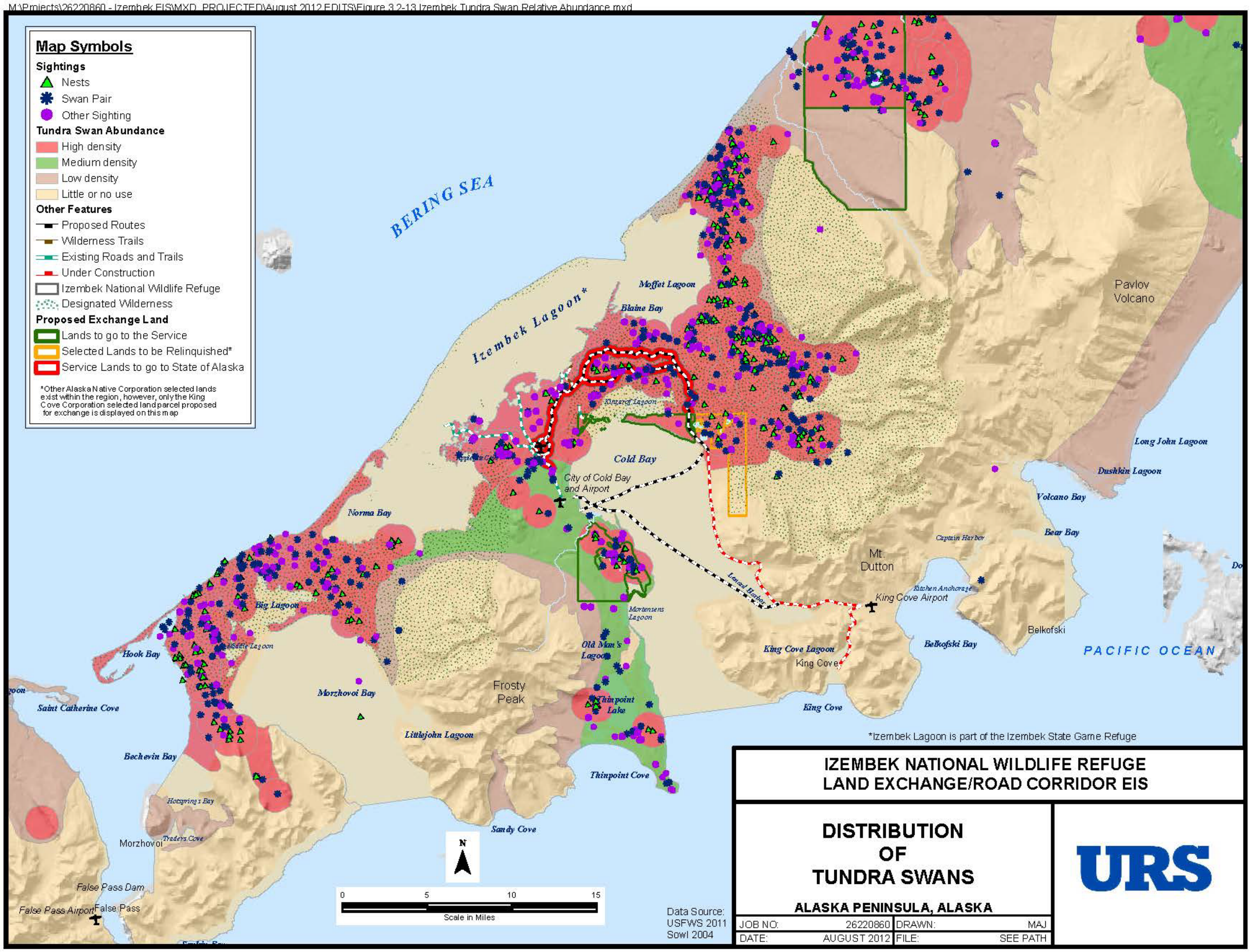
Habitat Use and Distribution

Tundra Swans are relatively long-lived birds which typically mate for life and share parental duties. They are very territorial during nesting season. During incubation, the male begins a wing feather molt which leaves him flightless for about a month. The parents guard their young (cygnets) for several months before they can fly, during which time the female completes her molt (Rosenberg and Rothe 2011). Swans appear highly selective in their breeding and molting habitats and usually prefer large, secluded lakes with emergent vegetation (Taylor and Sowl 2008). In summer, adult swans eat foliage, seeds, and tubers of various marsh plants. During the first few weeks after hatching, cygnets select a high protein diet of aquatic invertebrates and gradually shift to a vegetable diet similar to that of adults (Rosenberg and Rothe 2011).

Tundra Swans are widely distributed in the arctic with a number of distinct breeding populations. Two distinct groups of Tundra Swans breed on the southwestern Alaska Peninsula; a population that migrates south to wintering areas along the Pacific Flyway and a population that resides year round in the area of Izembek National Wildlife Refuge (Sarvis 1982; Dau and Sarvis 2002). They had been thought to be separated geographically but recent satellite telemetry work done in connection with avian influenza studies indicates that migratory and resident populations overlap in some places and times, but the movement patterns are unclear (Service 2008d; Sowl 2010a). Migratory swans begin flying south in late September or October, depending on the weather, usually in family units or in small flocks comprised of several families and some non-breeders. They arrive back on the breeding grounds in April or May. The Bristol Bay area is important to Tundra Swans because suitable habitat for nesting is available earlier than in more northerly nesting areas of Alaska (Wilk 1988).

The swans that reside year round in Izembek National Wildlife Refuge are the only known wild, non-migratory population of Tundra Swans in North America (Limpert and Earnst 1994; Dau and Sarvis 2002). During mild winters, resident swans can be found on freshwater ponds and rivers in the Izembek National Wildlife Refuge Unit and on Unimak Island (Figure 3.2-13). In harsh winters with heavy ice cover, individuals congregate at spring-fed lagoons, mouths of rivers, and other coastal areas with significant freshwater input (Sowl 2010a).

Figure 3.2-13 Distribution of Tundra Swans



Historically, 500-600 Tundra Swans have wintered on the lower Alaska Peninsula and Unimak Island (Service2008d, cited in Sowl 2004). Although some individuals of the resident population occasionally emigrate to join other members of the western population in the Pacific Northwest, there is no indication that populations mix on their breeding or Alaska wintering areas (Dau and Sarvis 2002). Izembek swans also appear to be morphologically distinct from other swans in the Western North American population (C. Dau, unpublished data, cited in Sowl 2004).

The distribution of breeding habitat, which includes suitable nesting and foraging areas, varies among the land parcels considered in the EIS (Figure 3.2-13). Relatively high density nesting areas include the Mortensens Lagoon and Kinzarof Lagoon parcels, the road corridors, the northern portion of the King Cove Corporation selected lands, and the northern township of the state lands, with lower nesting densities in the southern township of the state lands north of Izembek National Wildlife Refuge. The status of Tundra Swans on the Sitkinak parcel is not known.

Abundance and Population Trend

The Western Population of Tundra Swans breeds in western and northwestern Alaska and, except for the small resident population in the Izembek area (about 600), winters in the western United States and coastal British Columbia. The Western Population has increased significantly and steadily since the 1940s and was estimated at over 120,000 wintering swans in 1999 (Pacific Flyway Council 2001). The annual Alaska-Yukon waterfowl breeding survey (Mallek and Groves 2009) indicated the 2009 index for the Western Population of Tundra Swans was 111,000 swans, which was 13 percent above the long-term mean (1964-2008).

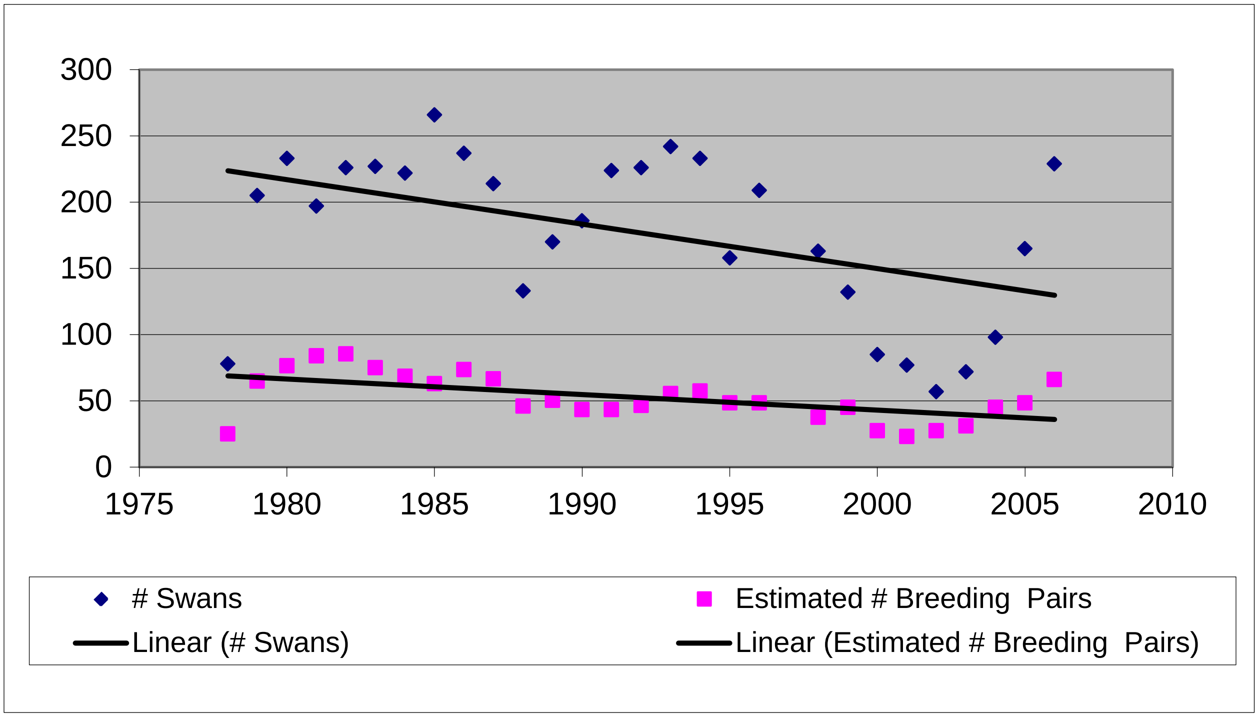
Tundra Swan surveys are conducted each spring over lands within or adjacent to the Izembek National Wildlife Refuge Unit (Taylor and Sowl 2008). Average breeding pair density in the Izembek National Wildlife Refuge Unit averaged 0.13 pairs per square mile from 1978-2006 (0.06 - 0.21 pairs per square mile) (Sowl 2007b); however, the density of breeding pairs has declined steadily over the past 2 decades (Figure 3.2-14). The number of swans breeding in the vicinity of Cold Bay appears to be more depressed than the number breeding in more remote areas of the refuge (Sowl 2004). High density breeding areas historically included lakes in the vicinity of the Cold Bay road system (Service 1996), but few swans nest near the Cold Bay roads today (Sowl 2004).

Meixell (2007) analyzed data from 1978-1996 on the reproductive success and survival rates of Tundra Swans in and around Izembek National Wildlife Refuge. Rates of productivity were lower and more variable than for other swan populations. He found a negative correlation between Tundra Swan nesting success and brown bear densities, concluding that brown bear depredation played a primary role in reducing nesting success. Annual rates of adult survival were also lower and more variable than observed in other swan populations. However, these apparent low survival rates were attributed to high rates of permanent emigration of adults.

Conservation Concerns

The Western Population of Tundra Swans migrates twice a year across long distances and encounters some hunting pressure, many disturbance factors, and other challenges. The overall population appears healthy and is far larger than the management target for this population (Pacific Flyway Council 2001).

Figure 3.2-14 Breeding Tundra Swan Trends on the Izembek National Wildlife Refuge, 1978-2006. From Sowl (2007)



Estimated breeding pairs = Observed pairs + 1/2 Singles (Singles with nests counted as breeding pairs).

The unique population of Tundra Swans that resides year round in the Izembek National Wildlife Refuge area is not as stable and may be susceptible to human disturbance and additional sources of mortality. This essentially non-migratory population is small, has a low productivity rate due to high rates of mortality of eggs and young, and persists primarily due to adult longevity (Sowl 2004). Swans are very sensitive to disturbance, especially pedestrian traffic, and may have an unsuccessful breeding season if high levels of human activity occur near their chosen nesting site (Henson and Grant 1991). The Izembek population has been given special status and has been excluded from sport harvest for more than 20 years (Taylor and Sowl 2008). In 2005, Tundra Swans on the lower Alaska Peninsula and Unimak Island were also excluded from spring and summer subsistence migratory bird harvest (Taylor and Sowl 2008).

3.2.4.5 Northern Pintail

Habitat Use and Distribution

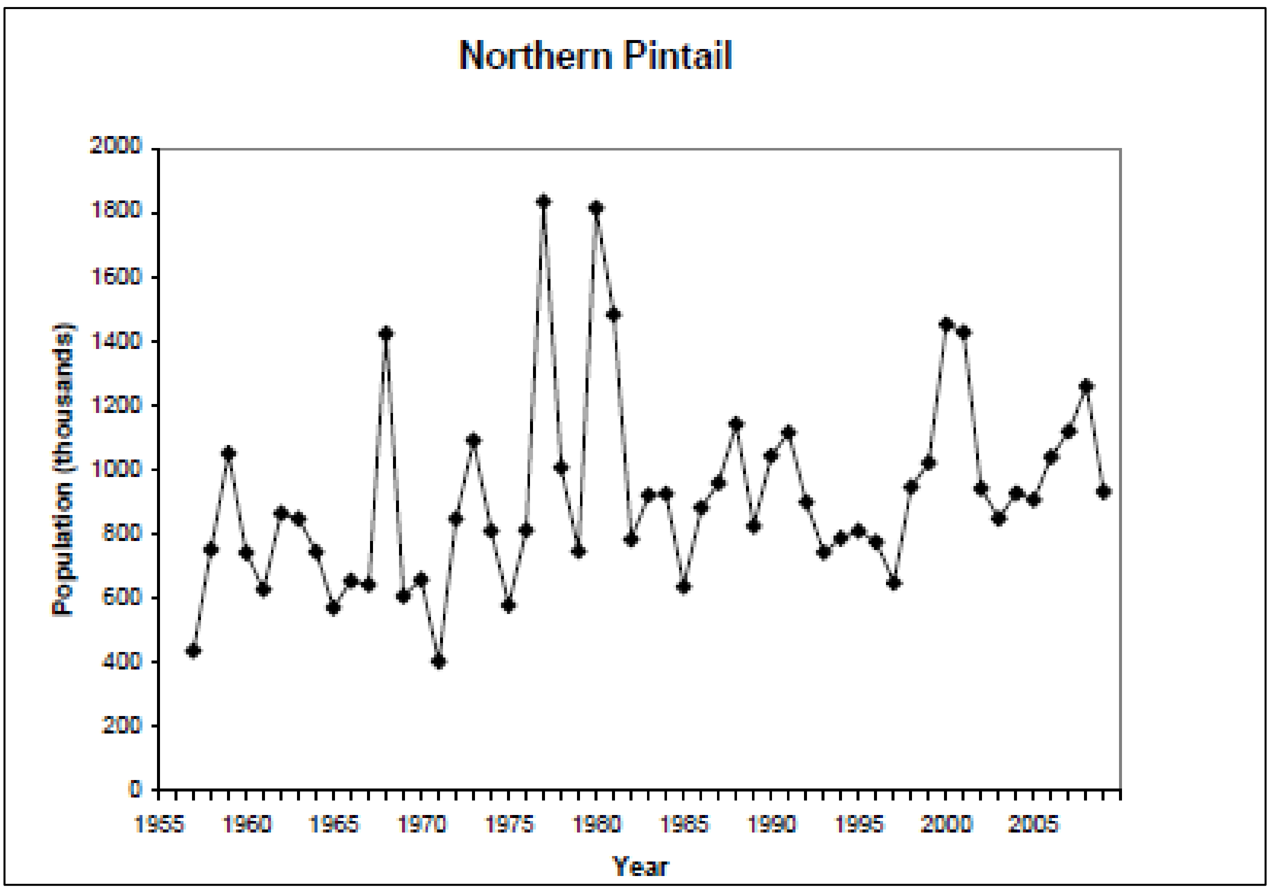
The Northern Pintail is distributed widely throughout the Northern Hemisphere. Pintails are among the earliest waterfowl nesters and arrive on breeding grounds as soon as they are free of ice. They nest in tidal areas associated with grasses and sedges and upland areas associated with willow, birch, and crowberry. The female incubates the eggs, which take about 3 weeks to hatch. Ducklings fledge when they are a little more than a month old. They winter in freshwater habitats including marshes, ponds, lakes, and rivers (Austin and Miller 1995).

Northern Pintails are seasonally abundant in Izembek National Wildlife Refuge in the spring and fall, and breed on the refuge in the summer (Sowl 2004). They are regularly found in Izembek and Kinzarof lagoons, surrounding freshwater lakes, and in Cold Bay and are a common dabbling duck species staging at Izembek National Wildlife Refuge during fall migration. They are prominent grazers of eelgrass seeds, which are generally strained from bottom sediment and stripped from the flower (Sowl 2004; ADF&G 2010i).

Abundance and Population Trend

Northern Pintail has traditionally been the most numerous dabbling duck in Alaska and accounted for a significant portion of the Pacific Flyway total for the species (Mallek and Groves 2009). The most recent population estimate (2009) from the annual Alaska-Yukon waterfowl survey (excluding the arctic region) was 932,500 birds (Mallek and Groves 2009). The 2009 count was 15 percent lower than the previous 10 year mean of 1,085,410 birds, but the overall population trend has been increasing (Figure 3.2-15) (Mallek and Groves 2009). Up to 20,000 Northern Pintails have been counted during aerial fall migration surveys of coastal lagoons of Izembek National Wildlife Refuge (Sowl 2004).

Figure 3.2-15 Population Trends of Northern Pintail from the Alaska-Yukon Breeding Population Surveys



Source: Mallek and Groves 2009.

Conservation Concerns

Northern Pintails are a common waterfowl species and are hunted from September into December in Izembek Lagoon (ADF&G 2010i). The *North America Waterfowl Management Plan* is working with agencies and private organizations, such as Ducks Unlimited and California Waterfowl Association, to protect and enhance breeding and wintering habitat through cooperative programs with landowners. Activities to restore wetlands and integrate waterfowl management with farming operations have been coordinated through the *North America Waterfowl Management Plan* (Austin and Miller 1995).

3.2.4.6 Black Scoter

Habitat Use and Distribution

Two breeding populations of Black Scoters are in North America, the eastern and western populations. The western population breeds on coastal tundra areas around the Alaska Peninsula, the Bristol Bay lowlands, Yukon-Kuskokwim Delta, Kotzebue Sound, and the North Slope (Bordage and Savard 1995). They are common breeders and overwinter residents in the Izembek isthmus area (Sowl 2004). Their nests are concealed in brushy, dense vegetation near shallow tundra lakes. Males depart to molting sites after the eggs are laid. Females stay for at least 4 weeks after the eggs are hatched and only then do they begin the molt (Bordage and Savard 1995). They dive for mollusks and crustaceans in marine habitats or feed on insects, larvae, and vegetation in freshwater habitats.

Abundance and Population Trend

The population of Black Scoters in Alaska has been estimated at 200,000 breeding birds (Bordage and Savard 1995). The Service has conducted aerial surveys for breeding Black Scoters in western Alaska. In 2004 and 2005, survey results indicated a breeding population in the survey area of about 108,000 Black Scoters (Stehn et al. 2006). The Yukon Delta and Bristol Bay transects had the greatest numbers of Black Scoters, but the highest average density of breeding birds was near Port Moller and Izembek Lagoon with 4.69 birds per square mile. A comparison of the average population estimates from 2004-2005 with similar surveys conducted in 1989-1997 showed that the population appears to be declining at 3.1 percent per year. However, differences in the survey protocols and other factors may account for some of this decline (Stehn et al. 2006). In a study conducted from 1992 to 1996 in tundra areas of Izembek National Wildlife Refuge where Black Scoters predominate, the breeding density of Black Scoters was 7.1 birds per square mile (Taylor and Sowl 2008).

Conservation Concerns

This species is subject to a combination of threats including subsistence harvest, food chain contaminants, habitat disturbances, and hunting. The Black Scoter is the least abundant and least studied scoter in North America (Taylor and Sowl 2008). Several national wildlife refuges in Alaska, including Izembek National Wildlife Refuge, participated in a project to assess population size, distribution, and relationships among populations of Black Scoters in Alaska (Bowman et al. 2004).

Subsistence harvest has been estimated to be around 6,000 birds per year (Bordage and Savard 1995). In the most recent estimates available (2008), the subsistence harvest of Black Scoters in Alaska was about 4,700 birds, almost all taken in the Yukon-Kuskokwim Delta (Naves 2010b).

3.2.4.7 Other Waterfowl and Waterbirds

Habitat Use and Distribution

Izembek National Wildlife Refuge and adjacent coastal areas are important habitats for many species of waterfowl (Table 3.2.12) and the area is an international crossroad for migration routes. Waterfowl are at their peak numbers on the refuge in the spring (March/April) and fall (September/October) (Sowl 2004). The Izembek National Wildlife Refuge has the highest concentration of staging waterfowl in the area with up 150,000 ducks staging at Izembek and Kinzarof lagoons, Big, Middle and Little lagoons, and Hook Bay. The most important staging areas on the refuge include Izembek and Moffet lagoons (Taylor and Sowl 2008). The lowland tundra, meadows, and wetlands are important habitats for breeding. The most common species breeding on the lower Alaska Peninsula are Mallards, Green-winged Teal, Greater Scaup, and Black Scoters, with Mallards occurring in the highest densities on the Izembek National Wildlife Refuge (Dau and Schafer 1996). These waterfowl forage on eelgrass and sedge seeds, and invertebrates in the eelgrass beds or freshwater lakes. Thousands of ducks migrate through the area and stage at Izembek National Wildlife Refuge in the spring and fall, including Northern Pintail, Mallards, Green-winged Teal (North American and Aleutian), American and Eurasian Widgeon, Gadwall, and Greater Scaup. Common Goldeneyes, Harlequin and Long-tailed Ducks, Common and Red-breasted Mergansers, Common Eiders, Black and White-winged Scoters, and Bufflehead remain throughout winter in the coastal waters of the refuge feeding on marine invertebrates (Sowl 2004).

Other waterbirds nest on or adjacent to Izembek National Wildlife Refuge, including Common and Red-throated Loons and Red-necked Grebes. Gulls are common breeders in the refuge, with Mew Gulls nesting on isolated rocks in shallow lakes and Glaucous-winged Gulls nesting in large colonies on islands. Waterbird species that commonly winter in Cold Bay and other bays along the Alaska Peninsula include Common, Pacific, and Red-throated Loons, and Horned and Red-necked Grebes (Sowl 2004).

Abundance and Population Trend

Each spring the Service conducts an aerial waterfowl survey in the major breeding areas of Alaska. For the waterfowl species that occur at Izembek National Wildlife Refuge, Table 3.2-14 shows the most recent (2009) population estimates and the 10-year average population estimates in the Alaska-Yukon regions (Mallek and Groves 2009). Most waterfowl species experienced a decrease in 2009 when compared to previous 10-year mean estimates. However, total duck numbers were 13 percent above the long-term mean.

Table 3.2-14 Adjusted Waterfowl Breeding Population Estimates in the Alaska-Yukon Region

Species		2009	10 Year Average (2000-2009)
Ducks			
Dabblers:	Mallard	496,400	662,700
	Gadwall	2,000	3,030
	American Wigeon	795,000	970,310
	American Green-winged Teal	649,600	806,360
	Northern Shoveler	457,000	597,130
	Northern Pintail	932,500	1,085,410
	Subtotal:	*3,332,500*	*4,124,940*
Divers:	Redhead	800	2,530
	Canvasback	41,000	190,280
	Scaup spp.	822,000	1,012,370
	Goldeneye spp.	31,900	69,560
	Bufflehead	58,300	46,580
	Subtotal:	*954,000*	*1,244,310*
Miscellaneous:	Long-tailed Duck	65,800	91,950
	Eider spp.	14,800	14,810
	Scoter spp.	366,400	351,610
	Merganser spp.	24,200	27,630
	Subtotal:	*471,200*	*486,000*
Total Ducks		**4,757,700**	**5,855,250**

Source: Mallek and Groves 2009

Conservation Concerns

Waterfowl migrating through the refuge in the fall are important to hunters from the local communities, other parts of Alaska, and the rest of the U.S. and world. Ducks and geese are hunted in Izembek Lagoon and the freshwater lakes in the adjacent areas from September into December (ADF&G 2010i). State and federal hunting regulations are established annually to maintain sustainable populations of waterfowl while providing opportunities for subsistence and sport hunters. Subsistence regulations are developed with input from the Alaska Migratory Bird Co-Management Council, which includes representatives of Alaska's Native population and professional agency staff.

The Sea Duck Joint Venture was developed under the *North American Waterfowl Management Plan* to address conservation and management concerns for sea ducks throughout the Northern Hemisphere. Its main goal is to promote conservation by providing knowledge and understanding to effectively manage sea ducks (Taylor and Sowl 2008).

3.2.4.8 Bald Eagle

Habitat Use and Distribution

Bald Eagles are the most common raptor species to occur on the refuge lands year round (Sowl 2004). They feed on waterfowl, shorebirds, seabirds, and fish primarily but occasionally eat marine mammal carcasses that wash ashore in the Izembek National Wildlife Refuge (Sowl 2004). In the fall, they are concentrated around Izembek Lagoon and other staging areas, feeding on migratory waterfowl.

Bald Eagle pairs form lifetime bonds, share incubation duties, and defend territories during breeding. They sometimes have alternative nests along with the active nest, and nests are typically used year after year (Service 2007). They nest on cliffs, large inland boulders, small islands in freshwater ponds, on sea stacks, large sand dunes, dense stands of alders, human-made structures and on the Sitka spruce trees at Cold Bay, Alaska (Sowl 2004). Known Bald Eagle nests in the project area are shown in Figure 3.2-16.

Abundance and Population Trend

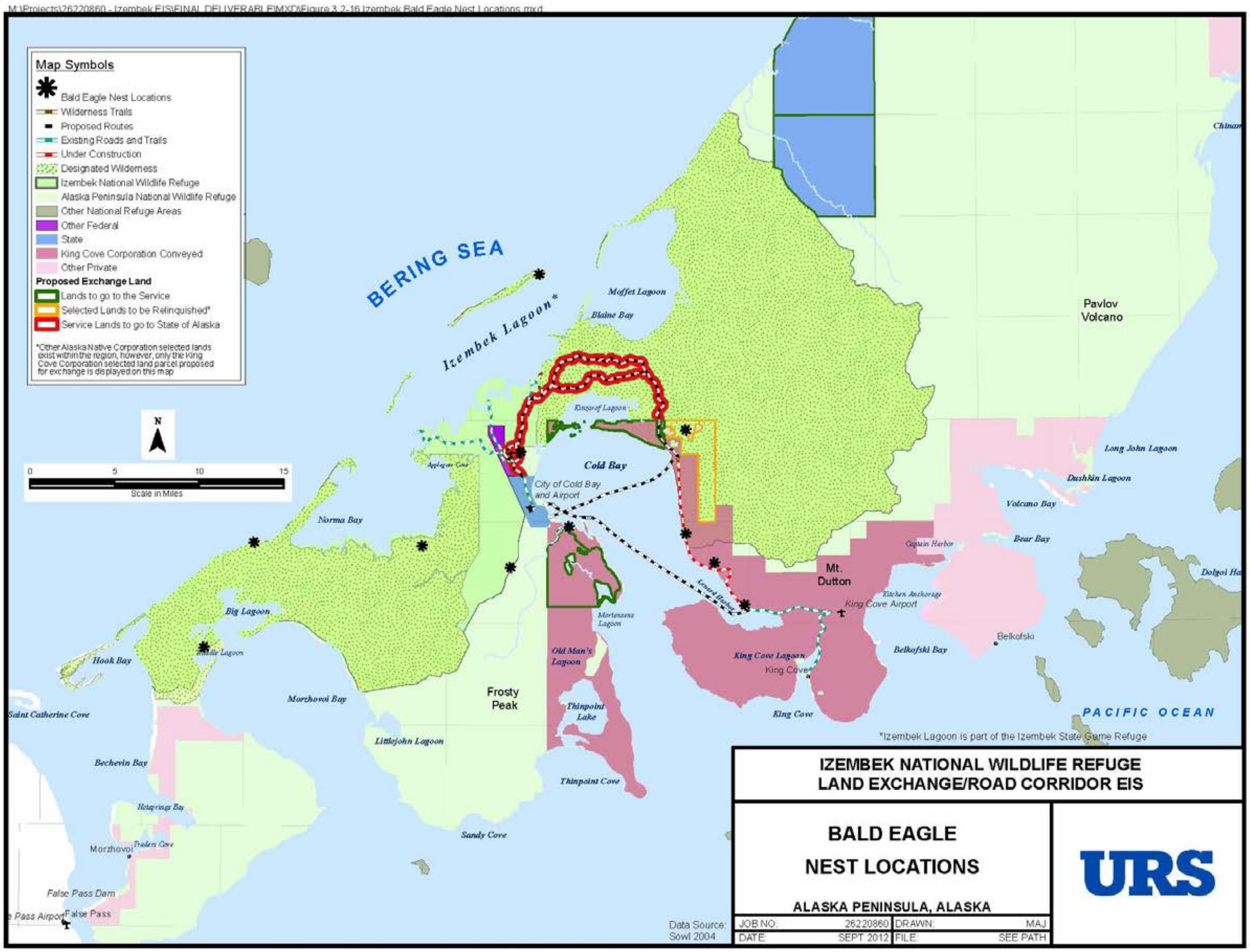
As of June 2007, there was an estimated 70,000 Bald Eagles in the United States, with about 75 percent of them in Alaska (Service 2008b). During the Izembek Breeding Bird Survey in mid-June, an average of 3.1 Bald Eagles were observed each year between 1993 and 2009 in the Cold Bay road system (Sauer et al. 2011). In the Izembek Christmas Bird Count week, between 1963 and 2008, the mean number of Bald Eagle seen was 22 birds (National Audubon Society 2010a).

Conservation Concerns

The Bald Eagle has gone through dramatic population fluctuations in the U.S. The population was once reported so high in Alaska that a bounty was established before it was overruled by federal regulations in 1952. In the mid to late 1900s, the Bald Eagle became rare in the lower 48 states due to pesticides lowering reproduction rates, but has since recovered in many areas (Buehler 2000).

Bald Eagles are protected by the Bald and Golden Eagle Protection Act of 1972 (Title 16, USC 668 and several amendments) and the Migratory Bird Treaty Act (Service 2007). A variety of human activities can potentially interfere with Bald Eagles, including disturbance that affects their ability to nest, roost, breed, raise young, and forage. The Service developed guidelines to help minimize disturbance impacts to Bald Eagles, especially around nest sites (Service 2007). Construction activities are limited by proscribed buffer zones around active nests and seasonal restrictions. Bald Eagle nest surveys have been conducted in Alaska since the 1960s to locate nests for protection and to help development projects comply with the Bald and Golden Eagle Protection Act (Service 2007). Several Bald Eagle surveys have been conducted on the Pacific side of the Alaska Peninsula (Savage and Hodges 2006). The Service has recently issued new rules to authorize the issuance of permits to take Bald Eagles and Golden Eagles on a limited basis consistent with their conservation and public safety interests (Service 2009a).

Figure 3.2-16 Bald Eagle Nest Locations



3.2.4.9 Gyrfalcon

Habitat Use and Distribution

Gyrfalcons are solitary species except during the breeding season when they form monogamous pairs. They nest on the ground, on cliff edges, and sometimes in the nests of other birds, with the majority nesting in the arctic tundra. Some Gyrfalcons do not breed every year because both reproduction and winter movements are influenced by the availability of food. Both adults incubate the eggs, with the female incubating a greater proportion of the time. The female broods the young and the male brings the food (Booms, Cade, and Clum 2008). Gyrfalcons breed in low densities and are year round residents on the Izembek National Wildlife Refuge (Sowl 2004). Gyrfalcons tend to use hilltops as perches and the Izembek isthmus as a foraging area, where they prey on shorebirds and waterfowl (Sowl 2010b).

Abundance and Population Trend

Gyrfalcons have an estimated global population of 10,000 pairs, with an additional 30,000 or more immature and non-breeding adults (CITES 2000). Alaska supports the entire U.S. breeding population of Gyrfalcons (Service 2008b). Surveys of nesting Gyrfalcons in Alaska yield an estimated nesting population of 375 to 635 pairs, but this estimate does not include young of the year, immature, and non-breeding adults (CITES 2000).

Conservation Concerns

Gyrfalcons are a species of concern in the *Alaska Raptor Management Plan* due to the lack of information on the species (Taylor and Sowl 2008). This species may be potentially affected by global warming due to its reliance on arctic habitats and prey and its narrow ecological niche as a specialist predator (Booms, Cade, and Clum 2008). Except for long-term monitoring programs and legal protections under the *Migratory Bird Treaty Act*, very little additional management work is being done in the U.S or Canada due to limited funding (CITES 2000).

3.2.4.10 Other Raptors and Landbirds

Habitat Use and Distribution

This section describes the hawks, owls, and primarily terrestrial species of birds which occur in the Izembek isthmus area. The landbirds include several common residents such as Common Raven, Black-billed Magpie, Snow Bunting, and Willow Ptarmigan, and a number of species that breed in the area, but migrate to other areas for the winter, including swallows, sparrows, and warblers (Table 3.2-12).

Raptors feed on waterfowl, shorebirds, ptarmigan, small mammals, and fish that occur in Izembek National Wildlife Refuge. Rough-legged Hawks, Short-eared Owls, and Golden Eagles have been documented to breed on the refuge but only rarely. The most important breeding habitat for raptors is on the cliffs on the Pacific side of the Alaska Peninsula in the Pavlof and Unimak Island Units (Sowl 2004).

At least 20 species of songbirds, 2 species of ptarmigan, and Sandhill Cranes breed on the Izembek National Wildlife Refuge. The year round residents of the refuge include Black-billed Magpie, American Dipper, Common Raven, Northern Shrike, Gray-crowned Rosy Finch, Common Redpoll, Snow Bunting, and Willow and Rock Ptarmigan. Flocks of Snow Buntings, with the occasional McKay's Bunting, and Gray-crowned Rosy Finches are observed on the refuge in the winter months. Lapland Longspurs, American Pipits, and Savannah Sparrows are common breeders that nest on the tundra of Izembek National Wildlife Refuge. Golden-crowned and Fox Sparrows, Yellow Warblers, Wilson's Warbler, and Common Redpolls are also common breeders of the Izembek National Wildlife Refuge and nest in shrub habitats. The less common breeders in the Izembek National Wildlife Refuge include Northern Shrike, Bank and Tree Swallows, Pine Grosbeak, Hermit Thrush, and Orange-crowned Warbler (Sowl 2004, 2011d). Sandhill Cranes nest in low densities in sedge-grass meadows. The abundant Willow Ptarmigan and the less common Rock Ptarmigan are important sport hunting species for subsistence hunters.

In a recent ground-based survey on the Izembek isthmus, over 2,300 birds were detected, 35 percent of which were landbirds and 1 percent were raptors. Savannah Sparrow and Bank Swallow were found in wet and mesic graminoid meadows in low areas, along small drainages, and near shorelines. Golden-crowned Sparrow, Yellow Warbler, Willow Ptarmigan, White-crowned Sparrow, and Northern Shrike occurred in willow shrubs on slopes and around lakes. Lapland Longspur was abundant in crowberry heath tundra. American Pipit was found in gravel areas and on hilltops (Sowl 2011d).

Abundance and Population Trend

Many landbirds are only found in Alaska and nowhere else in the U.S. or North America. The entire world population of McKay's Buntings resides in Alaska. The entire U.S. breeding populations of Willow and Rock Ptarmigan, Northern Shrike, Snowy Owl, Gray-cheeked Thrush, Lapland Longspur, Snow Bunting, and Common and Hoary Redpoll exist in Alaska (Service 2008a). Some species of landbirds that occur on the Izembek National Wildlife Refuge are widely distributed in the western parts of North America but have endemic subspecies that exist exclusively in the eastern Aleutian Islands and western Alaska Peninsula during the breeding season. These species include Fox, Song, and Savannah Sparrows, and Gray-crowned Rosy Finches (Taylor and Sowl 2008).

Population estimates for many landbird species are based on very limited and uncertain data, especially for species that nest in remote areas of Alaska, making trend analysis very difficult (Rich et al. 2004). Two nationwide monitoring programs have been conducted in the Izembek isthmus area, the Audubon Christmas Bird Count and the U.S. Geological Survey Breeding Bird Survey, both of which provide some information on population trends, but only when combined with other surveys for a regional or national perspective. The Christmas Bird Count has been conducted annually by Service biologists and volunteer birders in mid-December from 1963 through 2009 (National Audubon Society 2010). It is a measure of the presence of birds and average number of birds. The only 4 landbirds that are seen most years are Willow Ptarmigan (24 birds per year), Black-billed Magpie (11 birds per year), Snow Buntings (average 59 birds per year), and Gray-crowned Rosy-Finch (54 birds per year). The numbers of birds seen during Christmas Bird Counts often depend on the number of volunteers and the weather conditions for the given day, so variations in numbers from one year to the next are difficult to interpret. The Breeding Bird Survey has been conducted every year in June or July from 1993 through 2009. The Breeding Bird Survey is conducted by biologists under standardized conditions and the same locations every year, so the data is more amenable to population trend analysis. The most common landbirds detected are Lapland Longspur, Golden-crowned Sparrow, Savannah Sparrow, Bank Swallow, Yellow Warbler, American Pipit, and Black-billed Magpie (National Audubon Society 2010).

Conservation Concerns

Declines in landbird populations are partially attributed to loss, degradation, and fragmentation of habitat on breeding and wintering grounds and along migratory routes (Boreal Partners in Flight 1999).

3.2.4.11 Rock Sandpiper

Habitat Use and Distribution

Two subspecies of Rock Sandpipers winter in Izembek and Kinzarof lagoons (Sowl 2004). *Calidris ptilocnemis couesi* breeds exclusively on the Alaska Peninsula and Aleutian Archipelago of southwestern Alaska and *C.p. ptilocnemis* breeds on the Pribilofs and other Bering Sea Islands (Gill, Tomkovich, and McCaffery 2002). Rock Sandpipers (*C.p. couesi*) are the most common shorebirds that breed on the Izembek National Wildlife Refuge (Tibbitts, Gill, and Dau 1996). A common nesting area for this species is upland tundra and dry meadows from sea level to high elevations. This species is territorial and monogamous during nesting season. During breeding season, they feed on larval insects on the tundra and during the remainder of the year they feed on invertebrates in the intertidal zone (Gill, Tomkovich, and McCaffery 2002). Migration patterns vary among the 2 subspecies; 1 population (*C.p. couesi*) has local seasonal movements, while the other (*C.p. ptilocnemis*) has round trip flights of up to 5,600 miles (Gill, Tomkovich, and McCaffery 2002).

In a recent ground-based breeding bird survey conducted on the Izembek National Wildlife Refuge, Rock Sandpipers accounted for 15 percent of all bird detections and were the most frequently observed species, averaging 2.83 birds per survey point and occurring at 91 percent of all points observed. These high numbers may be due in part to the hatching period of Rock Sandpipers coinciding with the survey time period (mid to late June) (Sowl 2011d). Rock Sandpipers were found in crowberry heath tundra and foraging in the intertidal areas and waters of Kinzarof Lagoon (Sowl 2011d).

Abundance and Population Trend

The total population of the Rock Sandpiper in North America is estimated at 150,000 birds (Morrison et al. 2001), with *C.p. couesi* estimated at 75,000 birds and *C.p. ptilocnemis* estimated at 25,000 birds (Gill, Tomkovich, and McCaffery 2002). Shorebird surveys at Izembek National Wildlife Refuge in 1993 found a peak of 32,000 Rock Sandpipers on September 1 at Izembek Lagoon, with 90 percent being *C.p. couesi* and 10 percent *C.p. ptilocnemis*-(Tibbitts, Gill, and Dau 1996).

Conservation Concerns

C.p. ptilocnemis is listed as a subspecies of conservation concern in the *Alaska Shorebird Conservation Plan* due to limited distribution, small population size, and severe and prolonged cold spells suspected of causing mortality. The *C.p. couesi* subspecies should be considered a population of moderate concern (Alaska Shorebird Group 2008).

3.2.4.12 Dunlin

Habitat Use and Distribution

Two subspecies of Dunlin nest in Alaska, but only *Calidris alpina pacifica* likely nests or occurs at Izembek National Wildlife Refuge (Warnock and Gill 1996). This species is most common at Izembek and Kinzarof lagoons where it stages during fall migration (Sowl 2004). Fall shorebird surveys at Izembek and Kinzarof lagoons counted a peak of 28,000 Dunlins in mid-October (Tibbitts, Gill, and Dau 1996). Dunlin nest in wet marshes, meadows, and wetlands. The diet of this species consists of worms, clams, amphipods, and insect larvae (Warnock and Gill 1996). In a recent ground-based survey conducted on the Izembek National Wildlife Refuge, Dunlin were found nesting in wet and mesic graminoid meadows occurring in low areas near shorelines and foraging in the intertidal areas of Kinzarof Lagoon (Sowl 2011d).

Abundance and Population Trend

The population of *C.a. pacifica* is estimated at 550,000 birds (Morrison et al. 2006). There is concern that Dunlins have declined based on Christmas Bird Count and Breeding Bird Survey datasets (Andres 2009). The absence of range-wide population monitoring programs prevents accurate and reliable assessments of Dunlin population status and trend (Warnock and Gill 1996).

Conservation Concerns

The Dunlin has been designated as a species of high conservation concern in the *Alaska Shorebird Conservation Plan* (Alaska Shorebird Group 2008) due to restricted breeding range, suspected population declines, and threats on the wintering grounds.

3.2.4.13 Other Shorebirds

Habitat Use and Distribution

The highest densities of breeding shorebirds in North America occur in Alaska, with main breeding grounds on the Yukon-Kuskokwim Delta and Arctic Coastal Plain (Alaska Shorebird Group 2008). During migration, over 78,000 individuals of more than 30 shorebird species pass through Izembek National Wildlife Refuge, with the most abundant being Dunlin, Rock Sandpiper, and Western Sandpiper (Tibbitts, Gill, and Dau 1996). Most species that occur on the refuge are migrants, but at least 8 species are local breeders and 4 overwinter in the Izembek area (Table 3.1-12). They use the refuge's wetlands and lagoons to refuel during long migrations between arctic breeding areas and diverse wintering areas. The unvegetated mud and sand flats and sandy beaches are important habitats for these birds. The invertebrates that live within the eelgrass beds are important food sources for shorebirds during spring and fall migrations (Sowl 2004). Semipalmated Plovers nest on gravel surfaces, while Least Sandpiper, Red-necked Phalarope, Short-billed Dowitchers, and Wilson's Snipe nest in wet meadows, marshes and other wetlands. Black Oystercatchers breed on the barrier islands of Kinzarof Lagoon and possibly at the mouth of Nurse Lagoon (Sowl 2011c.).

In the fall of 1993, an estimated 78,000 to 285,000 shorebirds were staging at Izembek and Kinzarof lagoons. Dunlins and Western and Rock Sandpipers accounted for more than 95 percent of all the shorebirds recorded. Wintering populations of shorebirds in the lagoons were estimated to be about 9,000 birds which included Rock Sandpipers and Sanderlings (Tibbitts, Gill, and Dau 1996).

Abundance and Population Trend

Population estimates for many shorebird species are difficult to make and are often low priorities for natural resource agencies. Table 3.2-15 provides estimates of the North American populations of the shorebird species regularly occurring in the Izembek National Wildlife Refuge area. Trend information is generally not rigorous except for isolated localities and well-studied species (Morrison et al. 2006). However, some trend analysis has been made based on Christmas Bird Count and Breeding Bird Survey datasets and other sources of information (Andres 2009).

Table 3.2-15 Estimated North American Population Size, Trends, and Conservation Prioritization Ratings of Shorebirds occurring in Izembek National Wildlife Refuge

Species (subspecies)	Estimated Population Size	Population Trend	Conservation Rating
Black-bellied Plover	200,000	Declining	3
Pacific Golden-Plover	35,000-50,000	Declining	3
Semipalmated Plover	150,000	Stable	2
Black Oystercatcher	10,000	Increasing	4
Wandering Tattler	10,000-25,000	Unknown	3
Greater Yellowlegs	100,000	Stable	3
Lesser Yellowlegs	400,000	Declining	4
Whimbrel	66,000	Declining	4
Bar-tailed Godwit	90,000	Unknown	4
Ruddy Turnstone	245,000	Stable	3
Black Turnstone	95,000	Unknown	4
Sanderling	300,000	Declining	4
Semipalmated Sandpiper	2,000,000	Declining	3
Western Sandpiper	3,500,000	Stable	4
Least Sandpiper	700,000	Declining	3
Pectoral Sandpiper	500,000	Stable	2
Sharp-tailed Sandpiper	160,000	Unknown	2
Rock Sandpiper (*ptilocnemis*)	25,000	Unknown	4
Rock Sandpiper (*couesi*)	75,000	Unknown	3
Dunlin (*pacifica*)	550,000	Declining	4
Short-billed Dowitcher	153,000	Stable	4
Long-billed Dowitcher	400,000	Unknown	3
Wilson’s Snipe	2,000,000	Declining	3
Red-necked Phalarope	2,500,000	Stable	3
Red Phalarope	1,250,000	Declining	3

Sources: Population estimates are from Morrison et al. (2006). Trend analysis is from Andres (2009). Conservation ratings are from Alaska Shorebird Group (2008). Species with conservation ratings of 4-5 are of high concern, and those with ratings of 2-3 are of low to moderate concern (Alaska Shorebird Group 2008).

Conservation Concerns

Threats to shorebirds in Alaska include habitat conversion and degradation, transportation infrastructure, energy production and mining, biological resource harvesting, recreation and work in natural habitats, pollution, climate change and severe weather, invasive and problematic species, and disease (Alaska Shorebird Group 2008).

The Alaska Shorebird Group is a collaboration of wildlife agencies, academic researchers, conservation organizations, and other interested parties whose mission is to maintain or enhance current breeding populations, species diversity, and distribution of shorebirds throughout Alaska. This is done through research, population monitoring, habitat management and protection, environmental education and public outreach, international collaborations, and the implementation of the *Alaska Shorebird Conservation Plan* (Alaska Shorebird Group 2008). Table 3.2-15 lists the composite conservation prioritization scores (Conservation Rating) assigned by the Alaska Shorebird Group for shorebird species regularly occurring in the Izembek National Wildlife Refuge. Composite scores include consideration of the species population size and trend, threats on breeding habitats, threats on non-breeding habitats, and distribution on breeding grounds and wintering areas.

3.2.4.14 Seabirds

Habitat Use and Distribution

Many seabirds breed on or adjacent to Izembek National Wildlife Refuge, including Common Murres, Tufted and Horned Puffins, Cormorants (Red-faced, Double-crested, and Pelagic), Black-legged Kittiwakes, Pigeon Guillemots, and Glaucous-winged Gulls (Sowl 2004). Aleutian and Arctic Terns have been seen nesting at the Izembek Lagoon, but not much is known about their abundance and distribution (ADF&G 2010i). Seabird breeding colonies occur on offshore islands or on mainland cliffs while terns nest on sand flats, islands in lakes, and coastal barrier islands (Taylor and Sowl 2008). During the winter, seabirds may concentrate in waters offshore of the refuge when icing in the Bering Sea is extensive.

Abundance and Population Trend

The Service maintains the Beringian Seabird Colony Database as a baseline for colonial breeding seabirds in the Eastern Bering Sea and Gulf of Alaska (Stephensen and Irons 2003). For the species of seabirds that occur near Izembek National Wildlife Refuge, Table 3.2-16 provides population estimates and identifies their foraging guild.

Conservation Concerns

Seabird die-offs attributed to climatic effects and natural food shortages occur periodically. At times, shearwaters, storm-petrels and other seabirds are blown on shore during fall storms (Sowl 2004). Izembek National Wildlife Refuge staff have intermittently conducted beached bird surveys to help detect and monitor seabird die-offs. Other conservation concerns involve interactions with extensive commercial fishing operations in the Bering Sea, Aleutians, and the Gulf of Alaska, with some species being more susceptible to capture in fishing gear and oil pollution on the water (NOAA 2004b).

Table 3.2-16 Breeding Population Estimates and Foraging Guilds in the Eastern Bering Sea and Gulf of Alaska

Species	Foraging Guild[1]	Population	
		Eastern Bering Sea	Gulf of Alaska
Northern Fulmar	Pisc.	983,983	440,217
Fork-tailed Storm Petrel	Plank.	2,354,806	840,530
Leach's Storm Petrel	Plank.	2,483,392	1,067,952
Double-crested Cormorant	Pisc.	2,668	3,400
Pelagic Cormorant	Pisc.	24,184	19,257
Red-faced Cormorant	Pisc.	33,616	13,877
Mew Gull	Pisc.	234	14,135
Glaucous-winged Gull	Pisc.	85,199	167,036
Glaucous Gull	Pisc.	5,680	0
Black-legged Kittiwake	Pisc.	619,081	648,858
Arctic Tern	Pisc.	2,840	7,599
Aleutian Tern	Pisc.	2,770	6,793
Common Murre	Pisc.	1,505,849	1,326,793
Pigeon Guillemot	Pisc.	25,867	23,090
Ancient Murrelet	Plank.	54,363	164,403
Cassin's Auklet	Plank.	118,090	354,853
Least Auklet	Plank.	5,528,743	20
Parakeet Auklet	Plank.	349,181	57,992
Crested Auklet	Plank.	2,851,955	46,050
Tufted Puffin	Pisc.	1,389,380	888,864
Horned Puffin	Pisc.	160,513	760,265

[1]A piscivorous species (Pisc.) primarily feeds on fish, while a planktivorous species (Plank.) feeds on plankton and larvae. Source: Stephensen and Irons (2003).

3.2.4.15 Proposed Land Exchange Parcel and Project Site Summaries

Road Corridor

The bird life on the Izembek isthmus has been studied extensively although the specific footprints of the proposed road corridors have not been surveyed. In general, the corridors are likely to contain or be directly adjacent to nesting habitat for Tundra Swans, Northern Pintail, Green-winged Teal, Black Scoters, Greater Scalp, other ducks, Common Loons, Arctic and Aleutian Terns, Mew Gulls, Bald Eagles, Willow Ptarmigan, numerous songbirds, Rock Sandpipers, Dunlin, and other shorebirds. The Izembek isthmus provides foraging habitat for all of these nesting species and migrating Cackling Geese, other waterfowl, landbirds, and shorebirds. Resident Gyrfalcons also hunt for prey along the Izembek isthmus. The Izembek isthmus also serves as the main flight path for staging and wintering Emperor Geese, Brant, Tundra Swans, Steller's Eiders, other waterfowl, and other waterbirds as they move between Izembek and Moffet lagoons on the north side of the isthmus to Kinzarof Lagoon and Cold Bay on the south side.

Sitkinak Island

Very little information is available about bird habitat values of the Sitkinak parcel, although it appears to be primarily low wetlands. Emperor Geese have been documented in the adjacent lagoon in winter. The large lake and adjacent wetlands likely support a variety of waterfowl, other waterbirds, shorebirds, and landbirds for nesting and foraging.

State Lands

The State parcel lies to the north of the existing Izembek National Wildlife Refuge boundaries and has not been covered by many bird surveys. The southern half is primarily upland habitat and includes areas at higher elevations than any other parcels discussed in the EIS. It likely does not provide much habitat for waterfowl or other waterbirds but likely has good nesting and foraging habitat for Rock Ptarmigan and Willow Ptarmigan and other landbirds. Raptors such as Rough-legged Hawk, Golden Eagle, and Gyrfalcon may also find nesting habitat and hunting grounds on these higher elevations. The northern half has many wetland areas suitable for nesting Tundra Swans, Black Scoters, and other waterfowl, waterbirds, and shorebirds. The parcel also has shoreline along Bristol Bay which, although not as productive as the lagoons, provides some foraging and resting habitat for gulls, waterfowl, and shorebirds.

Mortensens Lagoon

This parcel contains primarily wetland areas, including a large lake, and shoreline habitat throughout Mortensens Lagoon. The wetlands support a high density of nesting Tundra Swans and likely other nesting waterfowl and shorebirds. Bald Eagle nests have been documented on the parcel and it likely supports a variety of other nesting landbirds. The shoreline and intertidal areas of Mortensens Lagoon are important foraging and resting habitat for Emperor Geese, migrating shorebirds and some waterbirds. It is also likely used by Gyrfalcons and other migratory raptors for hunting shorebirds and waterfowl.

Kinzarof Lagoon

These parcels have not been surveyed to the extent that the Izembek isthmus has, but likely provide nesting habitat for all of the same species listed above for the isthmus, although not necessarily in the same densities. These parcels lie between Kinzarof Lagoon and Cold Bay, both of which are important foraging and resting areas for most waterfowl, waterbird, and shorebird species. The shorelines and intertidal areas of these parcels are integral with the habitat values of these marine waters, which change throughout the seasons, but are important to a number of species in all seasons. The barrier islands of Kinzarof Lagoon provide nesting habitat for gulls, terns, Black Oystercatchers, and Common Eiders. They also provide molting habitat for Harlequin Ducks and roosting habitat for Emperor Geese, Brant, and other waterfowl.

King Cove Corporation Selected Lands

These lands lie inland from the Northeast Terminal site and do not border on any major waterbodies. This area is a mixture of wetland habitats in the northern half and upland habitats in the southern half. Although few inventories have been conducted, the area likely provides nesting and foraging habitat for the same species nesting on the isthmus, although not necessarily in the same densities. Tundra Swans nest in high densities in the wetland areas of this parcel, but not in the drier areas. The upland habitats likely provide good nesting and foraging habitat for ptarmigan and other landbirds.

Northeast Terminal, Lenard Harbor Ferry Terminal, Cold Bay Dock, and Cross Wind Cove Sites

The intertidal areas are important foraging and resting habitats for Rock Sandpipers, Dunlin, and other shorebirds and some waterbirds. As the majority of the terminal sites have been excavated for construction of hovercraft, ferry or landing craft facilities little habitat value remains. The Cold Bay dock structure provides breeding habitat for Pigeon Guillemots, Horned Puffins, Tree Swallows, and Common Raven. Pelagic Cormorants roost on the dock during winter. Cross Wind Cove provides foraging habitat for Emperor Geese, Rock Sandpipers, and Dunlin.

3.2.5 Land Mammals

Land mammals are an important category of wildlife. Maintaining wildlife populations and their habitats in their natural diversity is a primary purpose of the Izembek National Wildlife Refuge. The information in this section was compiled from existing information contained in resource agency reports, published literature, and personal communications. Common and scientific names of land mammals (Table 3.2-17) follow MacDonald and Cook (2009).

The proposed land exchange areas provide intact habitat for numerous species of wildlife, including several important large mammals. On the Alaska Peninsula, brown bears are abundant, feeding at streams rich with spawning salmon. Other large mammals on the treeless tundra landscape include caribou, moose, wolves, red fox, North American river otter, American mink, and wolverine. Small mammals such as Arctic ground squirrels, weasels, voles, and shrews flourish. Less common are Alaska hares, jumping mice, and lemmings (Service 2010h). On Sitkinak Island, mule (Sitka black-tailed) deer, North American river otter, red fox, and small mammals are present.

The long, thin shape of the Alaska Peninsula, coupled with numerous small lakes, streams and wetlands, which alternate with rugged volcanic peaks, creates a variety of habitat types. Large mammals of the region have evolved to migrate on a seasonal basis between areas to meet requirements for food, shelter, and breeding.

Many species of land mammals are hunted in the study area for subsistence and for recreational purposes. Subsistence use of land mammals is addressed in Section 3.3.7, Subsistence. Information on hunting of land mammals can be found in Section 3.3.6, Public Use, and to a lesser extent, Section 3.3.1, Land Ownership and Use.

3.2.5.1 Large Mammals

Brown Bear

Brown bears are probably as abundant now in Alaska as during earlier times, except where they have been displaced in human population centers and where livestock dominates the landscape. They are most common in areas of open tundra and grassland; den sites are often on hillsides (MacDonald and Cook 2009). Bears can occur in densities of up to 1 bear per square mile in productive areas (ADF&G 2011a). Brown bear are numerous along the Alaska Peninsula (MacDonald and Cook 2009) and relatively productive in comparison to other areas of the state; the Alaska Peninsula has some of the highest density brown bear populations in Alaska. In 2002, an aerial line transect survey was conducted on the southern Alaska Peninsula to estimate population size and density. Approximately 171.3 bears per 387 square miles were estimated to occur on the southern Alaska Peninsula (Becker and Quang n.d.). The population may be significantly larger because these mammals tend to be less active during daylight hours and are sometimes missed during daylight surveys (Service 1998a).

Table 3.2-17 Terrestrial Mammal Species with Potential to Occur in or near the Project Area

Common Names	Scientific Names
Cinereus (masked) shrew	*Sorex cinereus*
Dusky shrew	*Sorex monticolus*
Alaska (tundra) hare	*Lepus othus*
Arctic ground squirrel	*Spermophilis parryii*
American beaver	*Castor canadensis*
Collared lemming	*Dixrostonyx groenlandicus*
Brown lemming	*Lemmus trimucronatus*
Northern red-backed vole	*Myodes rutilus*
Root (tundra) vole	*Microtus oeconomus*
Meadow jumping mouse	*Zapus hudsonius*
North American porcupine	*Erethizon dorsatum*
Coyote	*Canis latrans*
Wolf	*Canis lupus*
Red fox	*Vulpes vulpes*
Brown bear	*Ursus arctos*
Wolverine	*Gulo gulo*
North American river otter	*Lontra canadensis*
Short-tailed weasel (ermine)	*Mustela ermine*
Least weasel	*Mustela nivalis*
American mink	*Mustela vison*
Moose	*Alces americanus*
Mule (Sitka black-tailed) deer	*Odocoileus hemionus sitkensis*
Caribou	*Rangifer tarandus*

Nomenclature according to MacDonald and Cook 2009.

Bears consume a variety of foods, including salmon, berries, grasses, sedges, cow parsnip, ground squirrels, carrion and roots. They are opportunistic feeders, and disperse widely, but focus on coastal grass flats, feeding on early growing herbaceous plants such as sedges. These are considered especially important because they provide a high quality food source during spring when brown bears are in their poorest condition. Brown bears are capable of hunting moose and caribou, especially newborns. As spring turns to summer and fall, brown bears move towards salmon spawning streams (ADF&G 2010i; ADF&G 2011a). Although generally solitary, they can form large groups near salmon spawning streams or other prime feeding locations.

By mid-November, brown bears move towards their upland denning sites (ADF&G 2010i). During the winter when food is limited, bears enter dens and sleep. The duration of denning is dependent on local conditions; where conditions are mild, they may stay active all winter.

The Joshua Green River watershed on the northeast side of Cold Bay supports the highest density of brown bears on Izembek National Wildlife Refuge and is considered to be the most important habitat for brown bears year round on the refuge. Figure 3.2-17 displays relative abundance of brown bear throughout the project area (Service 1998b) and Figure 3.2-18 displays the locations of brown bear sightings during August aerial surveys during 2007, 2008, and 2009 (Sowl 2009). The hills and mountains surrounding the Joshua Green River watershed are high density denning areas, including the Right and Left Hand Valleys (Service 1996). Lowland habitat provides important foraging areas during much of the summer. The abundance of salmon spawning in this region attracts an average density of 0.75 bears per square mile in late August (118 bears observed in 2002) compared to a spring density of 0.44 bears per square mile for the entire southern Alaska Peninsula (Sowl 2003). The Joshua Green River region is also a key natal area. Young bears produced in this area disperse throughout the southern Alaska Peninsula (Dau 1990). On average, 25 percent of the adult bears observed during August surveys in this area are maternal sows (Sowl 2003).

Brown bears in this portion of the Alaska Peninsula have very small home ranges (3.5-7.3 square miles; Dau 1990) compared to other areas on the Alaska Peninsula (over 96.5 square miles; Glen and Miller 1980). The small home ranges and high productivity of the Joshua Green River watershed result from a combination of high quality habitat, abundant food, and low levels of human disturbance. For this reason, Izembek National Wildlife Refuge cooperated with Alaska Department of Fish and Game to establish the Joshua Green Controlled Use Area in 1993 (Figure 3.2-19). This area is closed to the use of any motorized vehicle, except for outboard motor-powered boats for the purposes of sport hunting.

Conservation Concerns

Reported brown bear harvest throughout Game Management Unit 9 has steadily increased since the early 1980s (Butler 2009b), with not only the number of mature males (greater than 8 years old) in the harvest increasing but the proportion of the harvest composed of mature males also increasing. In addition, the Department recognizes that there are a large number of unreported illegal and defense of life and property bear kills each year, perhaps as many as 25 per year throughout Unit 9. Access to remote areas throughout Unit 9 via all-terrain vehicles or remote landing sites for small aircraft facilitate increased human/bear interactions that can result in unreported kills. Numerous requests submitted to the Board of Game to increase brown bear harvest to benefit moose and caribou survival continues to concern managers that an indiscriminate reduction of brown bear populations would not only threaten this healthy resource but would be an effective approach to increasing ungulate populations for sport and subsistence harvest.

Figure 3.2-17 Brown Bear Relative Abundance

M:\Projects\Federal\26220860 - Izembek EIS\MXD_PROJECTED\December Edits\Figure 3.2-17 Izembek Brown Bear Relative Abundance.mxd

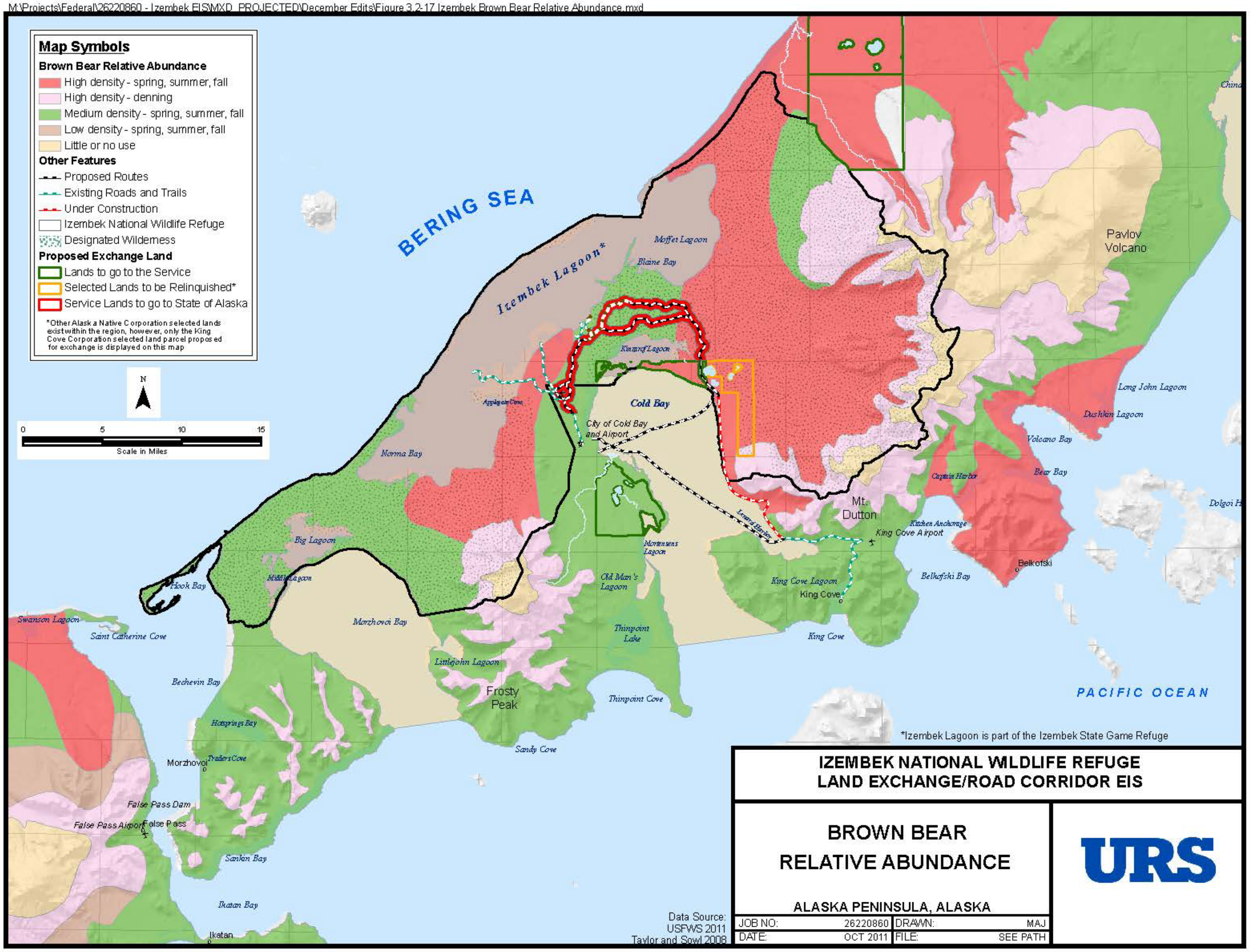


Figure 3.2-18 Brown Bear Observations

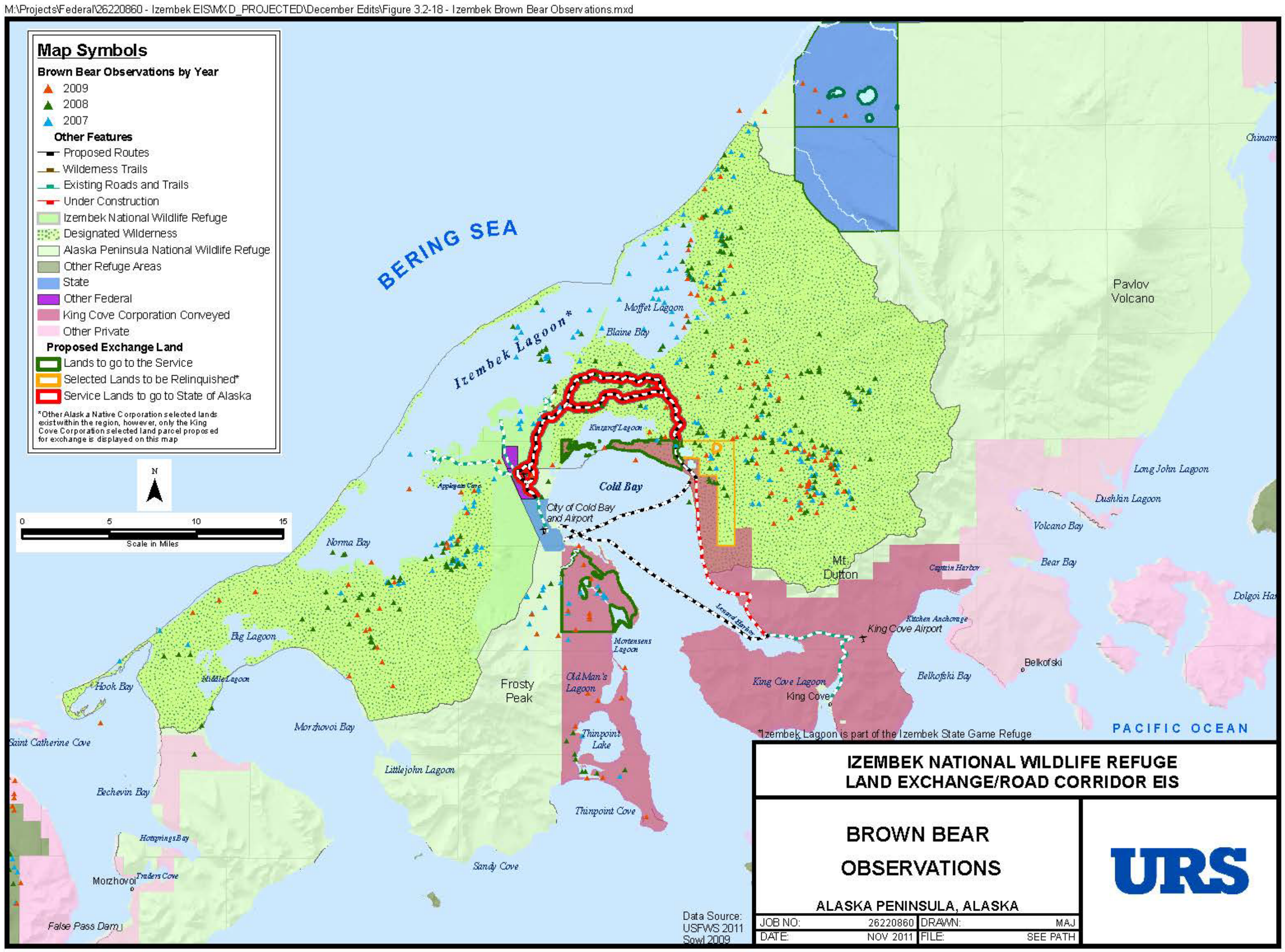
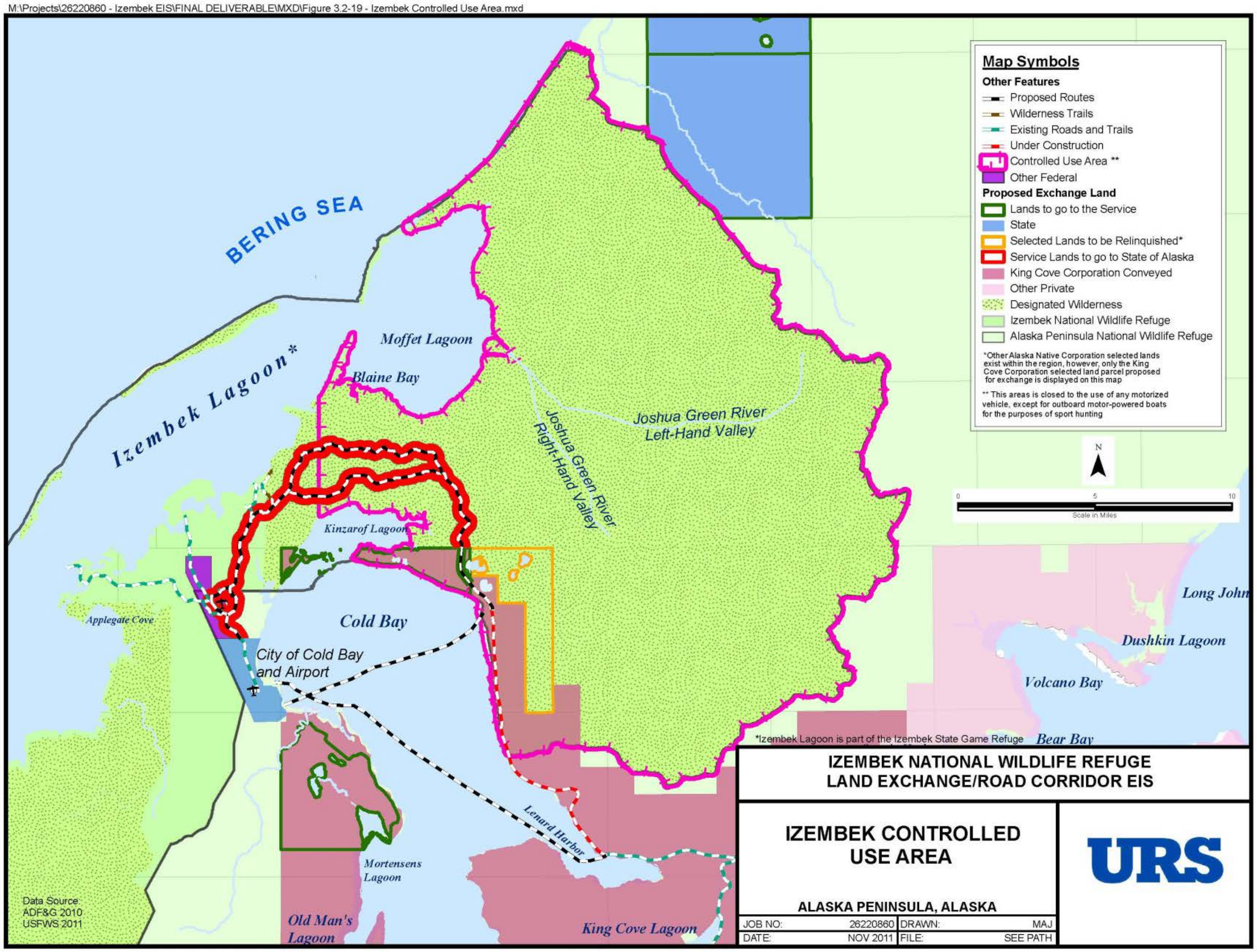


Figure 3.2-19 Izembek Controlled Use Area



Source: ADF&G 2010g

Caribou

Caribou are an important large mammal species in Alaska. Caribou range throughout the state in 32 discrete herds (ADF&G 2011c), some of which are shared with Canada's Yukon Territory. In general, caribou populations in Alaska are considered to be in healthy condition (MacDonald and Cook 2009).

The Southern Alaska Peninsula Caribou Herd occurs from Port Moller to Isanotski Strait/False Pass (Unimak Island). Adjacent herds are the Northern Alaska Peninsula Herd and the Unimak Herd. The Unimak Herd used to be considered part of the Southern Alaska Peninsula Caribou Herd, but has been designated as a separate herd due to calving group fidelity and recent evidence from genetic sampling.

Two sub-herds of the Southern Alaska Peninsula Caribou Herd have also been identified. One winters and calves in the Caribou River range near Pavlov Bay; the other winters around Cold Bay and calves on Black Hill northeast of the project area (Post 1995). Other subgroups of Alaska Peninsula herds have been reported to remain in a specific area year round (e.g., at the Cinder River near Aniakchak National Preserve) (Irvine 1976).

The Izembek isthmus, Cold Bay, and adjacent areas are located at the southern extent of the range of the Southern Alaska Peninsula Caribou Herd. The herd is actively managed to preserve herd integrity for subsistence purposes and big-game hunting (See Sections 3.3.7, Subsistence; 3.3.1, Land Ownership and Use; and 3.3.6, Public Use for more detail). Greater emphasis is placed on caribou in this section, than on other species, due to the importance of the Southern Alaska Caribou Herd to subsistence users, the herd's popularity with big game hunters, and concerns about low population levels in recent years. Subsistence and general caribou hunting has been closed in this area since 2008, with the exception of a re-opening of the federal subsistence caribou hunt as a limited registration permit hunt in 2012.

General Life History

Calving occurs in early June in southwestern Alaska. Females in very good condition can breed at 16 months old, but in most herds, they do not breed until 28 months. Most adult cows give birth to 1 calf every year. Predation is a major factor for calf survival. In some areas, wolves, brown bears, and Golden Eagles (*Aquila chrysaetos*) kill large numbers of newborns. After calving, caribou collect in large "postcalving aggregations" to avoid predators and escape mosquitoes and warble flies. These aggregations stay together in the high mountains and along seacoasts where wind and cool temperatures provide relief. They then scatter after insect numbers decline in August to feed heavily on willow leaves and mushrooms to regain body weight (ADF&G 2011c).

Caribou must keep moving to find adequate food. Large herds often migrate long distances (up to 400 miles) between summer and winter ranges. In Alaska, caribou prefer treeless tundra and mountains during all seasons, but many herds winter in the boreal forest. Calving areas are usually located in mountains or on open coastal tundra. Caribou tend to calve in the same general areas year after year, but migration routes used for many years may suddenly be abandoned in favor of movements to new areas with more food.

For the Southern Alaska Peninsula Caribou Herd, foraging preferences can vary by season and location. Generally, they prefer heath (dwarf shrub) habitat because of its high lichen cover (Post

1995; Talbot et al. 2000), their preferred forage. Other vegetation communities include wet and mesic sedge, willow (woody) wetlands, and riparian sedge. The study area contains a predominance of dwarf shrub and woody wetlands; however, the amount of lichen cover (less than 4 percent) and biomass on the Southern Alaska Peninsula represent the lowest reported for ranges of caribou and wild reindeer in mainland North America and Norway (Post 1995). However, a study of the Southern Alaska Peninsula Caribou Herd (Post and Klein 1999) recognizes that caribou productivity is noticeably influenced by forage quantity and quality on summer ranges.

Caribou movements are probably triggered by changing weather conditions, such as the onset of cold weather or snowstorms. The distances covered by the Southern Alaska Peninsula Caribou Herd are much smaller than other herds; therefore, instead of displaying a rapid and direct migration like other herds, they tend to leisurely follow a generally southerly fall migration toward wintering areas near the Izembek isthmus and Cold Bay and then drift towards calving grounds in the spring (Hemming 1971). Once migrating, caribou can travel up to 50 miles a day. Caribou apparently have a built in compass, like migratory birds, and can travel through areas that are unfamiliar to them to reach their calving grounds (ADF&G 2011c).

Because of the large area of ground covered annually by Alaska caribou, and the difficult survey conditions, much is still not known about the annual movements of the Southern Alaska Peninsula Caribou Herd. As said of this herd in Irvine (1976), “Many movements are not well understood or have no as yet perceivable pattern. Certain movements have been repeated for several years such as the movement to and from the calving grounds and to wintering areas, but within these large movements caribou may deviate from the normal path and much work remains to be done to determine if these movements have any significance.” Figures 3.2-21 and 3.2-22 identify known migration corridors and calving areas for caribou within and adjacent to the Izembek National Wildlife Refuge. Figure 3.2-20 displays the locations of caribou groups observed during 6 winter surveys.

Historical Population Trends

The size of the Southern Alaska Peninsula Herd has historically varied widely, in the range of 500 to 10,000 (ADF&G 2010i). It was in decline from 2002 to 2006 (Butler 2007). Valkenburg, et al. (2001) concluded that nutrition has had a significant effect on population growth for this herd, recognizing its long-term periodic (40-50 year) population fluctuations. The most current population estimate of greater than 920, along with the improved calf-to-cow ratio (20.0 calves to100 cows) and bull-to-cow ratio (40.2 bulls:100 cows) observed during the fall 2011 survey, demonstrate a recent improvement in calf survival and recruitment in the Southern Alaska Peninsula Caribou Herd following implementation of a wolf control program from 2008-2010 (see Wolf section below) (ADF&G 2012).”

Figure 3.2-20 Caribou Observations

M:\Projects\Federal\26220860 - Izembek EIS\MXD_PROJECTED\December Edits\Figure 3.2-20 - Izembek Caribou Observations.mxd

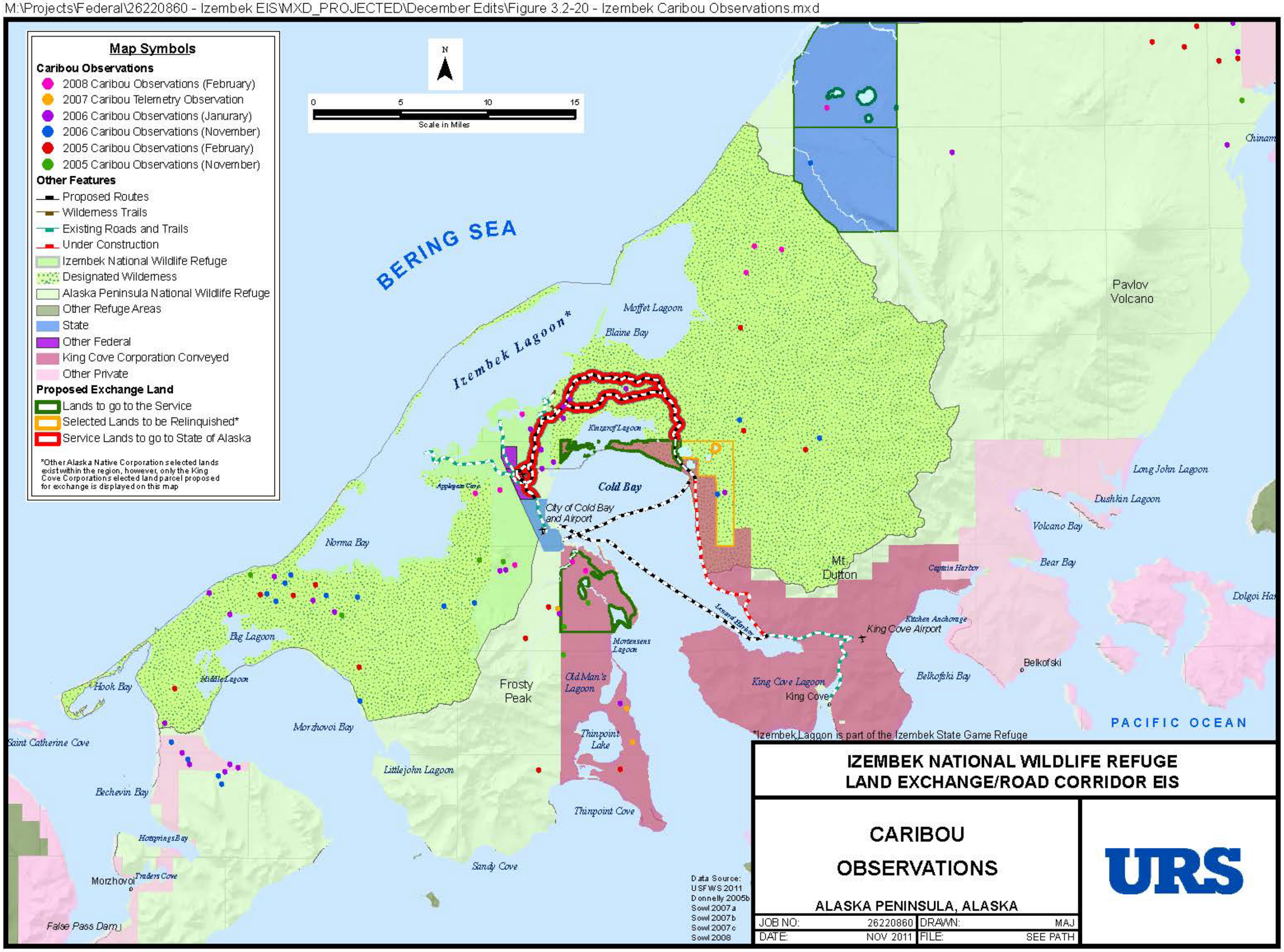
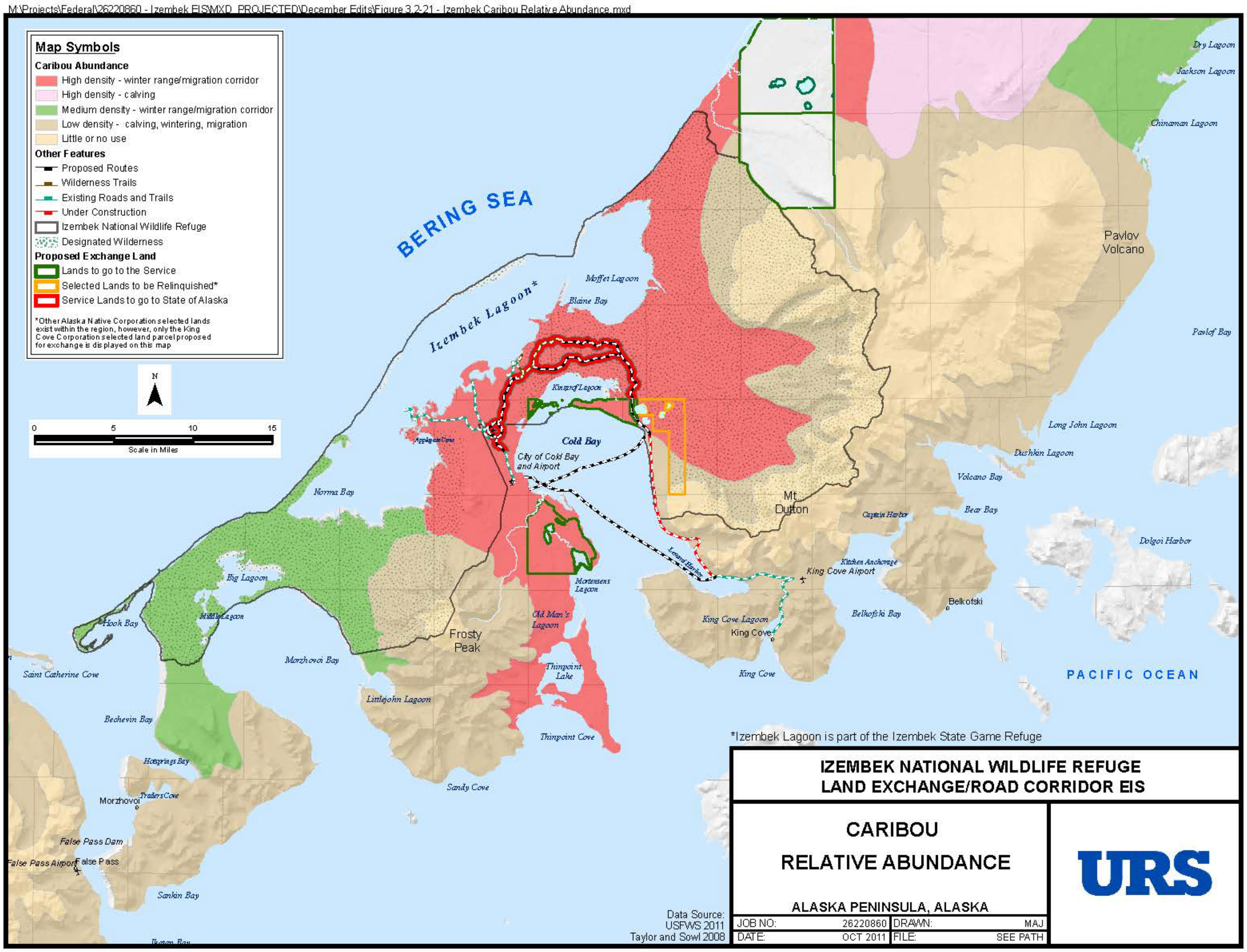
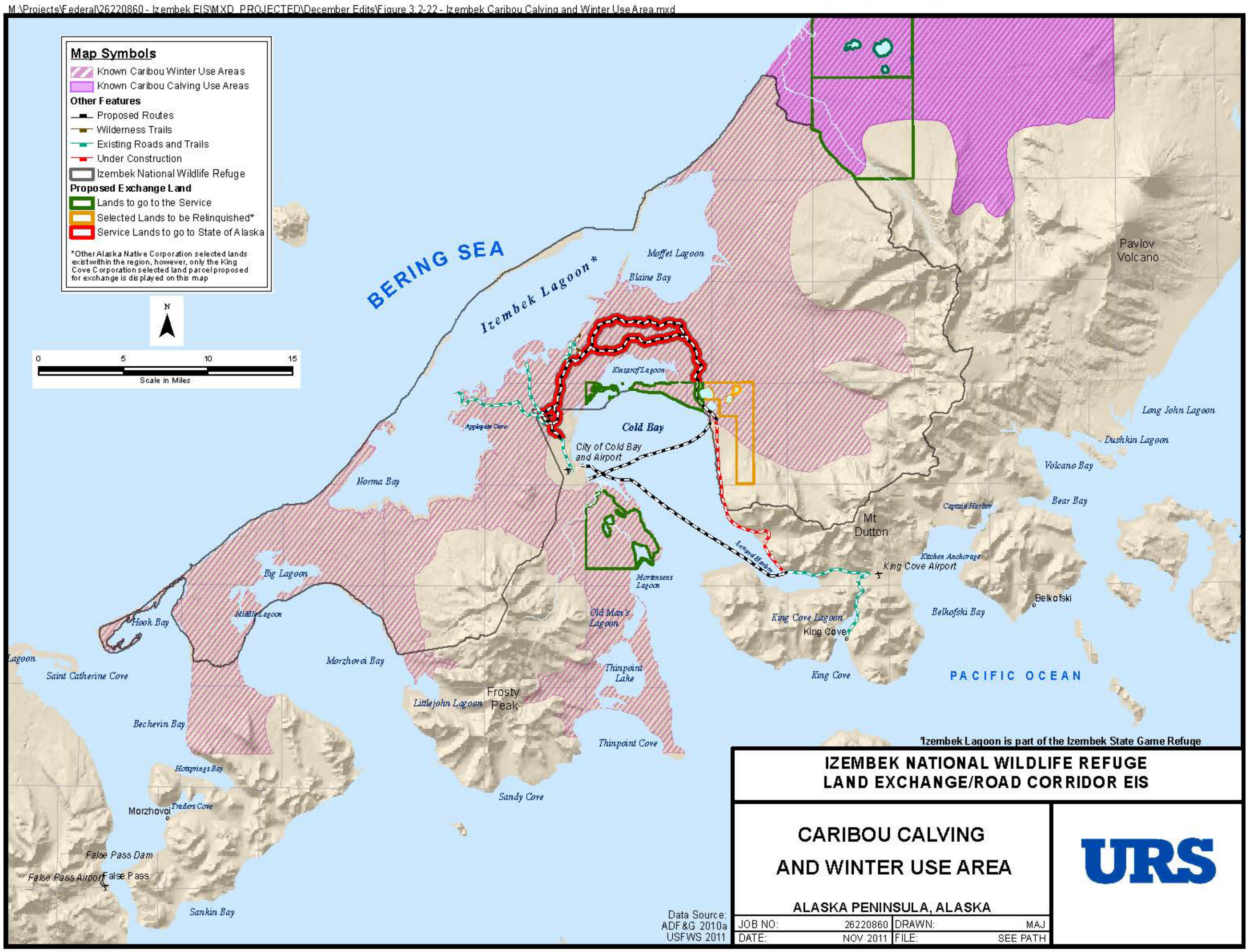


Figure 3.2-21 Caribou Relative Abundance



Source: ADF&G 2010i.

Figure 3.2-22 Caribou Calving and Winter Use Area



Source: Donnelly 2005a,b; Sowl 2007a,c,d, 2008

Skoog (1968) examined historical records of caribou on the Alaska Peninsula from 1875 to 1968. An excerpt is provided here, and post-1968 data are discussed following. At the time of publication, Skoog (1968) considered the area from Naknek Lake and River to Unimak Island (including the island) to be a single population. Since then, the Alaska Peninsula caribou have been subdivided into 3 herds; the following discussion encompasses what would now be considered the Northern Alaska Peninsula Herd, the Southern Alaska Peninsula Herd and the Unimak Island Herd. The author did recognize a separate population on Unimak Island, acknowledging crossing Isanotski Straight was possible, albeit sporadic and infrequent.

> In summary, the caribou population of the region has fluctuated considerably during the past 100 years, both in distribution and numbers. It would appear that prior to 1875 the population was large and was centered in the northeastern half of the Alaska Peninsula. The entire region was utilized, and seasonal movements extended both southward to Unimak Island and other coastal islands and northward into the Nushagak and Mulchatna River drainages of the mainland itself. It would seem logical that many animals wintered north of the Kvichak River, where lichens were most abundant. These plants are scarce south of the Naknek River drainage, possibly as a result of the relatively frequent volcanic eruptions in the south which periodically have blanketed the terrain with ash (see Powers, 1958). By the 1880's the southward movement essentially had stopped and in 1895 few animals remained to the southwest of Port Moller. The north-south movement across the Kvichak River also stopped about this time, and it seem likely that the bulk of the once large population had remained to the north of the Alaska Peninsula. This shift might have been influenced in part by the extensive hunting of caribou during the period of 1880-1910, occasioned by the high demand for meat and hides by the whalers and miners of that era and accentuated by the scarcity of sea otter, which caused the native to look elsewhere for revenue. By the 1905 the remaining population had shifted its center of abundance to the southwest of Port Moller, where it remained until the early 1940's. In 1925, O.J. Murie (1959) estimated the population at 12,000 animals. Three severe winters (1930-31, 1933-34, and 1938-39) resulted in heavy mortality, and a low point in the population probably was reached during the 1940's. On the other hand, an unknown number of [domestic] reindeer were absorbed into the population during 1930-1945. By 1949 the population was estimated at 2,500 and once again had shifted to the north; Unimak Island had been abandoned. Since then, Unimak has been repopulated, but most of the animals remain to the northeast of Moller. In numbers, it seems doubtful that the total population has exceeded 20,000 animals since the 1890's. The fluctuations in distribution and numbers that have occurred since then can be attributed probably to weather and perhaps, in part, to volcanic activity, both influences upon food supply and/or availability and therefore upon movements and survival. From a population estimated at 8,000 (calves excluded) in June, 1960, I estimate the current population (June 1967, calves excluded) at 16,000, assuming a 10 percent annual increase. I consider most of the Alaska Peninsula to be rather marginal habitat for a sustained large caribou population, because of the severe icing conditions that occur periodically. (Skoog 1968)

Others corroborate the theory that the size of the Southern Alaska Peninsula Herd has historically varied widely. Alaska Department of Fish and Game cites a population range of 500 to 10,000 (ADF&G 2010i) for the Southern Alaska Peninsula Caribou Herd. Most recently, the herd was growing between 1996 and 2002, and then in decline from 2002 to 2006 (Butler 2007, cited in ADF&G 2010i; Butler 2007).

In the spring of 2008, the Alaska Board of Game adopted an updated caribou management program in Game Management Unit (Unit) 9D (comprised of all sub-areas of the project area except Sitkinak Island). The intent of this revised operational plan was to address the number of caribou necessary to meet subsistence needs, to document new population objectives and specific management actions that will be implemented when the population reaches threshold levels (ADF&G 2008b). Surveys in 2007 indicated the number of caribou was approximately 600 with reportedly minimal caribou harvesting and good nutritional conditions for the herd. Adequate numbers of calves were being born, but nearly all of them were killed by predators within a few weeks of birth (ADF&G 2010j). Historical records indicate that this predator-prey cycle is long-standing (Skoog 1968). Subsequently, the Alaska Board of Game identified the Southern Alaska Peninsula Caribou Herd as “important for human consumption” under the state’s *Intensive Management Law* and mandated the Alaska Department of Fish and Game to take steps to “rescue the herd” (ADF&G 2011e).

A composition survey was conducted by Alaska Department of Fish and Game biologists on October 23, 2011. The herd was estimated to be comprised of 62.4 percent cows, 12.5 percent calves, and 25.1 percent bulls (ADF&G 2012). The trend from these data (in comparison to prior years) is that the proportion of calves has greatly increased following implementation of predator control from 2008-2010 (ADF&G 2012). Although the population of the herd is still low, it recently reached management objectives such that a limited subsistence hunt was implemented in 2012. An Operational Plan has been developed and adopted by both the Alaska Board of Game and the Federal Subsistence Board.

Conservation Concerns

Although calf recruitment has increased following the recent predator control efforts, the population of the herd is still below management objectives, which precludes subsistence harvest in the EIS project area (Butler 2009). Biologists have recognized similar and concurrent caribou population declines in other Southwest Alaska caribou herds and have speculated that nutritional stress or other unidentified environmental factors may be influencing these populations, but no weather patterns or changes in vegetative patterns have been observed as the basis for such a hypothesis. Butler (2009) has concluded that “a possible explanation of the initial decline is that the caribou range has not recovered sufficiently following the population high in the 1980s and the caribou were presented with a range reduced carrying capacity in the 2000s.” An Operational Plan has been developed and adopted by both the Alaska Board of Game and the Federal Subsistence Board.

Moose

Prior to the mid-1900s, moose were scarce on the Alaska Peninsula. However, even as moose populations increased and spread southwest onto the Alaska Peninsula during the 1950s and 1960s, they remained low south of Port Moller because of the scarcity of suitable habitat (ADF&G 2008a). Numbers of moose remain low on the southern portions of the Alaska

Peninsula. Moose can be found as far south as Cold Bay (Service 1987), and there have been reports of sightings as far south as False Pass on Unimak Island. Important winter foraging habitats for moose are found in riparian areas along streams, while upland shrub areas are used during summer.

Based on an extrapolation from a 1983 census of the central Alaska Peninsula, the Alaska Department of Fish and Game estimated in 2008 that the entire moose population for the western Alaska Peninsula (Unit 9D) was stable and probably contained about 600 moose (ADF&G 2008a). Although limited, the overall moose population of the local game management unit (Unit 9D) sustains a federal hunting season with a regulated harvest quota of 10 moose (Service 2010c) and a resident-only state hunting season. However, during surveys conducted in May and June 2002 for this area, the sex composition of this population was 87 bulls-to-100 cows, which indicates that the population is not heavily hunted (ADF&G 2008a).

Moose are rare within much of the Izembek National Wildlife Refuge, but are common on the State parcel northeast of Izembek National Wildlife Refuge because of the presence of shrub willow, which are preferred by moose. Most observations of moose on Izembek National Wildlife Refuge have been in the Joshua Green area near Moffet Lagoon, although a few sightings have also occurred near Kinzarof and Izembek lagoons and the City of Cold Bay. Moose have been recorded during a number of aerial wildlife surveys. Most recently, sightings have been of only a single or a few individuals, but 7 moose were reported to be observed in the Joshua Green Valley during an August 1998 bear survey. (Service 1998a) and 8 were observed during a November 2005 caribou survey (Donnelly 2005b). A cow with twin calves was observed in the Joshua Green area during an August 2006 bear survey (Sowl 2007). Although limited, the overall moose population of the local game management unit (Unit 9D) sustains a hunting season with a regulated harvest quota of 10 moose (Service 2010c).

During fall and winter, moose consume large quantities of willow-twigs. During summer, moose forage on forbs and grasses, the leaves of willow, and aquatic plants in shallow ponds, sedges, and equisetum (horsetail). Most moose make seasonal movements to calving, rutting, and wintering areas. They travel from only a few miles to as many as 60 miles during these transitions (ADF&G 2011d).

Brown bears kill calves primarily in the calves' first month of life, though they can kill calves and adults at any point when out of their winter dens (ADF&G 2008a). Wolves kill moose throughout the year. Predation limits the growth of many moose populations in Alaska (ADF&G 2011d).

Conservation Concerns

Low moose populations within the project area are due to limited habitat, illegal harvest and bear predation on neonate moose. Although regulatory adjustments can be made to reduce the possible effect of increased general and subsistence harvest in the future, increased access to remote areas of the Unit would likely further reduce moose populations through illegal harvest. Predator control efforts to reduce bear densities enough to affect moose populations would not be practical or publically acceptable.

Mule (Sitka Black-tailed) Deer

Mule (Sitka black-tailed) deer are native to Southeast Alaska, and have been introduced to the Yakutat area, Prince William Sound, and Kodiak Island (MacDonald and Cook 2009). Deer were introduced to Kodiak Island in 3 transplants, totaling 25 deer, between 1924 and 1934 (ADF&G 2010j). Deer were first noted on Sitkinak in the 1970s, probably colonizing the island from adjacent Kodiak Island. By the 1990s, they were well established (Van Daele 2011). They are not present on any of the other proposed land exchange parcels.

During summer, deer feed on herbaceous vegetation and the green leaves of trees and shrubs. During winter, they rely on evergreen forbs and woody browse. They prefer bunchberry and trailing bramble when snow depth allows access, however, during periods of deep snow, woody browse such as blueberry, yellow cedar and hemlock, and arboreal lichens are used. Woody browse alone is not an adequate diet and deer rapidly deplete their energy reserves when restricted to such forage (ADF&G 2011g).

Conservation Concerns

Without old-growth forest cover, which is common to most native mule (Sitka black-tailed) deer range, this introduced population on the Kodiak Archipelago is subject to severe population swings due to occasional deep snows and cold temperatures. Regulatory adjustments to liberalize harvest opportunities when the population rises, and closures during population declines, are the only practical management measures available to wildlife managers.

Wolf

The wolf occurs throughout mainland Alaska, on Unimak Island in the Aleutians, and on all of the major islands in Southeast except Admiralty, Baranof, and Chichagof (MacDonald and Cook 2009; ADF&G 2011h). Wolves are managed as both a big game animal and a furbearer, and are hunted and trapped in Alaska.

Wolves are highly social animals and usually live in packs of typically 2 to 12 animals, although packs of as many as 20 to 30 wolves sometimes occur. The average pack size is 6 or 7 animals. In most areas, wolf packs tend to remain within a territory used almost exclusively by pack members, with only occasional overlap in the ranges of neighboring packs (ADF&G 2011h). They can exist in a wide variety of climates and terrain (MacDonald and Cook 2009). Wolves that are primarily dependent on caribou may temporarily abandon their territories and travel long distances with their migratory prey. The territory of a pack often includes from 200 to 1,000 square miles of habitat, with the average in Interior Alaska being about 500 to 600 square miles ADF&G 2011h).

Wolf population survey techniques rely on snow cover to track wolf movements. Complete snow cover conditions, however, are uncommon on the southern Alaska Peninsula. Therefore, long-term status and trend population data for wolves on Izembek National Wildlife Refuge do not exist. In 1990, refuge staff estimated approximately 100 wolves in 16 packs on Izembek National Wildlife Refuge (Taylor and Sowl 2008). Wolf populations on the Alaska Peninsula are limited by prey abundance and rabies outbreaks (Taylor and Sowl 2008).

Reports from Alaska Department of Fish and Game suggest that little wolf hunting occurs in the study area. Hunters suggest that populations are increasing (ADF&G 2008). The best available data suggest that wolves probably occur at natural or typical densities in the area and the population appears to be healthy (Watts 2010).

Wolves using habitats adjacent to the Izembek National Wildlife Refuge have been the target of a recent predator control program conducted by the Alaska Department of Fish and Game to assist in the recovery of the Southern Alaska Peninsula Caribou Herd. During 2007 regulatory year, Alaska Department of Fish and Game biologists killed 28 wolves on the calving grounds (Figure 3.2-22) from helicopters. Additional wolf control occurred in 2008 (8 wolves killed) and 2009 (2 wolves killed). No wolves were killed during the 2010 effort (ADF&G 2012). The predator management program was conducted in the caribou calving areas east of the federally managed Izembek National Wildlife Refuge. Predator control was not authorized to occur on lands within Izembek National Wildlife Refuge or Alaska Peninsula National Wildlife Refuge. Following the four years of predator control the Alaska Department of Fish and Game reported that the fall bull caribou ratio had met management objectives for the first time since 2004. The calf ratio increased during the first year of the program, reversing the negative population trend. The program was suspended following the 2010 regulatory year activities.

Conservation concerns

The greatest conservation concern regarding wolves is the lack of accurate estimates of wolf populations in Game Management Unit 9D, due to the cost of conducting effective surveys and few opportunities to conduct surveys under suitable snow cover conditions. Estimates of populations based on sealing data is also unreliable because only limited wolf trapping and hunting occurs in the area, with the greatest efforts concentrated near communities.

3.2.5.2 Furbearers

Furbearing mammals, such as wolverine, North American river otter, and red fox, occur on the Alaska Peninsula. Population numbers are unknown, but they are trapped in many areas. Wolf (managed as both furbearer and big game species), river otter, wolverine, fox, American mink, coyote, and short-tailed weasel are economically important furbearers. American beaver are common to Sitkinak Island. While these species primarily inhabit upland areas, most make extensive use of the beaches, tidelands and submerged lands by foraging for carrion, small mammals and waterfowl. Weasels, red fox, mink, coyote and wolf are known to use the coastal tideland areas and water bodies searching for small mammals, carrion and other prey. Red foxes are abundant and seen year round along beaches, the tundra, and in the adjacent uplands. River otters are seen in coastal lagoons and on beaches and in the freshwater streams and lakes of the adjacent watersheds (ADF&G 2010f).

<u>Wolverine</u>

Wolverine is a widespread, but not abundant member of the Mustelidae family. They occur at low densities and require large expanses of wild lands. They are primarily solitary creatures throughout most of the year and are very sensitive to human disturbance. They occur the length of the Alaska Peninsula (MacDonald and Cook 2009; Copeland and Whitman 2003).

Wolverines travel extensively in search of food. Males generally have larger home ranges than females. Females without kits have larger ranges compared to females with kits, and home range size and use changes with season of the year. In Alaska, resident male home range sizes are large, ranging between 200-260 square miles. Movements of up to 40 miles per day have been documented (ADF&G 2011i); wolverines can occur from sea level to the tops of mountains (MacDonald and Cook 2009).

Wolverines are well adapted for scavenging, eating almost anything they can find. The wolverine has a powerful jaw and large neck muscles allowing it to crush and use bones and frozen flesh. They can survive for long periods on little food. Their diet reflects annual and seasonal changes in food availability. In the winter, wolverines primarily rely on the remains of moose and caribou killed by wolves, hunters or natural causes. Throughout the year, wolverines prey on small and medium-sized animals such as voles, squirrels, hares, and birds (ADF&G 2011i).

Conservation Concerns

The low population densities, large territorial requirements, and typically poor snow conditions of the region that inhibit good aerial population surveys and prevent managers from making reliable population status assessments. A population recovery, should over-harvest or other mortality factors increase, would be slow because of their low reproductive rate.

North American River Otter

North American river otter are found throughout Alaska, with the exception of the Aleutian Islands, the offshore islands of the Bering Sea, and the area adjacent to the arctic coast east of Point Lay (ADF&G 2008j). They are known to occur on the Alaska Peninsula (MacDonald and Cook 2009). They travel several miles overland between bodies of water and develop well-defined trails that are used year after year. They may flatten and dig up the vegetation or snow over an area of several square yards. River otters in Alaska hunt on land and in fresh and salt water. They eat snails, mussels, clams, sea urchins, insects, crabs, shrimp, octopi, frogs, a variety of fish, and occasionally birds, mammals, and vegetable matter. River otters have no significant predators except humans.

River otters are frequently observed on Izembek National Wildlife Refuge lands, and are presumed to occur on other portions of the study area. River otters are native to Sitkinak Island (Pyle 2010).

Conservation Concerns

River otters are pursued by local trappers, and populations can be influenced by trapping effort.

Red Fox

The red fox is found throughout Alaska, except for some of the islands of Southeast Alaska and the western Aleutians. Red fox are native to Kodiak Island, but are an introduced animal on many islands in the state as a result of fox farming operations in the early 1900s. The red fox lives in a wide variety of habitats (MacDonald and Cook 2009). The red fox is omnivorous. Although it might eat muskrats, squirrels, hares, birds, eggs, insects, vegetation, and carrion, voles seem to be its preferred food.

Red foxes are known to occur throughout the Alaska Peninsula (MacDonald and Cook 2009), on Izembek National Wildlife Refuge lands, the state lands parcel and Corporation lands where they occur year round along beaches, the tundra, and adjacent uplands (Service 2010h). Red foxes are established on Sitkinak Island, likely due to introduction for farming or hunting (MacDonald and Cook 2009; Paul 2009).

Conservation Concerns

Red fox are pursued by local trappers, and populations can be influenced by trapping effort. Wide-spread mortality of red fox can also occur as a result of epidemics of rabies, mange and distemper.

3.2.5.3 Small Mammals

The following description of small mammals on the Izembek National Wildlife Refuge was taken from the *Izembek National Wildlife Refuge Final Report of the 2004 Biological Program Review* (Taylor and Sowl 2008).

> Other terrestrial mammals that occur on Izembek NWR [National Wildlife Refuge] include porcupine, tundra hare, arctic ground squirrel, masked shrew, dusky shrew, northern red-backed vole, tundra (root) vole, brown lemming, Greenland collared lemming, and meadow jumping mouse. The small mammal populations that govern many tundra ecosystems are not as vital to the food web of Izembek NWR [National Wildlife Refuge]. Although many wildlife species prey on small mammals, a variety of other seasonal food sources are available, including salmon and salmon fry, bird eggs and young, migrating birds, beached animal carcasses, and intertidal invertebrates.
>
> Knowledge of the small mammals on Izembek NWR [National Wildlife Refuge] comes primarily from incidental trapping and a single study that inventoried habitats in the Cold Bay area (Murie 1959, Brown 1996). Brown (1996) observed that the most common and widespread members of the small mammal community on the Izembek NWR [National Wildlife Refuge] Unit were shrews, which were found in the majority of habitat types and usually in the greatest numbers. The highest concentrations of masked and dusky shrews were found near intertidal areas that provided a continual supply of marine invertebrates. Tundra voles were the dominant species on the barrier islands of Izembek Lagoon. Northern red-backed voles were found primarily in the foothill areas, while meadow jumping mice were found in small numbers in several habitat types. Both brown and collared lemmings occurred in low densities in alpine tundra areas. The arctic ground squirrel is ubiquitous on the tundra uplands and provides an important food resource for denning foxes, nesting eagles, post-denning brown bears, and other wildlife species.

The known status of small mammal species on Sitkinak Island is limited; however, the island is presumed to have a healthy population of at least some species due to the presence of foxes, which would rely on them for prey. According to William Pyle, Kodiak National Wildlife Refuge, native species on the island include the tundra vole, North American river otter and red fox (Pyle 2010).

The introduced Norway rat (an invasive species) has been recorded in King Cove (MacDonald and Cook 2009). Little brown myotis bats have been recorded at the northern end of the Alaska Peninsula as far south as King Salmon; the true extent of their distribution is not known (MacDonald and Cook 2009).

3.2.5.4 Harvest Regulatory Systems

Alaska has a dual system for the harvest of fish and wildlife resources, as both state and federal harvest regulations apply to much of the state. The federal land management agencies regulate subsistence harvest on federal public lands while the State of Alaska provides harvest opportunities for both recreational and subsistence purposes throughout the state. Subsistence harvest and associated federal regulations is discussed in more detail in Section 3.3.7. The foundation for the state's moose, caribou, and deer management regulations are described below.

The Alaska Legislature passed the *Intensive Management Law* in 1994. This law requires the Alaska Board of Game to identify moose, caribou, and deer populations that are especially important food sources for Alaskans, and to insure that these populations remain large enough to allow for adequate and sustained harvest (ADF&G 2010j). Intensive management is a process that starts with investigating the causes of low ungulate numbers, and then identifying steps to increase those numbers. This can include restricting hunting seasons and bag limits, evaluating and improving habitat, liberalizing harvest of predators, and predator control. Predator control currently occurs in specific areas totaling about 10 percent of the state. It is conducted only by authorized personnel and is managed differently than hunting (ADF&G 2010j). See the discussion on wolves (above) for information on the current status of the state's predator control efforts adjacent to the Izembek National Wildlife Refuge.

3.2.5.5 Proposed Land Exchange Parcel and Project Site Summaries

Road Corridors

Brown bears have been observed denning in the isthmus area and numerous brown bear sightings in the isthmus area, by refuge staff and visitors, have been recorded in the refuge's Incidental Wildlife Observations files since the 1960s (Service 2010e). This area of the proposed corridor is designated "medium density – spring, summer and fall" for brown bears (Service 1998b). According to the *Izembek State Game Refuge Management Plan*, important spring habitat occurs in and around the location of the proposed corridor (ADF&G 2010i, Map 9). No areas of high-density denning or feeding concentrations along streams occur in the area; however, lower concentrations of bears can occur. Bears in this area frequently roam Izembek Lagoon and the isthmus between the lagoon and Cold Bay in search of food. The bears also regularly roam the beaches of Kinzarof Lagoon and the proposed road corridor area when salmon are spawning. They visit the islands of Kinzarof Lagoon to raid the gull nesting colonies (Sowl 2011a). During point count surveys on the isthmus, bears were observed on 6 of 14 survey days during mid-June (Sowl 2011e). These bears use a wide variety of habitats, including tidelands and submerged lands, shorelands, lowland meadows and tundra, streams, midland tall shrub, and alpine zones (Taylor and Sowl 2008; ADF&G 2010i).

The interpretation of the relative importance of the isthmus to the Southern Alaska Peninsula Caribou Herd area varies through time. It is known that coastal storms can result in severe icing conditions during some winters, which may inhibit feeding activities over large areas (Hemming 1971; Butler 2010). Several studies of caribou herds have shown that it is not unusual for caribou to shift their breeding and wintering ranges. Skoog (1968) observed that the Alaska Peninsula Herd seems to have drifted up and down the Alaska Peninsula, with varied areas of concentrated use over the past century. An Alaska Department of Fish and Game Wildlife Technical Bulletin, *The Distribution Movement Patterns of Caribou in Alaska* (Hemming 1971), does not include the isthmus area as part of either the summer or winter range of the Southern Alaska Peninsula Caribou Herd. The winter range is shown on Figure 16 of the technical bulletin as occurring between Joshua Green River and Port Moller. A 1976 report from the Alaska Department of Fish and Game, *Population Size of the Alaska Peninsula Caribou Herd*, does show the area in the isthmus and around Cold Bay as part of the winter range (Irvine 1976; Figure 1). Post (1995) states that only a subset of the population migrates through the isthmus. The Black Hills group calves and spends summers in the mid-elevation foothills around Black Hill and Trader Mountain (approximately 35 miles northeast of the isthmus), then migrates to the low-lying *Empetrum nigrum*-dominated dwarf shrub heath around Cold Bay for winter. In contrast, the Caribou River group is resident year round in the sedge meadow plains transected by the Caribou River (more than 40 miles northeast of the isthmus) (Post 1995). According to the *Land Protection Plan for Izembek National Wildlife Refuge Complex*, caribou move through the isthmus area in the winter when they cross the isthmus between Izembek and Kinzarof lagoons (Service 1998b). The entire isthmus area is designated "high density – winter range/migration corridor" for caribou (Figure 3.2-21). Primary wintering areas are on Izembek National Wildlife Refuge to the west of the isthmus and calving and summer areas are south of Port Moller, east of the isthmus (Service 1998b). Also, according to unpublished Service data, the isthmus is a known winter use area (Service 2008c). Caribou have been routinely documented during the winter in the foothills of Frosty Peak, on the isthmus between Izembek and Kinzarof lagoons, and in the Joshua Green River area by the Service during aerial surveys (Figure 3.2-20) (Service, 2008c). Therefore, while the isthmus is a well-documented caribou use area in recent times, caribou movements and land use patterns shift as a result of caribou densities and other influences. Thus, use of an area, such as the isthmus, would be expected to vary.

Moose are considered an infrequent visitor to this area and mule (Sitka black-tailed) deer do not occur on Izembek National Wildlife Refuge. Wolves are known to occur in the Izembek National Wildlife Refuge and have been observed in the proposed road corridors, on beaches in northwest Cold Bay, and within the Cold Bay road system. Wolverines are known to occur on Izembek National Wildlife Refuge (Taylor and Sowl 2008). Because of their large home range and solitary nature, it is assumed that wolverines occur on the other nearby portions of the study area. River otters and red fox are also frequently observed on Izembek National Wildlife Refuge lands.

Small mammals common to the area include shrews, northern red-backed voles, meadow jumping mice, brown and collared lemmings, and Arctic ground squirrels.

Sitkinak Island

No brown bear are known to occur on Sitkinak Island (ADNR 2004b). Caribou and moose are also not known to occur on this parcel.

Mule (Sitka black-tailed) deer occur on Sitkinak Island. An introduced species, the original stock for transplants to Kodiak came from the Sitka area, Petersburg, and Prince of Wales Island. The species eventually expanded to Sitkinak Island, which supports perhaps 10,000 deer due to the good availability of forage grasses (Watts 2010). The proposed exchange parcel contains beach and tidelands used by deer for foraging during periods of deep snow.

Wolves do not occur on Sitkinak Island; they are absent from the Kodiak Island group. Wolverine are also absent from the Kodiak Island group, which includes Sitkinak Island (Alaskool 2010).

River otter are native to Sitkinak Island (Pyle 2010) and red fox are indigenous to the Kodiak archipelago and occur on most of the islands, including Sitkinak. Semi-domesticated blue fox were commonly put on small islands and on fox farms up until the mid-20th century, most of which eventually escaped and interbred with native foxes. The origin and genetic composition of the foxes on Sitkinak are unknown (MacDonald and Cook 2009; Paul 2009; Van Daele 2011).

Beaver were introduced to Kodiak Island and have colonized most of the archipelago. They occur on Sitkinak Island with lodges evident along the road system (Van Daele 2011). Small mammals present on Sitkinak Island also include tundra vole (Pyle 2010).

State Lands

Brown bear are known to occur on these state lands. Important spring foraging habitat occurs throughout the northern part, along the coastline of Bristol Bay. Concentrations of feeding bears are also known to occur along stream tributaries, which drain to Bristol Bay (ADF&G 2010i, Map 9) (See Figure 3.2-17). The refuge areas immediately east and west of this parcel are designated “high density – spring, summer and fall” and the area immediately south is designated “high density – denning” and “medium density – spring, summer and fall.” (Service 1998b). State lands are not designated under this ranking system. This area is not far from the Joshua Green River watershed which is heavily used by brown bears. The bears use a wide variety of habitats, including tidelands and submerged lands, shorelands, lowland meadows and tundra, streams, midland tall shrub, and alpine zones (Taylor and Sowl 2008; ADF&G 2010i). All of those habitats occur within this parcel.

The State parcel lies within the known calving use area (Figure 3.2-22) of the Southern Alaska Peninsula Caribou Herd, and similar to the Izembek isthmus, caribou may use the area in spring and fall and to some extent in winter. According to surveys in 2007-08, caribou tended to cluster on the North Creek and Cathedral River drainages in spring and fall within and adjacent to this parcel (Service 2008c). This parcel is also part of the area subject to wolf control discussed above. The Service (1998a) rates lands to the east and west of the parcel “high density – winter range/migration corridor;” however, because the parcel is currently state land, it is not given a specific designation by the Service.

Moose are common on the State parcel, within the North Creek and Cathedral river drainages.

Wolves occur on the State parcel. This is part of the area subject to wolf control by the Alaska Department of Fish and Game, which began in 2008, in an attempt to stabilize the caribou herd loss due to wolf predation of calves.

Wolverines are known to occur on Izembek National Wildlife Refuge (Taylor and Sowl 2008) and because of their large home range and solitary nature it is assumed they occur on these nearby portions of the study area. River otters and red fox are common to this area and small mammals common to this parcel include shrews, northern red-backed voles, meadow jumping mice, brown and collared lemmings, and Arctic ground squirrels.

Mortensens Lagoon

Brown bears are known to occur within these lands, which includes important summer and fall use when salmon are spawning. Most of this land is designated “medium density – spring, summer and fall” by the Service (1998a). Important spring habitat occurs throughout most of the parcels, and high density denning sites occur nearby on the slopes of Frosty Peak (ADF&G 2010i, Map 9), which is outside the project site.

As shown in Figure 3.2-22, these lands are known to have caribou during the winter (ADF&G 2010i, Map 8). This area is designated “high density – winter range/migration corridor” for caribou (Service 1998b) (Figure 3.2-21). Moose could be occasional visitors.

Given the wide-ranging habits of wolves, it is probable that wolves occur on these corporation lands. Wolverines are known to occur on Izembek National Wildlife Refuge (Taylor and Sowl 2008) and because of their large home range and solitary nature it is assumed that they occur on these nearby portions of the study area.

River otters and red fox are common to this area and small mammals common to the area include shrews, northern red-backed voles, meadow jumping mice, brown and collared lemmings, and Arctic ground squirrels.

Kinzarof Lagoon

Brown bear are known to occur within these lands, which are designated as important spring habitat. The western parcel lies within the Joshua Green Controlled Use Area (Figure 3.2-19), where no motorized vehicles can be used for hunting, transporting game, or equipment, to maintain this high quality bear habitat.

This area is designated “high density – winter range/migration corridor” for caribou (Service 1998b) (Figure 3.2-21). Moose could be occasional visitors to the lands.

Given the wide-ranging habits of wolves, it is probable that wolves occur on these lands. Wolverines are known to occur on Izembek National Wildlife Refuge (Taylor and Sowl 2008) and because of their large home range and solitary nature it is assumed they occur on these nearby portions of the study area.

River otters and red fox are common to this area. Small mammals common to the area include shrews, northern red-backed voles, meadow jumping mice, both brown and collared lemmings, and Arctic ground squirrels.

King Cove Corporation Selected Lands

Brown bears are known to occur within these selected lands, which lie within the Joshua Green Controlled Use Area. These selected lands, which are located only 3 miles southwest of the Joshua Green River watershed, are designated as important spring habitat.

Figure 3.2-22 shows that the selected lands are known to have caribou during the winter (ADF&G 2010i, Map 8). The northern portion of this area is designated “high density – winter range/migration corridor” for caribou (Service 1998b) Moose could be occasional visitors to the selected lands.

Given the wide-ranging habits of wolves, it is probable that wolves occur on these selected lands. Wolverines are known to occur on Izembek National Wildlife Refuge (Taylor and Sowl 2008) and because of their large home range and solitary nature it is assumed they occur on these nearby portions of the study area.

River otters and red fox are common to this area. Small mammals common to the area include shrews, northern red-backed voles, meadow jumping mice, brown and collared lemmings, and Arctic ground squirrels.

Northeast Terminal Site

The area adjacent to the beach of the Northeast Terminal site is designated “medium density – spring, summer and fall” (Service 1998b) for brown bear. This site also lies within the Joshua Green Controlled Use Area and is also designated as important spring habitat for brown bear.

As shown in Figure 3.2-22, this site is within an area known to have caribou during the winter (ADF&G 2010i, Map 8) In Figure 3.2-21, it is designated “high density – winter range/migration corridor” for caribou (Service 1998b) and moose have been observed as far south as Cold Bay (Service 2010h) and could therefore be considered occasional visitors to this site.

Given the wide-ranging habits of wolves, it is probable that wolves occasionally travel through this site. Wolverines are known to occur on Izembek National Wildlife Refuge (Taylor and Sowl 2008), but because of their solitary nature it is unlikely that they would use or even pass through this site.

River otters and red fox are common to this area. Small mammals common to the area include shrews, northern red-backed voles, meadow jumping mice, brown and collared lemmings, and Arctic ground squirrels.

Lenard Harbor Ferry Terminal Site

The beach at the Lenard Harbor site is located within an area designated “medium density – spring, summer and fall” (Service 1998b) for brown bear; however, human activity is adjacent to this site and brown bear may occur there less frequently. The higher elevation landscape adjacent to the Lenard Harbor site is recognized as high density denning habitat (ADF&G 2010i, Map 9).

This site is considered low density winter range/migration for the Southern Alaska Peninsula Caribou Herd by the Service (Figure 3.2-21); however, the Alaska Department of Fish and Game identifies the site as outside the known winter use area (Figure 3.2-22). Moose could be occasional visitors to this site.

Given the wide-ranging habits of wolves, it is probable that wolves occasionally travel through this site. Wolverines are known to occur on Izembek National Wildlife Refuge (Taylor and Sowl 2008), but because of their solitary nature it is unlikely that they would use or even pass through this site.

River otters and red fox are common to this area. Small mammals common to the area include shrews, northern red-backed voles, meadow jumping mice, both brown and collared lemmings, and arctic ground squirrels.

Cold Bay Dock Site and Cross Wind Cove

These sites also lie within the area designated as important spring habitat for brown bear (ADF&G 2010i, Map 9).

The sites are considered high density winter range/migration for the Southern Alaska Peninsula Caribou Herd by the Service (Figure 3.2-21); however, the Alaska Department of Fish and Game identifies the site as outside the known winter use area (Figure 3.2-22).

Moose have been observed as far south as Cold Bay (Service 2010h); therefore, they could be considered occasional visitors to this area.

Given the wide-ranging habits of wolves, it is probable wolves occasionally travel through this area. Wolverines are known to occur on Izembek National Wildlife Refuge (Taylor and Sowl 2008), but because of their solitary nature it is unlikely that they would use or even pass through these sites. River otters and red fox are common to the area. Small mammals common to the area include shrews, northern red-backed voles, meadow jumping mice, both brown and collared lemmings, and Arctic ground squirrels.

3.2.6 Marine Mammals

Fourteen species of marine mammals inhabit the North Pacific Ocean adjacent to Cold Bay and the Bering Sea adjacent to Izembek Lagoon (Table 3.2-18): harbor seal, Steller sea lion, northern fur seal, Pacific walrus, northern sea otter, beluga whale, killer whale, Pacific white-sided dolphin, harbor porpoise, Dall's porpoise, gray whale, humpback whale, fin whale, and minke whale (Allen and Angliss 2010; Zerbini et al. 2006; Moore et al. 2002). Two marine mammal species have been reported to occur on Sitkinak Island: Steller sea lion and harbor seal (Fritz et al. 2008a, Fritz et al. 2008b; Jemison et al. 2006; Hastings et al. 2004).

Table 3.2-18 Marine Mammal Species with Potential to Occur in the Vicinity of the Project Area

Common Names	Scientific Names
Harbor seal	*Phoca vitulina richardsi*
Steller sea lion	*Eumetopias jubatus*
Northern fur seal	*Callorhinus ursinus*
Pacific walrus	*Odobenus rosmarus*
Northern sea otter	*Enhydra lutris kenyoni*
Beluga whale	*Delphinapterus leucas*
Killer whale	*Orcinus orca*
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*
Harbor porpoise	*Phocoena phocoena*
Dall's porpoise	*Phocoenoides dalli*
Gray whale	*Eschrichtius robustus*
Humpback whale	*Megaptera novaeangliae*
Fin whale	*Balaenoptera physalus*
Minke whale	*Balaenoptera acutorostrata*

Northern fur seals, beluga whales, Pacific white-sided dolphins, Dall's porpoise, humpback whales, fin whales, and minke whales are either rarely or never seen within the coastal waters adjacent to the parcels proposed for exchange, so will not be further discussed. Pacific walrus have reportedly been observed offshore of Izembek Lagoon (Sowl 2011h), but with insufficient frequency or documentation to warrant further discussion. Steller sea lions and northern sea otters are discussed in Section 3.2.7, Threatened and Endangered Species.

The remaining species (harbor seal, killer whale, harbor porpoise, and gray whale) have been documented in or adjacent to Izembek Lagoon, Kinzarof Lagoon, or Cold Bay through personal observations and aerial surveys conducted by the National Marine Fisheries Service and the Service during the past decade (Taylor and Sowl 2008; Larned and Bollinger 2008, 2009; Dau and Mallek 2008, 2009; Mallek and Dau 2007; Bohl 2008; Sowl 2011d). Harbor seals and killer whales are the focus of this section because they are the most commonly observed species. Harbor porpoise and gray whales are periodically recorded as incidental observations and are noted below. All 4 species are federally protected under the *Marine Mammal Protection Act*.

Life history data likely do not differ for harbor seals and killer whales between the Izembek Lagoon, Cold Bay, and Sitkinak Island land exchange areas; baseline information for all locations have been combined.

3.2.6.1 Harbor Seal

Under the most recently published National Marine Fisheries Service management plan, harbor seals in the Cold Bay area and around Sitkinak Island have been classified as part of the Gulf of Alaska stock and seals in Izembek Lagoon part of the Bering Sea stock (Allen and Angliss 2010). Current abundance estimates for the Gulf of Alaska and Bering Sea stocks are 45,975 and 21,651, respectively. The National Marine Fisheries Service has, however, recognized that the current stock structure may not be appropriate (Allen and Angliss 2010). Recent studies indicated at least 12 genetically distinct sub-populations of harbor seals in Alaska (O'Corry-Crowe, Martien, and Taylor 2003; Westlake and O'Corry-Crowe 2002). As a result, boundaries for 12 new management stocks are currently being finalized. Under the revised stock structure, Izembek Lagoon is part of the Bristol Bay stock, Cold Bay is assigned to the Cook Inlet/Shelikof Strait stock, and Sitkinak Island is in the South Kodiak stock. Updated assessments of abundance and trends of these respective stocks are in progress and not currently available (London 2011).

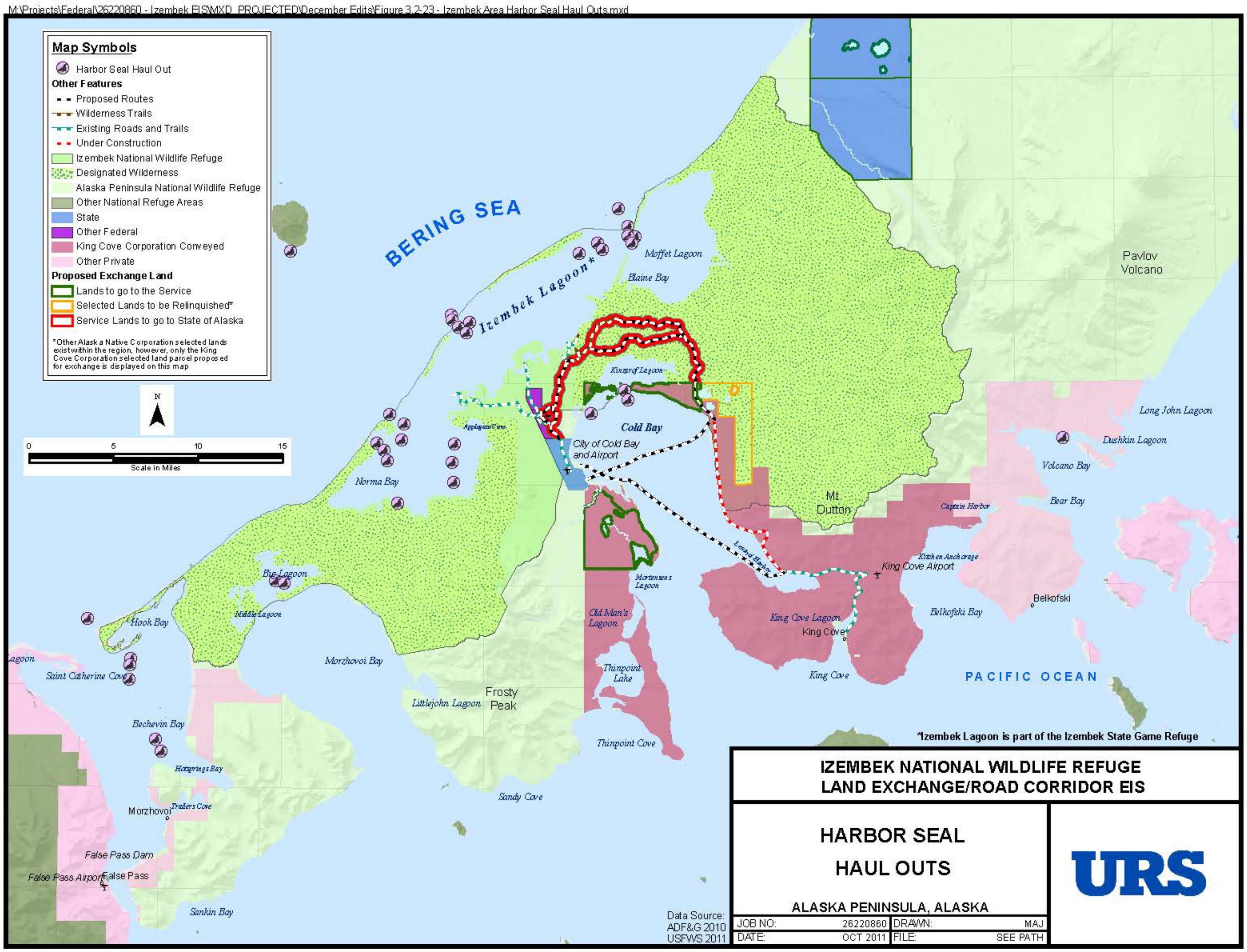
Harbor seals are not listed as "depleted" under the *Marine Mammal Protection Act* or listed under the *Endangered Species Act*.

Adult harbor seals can reach 5-6 feet in length and weigh approximately 150 pounds. Harbor seals have little sexual dimorphism, but males tend to be slightly larger than females. Harbor seals molt annually, in August and September, and spend significantly more time hauled out during the molting season (Daniel et al. 2003). They reach sexual maturity at 3-5 years and typically give birth to 1 pup per year during May through July. Average pup weight is 7 pounds and pups begin swimming within hours of birth (Greaves et al. 2005). In general, site fidelity in harbor seals is considerable and long range movements are rare. However, some long distance movements of tagged harbor seals have been documented in Alaska (Lowry et al. 2001).

Adult harbor seals are able to dive to depths up to 1,600 feet and can remain submerged for more than 20 minutes. The majority of dives are less than 65 feet and under 4 minutes in duration (Hastings et al. 2004). While pups begin swimming within hours of birth, these dives are shorter and shallower than their adult counterparts. Harbor seals are opportunistic feeders and eat a wide variety of fish and invertebrate species (Iverson, Frost, and Lowry 1997). The diet composition of harbor seals is known to vary seasonally, regionally, and most likely annually. Common prey items include herring, pollock, salmon, cod, and squid and crustaceans (Jemison 2001; Iverson, Frost, and Lowry 1997).

Harbor seals generally inhabit coastal waters and lagoons and haul out on rocks, reefs, beaches, and drifting glacial ice. Many factors determine haul out behavior including tides, weather, time of day, and life history traits such as age, molting, and reproduction. Harbor seals inhabit Cold Bay and Izembek Lagoon year round and use marine, estuarine, and freshwater habitats on a seasonal basis (USACE 2003) (Figure 3.2-23). Aerial surveys conducted by the National Marine Fisheries Service in August 2000 observed nearly 1,000 harbor seals per day in Izembek Lagoon (Withrow et al. 2001). Several studies conducted by the National Marine Fisheries Service and the Service have estimated approximately 200 harbor seals frequent Kinzarof flats and Cold Bay throughout the year (USACE 2003).

Figure 3.2-23 Harbor Seal Haul Outs



Harbor seals have been observed and tagged on Sitkinak Island (Jemison et al. 2006; Hastings et al. 2004; Boveng et al. 2003) at 3 primary haul out sites: Northeast Sitkinak Lagoon, South Sitkinak Lagoon, and Southeast Sitkinak Island (Small, Pendleton, and Pitcher 2003). Additional sites (northwest beach, an area east of the southeast site and areas along the northeast) have been recognized on the Sitkinak Island Conservation Plan map (NRCS 2011), and concurred with by the Alaska Department of Fish and Game (Goodglick 2011). The lagoon sites overlap or abut the parcels considered for exchange (Figure 3.2-24). Maximum counts from surveys during the molt period in August, 1999-2004, ranged from 137 (2000) to 205 (1999) at the North Lagoon site and from 84 (2001) to 213 (2004) at the South Lagoon site. Counts at the Southeast Sitkinak beach site are usually twice the maximum counts at the lagoon sites (Wynne 2011).

Conservation Concerns

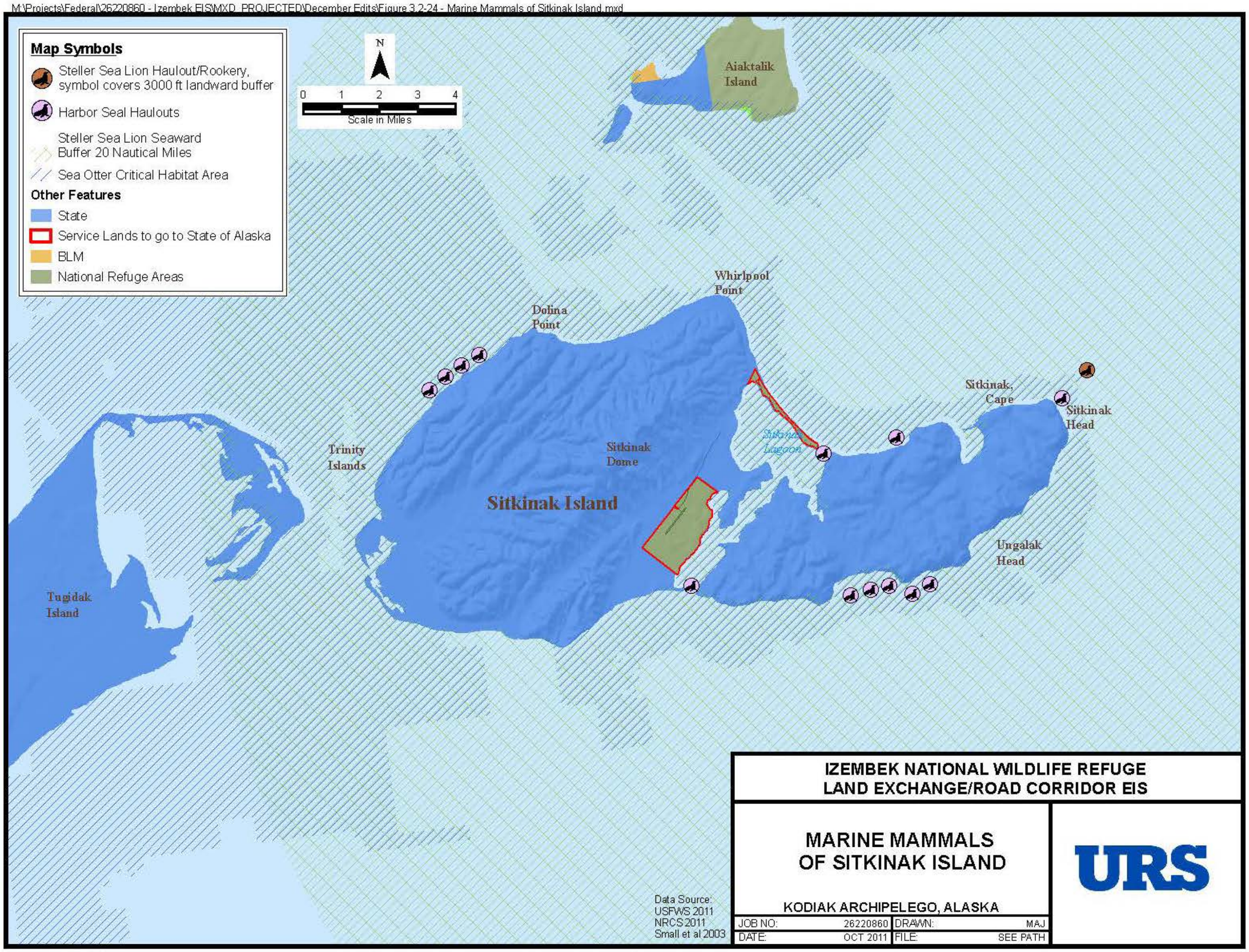
None of the stocks of harbor seals in Alaska are listed under the *Endangered Species Act* or designated as "depleted" under the *Marine Mammal Protection Act*. All are, however, subject to some level of human-caused mortality and injury, the sources of which include entanglement in fishing gear, occasional ship strikes, and subsistence harvests. A reliable estimate of the mortality rate incidental to commercial fisheries is currently unavailable because of lack of observer coverage in the salmon gillnet fisheries known to interact with several stocks of harbor seals. A mean annual mortality of 0.4 harbor seals was estimated for commercial groundfish fisheries for 2007 to 2009 (Allen and Angliss 2012). Alaska Native subsistence harvest of harbor seals has been estimated by the Alaska Native Harbor Seal Commission and the Alaska Department of Fish and Game. Information from the Alaska Department of Fish and Game indicates average annual harvest levels were 141 from the Bristol Bay stock, 78 from the South Kodiak stock, and 233 from the Cook Inlet/Shelikof stock from 2002 to 2008 (Allen and Angliss 2012).

3.2.6.2 Killer Whale

Killer whales are present in all oceans and seas of the world (Forney and Wade 2007). Three ecotypes are recognized that exhibit distinct prey preferences: "residents" and "offshores," which feed on fish; and "transients," which specialize on marine mammals. While little is known about the seasonal movements of killer whales, they have been observed in Alaska year round (Forney and Wade 2007). Observational reports of killer whales in Cold Bay include whales preying on marine mammals (sea otter and unidentified marine mammal; Sowl 2011a). It is therefore assumed that these animals belong to the transient ecotype. Recent surveys of killer whales in the western Gulf of Alaska and eastern Aleutian Islands corroborate this likelihood. On the south side of the Alaska Peninsula, all killer whale sightings by Zerbini et al. (2007) from Unimak Island (west of Cold Bay) to the Shumagin Islands (east of Cold Bay) were of the transient ecotype. Spring surveys in the False Pass region of Unimak Island, at the end of the Alaska Peninsula, and opportunistic observations along the Bering Sea coast of the Alaska Peninsula, suggest transient killer whales concentrate there to intercept gray whales migrating past the coast (Matkin et al. 2007).

Transient killer whales in Alaska are managed as the Gulf of Alaska, Aleutian Islands, and Bering Sea stock (Allen and Angliss 2010). The total abundance estimate for this stock is 552 animals, and a recent mark-recapture study estimates that 345 of these killer whales inhabit the waters from the central Gulf of Alaska to the central Aleutian Islands (Durban et al. 2010).

Figure 3.2-24 Marine Mammals of Sitkinak Island



Killer whales are not listed as "depleted" under the *Marine Mammal Protection Act* or listed under the *Endangered Species Act*.

Killer whales are long-lived animals with average life spans of 60 years, although maximum life spans may be over 80 years. Adult killer whales exhibit significant size dimorphism with female length and weight reaching 23 feet and 4 tons, while adult males can grow as long as 32 feet and 8 tons (Wynne 2007). Killer whales reach sexual maturity between 10 to 15 years of age and typically give birth to 1 calf every 2 to 4 years (Ward et al. 2009b). While large, matrilineal social groups are well defined for resident killer whales, transient killer whales tend to travel in smaller groups (approximately 3-5 animals) and males typically forage independently (Baird and Dill 1996).

Transient killer whales forage on a variety of marine mammal species ranging in size from sea otters to fin whales as determined by observational data, stomach contents, and stable isotope analysis (Herman et al. 2005; Jefferson, Stacey, and Baird 1991). Dive data for killer whales is limited, but 1 study recorded maximum dive depths of approximately 450 feet with males diving deeper than females (Baird, Hanson, and Dill 2005).

Killer whales have been reported as incidental observations in Cold Bay, Izembek Lagoon, and outside the adjacent barrier islands (Service 2010e; Sowl 2011a). Between 2002 and 2010, 3 documented sightings occurred during summer near the community of Cold Bay and 1 in December off Lenard Harbor. Incidental reports of killer whales entering Izembek Lagoon were in June and September. At least 1 killer whale attack on a sea otter was documented in Cold Bay (Bohl 2008; Sowl 2011b). While site-fidelity has been observed for North Atlantic killer whales (Foote et al. 2010), little is known regarding habitat preferences of transient killer whales in the North Pacific Ocean.

<u>Conservation Concerns</u>

Population trends and status of the Gulf of Alaska, Aleutian Islands, and Bering Sea transient stock of killer whales are currently unknown, but the stock is neither listed under the *Endangered Species Act* nor designated as "depleted" under the *Marine Mammal Protection Act*. Killer whales have no known predators other than humans. Sources of human-caused mortality include entanglement in fishing gear and ship strikes. A mean annual mortality of 1.5 killer whales was estimated for the Bering Sea/Aleutian Islands flatfish trawl fishery from 2007 to 2009. One ship strike of a killer whale was reported in the Bering Sea groundfish trawl fishery in 1998 (Allen and Angliss 2012). There is no subsistence harvest of killer whales in Alaska.

3.2.6.3 Harbor Porpoise

The stocks of harbor porpoise recognized in Alaska are the Southeast Alaska stock, the Gulf of Alaska stock, and the Bering Sea stock (Allen and Angliss 2010). Cold Bay, adjacent waters, and Sitkinak Island are within the range of the Gulf of Alaska stock. The Bering Sea stock range includes the north side of the Alaska Peninsula. Recent estimates of abundance are 31,046 for the Gulf of Alaska stock and 48,215 for the Bering Sea stock (Hobbs and Waite 2010). Harbor porpoise are not listed as "depleted" under the *Marine Mammal Protection Act* or listed under the *Endangered Species Act* (Allen and Angliss 2010).

Harbor porpoise primarily inhabit shallow (less than 328 feet or 100 meters) northern temperate and sub-arctic coastal waters and are often found in bays, tidal areas, estuaries, and harbors

(Allen and Angliss 2010; Leatherwood and Reeves 1983). They are occasionally documented as incidental wildlife observations in Cold Bay (Service 2010e; Sowl 2011a). Sightings range from Lenard Harbor to the mouth of Kinzarof Lagoon to the Cold Bay dock during summer (June-September) and winter (January). Although harbor porpoise may occur in Cold Bay year round, the incidence of observation is low. Their small size (4.9 feet on average), dark coloration and lack of acrobatics make them difficult to see except under calm sea conditions (Wynne 1997).

Conservation Concerns

None of the harbor porpoise stocks in Alaska are listed under the *Endangered Species Act* or designated as "depleted" under the *Marine Mammal Protection Act*. They are, however, susceptible to human-caused mortality and injury, primarily due to entanglement in fishing gear. There is no reliable estimate of the total number of mortalities incidental to commercial fisheries for the Gulf of Alaska stock due to lack of observer coverage in several salmon gillnet fisheries. However, the estimated minimum mortality rate is 72 harbor porpoise per year, primarily in salmon drift gillnet and set gillnet fisheries. The estimated annual mortality for the Bering Sea stock incidental to the Bering Sea-Aleutians Islands flatfish trawl fishery is 0.71 porpoise (Allen and Angliss 2012).

Since most harbor porpoise frequent relatively shallow, nearshore waters, they may be vulnerable to modifications of nearshore habitats through development projects (including waste management and nonpoint source runoff) and other activities, such as construction of docks and other structures, and dredging (Allen and Angliss 2012).

3.2.6.4 Gray Whale

Gray whales occur in the North Pacific Ocean and are divided into Western North Pacific and Eastern North Pacific stocks. The former is found along the coast of eastern Asia and the latter, along the west coast of North America (Allen and Angliss 2010). Eastern North Pacific gray whales traverse waters off the Alaska Peninsula and through Unimak Pass during spring and fall migrations (Wynne 1997). Gray whales seen in Cold Bay, Izembek Lagoon, and adjacent waters belong to this stock. Although most of the stock feeds in the northern and western Bering and Chukchi seas during summer, there are feeding aggregations reported off Kodiak Island and Southeast Alaska (Allen and Angliss 2010). The most recent population estimate for this stock was 18,178 whales (Allen and Angliss 2010). Steady increases in population abundance resulted in removal of the eastern North Pacific stock of gray whales from the List of Endangered and Threatened Wildlife in 1994 (Allen and Angliss 2010); they are no longer listed under the *Endangered Species Act*.

Gray whales prefer coastal, shallow waters over the continental shelf (Wynne 1997). They are periodically reported by residents of and visitors to Cold Bay and recorded as incidental wildlife sightings at the refuge (Service 2010e; Sowl 2011a). Sighting locations include inside of and offshore of Izembek Lagoon (5 sightings noted since 2002) and within Cold Bay as far north as the town dock (2 documented sightings since 2004). All occurred during summer. A single gray whale was documented in Cold Bay during fall aerial surveys for waterfowl in 2007 (Mallek and Dau 2007).

Conservation Concerns

The eastern North Pacific stock of gray whales is no longer listed under the *Endangered Species Act*, and is, therefore, not considered "depleted" under the *Marine Mammal Protection Act*. Current sources of human-caused mortality and serious injury include commercial fisheries, subsistence harvest, and ship strikes. An estimated 3.3 gray whales died annually from interactions with commercial fishing gear between 2003 and 2007 (Allen and Angliss 2012). This includes the entire U.S. west coast from California to Alaska and is considered a minimum estimate due to lack of observer coverage for most Alaska gillnet fisheries known to interact with gray whales (Allen and Angliss 2012).

Russian and Alaskan subsistence hunters traditionally harvested whales from this stock, although most are taken by Russian hunters. The current harvest quota approved by the International Whaling Commission includes an average annual allowable take of 120 whales by the Russian Chukotka people and four whales by the Makah Indian Tribe of Washington State (U.S.). The annual subsistence take averaged 121 whales from 2003 to 2007; all were taken in Russia (Allen and Angliss 2012).

3.2.6.5 Proposed Land Exchange Parcel and Project Site Summaries

Road Corridors

No marine mammals are within the proposed corridors.

Sitkinak Island

Harbor seals haul out at several locations on Sitkinak Island. The primary haulout sites from which aerial survey population counts are made are Northeast Sitkinak Lagoon, South Sitkinak Lagoon and Southeast Sitkinak Island beach (Small, Pendleton, and Pitcher 2003). The South Sitkinak Lagoon site directly abuts the southern tip of the larger parcel proposed for exchange (Figure 3.2-24). The Northeast Sitkinak Lagoon haulout site is adjacent to and overlaps with the spit of land considered for exchange on the north end of Sitkinak Lagoon (Figure 3.2-24). Approximately 200 harbor seals have been observed hauled out at each of the lagoon sites (Wynne 2011).

State Lands

The state lands proposed for conveyance on the Alaska Peninsula are terrestrial parcels with little coastal exposure. Harbor porpoise, killer whales, gray whales, or other marine mammals may occur in the marine waters offshore of the parcels, but not within the parcels themselves.

Mortensens Lagoon

Harbor porpoise commonly occur in shallow bays, estuaries and harbors. As they have been previously documented in Cold Bay, from Lenard Harbor to the Cold Bay dock (Service 2011b, Sowl 2011b), it is reasonable to assume they could occur in waters adjacent to Mortensens Lagoon near King Cove Corporation lands. However, as Mortensens Lagoon is extremely shallow, it is not reasonable to assume they enter the lagoon. Gray whales and killer whales are also occasionally seen within Cold Bay and could, therefore, potentially occur in the vicinity of Mortensens Lagoon.

Kinzarof Lagoon

Harbor seals are likely to occur in the vicinity of the Kinzarof Lagoon parcels. Approximately 200 harbor seals use Kinzarof flats and Cold Bay throughout the year (USACE 2003) and are known to haul out at this location (Figure 3.2-23).

Harbor porpoise have been observed at the mouth of Kinzarof Lagoon, in the waters adjacent to these parcels of land (Service 2011b, Sowl 2011b).

King Cove Corporation Selected Lands

This parcel is inland and thus not relevant to marine mammals.

Northeast Terminal and Lenard Harbor Ferry Terminal

Harbor porpoise and killer whales have been observed in the vicinity of Lenard Harbor (Service 2011b, Sowl 2011b). The killer whale sighting off Lenard Harbor occurred in December; harbor porpoise sightings range from summer to winter. All sightings for both species have been opportunistic, so frequency of occurrence in the area is not known. No information regarding marine mammal sightings in the vicinity of the Northeast Terminal site was found, however it is reasonable to expect some marine mammal use adjacent to that site as well.

Cold Bay Dock Site and Cross Wind Cove

Killer whales, harbor porpoise, and gray whales have been opportunistically observed in the vicinity of the community of Cold Bay and the Cold Bay dock (Service 2011b, Sowl 2011b). Harbor porpoise are likely the most common, but sightings are too irregularly recorded to determine the frequency with which these species are likely to occur in this area.

3.2.7 Threatened and Endangered Species

Species listed as either threatened or endangered, pursuant to the *Endangered Species Act of 1973*, as amended, and occurring in the Izembek National Wildlife Refuge and parcels under consideration for the proposed land exchange are described in this section. Included here are the Alaska breeding populations of Steller's Eider (*Polysticta stelleri*), the southwest Alaska distinct population segment of northern sea otter (*Enhydra lutris kenyoni*), and the western distinct population segment of Steller sea lion (*Eumetopias jubatus*). Federally designated critical habitats for these species within the regions under consideration are included in the following species descriptions.

Two species that are candidates for listed status, the Yellow-Billed Loon and the Kittlitz's Murrelet, are also included in this section. While these species currently receive no official legal protection under the *Endangered Species Act*, they could become listed at any time.

3.2.7.1 Steller's Eider

Three distinct breeding populations of Steller's Eiders are the Russian-Atlantic, Russian-Pacific, and Alaska breeding populations. The majority of Steller's Eiders belong to the two Russian breeding populations (Service 2002). Breeding occurs during summer on coastal tundra habitat in northern Russia and Alaska. The Russian-Atlantic population winters in northern Europe. The Russian-Pacific and Alaska breeding populations, which are indistinguishable, intermix during winter in southwest Alaska marine waters (Dau, Flint, and Petersen 2000; Service 2002). Sub-population structure or segregation by breeding area while wintering or molting along the Alaska Peninsula is not evident (Dau, Flint, and Petersen 2000; Pearce et al. 2005)

Annual aerial surveys to monitor population status of Steller's Eiders in southwestern Alaska (Yukon-Kuskokwim Delta to the end of the Alaska Peninsula) target peak staging for spring migration. Surveys have been conducted most years since 1992. Long-term trends suggest an exponential population decline of 2.7 percent per year. A greater number of peak counts during the early years (1992 to 1997) when multiple surveys were conducted annually could account for a slight negative trend bias. Inaccuracies in timing, observer effects, or other factors could also bias estimates (Larned and Bollinger 2011). Low population estimates from 2000 to 2002 were at least partly due to eiders moving northward during the survey and escaping detection (Larned and Bollinger 2009). The 2010 estimate of 54,888 eiders was the lowest recorded, which may relate to birds departing late from other wintering areas, or still being south of the survey area during the census (Larned and Bollinger 2011). Survey totals represent a minimal population estimate since, for the reasons listed above, some birds escape detection. Izembek and Kinzarof lagoons are included in annual spring migration surveys, with counts available specifically for those areas most years. Steller's Eiders are also counted incidental to spring Emperor Goose surveys (Dau 2011) (Table 3.2-19).

Table 3.2-19 Counts of Steller's Eiders from Spring Migration Surveys in Southwestern Alaska

	Areawide	Izembek	Kinzarof		Areawide	Izembek	Kinzarof
1992	137,907	27,379	0	**2002**	56,704	3,707	0
1993	88,636	31,937	1,604	**2003**	77,369	35,419	2,305
1994	107,589	6,491	0	**2004**	82,772	28,907	2,861
1995	Not Surveyed	5915	20	**2005**	79,022	33,275	1,327
1996	Not Surveyed	7187	30	**2006**	Not Surveyed	7573	800
1997	90,269	27,024	384	**2007**	87,400	46,562	2,622
1998	84,459	13,378	95	**2008**	70,480	37,802	1,310
1999	Not Surveyed	15,373	7	**2009**	77,777	35,011	1,760
2000	72,953	33,374	1,680	**2010**	54,888	27,051	1,067
2001	60,656	24,096	480				

Areawide = Yukon-Kuskokwim Delta to the end of the Alaska Peninsula

Shown are counts for the entire southwestern Alaska survey area and for Izembek and Kinzarof lagoons, which are subsets of the areawide totals. Izembek and Kinzarof counts in years with no areawide survey (1995, 1996, 1999, 2006) were obtained incidental to spring Emperor Geese surveys (Dau 2011).

Sources: Dau 2011; Larned 2001, 2007, 2008; Larned and Bollinger 2009, 2010; Larned 2011.

Steller's Eiders are counted coincident to fall aerial surveys for Emperor Goose in southwestern Alaska. The estimated count of Steller's Eiders in the Izembek Lagoon area in October 2009 was 8,056. Although this was 17 percent higher than the 2008 estimate of 6,875, it was 64 percent lower than the 34-year (1975-2008) average fall count of 22,470 (Mallek and Dau 2009).

Flint et al. (2000) estimated survival rates by banding and recapturing more than 60,000 Steller's Eiders molting in Izembek and Nelson lagoons between 1975 and 1997. Survival rates were lower for males than for females and there was weak evidence of a decrease in annual survival. Izembek National Wildlife Refuge began banding Steller's Eiders in 1961 and annual banding efforts increased tremendously in the 1990s (Taylor and Sowl 2008). Numbers of banded birds recaptured in consecutive years were insufficient to provide the data needed for the complex models originally used to analyze survival rates. The 1998-2004 banding data are, therefore, currently being re-analyzed with results anticipated in 2012, but after the completion of this EIS (Frost 2011).

Endangered Species Act Status

The Service listed the Alaska breeding population of Steller's Eiders as threatened under the *Endangered Species Act*, effective July 1997 (Federal Register 1997a). A substantial decrease in the nesting range and numbers nesting in Alaska warranted the determination. Decreased adult survival, particularly among males, may have played a role in the population decline (Flint et al. 2000) Only an estimated 1 percent of the wintering population occupying the marine habitats in Kinzarof and Izembek lagoons are thought to be from the listed Alaska breeding population

(Service 2007b). Critical habitat (see below) was designated in 2001 (Federal Register 2001) and a recovery plan was published in 2002 (Service 2002).

Critical Habitat Designation

The Service designated critical habitat for the Alaska breeding population of Steller’s Eiders in March 2001. An area was deemed critical habitat if: (1) it regularly supports significant concentrations (about 5,000 birds during most years and more than 10,000 in 1 year) of Steller's Eiders; and 2) it is used by individuals from the threatened Alaska-breeding population. Habitat designated as critical included breeding habitat on the Yukon-Kuskokwim Delta and 4 marine areas in southwest Alaska (Kuskokwim Shoals in northern Kuskokwim Bay, Seal Islands, Nelson Lagoon, and Izembek Lagoon) (Federal Register 2001).

The Izembek Lagoon critical habitat includes all waters of Izembek Lagoon (including Moffet Lagoon) and waters out to 0.25 mile offshore of the Kudiakof Islands and the adjacent mainland between 162°30'W and 163°15'W. It encompasses 140 square miles of marine waters and 186 miles of shoreline (Federal Register 2001). (Figure 3.2-25).

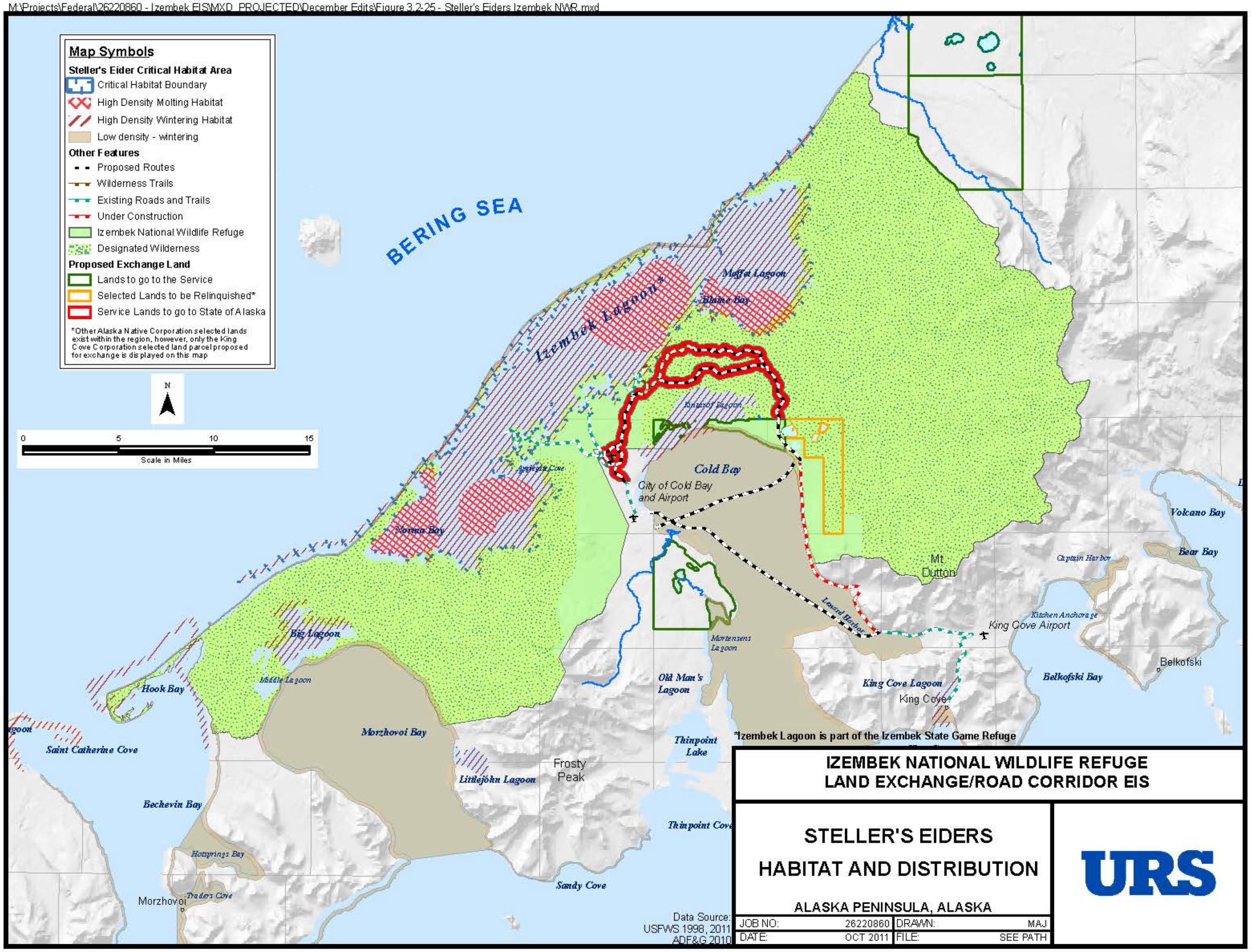
Habitat Use

The coastal marine waters of concern are used by Steller’s Eiders during the non-breeding season, from the molt in fall to pre-migration staging in the spring. Most of the Pacific population overwinters along the Alaska Peninsula, primarily in Izembek and Nelson lagoons. In general, Steller’s Eiders are absent from these areas from mid-May to mid-July after migrating to the northern breeding areas of the Alaska coastal plain and Russian Arctic (USACE 2003).

Roughly 20,000 to 40,000 Steller’s Eiders use Izembek Lagoon for molting (Dau, Flint, and Petersen 2000; Taylor and Sowl 2008), although Petersen (1981) reported almost 60,000 birds in a 1979 fall survey. A simultaneous wing molt renders the eiders flightless for approximately 3 weeks in September and October. High concentrations of molting eiders are found within Izembek Lagoon in deep channels near shallow areas with extensive eelgrass beds (Figure 3.2-25). Molting eiders feed on marine invertebrates, such as crustaceans, mollusks, polychaetes, and amphipods that occur in these eelgrass beds (Petersen 1981; Metzner 1993; Taylor and Sowl 2008; USACE 2003). Steller’s Eiders exhibit strong (greater than 95 percent) site fidelity to specific molting areas to which they annually return (Flint et al. 2000).

After molting, some Steller’s Eiders disperse widely from the Aleutian Islands to the Kodiak archipelago and the east side of Cook Inlet, although many remain in the lagoons where they molted (Service 2002). Steller’s Eiders overwinter in shallow (less than 33 feet), nearshore waters along the southern Alaska Peninsula, including coastal waters adjacent to Izembek National Wildlife Refuge (Taylor and Sowl 2008). The highest densities of eiders usually occur in Izembek and Kinzarof lagoons during winter (Laubhan and Metzner 1999; USACE 2003) (Figure 3.2-25).

Figure 3.2-25 Steller's Eiders Habitat and Distribution



Winter severity and ice conditions on Izembek Lagoon strongly influence distribution and habitat use (Lance, Lewis, and Flint 2007). Laubhan and Metzner (1999) noted a decrease in eiders using Izembek Lagoon and an increase in use of Kinzarof Lagoon and Cold Bay when ice cover on Izembek Lagoon exceeded 10 percent. Eiders returned to Izembek Lagoon as soon as it was ice free, indicating localized movements during severe weather conditions. Access to diverse habitats in close proximity and the ability to respond to changing environmental conditions, such as ice cover, are key strategies for winter survival (Metzner 1993). Foraging in the much smaller Kinzarof Lagoon, where preferred habitat is concentrated near the shoreline, leaves eiders susceptible to other pressures, such as predation by Bald Eagles (Lance, Lewis, and Flint 2007).

Steller's Eiders are visual foragers and are limited to daytime and to water depths with sufficient light penetration. Reduced day length and inclement weather during winter constrain foraging opportunities for eiders. More time is spent foraging during winter than spring, when courtship behavior increases (Laubhan and Metzner 1999). Formation and extent of sea ice along the southeastern Bering Sea shelf may also impact accessibility to wintering habitat and constrain energy intake during winter months (Lance, Lewis, and Flint 2007).

Steller's Eiders occur in nearshore waters of Sitkinak Island during winter. A group of 40 eiders were observed during winter 2001 aerial surveys adjacent to the narrow spit of land bordering Sitkinak Lagoon that is part of the proposed Sitkinak Island land conveyance (Larned and Zwiefelhofer 2001). It is unlikely that Steller's Eiders occur on state lands adjacent to the Alaska Peninsula National Wildlife Refuge North Creek Unit and Pavlof Unit, although they may use marine waters offshore of the North Creek Unit (Dau and Mallek 2009).

Conservation Concerns

At the time of the *Endangered Species Act* listing, the potential causes of population decline included predation, hunting, lead shot ingestion, and habitat changes (Service 2002). Depredation of eggs and chicks by jaegers, ravens, arctic fox, and snowy owls is commonplace on the Alaska breeding population's primary nesting area near Barrow (Quakenbush et al. 2004). Predation of Steller's Eiders by Bald Eagles during fall and winter has been documented (Lance 2011). Habitat destruction was not considered a major driver in the population decline (Federal Register 1997a).

Sport hunting for Steller's Eiders in Alaska has been banned since 1991 although they may occasionally be inadvertently shot during hunts for other harvestable species (Service 2002; USACE 2003). Steller's Eiders continue to be taken in relatively small numbers by subsistence hunters in the Yukon-Kuskokwim Delta and other areas along the Bering Sea coast (Naves 2011). Waterfowl hunting for other species occurs in the Izembek National Wildlife Refuge and disturbance caused during these activities could impact Steller's Eiders using Izembek Lagoon. Other sources of human-caused disturbances in Izembek National Wildlife Refuge include bird banding activities, vessel traffic, and aircraft overflights. Behavioral reactions of Steller's Eiders to noise and vessel activities may include avoidance through flushing, diving, or swimming away (USACE 2003).

Climate change, including sea ice loss and ocean acidification, could alter habitat and prey distribution and availability for Steller's Eiders throughout their breeding and non-breeding ranges. A great deal of uncertainty exists, however, in regards to modeled and projected effects of climate change. Arctic sea ice has declined faster than originally projected (Stroeve et al.

2007). Declining sea ice may lead to ecosystem and prey-field shifts that could cascade through the food web, with currently uncertain results and impacts. Models of climate change effects on breeding habitat for Steller's Eiders on the Arctic Coastal Plain range from potential increased habitat to a 20 percent decrease (Fuller, Morton, and Sarkar 2008). Warming trends that reduced ice cover in coastal areas of the Alaska Peninsula appeared to have resulted in increased availability of *Zostera* eelgrass for overwintering Brant (Ward et al. 2005) and, presumably, other species reliant on eelgrass. Calcified marine organisms, such as bivalves, crustaceans, and other invertebrates with calcium carbonate shells or skeletons, are at risk with increasing acidification (Fabry et al. 2009). High-latitude regions are expected to undergo the greatest changes, yet effects of chronic exposure to increased carbon dioxide and long-term implications of reduced calcification on species or communities are unknown (Fabry et al . 2008).

Another potential threat is exposure to oil or other contaminants (Service 2002). Areas with dense aggregations of Steller's Eiders are particularly vulnerable, as even relatively small habitat perturbations could influence a large proportion of the threatened population (Federal Register 2001). Steller's Eiders frequently forage in northwest Cold Bay adjacent to beaches contaminated by hydrocarbon seeps (Jacobs Engineering Group Inc. 2005) and may thus be vulnerable to exposure (Sowl 2011).

3.2.7.2 Yellow-billed Loon

An estimated 16,000 Yellow-billed Loons occur worldwide (Earnst 2004). Approximately 3,300 Yellow-billed Loons breed in the freshwater treeless tundra of Alaska, on the North Slope, in western Alaska north of Unalakleet, and the foothills of the Brooks Range (Earnst 2004). According to the *Yellow-billed Loon Conservation Agreement* (ADF&G 2006), marine habitats in Alaska are important for non-breeding, migrating and wintering Yellow-billed Loons. Yellow-billed Loons winter in marine waters around the North Pacific from Puget Sound to the Yellow Sea. Specific characteristics of wintering habitats are not well known, but the species normally occurs in protected nearshore marine waters.

Endangered Species Act Status

The Yellow-billed Loon was designated a candidate species for listing, with "warranted, but precluded" status in 2009. The Service determined that listing the species as either threatened or endangered was warranted, but doing so was precluded by higher priority species' listings (Federal Register 2009a).

Habitat Use

No critical habitat has been designated for Yellow-billed Loons. The occurrence of Yellow-billed Loons in Izembek National Wildlife Refuge is rare (Taylor and Sowl 2008). Only 8 Yellow-billed Loons were recorded during Izembek Christmas Bird Counts, 1987-2010, with none seen since 1998 (National Audubon Society 2010a). Three Yellow-billed Loons were recorded incidental to spring migration surveys for Steller's Eiders in Southwest Alaska – 2 in 1992 and 1 in 2002 (Larned and Bollinger 2010). These occurrences were during spring or fall migration, or during the winter.

Yellow-billed Loons could use the off-shore habitat in the EIS project area during the spring or fall migration, or during the winter.

Conservation Concerns

Yellow-billed Loons have been adversely affected by subsistence harvest, oil and gas development and other contaminants, climate change, fishing bycatch, and marine pollution in wintering habitat in Asia (Service 2009b).

3.2.7.3 Kittlitz's Murrelet

The Kittlitz's Murrelet is thought to be one of the rarest seabirds in North America, with a total population estimate of 9,000-25,000 birds. Surveys indicate significant population declines have occurred in 3 core areas: 84 percent in Prince William Sound since 1989; 38-75 percent near Malaspina Glacier; and a rate of decline that could result in extinction in 40 years in Glacier Bay. No long-term data exists with which to calculate a rangewide population trend. In 2010, the Alaska Department of Fish and Game contracted ABR, Inc. to conduct an assessment of historical Kittlitz's Murrelet survey information. ABR (2011) concluded that the baseline data are not adequate for concluding that Kittlitz's Murrelets have undergone dramatic, catastrophic declines across large parts of their range.

Endangered Species Act Status

On May 4, 2004, the Kittlitz's Murrelet was designated a candidate for protection under the *Endangered Species Act*.

Habitat Use

No critical habitat has been designated for Kittlitz's Murrelets. Kittlitz's Murrelets have been seen in Cold Bay and are known to breed in the Izembek National Wildlife Refuge (Bailey 1973). Nesting habitat is described as unvegetated scree fields, coastal cliffs, barren ground, rock ledges, and talus above timberline in coastal mountains (Service 2006b). Kittlitz's Murrelets arrive on their nesting grounds in pairs and nest non-colonially on steep, barren hillsides and talus slopes above timberline, generally near glaciers and cirques. Their nest site is on the ground with little vegetation, as much as 980 feet to 3,300 feet above sea level, and up to several miles inland. No steep barren hillsides are in the road corridor so Kittlitz's Murrelets are not expected to nest there. The closest potentially suitable, but unconfirmed, habitat is the area along the access road to the northeast of Cold Bay and the King Cove Corporation selected lands.

Conservation Concerns

According to the Service (2007c), the causes of decline in Kittlitz's Murrelets is not known, but may be related to the retreat of tidewater glaciers since the turn of the century. Exactly how glacier retreat might affect the Murrelets is unknown, but studies in other regions have recorded low biological productivity in fjords with receding glaciers as a result of increased sedimentation and lowered salinity (Day et al. 1999, cited in Service 2007c). Lowered productivity could result in fewer forage fish, or sedimentation that affects feeding efficiency. In addition to changes in fjord habitats, Kittlitz's Murrelets may also be affected by changes in their available prey species relative to changes in the greater marine environment (Kuletz 2004, cited in Service 2007c).

3.2.7.4 Northern Sea Otter: Southwest Alaska Distinct Population Segment

The southwest Alaska distinct population segment of northern sea otters extends from Attu Island at the western end of the Aleutian Islands to Kamishak Bay on the west side of Cook Inlet. Included are the coastal waters of the Aleutian Islands, the Alaska Peninsula, the Kodiak archipelago and the Barren Islands (Federal Register 2005a).

Sea otters were heavily hunted and nearly extirpated during commercial fur harvests of the 18th and 19th centuries. Protection under the *International Fur Seal Treaty of 1911* enabled the southwestern Alaska population to rebound (Kenyon 1969).

Since the mid-1980s, however, this population experienced a widespread and precipitous 56-68 percent decline (Burn and Doroff 2005). The decline was first noticed in the Aleutian Islands where counts decreased 75 percent from 1965 to 2000, at a rate of 17.5 percent per year in the 1990s (Doroff et al. 2003). Since the onset of the decline in the mid-1980s, a net loss of 47,000-86,000 sea otters has been estimated (Burn, Doroff, and Tinker 2003).

Population declines along the Alaska Peninsula occurred simultaneously to those in the Aleutian Islands. Since 1986, estimated abundance in offshore habitat decreased 27–49 percent in the northern Alaska Peninsula area and 93–94 percent in the southern Alaska Peninsula area. A subsection of the northern area that includes the waters in and around Izembek Lagoon experienced a 91–94 percent decline in abundance, with counts dropping from 4,236–7,240 in 1986 to 374 in 2000. Abundance estimates for the southern Alaska Peninsula, which includes Cold Bay and Kinzarof Lagoon, decreased from 13,900-17,500 in 1986 to 1,005 in 2001 (Burn and Doroff 2005).

Aerial surveys in Cold Bay by the Service yielded a 2001 spring population estimate of 179 otters, 15 of which were pups (USACE 2003). During this period of decline, a distribution shift from offshore locations to nearshore bays and lagoons was apparent. Burn and Doroff (2005) hypothesized these nearshore areas are preferred sea otter habitat and, at low densities, may be the only locations where sea otters remain. Surveys of the southern Alaska Peninsula islands conducted in 2007 and 2008 showed a continued decline in sea otter abundance in the area, for an overall decrease of 91 percent from 1986 to 2008 (Osterback et al. 2009). Izembek Lagoon, Kinzarof Lagoon, and Cold Bay were not included in these recent surveys.

Sea otters are also counted incidental to spring and fall waterfowl surveys in southwestern Alaska. Spring surveys by Dau and Mallek (2007, 2009) and fall surveys by Mallek and Dau (2007, 2008, 2009) subdivide the Alaska Peninsula and the Izembek Lagoon and Cold Bay regions into survey segments. The numbers of sea otters sighted in different parts of Izembek Lagoon and other areas of interest vary widely between and within years, and by area (Table 3.2-20). Sea otters are mobile animals that move with wind, tide, and ice conditions.

Small numbers of sea otters have been sighted in the Sitkinak Island area coincident to winter Steller's eider surveys; however, specific locations were not available (Larned and Zwiefelhofer 2001).

Table 3.2-20 Mean Number of Northern Sea Otters Recorded During Aerial Waterfowl Surveys at Izembek National Wildlife Refuge.

	Izembek Lagoon (1981-2005)			Kinzarof Lagoon (1981-2010)		
Month	**n**	**Mean**	**Max**	**n**	**Mean**	**Max**
Jan	14	457.7	967	19	7.2	47
Feb	8	310.0	572	17	21.2	133
Mar	11	300.6	537	12	17.9	76
Apr	21	254.9	519	36	15.0	95
May	18	299.7	859	27	23.4	112
Aug	5	323.4	579	5	8.8	35
Sept	36	252.9	646	43	6.5	57
Oct	81	293.4	1070	94	9.1	127
Nov	17	264.4	610	18	16.8	76
Dec	7	344.4	608	7	19.7	55

n = number of surveys
Max = maximum number of sea otters recorded for that month, all years
Izembek Lagoon = Entire Lagoon
Kinzarof Lagoon = Cold Bay dock to Kinzarof Lagoon to Lenard Harbor
Data source: Unpublished Izembek National Wildlife Refuge files

Endangered Species Act Status

The Service listed the southwest Alaska distinct population segment of the northern sea otter as threatened effective September 2005 (Federal Register 2005a) based on the population decline since the mid-1980s. Reasons for such dramatic declines are uncertain, although increased killer whale predation is considered a possible primary causal agent (Estes et al. 1998). Additional hypotheses include shark predation, contaminants (in the Aleutians), and disease (Kuker and Barrett-Lennard 2010). Critical habitat was designated in 2009 (Federal Register 2009b) and the Service published a draft recovery plan in October 2010 (Service 2010k).

Critical Habitat Designation

The Service published the final rule designating critical habitat for the southwest Alaska distinct population segment of the northern sea otter in October 2009 (Federal Register 2009b). The primary constituent elements deemed essential to the conservation of the southwest Alaska distinct population segment are: 1) shallow, rocky areas where marine predators are not likely to forage; 2) nearshore waters within 328 feet of the mean high tide line that may provide protection from marine predators; 3) kelp forests that provide marine predator protection; and 4) adequate prey availability and quality within primary constituent elements 1-3 (Federal Register 2009b). Areas included as critical habitat contain some or all of the primary constituent elements, or may require special management considerations or protection.

The Service designated 5 management units as critical habitat: 1) Western Aleutian Unit; 2) Eastern Aleutian Unit; 3) South Alaska Peninsula Unit; 4) Bristol Bay Unit; and 5) Kodiak, Kamishak, Alaska Peninsula Unit. The latter 3 units are of concern in this EIS. Izembek Lagoon is a subunit of the Bristol Bay Unit and includes approximately 130 square miles of nearshore marine environment within the Izembek and Moffett Lagoon systems (Federal Register 2009b). Cold Bay and Kinzarof Lagoon are within the South Alaska Peninsula Unit and Sitkinak Island lies within the Kodiak, Kamishak, Alaska Peninsula Unit (Figure 3.2-26).

Habitat Use

Sea otters appear year round in marine waters adjacent to the Izembek National Wildlife Refuge. They frequent shallow, coastal areas and forage on benthic marine invertebrates, such as the abundant helmet crabs in Izembek Lagoon (Taylor and Sowl 2008). Izembek Lagoon may also be an important natal area. Sea otters require access to open water to forage during severe ice and winter weather conditions. Large numbers of sea otters haul out on the sandbars at the entry channels, and on the shore ice, ice floes, or the barrier islands of Izembek Lagoon during winter (Taylor and Sowl 2008, citing Service unpublished data). Up to 350 have been observed hauled out on sandbars near Cape Glazenap (Sowl 2011b).

Upper Cold Bay and Kinzarof Lagoon are areas with high-density sea otter concentrations; concentrations are highest near the entrance to Kinzarof Lagoon (USACE 2003). Nearly half the current regional population uses these areas. Sand and gravel islands and spits near the entrance to Kinzarof Lagoon provide haulouts for up to 200 sea otters at a time during the ice-free part of the year (Dau 2010; USACE 2003), although otters use the area year round. This is an important foraging habitat for otters, although the prey base has not been fully characterized. Weather, breeding, and food availability are primary determinants of seasonal occurrence and behavior of sea otters using the Cold Bay–Kinzarof Lagoon area. Kinzarof Lagoon may also be an important haven for killer whale predation avoidance (USACE 2003).

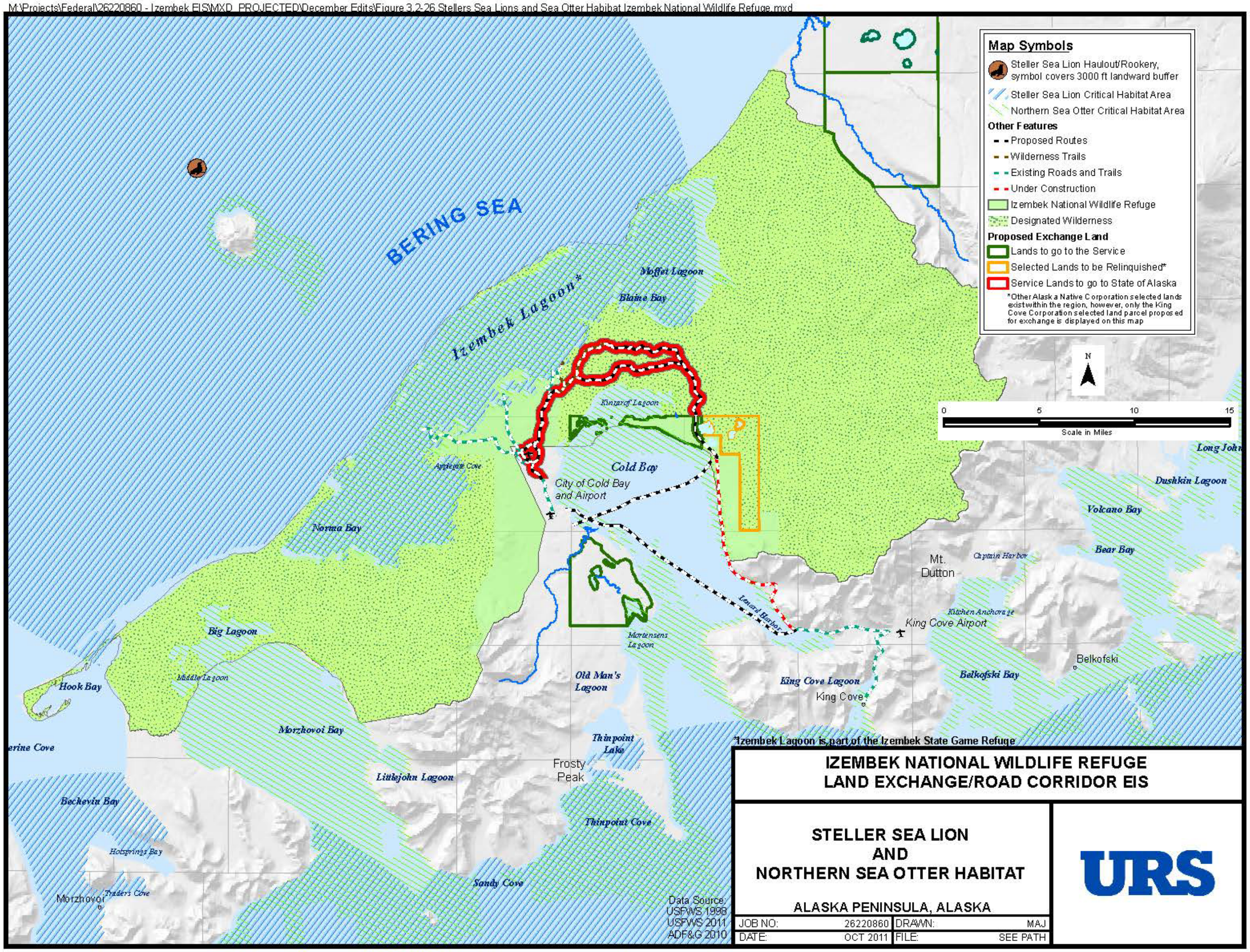
State lands adjacent to the Alaska Peninsula National Wildlife Refuge North Creek Unit and Pavlof Unit that are proposed for inclusion in the land conveyance and wilderness designation are largely terrestrial and undeveloped. The small segment along the northern border that abuts the shoreline, may include habitat used by sea otters.

Conservation Concerns

Potential threats to the sea otter population are human and non-human in origin. Human threats include contamination from pollutants such as heavy metals, PCBs, or petroleum hydrocarbons; marine discharge by seafood processing plants; disturbance from research, recreational and industrial activity; entanglement in fishing gear; prey competition with commercial fisheries; and subsistence harvests. Non-human threats include predation, changes in food availability or quality, and naturally occurring diseases and biotoxins (Taylor and Sowl 2008; Service 2010k). Impacts from climate change are unknown but may include changes to prey abundance or distribution, community ecology, or vulnerability to new or existing diseases.

Killer whale predation has been implicated as the primary causal agent in the decline of this distinct population segment (Estes et al. 1998; Federal Register 2005a). Shark predation may have also played a role (Kuker and Barrett-Lennard 2010). Predation was considered of moderate importance to otters in the Bristol Bay, Kodiak, Kamishak, and Alaska Peninsula Management Units, and of high importance as a threat to recovery for otters in the South Alaska Peninsula Management Unit (Service 2010k).

Figure 3.2-26 Steller Sea Lion and Northern Sea Otter Habitat



Contaminants and disease potentially influenced the population decline (Kuker and Barrett-Lennard 2010). Elevated levels of organochlorines were found in livers of sea otters collected in the western Aleutian Islands, although the origin of the compounds was unknown (Estes et al. 1997). Concentrations of perfluorinated chemicals, particularly perfluorononanoate, were found in livers of northern sea otters from the southcentral Alaska distinct population segment (Hart, Gill, and Kannan 2009); the southwest Alaska distinct population segment was not included in this study. Phocine distemper virus was recently detected in sea otters from the eastern Aleutian Islands (Fox Island, South Alaska Peninsula), the Kodiak Archipelago, and southcentral Alaska. It is unclear whether the disease played a role in the population decline, but it may be a current factor in sea otter deaths (Goldstein et al. 2009). Contaminants are considered of low importance for all management units, while disease is of moderate importance as a threat to the Kodiak, Kamishak, Alaska Peninsula Management Unit (Service 2010k).

Sea otters are particularly vulnerable to contamination by oil, since they depend entirely on their fur for insulation. Oiled animals are susceptible to hypothermia and mortality, as evidenced by mortality rates following the Exxon Valdez oil spill in 1989 (Garrott, Eberhardt, and Burn 1993). Oil spills are considered of low importance for Bristol Bay and Alaska Peninsula Management Units, but of moderate importance as a threat to sea otter recovery in the Kodiak, Kamishak, Alaska Peninsula Management Unit (Service 2010k).

Several fisheries exist within the range of the southwest Alaska distinct population segment. Only the Kodiak salmon set gillnet fishery is identified as directly interacting with this stock. Trawl, longline, pot, and purse seine gear appear less likely to interact with sea otters either because of where they operate, the specific gear used, or both (Allen and Angliss 2010). Fishery bycatch is therefore considered a threat of low importance across all management units (Service 2010k). Indirect effects of commercial fishing on northern sea otters include the potential for parasite infestations through ingesting waste from fish processing plants (Ballachey, Gorbics, and Doroff 2002).

Alaska Natives are legally allowed to harvest sea otters for subsistence use or for creating and selling authentic handicrafts or clothing. The reported mean annual subsistence take from this distinct population segment for 1989-2008 was 89 animals (range 23-180), most (82 percent) of which came from the Kodiak archipelago. Harvests from the Bristol Bay Management Unit and the South Alaska Peninsula Management Unit comprised 6.4 and 9.6 percent of the total, respectively (Service 2010k). Areas within the distinct population segment that have experienced population declines show little to no record of subsistence harvest (Allen and Angliss 2010). No sea otters have been reported harvested from the communities of Cold Bay, False Pass, or Nelson Lagoon between 2008 and 2010, and an annual average of 7 (range 1-13) were harvested by the community of King Cove during that time (Service 2010j). Human harvest is not considered a significant source of sea otter mortality in the Cold Bay vicinity (USACE 2003) and is deemed of low importance as a threat to recovery in all but the Kodiak, Kamishak, Alaska Peninsula Management Unit, where it is of moderate importance (Service 2010k).

Boat strikes are a leading cause of death for the southcentral distinct population segment of sea otters in Kachemak Bay. It is, therefore, of potential concern for sea otters in the Izembek-Cold Bay area (Gill 2010).

3.2.7.5 Steller Sea Lion: Western Distinct Population Segment

Steller sea lions range along the North Pacific Rim from northern Japan to California. Two distinct population segments are recognized within U. S. waters based on phylogeographic and genetic differences. The eastern distinct population segment includes animals east of Cape Suckling, Alaska (144°W), and the western distinct population segment includes animals west of Cape Suckling through the Aleutian Islands (Loughlin 1997). Steller Sea Lion habitat is shown in Figure 3.2-26.

Substantial population declines occurred in the eastern Aleutian Islands and western Gulf of Alaska between the 1960s and mid-1970s. Declines occurred in all areas across the range of the western distinct population segment beginning in the late 1970s (Merrick, Loughlin, and Calkins 1987). Surveys conducted in southwestern Alaska in 1984-1986, from the central Gulf of Alaska through the central Aleutian Islands, revealed a 52 percent decline in adults and juveniles since 1956-1960, with the greatest declines (79 percent) in the eastern Aleutian Islands. Causes of the declines were unknown, but possibilities included disease, prey availability or quality, or a combination of these and other factors (Merrick, Loughlin, and Calkins 1987). Counts of Steller sea lions at trend sites for the western U. S. distinct population segment decreased an additional 40 percent between 1991 and 2000. This equals an average annual decline of 5.4 percent (Loughlin and York 2000).

Regional variability in recent trends is considerable. Increases in the central and western Gulf of Alaska and eastern Aleutian Islands were offset by decreases in the eastern Gulf of Alaska and central and western Aleutian Islands (Fritz et al. 2008a). Following a 4-year (2000-2004) period of a 3 percent per year increase, 2004-2008 trends in non-pups in the western stock was stable to declining slightly. Counts were up in the eastern Aleutians (more than 17 percent), but the central and western Gulf of Alaska counts increased from 2004-2007, then declined slightly from 2007-2008 (Fritz et al. 2008b). Combined data from pup and non-pup counts resulted in a minimum abundance estimate of 41,197 Steller sea lions in the western U.S. distinct population segment in 2004-2008 (Allen and Angliss 2010).

Most major haulouts and rookeries were surveyed for pups in 2009, with the exception of the western Aleutians and Pribilof Islands. From 2001/2002 to 2009, pup production on rookeries decreased 43 percent in the western and 7 percent in the central Aleutian Islands, while increasing 47 percent in the eastern Aleutians and 23 percent, 6 percent, and 57 percent in the western, central, and eastern Gulf of Alaska, respectively (DeMaster 2009).

Trend sites in the vicinity of areas under consideration in this EIS were also recently surveyed. Two rookeries, Clubbing Rocks North and Clubbing Rocks South, are those closest to Cold Bay on the Pacific side of the Alaska Peninsula, 20 nautical miles to the south. Counts were 778 pups and 1,023 non-pups for both rookeries combined in 2009 (DeMaster 2009) and 600 pups and 900 non-pups in 2010 (Fritz, Finneseth, and Sweeney 2010). Amak Island (and nearby rocks), managed by the Alaska Maritime National Wildlife Refuge, is the closest haulout to Izembek Lagoon on the north side of the Alaska Peninsula. Amak is no longer considered a rookery, and only 1 pup was sighted there in 2009, along with 324 non-pups (DeMaster 2009). In 2010, there were 0 pups and 350 non-pups present (Fritz, Finneseth, and Sweeney 2010). The Sitkinak/Cape Sitkinak haulout is another trend site where 62 non-pups were counted in 2009 (DeMaster 2009) and 44 in 2010 (Fritz, Finneseth, and Sweeney 2010).

Endangered Species Act Status

The National Marine Fisheries Service listed the Steller sea lion as threatened under the *Endangered Species Act* in April 1990 (Federal Register 1990) due to substantial declines in the western part of the range. At that time, sea lion abundance in southeastern Alaska and Canada was increasing at approximately 3 percent per year (NMFS 2008). In 1997, based on demographic and genetic differences (Loughlin 1997), the National Marine Fisheries Service designated 2 distinct population segments of Steller sea lions under the Endangered Species Act. The western distinct population segment, showing continued decline, was reclassified as endangered in 1997, while the eastern distinct population segment remained classified as threatened (Federal Register 1997b; NMFS 2008). Critical habitat was designated in 1993 (Federal Register 1993). A final recovery plan was published in 1992 and was later revised in 2008 (NMFS 2008).

Critical Habitat Designation

Critical habitat for Steller sea lions was designated by the National Marine Fisheries Service in August 1993 (Federal Register 1993) based on the location of terrestrial rookery and haulout sites, spatial extent of foraging trips, and prey availability. Critical habitat for the western distinct population segment include: 1) 20-nautical mile buffer around all major haulouts and rookeries; 2) terrestrial zone extending 3,000 feet landward from the baseline or base point of each major rookery and major haulout; 3) air zones 3,000 feet above the terrestrial zones noted previously; and 4) 3 “special aquatic foraging areas” (Shelikof Strait, Bogoslof, and Seguam Pass areas).

No Steller sea lion haulouts or rookeries are within the Izembek National Wildlife Refuge or Cold Bay, although a 20-nautical mile critical habitat buffer extends into the region along the north side of the Alaska Peninsula (Figure 3.2-26). The buffer zone around the former rookery and current haulout near Amak Island, approximately 11 miles north of Izembek Lagoon (Taylor and Sowl 2008), extends into the lagoon. No critical habitat exists within Cold Bay. The nearest critical habitat to Cold Bay surrounds 2 rookeries (Clubbing Rocks North and Clubbing Rocks South) that are more than 20 nautical miles south of the bay in the Pacific Ocean. Waters around Sitkinak Island and the parcel under consideration in the land transfer lie within the 20 nautical mile buffer around the Sitkinak/Cape Sitkinak haul-out site (NMFS 2008).

Habitat Use

Information on Steller sea lion occurrence and habitat use within the area of concern is limited. Up to 50 Steller sea lions may occur in Cold Bay at any specific time (Sease, cited in USACE 2003). Sea lions occur year round in Cold Bay, although most observations are during the summer salmon season, when sea lions feed near spawning streams and on fish scraps from the fish cleaning area at the Cold Bay dock (Dau, cited in USACE 2003). Sea lions are more common near the mouth of Cold Bay, but have occasionally been seen in the upper bay, near Kinzarof Lagoon (USACE 2003).

Steller sea lions haul out on a rock off Cape Sitkinak (the trend site known as Sitkinak/Cape Sitkinak) (DeMaster 2009) on the east end of Sitkinak Island. No other haulouts are on Sitkinak Island (Fritz 2010).

State lands adjacent to the Alaska Peninsula National Wildlife Refuge North Creek Unit and Pavlof Unit proposed for inclusion in the land conveyance and wilderness designation are largely terrestrial, so are likely of little to no consequence to Steller sea lions.

Conservation Concerns

Numerous sources of mortality and causes for population decline have been proposed and investigated. Included are anthropogenic sources (subsistence hunting, illegal shooting, incidental taking, competing with fisheries), natural causes (predation by killer whales and sharks), and nutritional stress (Loughlin and York 2000).

The revised Recovery Plan for Steller sea lions (NMFS 2008) assesses the different potential threats currently impeding the recovery of Steller sea lions. The low threat category includes: 1) Alaska Native subsistence harvest; 2) illegal shooting; 3) entanglement in marine debris; 4) incidental take by fisheries; 5) disease; and 6) disturbance from vessel traffic and scientific research. Toxic substances were considered a medium level threat. Potentially high-level threats include: 1) competition with fisheries for food; 2) environmental variability; and 3) predation by killer whales. A great deal of research has been conducted to investigate the role of various threats (e.g., Table 3b in Allen and Angliss 2010), but the reasons for the decline and lack of recovery of the western distinct population segment remain uncertain.

3.2.7.6 Proposed Land Exchange Parcel and Project Site Summaries

Road Corridors

None of the threatened or endangered species occur directly within the boundaries of the proposed corridors.

Sitkinak Island

Steller's Eiders occur in nearshore waters of Sitkinak Island during winter. During winter aerial surveys, Larned and Zwiefelhofer (2001) observed 40 eiders adjacent to the narrow spit of land bordering Sitkinak Lagoon that is part of the proposed land conveyance.

Designated critical habitat for northern sea otters and for Steller sea lions includes the waters adjacent to both parcels under consideration for exchange on Sitkinak Island (Figure 3.2-26)

State Lands

It is unlikely that Steller's Eiders occur on state lands adjacent to the Alaska Peninsula National Wildlife Refuge North Creek Unit and Pavlof Unit, although they may use marine waters offshore of the North Creek Unit (Dau and Mallek 2009). These lands are unlikely to be important habitat for either Steller sea lions or northern sea otters. The small segment along the northern border that abuts the shoreline could include coastal habitat of interest to sea otters.

Mortensens Lagoon

The lands adjacent to the lagoon are not used by the threatened or endangered species discussed here. Mortensens Lagoon lies within low density wintering habitat for Steller's Eiders (Figure 3.2-25) and the nearshore marine environment of the lagoon is within sea otter critical habitat of the South Alaska Peninsula Unit (Figure 3.2-26).

Kinzarof Lagoon

Kinzarof Lagoon is a high density wintering habitat for Steller's Eiders (Laubhan and Metzner 1999; USACE 2003) (Figure 3.2-25). This includes the entirety of the lagoon, the north side of the proposed exchange parcels, the entrance to the lagoon between the proposed exchange parcels, and waters on the south side of the western parcel. Laubhan and Metzner (1999) noted a decrease in eiders using Izembek Lagoon and an increase in use of Kinzarof Lagoon and Cold Bay when ice cover on Izembek Lagoon exceeded 10 percent.

Upper Cold Bay and Kinzarof Lagoon are also areas with high-density sea otter concentrations, particularly near the entrance to Kinzarof Lagoon (USACE 2003). Otters use the area year round. Sand and gravel islands and spits near the entrance to Kinzarof Lagoon provide haulouts for up to 200 sea otters at a time during the ice-free part of the year (Dau, personal communication, cited in USACE 2003). This area is designated critical habitat for northern sea otters (Figure 3.2-26).

Steller sea lions are more common near the mouth of Cold Bay, but are occasionally seen in the upper bay near Kinzarof Lagoon (USACE 2003).

King Cove Corporation Selected Lands

None of the threatened or endangered species occur directly within the boundaries of this parcel.

Northeast Terminal Site

This area lies within low density wintering habitat for Steller's Eiders (Figure 3.2-25) and the nearshore marine environment in this portion of Cold Bay is within sea otter critical habitat of the South Alaska Peninsula Unit (Figure 3.2-26).

Lenard Harbor Ferry Terminal Site

This site lies within low density wintering habitat for Steller's Eiders (Figure 3.2-25). The nearshore marine environment of Lenard Harbor includes sea otter critical habitat designated within the South Alaska Peninsula Unit (Figure 3.2-26).

Cold Bay Dock Site

The area in the vicinity of the dock is considered low density wintering habitat for Steller's Eiders (Figure 3.2-25). The nearshore marine environment and upper Cold Bay are designated northern sea otter critical habitat (Figure 3.2-26). Most Steller sea lion observations in Cold Bay occur during the summer salmon season when sea lions feed near spawning streams and on fish scraps from the fish cleaning area at the Cold Bay dock (Dau, cited in USACE 2003).

Cross Wind Cove

The area in the vicinity of Cross Wind Cove is considered low density wintering habitat for Steller's Eiders (Figure 3.2-25). The nearshore marine environment and upper Cold Bay are designated northern sea otter critical habitat (Figure 3.2-26).

U.S. Department of Interior
U.S. Fish & Wildlife Service

http://www.fws.gov
http://izembek.fws.gov/eis.htm

Federal Relay
1 800/877 8339 Voice and TTY

February 2013