United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
Southern Alaska Fish and Wildlife Field Office
4700 BLM Road
Anchorage, Alaska 99507

In Reply refer to:
FWS/R7/SAFWFO/2024-0125485

October 14, 2025

Memorandum

To: Karlin Itchoak, Assistant Regional Director, National Wildlife Refuge System, Alaska Region

From: Douglass Cooper, Acting Field Supervisor, Southern Alaska Fish and Wildlife Field Office, Anchorage, Alaska DOUGLASS COOPER Digitally signed by DOUGLASS COOPER Date: 2025.10.14 14:50:16 -08'00'

Subject: Biological Opinion for the Izembek National Wildlife Refuge Land Exchange for a Proposed Road Corridor (Consultation Number 2024-0125485)

This memorandum transmits the U.S. Fish and Wildlife Service's (Service) biological opinion, based on our review of the Izembek National Wildlife Refuge land exchange for a proposed road corridor and its effects on the threatened Alaska-breeding population of Steller's eiders (*Polysticta stelleri*), the threatened southwest Alaska Distinct Population Segment (DPS) of northern sea otter (*Enhydra lutris kenyonii*), and designated critical habitat for the Alaska-breeding population of Steller's eider and southwest Alaska DPS of northern sea otter, in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*., ESA). We received your request for formal consultation on July 2, 2025. You have also made a no effect determination for short-tailed albatross (*Phoebastria albatrus*). We have reviewed this no effect determination and adopt it as part of our analysis of the proposed action in this biological opinion.

We have based the attached biological opinion on the best available scientific and commercial information from a variety of sources including the June 30, 2025, Biological Assessment, the November 2024 draft Supplemental Environmental Impact Statement, the 2013 Final Environmental Impact Statement and Record of Decision, Microsoft Teams and telephone conversations, emails, peer-reviewed publications, unpublished reports available through the Service, and other sources of information cited in the biological opinion. A complete record of this consultation is on file at the Southern Alaska Fish and Wildlife Field Office in Anchorage, Alaska.

We appreciate your efforts in conserving listed species as part of your responsibility under the ESA. If you have questions regarding this consultation, please contact me at douglass_cooper@fws.gov or (907) 891-6164 and refer to consultation number 2024-0125485.

Attachment: Biological Opinion

BIOLOGICAL OPINION
for the

Proposed Izembek National Wildlife Refuge Land Exchange for a Road Corridor

Project Code: Consultation Number 2024-0125485

Federal Action Agency
United States Fish and Wildlife Service
National Wildlife Refuge System
Anchorage, Alaska

October 14, 2025

Consultation Prepared by:
U.S. Fish and Wildlife Service
Southern Alaska Fish and Wildlife Field Office
Anchorage, Alaska

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LIST OF ABBREVIATIONS USED IN THIS DOCUMENT

ADEC:	Alaska Department of Environmental Conservation
ADF&G:	Alaska Department of Fish and Game
ADOT&PF:	Alaska Department of Transportation and Public Facilities
ANILCA:	Alaska National Interest Lands Conservation Act
ANCSA:	Alaska Native Claims Settlement Act
ATV:	All-Terrain Vehicle
CI:	Confidence Interval
CFR:	Code of Federal Regulations
CUD:	Client Use Day
dBA:	A-weighted decibels
DPS:	Distinct Population Segment
EIS:	Environmental Impact Statement
ESA:	Endangered Species Act
FR:	Federal Register
GAM:	Generalized Additive Model
KCC:	King Cove Corporation
MMPA:	Marine Mammal Protection Act
MTRP:	Marking Tagging Recapture Program (Service's Marine Mammals Management)
MU:	Management Unit
NMFS:	National Marine Fisheries Service (in-text citations only)
NOAA:	National Oceanic and Atmospheric Administration
PBF:	Physical and Biological Feature (equivalent to PCE)
PCE:	Primary Constituent Element (equivalent to PBF)
PSO:	Protected Species Observer
Refuge:	National Wildlife Refuge
SAFWFO:	Southern Alaska Fish and Wildlife Field Office
SE:	Standard Error
SEIS:	Supplemental Environmental Impact Statement
Service:	U.S. Fish and Wildlife Service
SSA:	Species Status Assessment
SWPPP:	Stormwater Pollution Prevention Plan
USFWS:	U.S. Fish and Wildlife Service (citations only)

1 INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion, based on our review of the proposed Izembek National Wildlife Refuge land exchange with King Cove Corporation (KCC) on the threatened Alaska-breeding population of Steller's eider (*Polysticta stelleri*), the threatened southwest Alaska Distinct Population Segment (DPS) of northern sea otter (*Enhydra lutris kenyonii*), and designated critical habitat for the Alaska-breeding population of Steller's eider and the southwest Alaska DPS of northern sea otter, in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*., ESA). The land exchange would provide KCC with a corridor of land that KCC proposes to use for the construction and operation of a single-lane, gravel road to link King Cove, Alaska with the airport at Cold Bay, Alaska. The land exchange would provide the Service with additional lands to be managed as part of the Izembek National Wildlife Refuge. The National Wildlife Refuge (hereafter, Refuge) System requested formal consultation on June 30, 2025.

The federally endangered short-tailed albatross (*Phoebastria albatrus*) was considered due to its presence in Alaskan waters along the Aleutian chain. The species is associated with the continental shelf break and slope regions of the Bering Sea (Aleutian Archipelago) and, to a lesser extent, the Gulf of Alaska (Suryan and Kuletz 2018). Short-tailed albatrosses do not breed in the U.S., but forage extensively and spend considerable time in Alaskan waters along the Aleutian Archipelago. The species has not been recorded on Izembek National Wildlife Refuge and is unlikely to occur within the proposed action area (which comprises nearshore coastal waters not within the continental shelf break). The Refuge has determined the proposed action will have no effect on the short-tailed albatross. We concur with this determination; therefore, short-tailed albatross is not analyzed further in this biological opinion.

We have based this biological opinion on the best available scientific and commercial information from a variety of sources including the June 2025 Biological Assessment, the November 2024 draft Supplemental Environmental Impact Statement, the 2013 Final Environmental Impact Statement and Record of Decision, Microsoft Teams and telephone conversations, emails, peer-reviewed publications, unpublished reports available through the Service, and other sources of information cited in the biological opinion. A complete record of this consultation is on file at the Southern Alaska Fish and Wildlife Field Office (SAFWFO) in Anchorage, Alaska.

1.1 Consultation History

- The SAFWO provided technical assistance on previous iterations of this project, including commenting on September 9, 2024, on an initial draft biological assessment for a previous iteration of the proposed Izembek Land Exchange.
- June 6, 2025: The SAFWFO met with representatives from King Cove Group, the Alaska Department of Transportation and Public Facilities (ADOT&PF), the Refuge System, and the Service's Regional Director to discuss proposed conservation measures to avoid, reduce, and mitigate potential impacts to federally listed species prior to initiation of formal consultation.
- June 30, 2025: The SAFWFO received a biological assessment and request to initiate formal consultation on the most recent iteration of the proposed Izembek Land Exchange.

- July 28, 2025: The SAFWFO was forwarded an email exchange between King Cove Native Corporation and the National Marine Fisheries Service regarding potential use of existing hovercraft landing areas in lieu of constructing two, new barge landing sites/staging areas of 0.5 acre (0.2 hectare) each. The Service updated the project description accordingly and analyzed the effects of the proposed action as described in the July 2, 2025, biological assessment minus construction of these sites.
- August 14, 2025: The SAFWFO received an addendum to the Final Proposed Action for the 2025 Proposed Izembek Land Exchange and Road Corridor, which provides a description of modifications to the proposed road corridor and proposed road construction and includes additional avoidance and minimization measures.
- August 25, 2025: The SAFWFO received updated language for the addendum to the Final Proposed Action for the 2025 Proposed Izembek Land Exchange and Road Corridor, which clarifies Blinn Lake will not be used as a source of water for the project due to suspected per- and polyfluoroalkyl substances (PFAS) contamination.

1.2 Description of the Proposed Action

Regulations implementing the ESA (50 CFR 402.02) define "action" as, "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas… ." The following is a description of the proposed action. Additional information can be found in the November 2024 draft Supplemental Environmental Impact Statement (SEIS) (USFWS 2024*a*).

The proposed action considered herein is authorization of a land exchange between the Federal government and KCC at Izembek Refuge, Alaska. Lands to be conveyed out of Federal ownership under the proposed action are identified in U.S. Survey 14495 and consist of an irregularly shaped corridor-like parcel that is approximately 15 miles long and contains approximately 490 acres (198 hectares) of public lands; 484 acres (196 hectares) of these lands are administered by the Service as the Izembek Refuge (336 acres [136 hectares] as Izembek Wilderness; Figure 1). These lands are located on an isthmus connecting Izembek and Moffet Lagoons to the north and Kinzarof Lagoon to the south (Figure 2). Lands to be conveyed into Federal ownership include the surface estate of certain lands KCC owns within Izembek Refuge; the specific surface estate to be conveyed contains 1,739 legal acres (704 hectares) from the "KCC Exchange Lands Pool" (Figure 1).

The lands affected by the land exchange authorization would include the following:

- The United States government would convey by patent approximately 490 acres (198 hectares) of public land (surface and subsurface estates, as delineated in U.S. Survey 14495), owned by the United States government and administered by the Service as Izembek Refuge, out of Federal ownership and into private ownership by KCC.
    - This includes 484 acres (196 hectares) administered by the Service as Izembek Refuge, of which 336 acres (136 hectares) are located in Izembek Wilderness.
    - This also includes approximately 6 acres (2.4 hectares) of subsurface estate owned by the United States government, in the location of a proposed material site on KCC surface lands.

- KCC would convey to the United States government the surface estate of certain lands it owns within the boundary of Izembek Refuge, quantity and specific area presently unknown.
    - Surface estate to be conveyed to the United States government would be selected from the "KCC Exchange Lands Pool" (Figure 1), which contains 1,739 legal acres (704 hectares) that lie within the boundary of the Izembek Wilderness.
- KCC would relinquish its selection rights under the Alaska Native Claims Settlement Act (ANCSA) to 5,430 acres (2,197 hectares) located within Izembek Refuge on the east side of Cold Bay, identified as "KCC Selected Lands Relinquished" in Figure 1. KCC would remain entitled to conveyance of an equivalent metric of land previously selected but not yet conveyed under ANCSA from outside the Izembek Refuge.

The purpose of the proposed land exchange is to enter into an equal value land exchange where the Service conveys surface and subsurface interests to provide KCC with lands that would allow KCC to pursue the construction and operation of a long-term, safe, reliable, and affordable year-round road that would connect with other existing roads for the purpose of construction and operation of a road between the City of King Cove and Cold Bay Airport, Alaska in return for interests in other lands within Izembek Refuge that further the purposes of the Alaska Native Interests Lands Conservation Act (ANILCA). The road project applicant has not yet been identified but is assumed to be the State of Alaska or the Aleutians East Borough (USFWS 2024*a*, 2025*a*). The proposed road would be 18.9 miles (30.4 kilometers) of a single-lane, gravel road from the existing King Cove Access Road northeast terminal, at the eastern end of the isthmus, to the intersection of Outer Marker Road and Blinn Lake Loop, near the Cold Bay Airport. There are no proposed restrictions on use of the road, and guardrails to address potential off-road vehicular traffic transgressions into Izembek Refuge are not included as part of the proposed design standard.

The general route for the road corridor is identified in U.S. Survey 14495 and is also the same route identified as "Alternative 2 southern road alignment" in the 2013 final Environmental Impacts Statement (EIS), with minor adjustments based on further refinement and design by the ADOT&PF (ADOT&PF 2021). Road construction would also include 15 material sites. Twelve of the proposed material sites are located within what is currently Congressionally designated wilderness. Road construction is anticipated to take place over 2 years, during a May through November window. At the closest point, the road would be located 0.5 to 1 mile (0.8 to 1.6 kilometers) from Kinzarof Lagoon, 0.7 mile (1.1 kilometers) from Izembek Lagoon, and 1.7 miles (2.7 kilometers) from Moffet Lagoon. The closest material site to Kinzarof Lagoon is 0.33 mile (0.53 kilometer), and the closest material site to Izembek Lagoon is 0.7 mile (1.13 kilometers).

The areas that would be affected through the land exchange and subsequent construction and use of a road between the City of King Cove and the Cold Bay Airport are described in the Action Area, section 2.1.

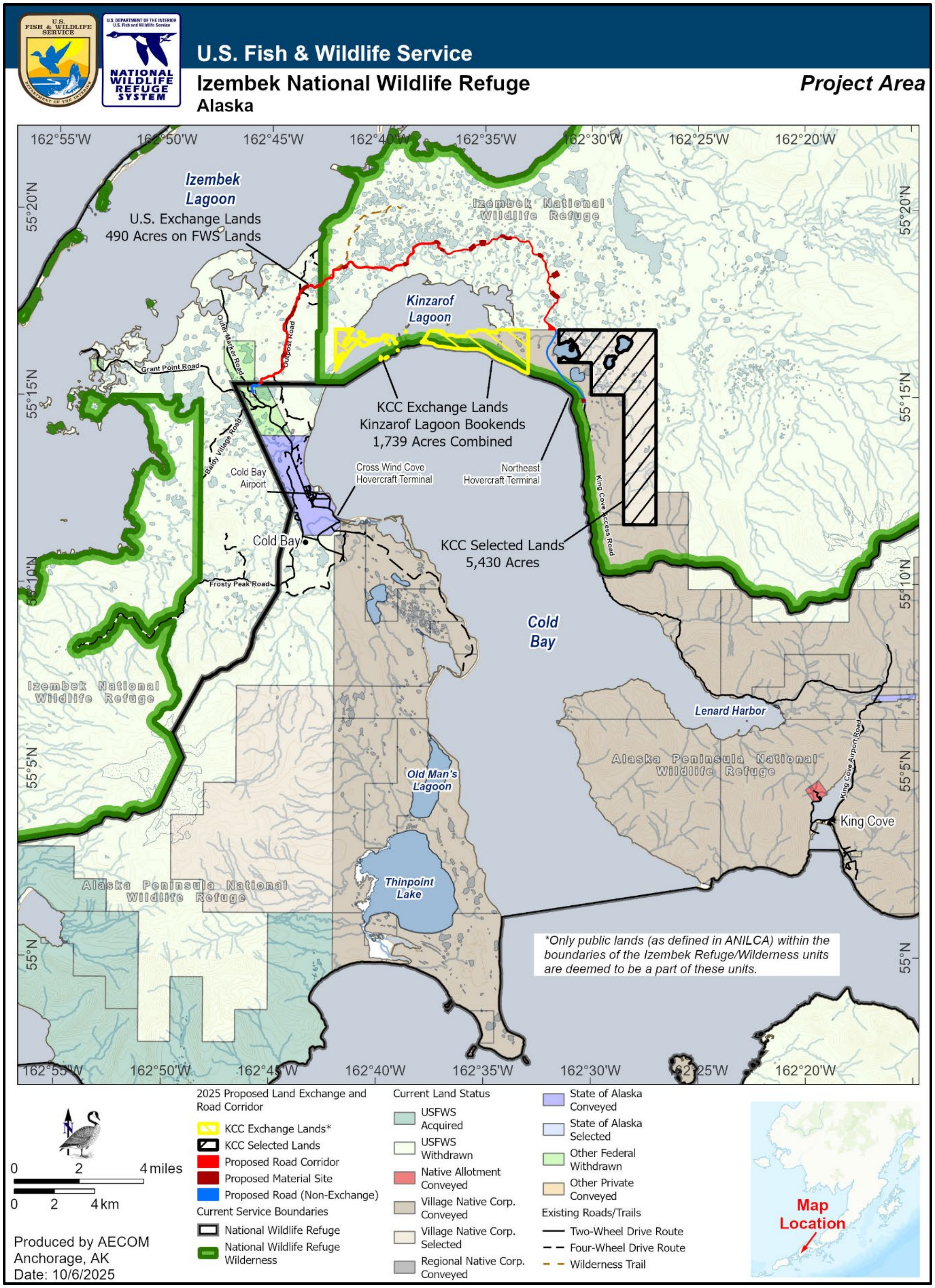

Figure 1. Map of the proposed action. Public lands (surface and subsurface estate) to be conveyed to KCC include the proposed road right-of-way (red line) and material sites (maroon polygons).

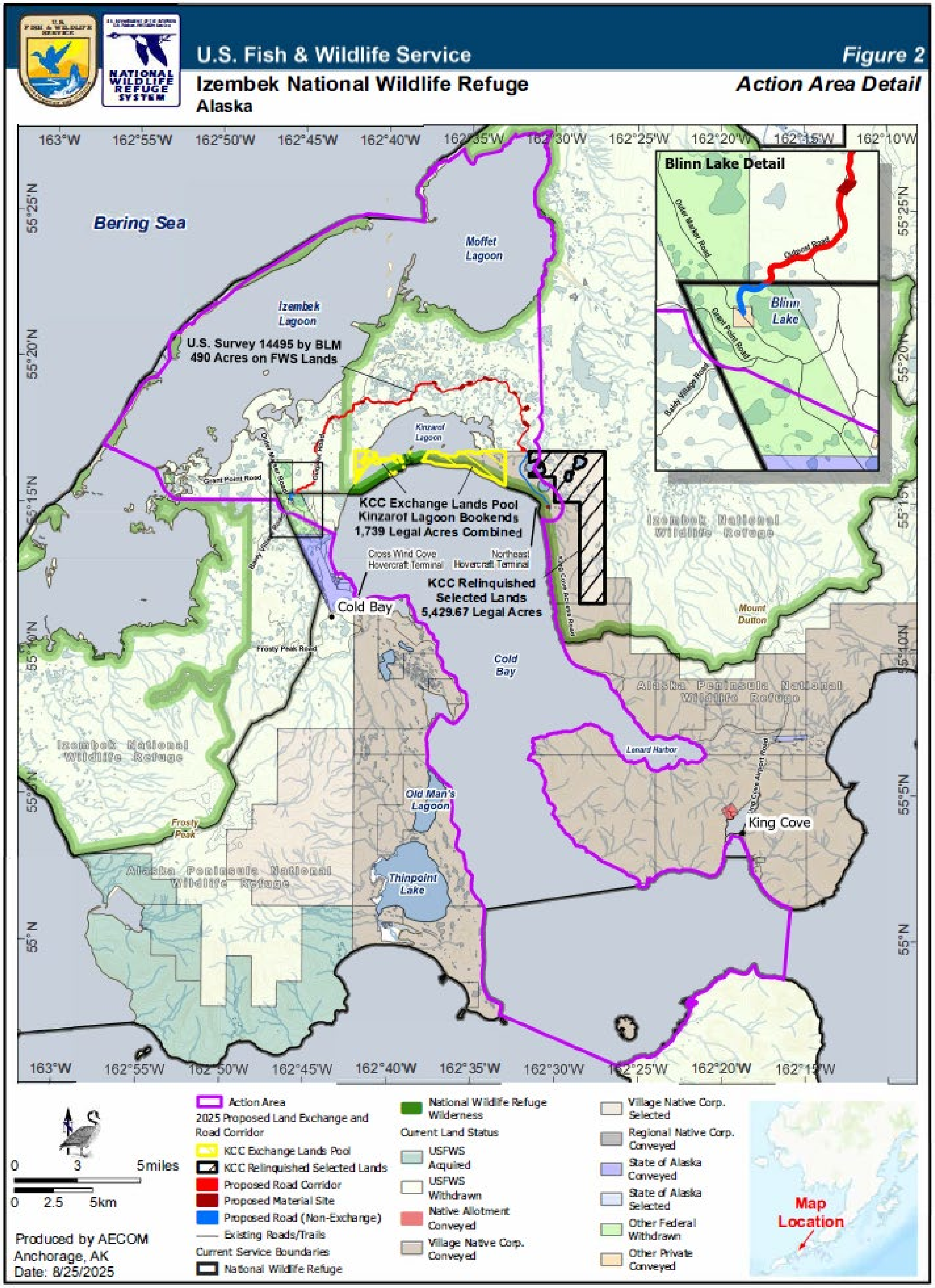

Figure 2. Map of the proposed action. Public lands (surface and subsurface estate) to be conveyed to KCC include the proposed road right-of-way (red line) and material sites (maroon polygons).

1.3 Action Area

The action area is defined (50 CFR 402.02) as, "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." We consider the entire road corridor and the surrounding areas that might be impacted from road construction and use to be included in the action area (Figure 2). Therefore, the Service has determined the action area encompasses all lands included (or potentially included) within the proposed land exchange; the entirety of the isthmus between Izembek and Kinzarof Lagoons (hereafter, Izembek Isthmus); Kinzarof, Moffet, and Izembek Lagoons, where we predict an increase in human activity due to increased access facilitated by a road; and the marine waterbody of Cold Bay, from Kinzarof Lagoon south to the mouth of Cold Bay at Deer Island, where barging and vessel traffic associated with the proposed action are expected to increase above current baseline levels. The action area contains habitat used by Steller's eiders during fall migration and molt, spring migration and staging, and wintering for foraging, resting, and courtship and pair bonding and nearshore habitats used by northern sea otters year-round as natal grounds, protection from predators, shelter from storms, and for access to prey. The action area also contains portions of the critical habitat designated for each species (see section 4, Status of the Species and Critical Habitat).

1.3.1 Izembek Isthmus

The Izembek Isthmus is a narrow (approximately 3 miles [4.8 kilometers] wide) isthmus comprised of a low-lying wetland complex consisting of wet sedge meadows and numerous lakes and ponds interspersed with upland tundra. The isthmus is situated between the highly productive waters of the Bering Sea and the Gulf of Alaska and is hydrologically connected to Izembek, Moffet, and Kinzarof Lagoons. It is crossed by multiple anadromous streams. There is an existing network of roads and trails near the communities of Cold Bay and King Cove, on either end of the isthmus. Some overgrown trails also exist in portions of the isthmus, left over from the military's presence in the area during and after World War II (USFWS 2003).

Groundwater in this area is generally unconfined within sand and gravel lenses and is recharged through the infiltration of rainfall and snowmelt. Groundwater is assumed to flow from south to north along the slopes of Frosty Peak, discharging into Cold Bay via Kinzarof Lagoon and/or into Izembek Lagoon (Rice and Hogan 1995). The proposed action on the Izembek Isthmus would include the following:

- Approximately 15.6 miles (25.1 kilometers) of the proposed 18.9-mile (30.4 kilometers) road would be located on lands currently within the Izembek Refuge:
    - The new road alignment would begin at the current boundary of Izembek Refuge, at the northeast terminal of the existing King Cove Access Road, extending in a northerly direction for approximately 2.8 miles (4.5 kilometers).
    - The road would enter what is currently the Izembek Wilderness area, then would continue northerly for approximately 3.5 miles (5.6 kilometers) before turning west; continue westerly for approximately 7 miles (11.3 kilometers) before turning southwest; and continue southwesterly for approximately 5.1 miles (8.2 kilometers) before exiting the current boundary of Izembek Refuge.
    - Between Mileposts 2.8 to 13.3 (kilometer 4.5 to 21.4), 10.5 miles (16.9 kilometers) of the road corridor within the current boundary of the refuge would

be new construction in an area with a mix of disturbed and undisturbed lands; this area is part of the proposed land exchange. Approximately 2.8 miles (4.5 kilometers) of the road corridor within the refuge boundary would be constructed on lands with surface estate owned by KCC; surface estate is not part of the proposed land exchange. Subsurface is in Federal ownership.
    - Between Mileposts 13.3 to 18.9 (kilometer 21.4 to 30.4), 5.1 miles (8.2 kilometers) of the road corridor within the current boundary of the refuge and an additional 0.5 mile of the road corridor outside of the current refuge boundary would be new construction on existing roads and trails within the area.
- Beyond the current boundary of the Izembek Refuge, the road would continue for another 0.5 mile (0.8 kilometer), where it would terminate at the intersection of Outer Marker Road and Blinn Lake Loop.
- Other lands that are not part of the proposed land exchange between the Service and KCC would be encumbered by the proposed road corridor on the western and eastern ends:
    - Approximately 12 acres (5 hectares) of other Federal property currently administered by the Federal Aviation Administration as an air navigation site (Withdrawal No. 176); this includes approximately 0.4 mile (0.64 kilometer) of the road corridor on the west end, from mile 18.5 of the proposed road to the intersection with Outer Marker Road.
    - A section on the west end of the proposed road corridor near the intersection of Outer Marker Road and Blinn Lake Loop, approximately 2 acres (0.8 hectares) and less than 0.1 mile (0.16 kilometer) in length, is within a 22.95-acre (9.29-hectare) parcel of private land. Authorization for use of the road would have to be obtained from the current owner of this parcel.
    - Additionally, the proposed road would involve 2.8 miles (4.5 kilometers) of new road construction on KCC surface estate at the eastern end of the project.
- Fifteen material sites have been identified for construction of the proposed road:
    - Approximately 13 material sites would be excavated from the proposed road corridor, via expansion of the cut limits, with specific locations of competent material to be determined. Sites would vary in size, with the largest at 800 feet long by 1,150 feet wide (243 meters long by 351 meters wide).
    - One new, dedicated material site would be developed at mile 4.9 (kilometer 7.9) of the proposed road. This site, separate from the road embankment, would also require construction of an access road.
    - One existing, dedicated material site (located on KCC surface estate) would be expanded at the eastern end of the project, impacting approximately 6 acres (2.4 hectares) of KCC surface estate plus U.S. government-owned subsurface estate that is managed as Izembek Refuge.
    - Twelve of the proposed material sites would be located within the current boundaries of the Izembek Wilderness.
- Three water sources have been preliminarily identified for use during road construction:
    - Shake Lake, a 33-acre (13.4-hectare) lake that is unconnected to anadromous waters, located on the west end of the current Izembek Wilderness boundary;
    - Bactrian Lake, a 128-acre (51.8-hectare) lake located midway along the road alignment, connected to Kinzarof North Stream (Anadromous Waters Catalog #283-34-10500; ADF&G 2024);

- Southeast Kinzarof Stream (Anadromous Waters Catalog #283-34-10700; ADF&G 2024), located on the east end of the proposed road.

- Temporary support facilities (e.g., job trailers and personnel housing) would also be required during construction. Sites for temporary support facilities have not been identified, but possibilities include the northeast terminus of the existing King Cove Access Road. No support facilities would be staged within the modified boundaries of Izembek Refuge (USFWS 2025*a*).

1.3.2 Greater Cold Bay

Cold Bay is a large, deepwater embayment of the Pacific Ocean located on the south (i.e., Gulf of Alaska) side of the Alaska Peninsula. Within approximately 1,600 feet (500 meters) of the shoreline, water depth in Cold Bay increases gradually to 20 feet (6 meters), beyond which water depths increase rapidly and approaches 197 feet (60 meters) in depth at 3,280 feet (1 kilometer) from shore. The City of Cold Bay, 56 residents (State of Alaska 2025), is located on the northwestern shore of this large waterbody, near the head of the bay. The City of King Cove, 866 residents (State of Alaska 2025), is located 18 miles (29 kilometers) southwest of the City of Cold Bay, just outside the bay itself.

In this region, winters are cold and stormy, and summers are mild and cloudy due to moderating effects of the ocean. Autumn arrives in early October and is usually the wettest season. The first frost usually occurs in October or November. In winter, snow often alternates with rain. Sea ice can form in the coastal lagoons and bays during the winter.

Cold Bay is lined by multiple shallow lagoons, including Kinzarof Lagoon, which is located at the northern head of Cold Bay. The Cold Bay embayment is about 8.7 miles (14 kilometers) across at its widest point and protrudes inland approximately 24.9 miles (40 kilometers) (Rice and Hogan 1995). Cold Bay, like many coastal areas on the Alaska Peninsula, is characterized by a two-layered, estuarine-circulation system. In this system, spring season brings increased freshwater that drives freshwater flows seaward along the surface. This freshwater is replaced by saltwater that intrudes at greater depths. In fall and winter, storms and reduced runoff combine to mix the layers and destroy this system (Rice and Hogan 1995).

The coastline of Cold Bay is made up of gravel, sand and gravel beaches, and sand and mud beaches of various widths and inclines, as well as riparian and lagoon habitat (NOAA 2025). Although Cold Bay is largely unvegetated, the nearshore habitat of Cold Bay is lined with patchy and continuous bands of soft brown kelp (*Laminaria*) species and dragon kelp (*Eularia fistulosa*) species (NOAA 2025). Continuous, and patchy eelgrass (*Zostera marina*) habitat also occurs around much of Cold Bay (NOAA 2025). Numerous (greater than ten) anadromous streams feed into Cold Bay (ADF&G 2024).

The proposed action would involve the following activities in and adjacent to the waters of Cold Bay:

- Use of the existing hovercraft ramps at both ends of the road corridor, at the northeast terminal of the existing King Cove Access Road and at Cross Wind Cove near Cold Bay, for barge landing sites/staging areas.

- Barging activities may originate from, return to, or stop (for refueling) at the following port locations: Seattle, Washington; and Seward, Anchorage, Kodiak, and Dutch Harbor, Alaska.
- Temporary support facilities (e.g., job trailers and personnel housing) would also be required during construction. Sites for temporary support facilities have not been identified, but possibilities include Lenard Harbor, the City of King Cove, and the City of Cold Bay.

1.3.3 Izembek, Moffet, and Kinzarof Lagoons

Izembek and Moffet Lagoons (hereafter, Izembek Lagoon, except where otherwise noted) are connected bodies of water on the Bristol Bay side of the Izembek Isthmus, whereas Kinzarof Lagoon is on the opposite side of the isthmus and is connected to Cold Bay and the greater Gulf of Alaska. Izembek Lagoon experiences a vastly different tidal cycle relative to Kinzarof Lagoon: Izembek Lagoon experiences semi-diurnal and mixed diurnal tides, with a typical semi-diurnal tidal range of 5.3 feet (1.6 meters; Environmental Science and Engineering Inc. 1989). Kinzarof Lagoon, like Cold Bay, experiences a semidiurnal tide ranging from 23 to 26 feet (7 to 8 meters). The tides between these two sides of the Izembek Isthmus are not synchronous.

Ice often covers more than 75 percent of Izembek Lagoon for 1 to 2 months annually, between December and March, but ice conditions vary annually (Ward et al. 1997, Petrich et al. 2014). During harsh winters, Izembek Lagoon will freeze to the bottom, whereas Kinzarof Lagoon (and Cold Bay) typically remains open. Together, Izembek and Kinzarof Lagoons form the "Izembek Complex," which henceforth we use to include Cold Bay, the lagoons, isthmus, and connected watersheds.

Izembek Lagoon is a marine body of water formed by long, narrow, sparsely vegetated barrier islands (the Kudiakof Islands) along the Izembek Isthmus, on the north side of the Alaska Peninsula near its southwestern tip. Izembek Lagoon is connected to Bristol Bay and in turn the Bering Sea. The southwestern end of the lagoon is located about 6.2 miles (10 kilometers) north of the city of Cold Bay, Alaska. Izembek Lagoon contains extensive eelgrass beds that are exposed at low tide, along with sandflats and mudflats (78 percent of the lagoon; McRoy 1966) and a few deeper channels connecting the lagoon to the Bering Sea (22 percent of the lagoon; McRoy 1966). Much of the lagoon is less than 6.5 feet (2 meters) deep (Petrich et al. 2014). Izembek Lagoon contains the largest eelgrass (Zostera marina) beds in the world (Ward et al. 1997); about 44 to 47 percent of the lagoon is vegetated with eelgrass (Ward et al. 2022). Macro-invertebrate surveys found that gastropods and Caprella shrimp were the most common macro-invertebrates in Izembek Lagoon, but crabs, sponges, sea stars, and mussels were also found (Ward et al. 2022). Izembek Lagoon contains only small bands of patchy and continuous soft brown kelp (Laminaria) species, primarily in Norma Bay and Applegate Cove (NOAA 2025). Izembek Lagoon is connected to Moffet Lagoon.

Moffet Lagoon is functionally part of Izembek Lagoon, with its southwestern boundary located about 15 miles (24 kilometers) northeast of the City of Cold Bay. Much of Moffet Lagoon is vegetated with eelgrass, with sandflats and mudflats close to gaps between barrier islands. Moffet Lagoon is fed by major freshwater inlets such as the Joshua Green River (Ward et al. 2022).

Kinzarof Lagoon, located 5 miles (8 kilometers) northeast of the City of Cold Bay, is hydrologically connected to Cold Bay and the Gulf of Alaska. Similar to Izembek Lagoon, eelgrass covers about 45 to 50 percent of Kinzarof Lagoon. This is the largest eelgrass bed on the Pacific side of the Alaska Peninsula (USFWS/Williams 2023). Seaweeds cover about one-third of Kinzarof but are much less prevalent in Izembek. Their prevalence in Kinzarof is likely linked to the rockier substrate in Kinzarof Lagoon, which is ideal attachment surface for seaweeds. Small bands of patchy and continuous soft brown kelp (Laminaria) species are also present (NOAA 2025). Mud is a dominant sediment in Kinzarof Lagoon (Feder and Jewett 1987). Surveys found that macro-invertebrates were generally less common in Kinzarof Lagoon than Izembek Lagoon. Telmessus crab was the most common macro-invertebrate surveyed in Kinzarof Lagoon and were more common than in Izembek. Gastropods and Caprella shrimp were also found but mussels were absent. Peak eelgrass biomass in these lagoons usually occurs July to August (Ward et al. 2022).

1.4 Proposed Road from City of King Cove to Cold Bay Airport

The land exchange under consideration herein would provide KCC with the lands to construct an 18.9-mile (30.4 kilometers) single-lane, gravel road on the Izembek Isthmus, between the City of King Cove and the Cold Bay Airport. The road would be 13 feet (3.96 meters) wide at the surface with an approximately 24-foot-wide (7.3 meters) subgrade (USFWS 2024*a*, 2025*a*). A centerline survey, geotechnical investigations, and other detailed site surveys to inform detailed design have not been completed for the proposed road. Specific information noted herein is derived from the draft SEIS and the final biological assessment (USFWS 2024*a*, 2025*a*).

1.4.1 Road Design Criteria

The proposed road would be 13 feet wide (4 meters) at the surface (11-foot [3.4-meter] driving lane with two, 1-foot [0.3-meter] shoulders), with approximately 113 turnouts constructed along the road corridor to enable safe passage of approaching vehicles. The draft SEIS and final biological assessment prepared by AECOM for the Refuge System (USFWS 2024*a*, 2025*a*) note design guidance for the proposed road is based on the American Association of State Highway and Transportation Officials Policy on Geometric Design of Highways and Streets ("Green Book," updated in 2019) and Guidelines for Geometric Design of Very Low Volume Roads, and the Alaska Department of Transportation and Public Facilities (ADOT&PF) 2005 Alaska Highway Pre-Construction Manual. The biological assessment states the road alignment has been developed to a 35 percent design level and is based primarily on information contained in the ADOT&PF's draft King Cove Cold Bay Road Plan and Profile, dated 2021, and the ADOT&PF's 2020 SF-299 right-of-way application submitted by the State of Alaska under ANILCA Section 1110(b) for Access to Inholdings at King Cove, Alaska.

Based on reconnaissance-level design, the proposed road would require 71 drainage structures (USFWS 2024*a*, 2025*a*). These would include one bridge over Southeast Kinzarof Stream, a large stream near mile 2.6 (Anadromous Waters Catalog #283-34-10700; ADF&G 2024), 7 culverts/pipe arches or small bridges to cross small streams, and 63 cross drainage culverts to maintain natural drainage patterns. Culverts would be designed for the 50-year storm event in final design and analyzed for passage of the 100-year storm event where drainage structures are located in a flood zone. To the extent practicable, for fish passage design, crossings over fishbearing streams will follow the Service's Culvert Design Guidelines for Ecological Function (Revision 10, 2025).

1.4.2 Road Construction Activities and Materials

Construction of the road would likely occur between May and November over 2 years. Major activities involved with construction would include development of material sites and processing of crushed rock; road embankment construction including cut, fill, and placement of geotextiles; water withdrawal from local sources for road embankment impaction and dust control; heavy equipment operations; and vessel operations. Specific details noted herein are derived from the draft SEIS and the final biological assessment (USFWS 2024*a*, 2025*a*).

Approximately 1.7 million cubic yards (1.3 million cubic meters) of material would be moved during cut and fill activities for construction of the proposed road. Construction equipment is expected to include large capacity vehicles that haul up to 20-cubic-yard (15-cubic-meter) loads. Such vehicles require a 12-foot-wide (3.7-meter-wide) operating width, which is expected to result in a subgrade of approximately 24 feet (7.3 meters) in width, and could require additional, temporary widening for safe passing between the permanent turnout areas. Organic soils and other materials disturbed during construction that are considered unusable for construction would be staged and stockpiled within the road corridor, then used for finishing graded backslopes and reclaiming abandoned sections of existing roads and trails.

Approximately 521,000 cubic yards (398,000 cubic meters) of crushed rock is planned for road construction. An additional 10,000 cubic yards (7,646 cubic meters) would be processed and stockpiled at material sites for future road maintenance. Most materials required for the roadway would be excavated from the proposed road corridor via expansion of the cut limits (approximately 13 material sites have been preliminarily identified). In addition, one material site at the eastern end of the road corridor would be expanded to obtain approximately 200,000 cubic yards (152,911 cubic meters) of fill, and one new material site would be developed at mile 4.9 (kilometer 7.9) of the proposed road.

Water for embankment compaction and dust control would be supplied from four water sources, three lakes and one stream, during road construction. Water requirements over the course of construction are expected to be relatively low due to typically wet weather in the action area (USFWS 2025*a*), preliminarily estimated to consist of 3.5 million gallons (13.2 million liters) to be obtained from two lakes and Southeast Kinzarof Stream (see USFWS 2024*a*, excepting Blinn Lake is no longer a water source under consideration for this project).

1.4.3 Road Use and Maintenance

The draft SEIS estimates four pieces of equipment and one additional person at the ADOT&PF Cold Bay maintenance station would be required for maintenance of the road. The road is assumed to have a lifespan of greater than 50 years, with gravel for maintenance required over the life of the road (USFWS 2024*a*). Roads and trails constructed during World War II have persisted on the landscape of the Izembek Isthmus long past their period of maintenance (see section 4.1 and DOI/USFWS2013*a*). Thus, we expect the road will continue to exist on the landscape and be used by four-wheel drive and off-road vehicle long after maintenance of the road ceases, and we define the lifespan of the road as 100 years for purposes of this biological opinion.

The road project applicant, once identified, would be responsible for road maintenance and operation under their normal operational plans (USFWS 2025*a*), with day-to-day management assumed to be provided by state resources or local entities under a management agreement (USFWS 2024*a*).

1.5 Conservation Measures

While conservation measures for Steller's eiders, northern sea otters, and their designated critical habitats were identified in the Service's final biological assessment (USFWS 2025*a*), no commitments were made to implementing these measures. In additional discussions between the Service, KCC, and ADOT&PF, conservation measures were negotiated and committed to by the various parties. While these were not all included in the BA, we received adequate assurance of implementation to consider the measures as part of the activities that would occur but for the proposed action.

The following measures will be implemented as part of the proposed action.

1. Sea Otter Best Management Practices for Vessel Operations:
    - For smaller vessels (<24 meters, <80 feet), vessels will maintain a minimum distance of 100 meters (328 feet) from single sea otters, 200 meters (656 feet) from female-pup sea otter pairs and 500 meters (1,640 feet) from rafts of sea otters (groups of 10 sea otters or more) when safe and practicable.
    - For larger vessels (>24 meters, >80 feet), vessels will maintain a minimum distance of 300 meters (984 feet) from sea otters when safe and practicable.
    - If vessel operators observe sea otters consistently flushing in response to the vessel transiting at the minimum distance, then the vessel operator shall increase the minimum distance until sea otters are no longer flushing in response to the vessel.
    - Vessels shall maintain maximum distance practicable from areas of surface kelp.
    - If marine mammals approach a vessel, place engines in neutral and allow them to pass.
    - All operations shall take precautions to minimize the risk of spilling fuels.
    - While operating skiffs in near shore areas, scan the water surface ahead of the boat vigilantly for otters. In choppy water conditions sea otters are difficult to spot.
    - If you are boating with another person, place them in the bow to help search. You may encounter otters as individuals, a mother and a pup, or rafts of 10 or more.
    - When you see an otter(s), alter your course and slow down to avoid disturbance and collision. Once you have spotted an otter(s), you should not assume that the otter(s) will dive and get out of the way. Even if they are alert, capable, and do dive, your action of knowingly staying your course would be considered harassment.
    - Do not operate a skiff at ANY rate of speed heading directly at the otter(s). A good rule of thumb is that your buffer should be great enough that there is ample room for the otter(s) to swim away without startling them. It is your responsibility to minimize the stimulus and threat of a loud boat approaching quickly.

2. Steller's Eider Best Management Practices for Vessel Operations:
    - If Steller's eiders are identified, vessel operators will follow procedures identical to those for sea otters to avoid disturbance or collision.
3. Essential Fish Habitat measures for anadromous streams (that will also help reduce impacts to designated critical habitat):
    - Natural vegetation will be retained along anadromous streams to the greatest extent practicable.
    - This will be accomplished by requiring contractors to salvage the vegetated mat along streambanks prior to ground disturbance.
    - This vegetated mat will be maintained (usually via periodic watering) until the revegetation stage and staked in place for reestablishment.
    - In addition, further mitigation of impacts such as willow staking and the placement of large woody debris will be analyzed for employment at these locations.
    - The deployment of riprap in anadromous streams will be limited and only installed where it is required for protection of infrastructure.

These Essential Fish Habitat measures apply where drainage structures will be constructed in anadromous streams. These will help decrease bank erosion, support natural vegetation, and increase long term stability of banks which in turn will help to reduce impacts to critical habitat downstream.

2 ANALYTICAL FRAMEWORK FOR JEOPARDY AND DESTRUCTION / ADVERSE MODIFICATION DETERMINATIONS

2.1 Jeopardy

In accordance with our regulations (see 50 CFR 402.02, 402.14(g)), the jeopardy determination in this biological opinion relies on the following four components:

1. The Status of the Species component evaluates the species' current range-wide condition relative to its reproduction, numbers, and distribution; the factors responsible for that condition; its survival and recovery needs; and explains if the species' current range-wide population retains sufficient abundance, distribution, and diversity to persist and retains the potential for recovery (see USFWS and NMFS 1998).

2. The Environmental Baseline component refers to the condition of the listed species in the action area, without the consequences to the listed species caused by the proposed action. The environmental baseline includes the past and present impacts of all federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The impacts to listed species from

federal agency activities or existing federal agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

3. The Effects of the Action component evaluates all consequences to listed species that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action.

4. The Cumulative Effects component evaluates those effects of future State or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation.

In determining whether an action is likely to jeopardize the continued existence of a species, the action is viewed against the aggregate effects of everything that has led to the species' current status and, for non-federal activities, those things likely to affect the species in the future (USFWS and NMFS 1998).

"Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02).

In accordance with 50 CFR 402.14(g), the Service is responsible for (1) reviewing all relevant information provided by the Federal agency or otherwise available; (2) evaluating the current status and environmental baseline of the listed species; (3) evaluating the effects of the action and cumulative effects on the listed species; and (4) adding the effects of the action and cumulative effects to the environmental baseline and in light of the status of the species, and (5) formulating the Service's opinion as to whether the action is likely to jeopardize the continued existence of listed species.

2.2 Destruction / Adverse Modification

A final rule revising the regulatory definition of "destruction or adverse modification" of critical habitat was published on August 27, 2019 (84 FR 44976). The final rule became effective on October 28, 2019. The revised definition states: "Destruction or adverse modification" means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species (50 CFR 402.02).

In accordance with our regulations (see 50 CFR 402.02, 402.14(g)), the destruction or adverse modification determination in this biological opinion relies on the following four components:

1. The Status of Critical Habitat component evaluates the range-wide condition of the critical habitat in terms of essential habitat features, primary constituent elements (PCEs), also known as physical and biological features (PBFs), that provide for the conservation of the listed species; the factors responsible for that condition; and the intended value of

the critical habitat for the conservation of the listed species. (see Endangered Species Consultation Handbook, March 1998).

2. The Environmental Baseline component refers to designated critical habitat in the action area, without the consequences to the designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The impacts to designated critical habitat from federal agency activities or existing federal agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

3. The Effects of the Action component evaluates all consequences to critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action.

4. The Cumulative Effects component evaluates those effects of future State or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation.

In determining whether an action is likely to result in destruction or adverse modification of designated critical habitat, the action is viewed against the aggregate effects of everything that has led to the status of the designated critical habitat and, for non-federal activities, those things likely to affect the designated critical habitat in the future (USFWS and NMFS 1998).

In accordance with 50 CFR 402.14(g), the Service is responsible for (1) reviewing all relevant information provided by the federal agency or otherwise available; (2) evaluating the current status and environmental baseline of the critical habitat; (3) evaluating the effects of the action and cumulative effects on the critical habitat; and (4) adding the effects of the action and cumulative effects to the environmental baseline and in light of the status of the critical habitat, and (5) formulating the Service's opinion as to whether the action is likely to result in the destruction or adverse modification of critical habitat.

3 STATUS OF THE SPECIES AND CRITICAL HABITAT

3.1 Status of the Steller's Eider

The Steller's eider (anarnissakuq/caqiar(aq) in Central Yup'ik, Igniquaqtuq in Inupiaq, Aglekesegak in Saint Lawrence Island Yupik, Latin *Polysticta stelleri*) is a small sea duck with circumpolar distribution and is the sole member of the genus *Polysticta*. The Steller's eider is divided into Atlantic and Pacific populations, which have limited, if any overlap (USFWS

2025*b*). The Pacific population is further subdivided into the Russia-breeding and Alaska-breeding populations, which mix together in molting and wintering areas. This collective population is also known as the "Pacific-wintering population." Alaska-breeding Steller's eiders represent approximately 1 percent of the Pacific-wintering population (Hodges and Eldridge 2001).

The Alaska-breeding population of Steller's eider consists of two breeding subpopulations, referred to as the northern and western Alaska subpopulations. In Alaska, Steller's eiders now breed almost exclusively in the northern subpopulation (i.e., on the Arctic Coastal Plain). The western Alaska subpopulation, which historically occurred on the coastal fringe of the Yukon-Kuskokwim Delta, is considered nearly extirpated (USFWS 2025*b*).

Steller's eider breeding plumage is sexually dimorphic (Figure 3). Males are in breeding plumage (Figure 3) from early winter through mid-summer, during which time they have a large, white shoulder patch contrasting with a chestnut breast and belly that darkens centrally, and a black spot on each of their wings. Their head is white to silver with pale green on the lores, a distinctive black spot surrounding the eye, and a dark olive patch flanked by black on the nape. Their neck is black, extending in an arrow shape down their back. The non-breeding male plumage resembles the female but maintains white upper wing coverts. Females, year-round, are dark, mottled brown with a white-bordered, blue wing speculum. Juveniles are dark, mottled brown until fall of their second year when they acquire breeding plumage. Compared to the true eiders (*Somateria* species), the Steller's eider resembles dabbling ducks in size, appearance, and the body-tipping foraging behaviors employed on the tundra breeding grounds (USFWS 2025*b*). During flight, adult Steller's eiders are distinguished from the true eiders by their faster wing beat, small size, blue wing speculum with white border, and (for males only) black back and white belly).

3.1.1 Listing Status

The Alaska-breeding population was recognized as a DPS because it was considered both discrete and significant based on definitions of those terms in Service policy (96 FR 4722). The Alaska-breeding population of Steller's eiders was listed as threatened on July 11, 1997 (62 FR 31748) based on:

1. A substantial contraction of the species' nesting range on the Arctic Coastal Plain and Yukon-Kuskokwim Delta. Steller's eiders on the Arctic Coastal Plain historically occurred east to the Canada border but may have abandoned the eastern Arctic Coastal Plain in the decades leading up to listing (USFWS 2002*a*, USFWS/Obritschkewitsch and Martin 2002). Steller's eiders historically occurred on the coastal fringe of the Yukon-Kuskokwim Delta and were a common breeding bird at Kokechik Bay in 1924 (62 FR 31748), with low numbers of nests also reported in southwestern Alaska, the Seward Peninsula, and St. Lawrence Island prior to 1960 (62 FR 31748).
2. Reduced numbers of Steller's eiders nesting in Alaska; and
3. Resulting vulnerability of the remaining Alaska-breeding population to extirpation (USFWS/Trust et al. 1997).

Figure 3. Male and female Steller's eiders in breeding plumage.

In 2001, the Service designated 2,830 square-miles (7,330 square-kilometers) of critical habitat (see section 3.2) for the Alaska-breeding population of Steller's eiders that includes: historical breeding areas on the Yukon-Kuskokwim Delta; molting and staging areas in the Kuskokwim Shoals and Seal Islands; molting, wintering, and staging areas at Nelson Lagoon and Izembek Lagoon (USFWS/Obritschkewitsch and Martin 2001). No critical habitat has been designated for Steller's eiders on the Arctic Coastal Plain.

3.1.2 Life Cycle and Distribution

Steller's eiders spend most of their lives in the marine environment, only occupying terrestrial habitats during the breeding season. During the non-breeding season, Steller's eiders use two habitat types: shallow, nearshore intertidal sand flats and mudflats and rocky or mud-bottomed, deepwater but nearshore areas (USFWS 2025*b*). Expansive eelgrass beds, such as those found at Izembek Lagoon and other areas on the north side of the Alaska Peninsula and Kuskokwim Shoals, are used by large numbers of Steller's eiders during the fall molt and staging period and during spring migration staging (Fredrickson 2001). Steller's eiders associate with eelgrass communities during a large portion of their annual cycle, demonstrating it is an important habitat factor (USFWS 2025*b*).

The Alaska-breeding population of Steller's eider winters in marine habitats in southwest Alaska, along with most of the Pacific Russia-breeding population (Figure 4). There is limited information on migratory movements of Steller's eiders in relation to nesting areas, and it remains unclear where the Pacific Russia- and Alaska-breeding populations converge and diverge during their fall molt and spring migrations (USFWS 2025*b*). Because we cannot distinguish between Alaska-breeding and Pacific Russia-breeding birds away from the nesting areas – and because band recovery, tracking, and genetic data suggest Alaska-breeding and Pacific Russia-breeding birds intermix in southwest Alaska – we assume data on distribution and habitat use by Steller's eiders in the combined Pacific wintering population applies to the Alaska-breeding population during the molting, wintering, and spring staging periods (USFWS 2025*b*).

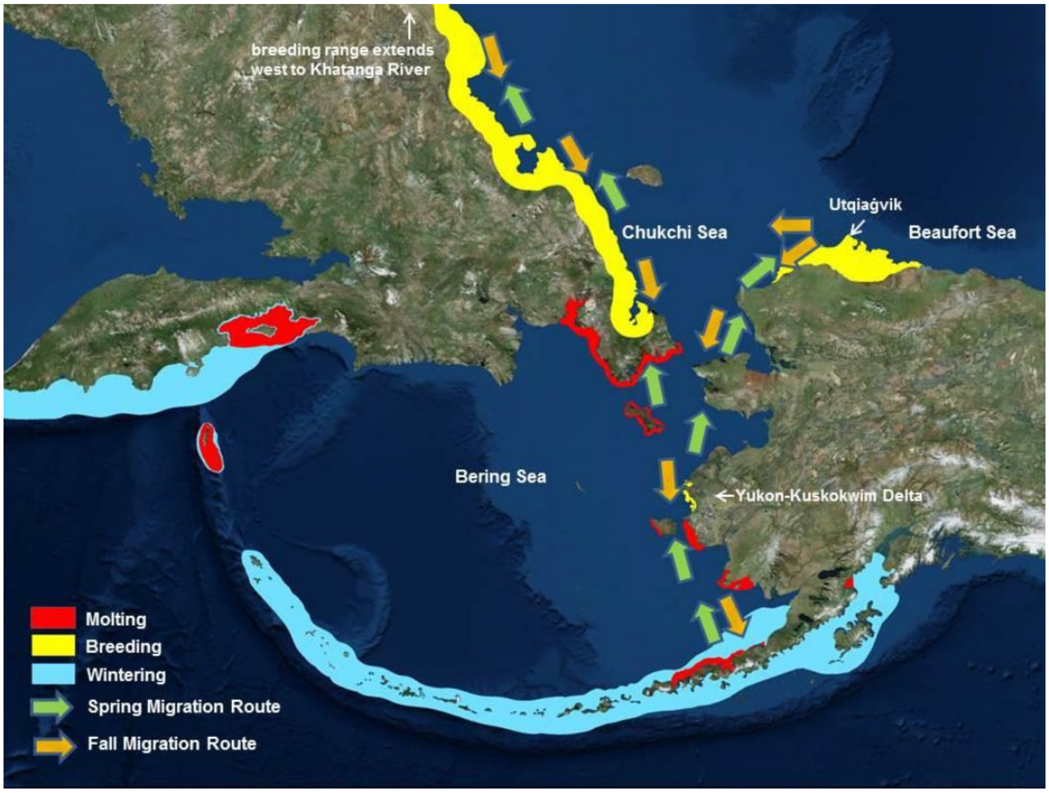

Figure 4. Distribution of the Pacific population of Steller's eider in marine waters of the Bering, Chukchi, and Beaufort Seas and on tundra breeding areas of Russia and Alaska. Figure from (USFWS 2025b).

3.1.2.1 Breeding and Post-breeding

Steller's eider nesting is concentrated in tundra wetlands near Utqiaġvik (Figure 4) and occurs at lower densities elsewhere on the Artic Coastal Plain, from Wainwright east to the Sagavanirktok River (Quakenbush et al. 2002, USFWS 2025*b*). Steller's eiders arrive in small flocks of breeding pairs on the Arctic Coastal Plain in late May to early June (USFWS 2025*b*). They typically initiate nesting in mid-June; but timing of nest initiation is affected by timing of snowmelt, which varies annually (USFWS 2024*a*). Egg hatching typically occurs from mid-July through early August, after which females move their broods to adjacent ponds with emergent vegetation and rear their broods to fledge, which occurs 32 to 36 days post hatch (Quakenbush et al. 2004, USFWS/Safine 2011).

Upon leaving the nesting areas, Steller's eiders are observed on the tundra and along the Chukchi and Beaufort Sea coasts near Utqiaġvik (USFWS/Obritschkewitsch and Martin 2001, USFWS/Rojek 2006), where they rest and forage in freshwater and marine habitats prior to fall migration. Timing of departure from nesting areas differs between sexes and varies depending on reproductive success. In years with relatively high breeding effort, flocks of Steller's eiders are primarily comprised of males that remain in the area until the second week of July. From mid-July to early August, flocks with a higher proportion of females (presumably failed breeders) are observed on the tundra and along the Chukchi and Beaufort Sea coasts near Utqiaġvik (USFWS/Obritschkewitsch and Martin 2001, USFWS/Rojek 2006). Females with successfully fledged broods depart the nesting areas in late August to mid-September (USFWS/Safine 2012) and are often observed resting and foraging in freshwater and marine habitat near Point Barrow. During this period, marked Steller's eiders and broods have been observed to frequent areas traditionally used for subsistence waterfowl hunting (USFWS/Safine 2012, Rosenberg et al. 2014, Martin et al. 2015). In years with low breeding effort, flocks are composed of both sexes, and birds depart earlier than in nesting years (Quakenbush et al. 2004; J. Bacon, North Slope Borough Department of Wildlife Management, pers. comm.).

3.1.2.2 Fall Migration and Molt

Following the post-breeding rest and foraging period, Steller's eiders depart from the nesting areas and migrate along the Chukchi Sea coast to southwest Alaska in a protracted fall migration. Specific data on areas used during "molt migration" (i.e., migration from nesting areas to molting areas) in Steller's eiders is limited to one study (Martin et al. 2015), which tracked thirteen Steller's eiders (7 males, 6 females) from the Alaska nesting areas in 2000 and 2001. Most stopover locations (greater than 95 percent) for these tracked individuals were in nearshore marine waters within 3 miles (5 kilometers) of the coastline, with primary molt migration stopover sites along the north coast of Chukotka, Russia (56 percent), the Bering Strait region (20 percent), the Chukchi Sea coast of Alaska (19 percent), and the Yukon-Kuskokwim River Delta (5 percent). A recent survey suggests Kuskokwim Shoals may be an important fall stopover site for birds molting farther south (USFWS 2025*b*).

Upon arrival to the molting areas, Steller's eiders undergo a complete remigial (i.e., flight feather) molt, rendering them flightless, for a period of three weeks to greater than one month (Petersen 1980; T. Hollmén, Alaska Sealife Center, pers. comm. 2018). Molting Steller's eiders also have an impaired diving capacity (Howell et al. 2003, Savard and Petersen 2015). Sub-adult Steller's eiders are the first to undergo molt, with numbers peaking in early August based on observations at Nelson Lagoon (Petersen 1980). Timing of molt in adult Steller's eiders coincides with arrival to molting areas: males arrive to molting areas first in late August (Petersen 1980), followed by unsuccessful breeding and non-breeding females, then successful females and broods (Rosenberg et al. 2014, Martin et al. 2015). The timing of molt in female Steller's eiders varies annually based on breeding success; thus, the sex and age ratio of Steller's eiders at molting areas varies within the season and among years (USFWS 2025*b*). Generally, the Steller's eider molting period may begin in late July and continue through October.

In waterfowl, molting site selection is assumed to be partially driven by availability of energy-dense prey with high protein content (which is limited relative to other nutrients in most environments) and reduced survival risk, including through refugia from predators (Hohman et al. 1992). During the flightless period, Steller's eiders prefer shallow, protected lagoons, embayments, and estuaries that include eelgrass beds and intertidal mud and sand flats (Petersen

1981, Laubhan and Metzner 1999, Dau et al. 2000). In areas with expansive eelgrass beds, large numbers (i.e., tens of thousands) of eiders aggregate in dense, singles-species flocks, using deep channels close to shore (Dau et al. 2000, USFWS/Williams et al. 2016). The shelled prey Steller's eiders consume during the molting period is eelgrass-associated (Metzner 1993), and shallow waters support their specific feeding ecology (see section 3.1.2.5).

Primary, traditional molting areas for the Pacific-wintering population of Steller's eiders include Izembek Lagoon, Nelson Lagoon, Port Heiden, and Seal Islands on the north side of the Alaska Peninsula (Petersen 1981, USFWS/Wilk et al. 1986, Rosenberg et al. 2014), as well as the Kuskokwim Shoals in northern Kuskokwim Bay (Dau 1987, Rosenberg et al. 2014, Martin et al. 2015, USFWS 2025*b*); see section 3.2, Critical Habitat. Smaller numbers have also been reported around islands in the Bering Sea, along the coast of Bristol Bay including near Cape Peirce, and in smaller lagoons along the Alaska Peninsula (USFWS/Dick and Dick 1971, Petersen and Sigman 1977, USFWS/Wilk et al. 1986, Dau 1987). Smaller numbers of Steller's eiders (numbering hundreds to low thousands) have been documented molting outside the Alaska Peninsula (USFWS/Larned 2006, Rosenberg et al. 2014), Martin et al. 2015). At least some individuals have a high degree of molting site fidelity to specific lagoons in subsequent years, as shown by studies at Izembek and Nelson Lagoons (95 percent or greater site fidelity; Flint et al. 2000) and by data derived from a small sample of individual birds tracked from wintering areas near Kodiak Island (Rosenberg et al. 2014). There is no evidence the two breeding populations (Alaska-breeding and Pacific Russia-breeding) segregate in the molting areas along the Alaska Peninsula (Dau et al. 2000, Pearce et al. 2005).

A recent survey (i.e. fall 2016) at historically important molting sites along the Alaska Peninsula recorded 99 percent of molting Steller's eiders in the Seal Islands and Nelson and Izembek Lagoons (USFWS/Williams et al. 2016). This survey found reduced numbers of Steller's eiders in these traditional molting, particularly Nelson Lagoon but also the Izembek Complex, compared to the recent mean (the 2016 estimate was 25 percent lower than the mean for the period 2012 to 2015; (USFWS/Williams et al. 2016). The reason behind reduced numbers in these traditional sites are unclear but could suggest a potential change in molting distribution and/or may represent a decline in the Pacific-wintering population (Hollmén et al. 2022, Maliguine et al. 2025, USFWS 2025*b*).

3.1.2.3 Wintering

Some of the Pacific-wintering Steller's eiders disperse to rocky, intertidal areas or deeper, nearshore waters following the completion of molt, including areas on the south side of the Alaska Peninsula, the Aleutian Islands, and the western Gulf of Alaska ((King and Dau 1981*a*, USFWS/Larned 2006, Rosenberg et al. 2014, Martin et al. 2015). Flocks of up to thousands of birds will remain in their eelgrass-dominated, intertidal molting lagoon habitats for at least a portion of the wintering period, unless forced out of these habitats by icing conditions (Laubhan and Metzner 1999). The wintering period is defined as January to April but could also be considered to include the period immediately following molt. The Alaska-breeding subpopulation does not appear to preferentially use specific wintering areas (Dau et al. 2000, Pearce et al. 2005), including as evidenced from a small sample of birds tracked with satellite transmitting tags (Figure 5; Martin et al. 2015). Individual birds may have some fidelity to specific wintering areas, as suggested by a small sample of satellite transmitter-outfitted birds tracked from wintering sites near Kodiak Island (11 of 12 birds returned to their "original" wintering area in the second winter; Rosenberg et al. 2014). It is possible birds also move between wintering sites; most birds tracked in the Martin et al. 2015 study appeared to have a primary and a secondary wintering site, which were discrete and relatively small compared to the broad wintering distribution (Martin et al. 2015).

Figure 5. Distribution of Alaska-breeding Steller's eiders during the non-breeding season, based on locations of 13 birds implanted with satellite transmitters in Utqiaġvik, Alaska, during June 2000 and June 2001. Marked locations include those at which a bird remained for at least 3 days. Onshore summer use areas comprised locations that birds departed Utqiaġvik, apparently without attempting to breed in 2001 (USFWS 2002*b*).

Wintering Steller's eiders usually occur in shallow waters (less than 33 feet [10 meters] deep) within 1,300 feet (400 meters) of shore but can be found farther offshore where shallows extend beyond this distance (e.g., in areas of bays, lagoons, and reefs; (USFWS 2002*b*). Substantial use of habitats greater than 33 feet (10 meters) deep has been reported during mid-winter, which may reflect nocturnal rest periods or shifts in availability of food resources (Petersen 1980, Martin et al. 2015) and may may be related to freezing conditions forcing a shift to deeper, ice-free waters (Laubhan and Metzner 1999).

Pair bonding and courtship behavior begins in late winter and is completed prior to departure to the breeding grounds (Fredrickson 2001, Martin et al. 2015).

3.1.2.4 Spring Migration

The majority of the global population of Steller's eiders migrates along the Bristol Bay coast of the Alaska Peninsula in the spring (i.e., April and May), traveling from their wintering areas to breeding grounds in Russia or Alaska and stopping en route to feed at the mouths of lagoons and other productive habitats (USFWS 2025*b*). Birds stage in these productive habitats while waiting on farther north habitats along the migration corridor and in the nesting areas to thaw (King and Dau 1981*a*). Historically, aggregations of Steller's eiders at spring staging areas along the Bristol Bay coast of the Alaska Peninsula were observed at Nelson Lagoon, Izembek Lagoon, and Bechevin Bay and numbered approximately 200,000 individuals combined at peak (Jones 1965). Birds moved between these three sites annually depending on ice conditions, with typically half aggregated at Nelson Lagoon and the other half split between Izembek Lagoon and Bechevin Bay (Jones 1965). In 2012, a spring survey along the Alaska Peninsula counted approximately 60,000 Steller's eiders, and an annual decline of 2.4 was assessed in spring-staging eiders during the period 1992 to 2012 (USFWS/Larned 2012*a*).

The spring migration of Steller's eiders is characterized by frequent stopovers at coastal locations (Rosenberg et al. 2014), although some birds may make straight line crossings of water bodies such as Bristol Bay (USFWS/Larned 1998). In a small sample of satellite-tracked birds, the majority first staged in estuaries along the north coast (i.e., Bristol Bay side) of the Alaska Peninsula or lower Cook Inlet (Rosenberg et al. 2014); after leaving the Alaska Peninsula, tracked birds staged for extended periods at Kuskokwim Shoals (Rosenberg et al. 2014, Martin et al. 2015); Figure 5).

Steller's eiders congregate in staging areas in large numbers to feed in ice-free habitats before continuing northward, showing strong site fidelity to specific areas (USFWS/Larned 1998, Martin et al. 2015). Areas known to receive consistent use by Steller's eiders during spring migration include Bechevin Bay, Morzhovoi Bay, Izembek Lagoon, Nelson Lagoon/Port Moller Complex, Cape Seniavin, Seal Islands, Port Heiden, Cinder River State Critical Habitat Area, Ugashik Bay, Egegik Bay, Kulukak Bay, Togiak Bay, Nanwak Bay, Kuskokwim Bay, Goodnews Bay, and the south side of Nunivak Island (USFWS/Larned et al. 1993, USFWS/Larned 1998, 2000). Steller's eiders likely use spring leads for feeding and resting as they move northward, although there is little information on distribution or habitat use after departure from spring staging areas. Food availability at spring staging areas plays a key role in reproductive capability of Steller's eiders, and having access to a series of specific foraging locations along their northward route is likely important for maintaining adequate physiological condition (USFWS 2025*b*).

3.1.2.5 Non-Breeding Summer Distribution in Southern Alaska

A small number of Steller's eiders are known to remain along the Alaska Peninsula and in Kachemak Bay during the summer months; approximately 100 Steller's eiders have been observed in Kachemak Bay, and a few individuals may spend the summer at Izembek Lagoon (Chris Dau, USFWS, unpublished data).

3.1.2.6 Non-Breeding Foraging Ecology and Diet

Steller's eiders appear to have low flexibility in their foraging ecology, which may be constrained by their diving physiology (they use the same, shallow habitats throughout the molting period and the winter) or bill morphology (USFWS 2025*b*). Despite this, outside of the remigial molting period, Steller's eiders forage on a wide selection of food items, and diet appears to be based on prey availability (Metzner 1993, Fredrickson 2001). Their diet includes diverse taxa belonging to four main invertebrate groups found throughout the water column (i.e., between the water surface and the benthos): *Crustacea*, *Bivalvia*, *Gastropoda*, and *Polychaeta* (Petersen 1980, Metzner 1993). Like other small-bodied sea ducks, Steller's eiders daily consumption of prey equates to a high percentage of their own body mass (Ouellet et al. 2013).

During the molting period, Steller's eiders increase their consumption of bivalves and other shelled prey (e.g., gastropods) relative to soft-bodied crustacean prey (e.g., amphipods; (Petersen 1980, Troy and Johnson 1989, Metzner 1993) and consume larger prey than is commonly available in local substrate (Petersen 1980). Molt is energy-demanding, and waterfowl such as eiders that undertake simultaneous remigial molt may be nutritionally stressed during this period (Hohman et al. 1992, Howell et al. 2003, Savard and Petersen 2015). Bivalves and gastropods are more energy dense than other common macroinvertebrates used by Steller's eiders (e.g., amphipods), suggesting Steller's eiders could be limited or specialized in their diet during this stage of their annual cycle, focusing on prey with relatively higher energy content to meet necessary energetic requirements (Petersen 1981, USFWS 2025*b*).

Birds that are flightless during their molting periods are limited to the available prey at their molting sites. Therefore, Steller's eiders require molting sites with abundant and high-quality prey (USFWS 2025*b*). Because prey accessibility is also important, Steller's eiders prefer shallow lagoons and embayments with eelgrass beds and intertidal mud and sand flats, where they forage primarily at low tide (Petersen 1981) and close to shore (Dau et al. 2000, USFWS/Williams et al. 2016). The invertebrate community on which Steller's eiders rely, throughout the water column and benthos, is an important component of critical habitat in the non-breeding areas (see section 4.3).

3.1.3 Populations and Trends

Available data suggest that very few Steller's eiders, perhaps tens of individuals, breed in western Alaska (i.e., on the Yukon-Kuskokwim Delta; USFWS 2019). The western Alaska sub-population is considered nearly extirpated (USFWS 2025*b*). Therefore, the population of Alaska-breeding Steller's eiders primarily consists of individuals breeding in northern Alaska (i.e., on the Arctic Coastal Plain), with the number of Steller's eiders breeding annually on the Arctic

Coastal Plain being low and highly variable, and the highest densities near Utqiaġvik. The mean number of Steller's eiders present on the Arctic Coastal Plain from 2007 to 2024 is estimated as 406 Steller's eiders (95% CI = 207.67 – 750.02; see section 4.1.3.1 and (USFWS 2025*b*).

Methods to estimate the abundance of the listed Alaska-breeding population of Steller's eiders are limited to surveys of breeding pairs because Alaska-breeding Steller's eiders cannot be distinguished from Pacific Russia-breeding Steller's eiders when the subpopulations are intermixed. This contributes to uncertainty in the size of the listed population: the proportion of Alaska-breeding Steller's eiders present on the breeding grounds may vary annually, and their breeding propensity also appears to vary considerably (USFWS 2025*b*).

3.1.3.1 Arctic Coastal Plain Subpopulation

Three, ongoing surveys monitor the number of Steller's eiders present on the Arctic Coastal Plain annually: the Arctic Coastal Plain Waterfowl Breeding Population Survey (Arctic Coastal Plain Survey), the Utqiaġvik Triangle Survey, and the Utqiaġvik Ground-based Breeding Pair Survey (Utqiaġvik Ground Survey). Design and caveats of each survey are described in detail in the Steller's Eider Species Status Assessment (USFWS 2025*b*).

The Arctic Coastal Plain Survey covers the largest portion of the range of Steller's eiders in northern Alaska (22,139 square-miles [57,339 square-kilometers]) but has low sampling coverage (varying between 1 and 8 percent among strata during 2007 to 2019 and 2022 to 2024) and a small number of Steller's eider observations each year (USFWS 2025*b*). The highest density of observations occurs in the northwestern region of the Arctic Coastal Plain, near Utqiaġvik (Figure 6). Two surveys provide more intensive coverage of the Steller's eider nesting range in northern Alaska containing the highest densities of breeding birds: the aerial Utqiaġvik Triangle Survey and the complementary Utqiaġvik Ground Survey. The Utqiaġvik Triangle Survey provides coverage of 25 to 50 percent of a 1,034 to 1,065 square-mile (2,677 to 2,757 square-kilometer) area, from just south of the community of Utqiaġvik to the Meade River (conducted 1999 to 2019 and 2021 to 2023). The Utqiaġvik Ground Survey has nearly 100 percent spatial coverage of the 52 square-mile (134 square-kilometer) study area surrounding the Utqiaġvik road system. The Utqiaġvik Ground Survey counts the number of male Steller's eiders (assumed to be associated with a more cryptic and sometimes unobserved female) prior to and during nest initiation and monitors nest fate (detection is not estimated).

The Service's most recent estimate of the population size of the Alaska-breeding Steller's eider uses a negative binomial, spatiotemporal generalized additive model (GAM), incorporating survey data from the two aerial surveys: the Arctic Coastal Plain Survey and Utqiaġvik Triangle Survey (USFWS 2025*b*). The GAM-estimated mean number of Alaska-breeding Steller's eiders, estimated across the period 2007 to 2024, is 406 Steller's eiders (95% CI = 207.67 – 750.02; (USFWS 2025*b*). The estimate includes: a predicted mean estimate of birds occurring across the Arctic Coastal Plain but outside the Utqiaġvik Triangle Survey area (n = 152 eiders; 95% CI = 59.19 – 340.67; years 2007 to 2024) and an estimated average annual number of birds occurring in the Utqiaġvik Triangle Survey area (n = 213 eiders; 95% CI = 123.7 – 403.1, years 1999 to 2023). Over half of the Steller's eiders estimated by the spatiotemporal GAM occur within the combined area covered by Utqiaġvik Triangle Survey and road system survey. For comparison, the Utqiaġvik Ground Survey provides an index of Steller's eider abundance in the high-density breeding habitat around the road system. The mean annual number of nesting Steller's eiders (i.e., the count of observed males multiplied by two) estimated in the road system survey area is 101 (SD = 78, range = 0 – 264; USFWS 2025*b*).

The GAM suggests the Alaska-breeding Steller's eider population undergoes cyclical patterns of abundance, fluctuating between short periods of increases and decreases, with an approximate 6.5-year period. Overall, the long-term population trend suggests an increasing or slightly decreasing population, depending on the time interval analyzed (USFWS 2025*b*).

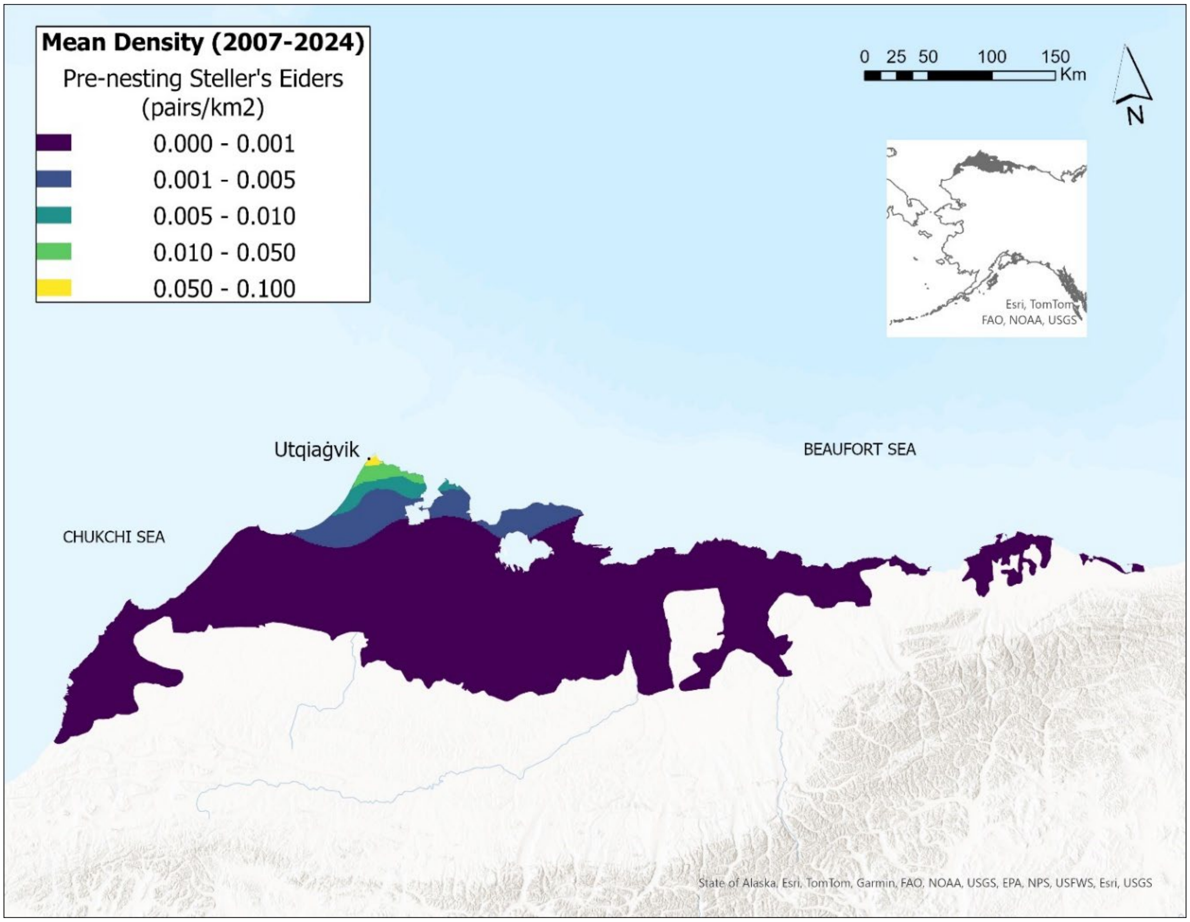

Figure 6. Average predicted densities of pre-nesting Steller's eider pairs across the aerial ACP Survey area, June 2007 to 2024 (USFWS 2025*b*). Data are not corrected for incomplete detection.

The proportion of the overall Arctic Coastal Plain subpopulation that breeds in any given year varies. Thus, some unknown number of Alaska-breeding Steller's eiders are not available to be detected in the surveys every year. Non-breeding birds may remain in marine areas, stage in other terrestrial areas prior to molt, or visit nesting areas of the Arctic Coastal Plain briefly before moving back to marine habitat. It is possible some birds nest in Russia in years when they are not present in Alaska. However, although information on breeding site fidelity of Steller's eiders is limited, analysis using genetic mark-recapture techniques and recapture of nesting eiders both suggest breeding site fidelity is high (Safine et al. 2020, USFWS unpublished data).

3.1.3.2 Yukon-Kuskokwim Delta Subpopulation

Historical observations of nesting Steller's eiders have been recorded in western and southwestern Alaska, including the Alaska Peninsula, the Seward Peninsula, St. Lawrence Island, and Agattu Island (62 FR 31748). However, contemporary observations (i.e., 1960s to present) of breeding Steller's eiders in the "western" subpopulation are limited to the central coastal zone of the Yukon-Kuskokwim Delta (USFWS 2025*b*).

The Service has conducted three breeding waterfowl surveys annually on the Yukon-Kuskokwim Delta. These include two aerial surveys, the Waterfowl Breeding Population and Habitat Survey (1957 to 2024) and the Alaska Yukon-Kuskokwim Delta Aerial Breeding Pair Survey (1985 to 2024), and one ground survey aimed at estimating the number of waterfowl nests on the central coast (1985 to 2019, 2022).

Only four Steller's eiders have been recorded during aerial surveys from 1988 to 2023: three were observed in 1988, and one lone male was recorded near the Manokinak River in 2018 (observation from J. Fischer, USFWS, pers. comm.). During ground (i.e., nest plot) surveys and other avian research conducted from 1997 to 2023, there have been observations of 62 adult Steller's eiders, plus 12 nests and 1 brood (Flint and Herzog 1999, USFWS 2025*b*), USFWS unpubl. data). Observations of adults have consisted of pairs and lone males in wetland habitat and singles and pairs flying by along a river or the coast; nests were found at Kigigak Island and near the Tutakoke and Kashunuk Rivers (USFWS 2025*b*). When the species was listed in 1997, no Steller's eider nests had been found on the Yukon-Kuskokwim Delta for approximately 20 years (since 1975; Kertell 1991).

Field research is conducted sporadically throughout the central coastal zone of the Yukon-Kuskokwim Delta by the Service, the U.S. Geological Survey, universities, and other entities. Incidental observations of Steller's eiders would likely be recorded and reported during these activities, as mandated by Yukon Delta Refuge research permits and given the species' rarity and resulting interest in the species (USFWS 2025*b*). The small number of Steller's eider observations in nesting habitat over many years, despite substantial research and activity, suggests that Steller's eiders breeding in this region of Alaska remain rare. Given the small number of observations, it is not possible to estimate a trend in subpopulation abundance since listing (USFWS 2025*b*).

3.1.3.3 Importance of the Pacific Russia-Breeding Population

The population size of the non-listed Pacific Russia-breeding population of Steller's eiders is currently unknown, and the total size of the larger Pacific-wintering population and its overall trend are difficult to estimate with the available data (C. Bradley, USFWS, pers. comm. 2017). Historically, 200,000 Steller's eiders were estimated to "winter" along the Alaska Peninsula, considered to be the primary non-breeding region for the Pacific-wintering population (Jones 1965); by 1979, Steller's eiders along the Alaska Peninsula numbered 135,000 (Petersen 1981), and by 1991, less than 65,000 Steller's eiders were counted in this region during the non-breeding season (Kertell 1991). In the contemporary dataset, separate surveys have counted birds belonging to the Pacific-wintering population during either spring staging or fall molt. Steller's eiders staging in spring along the western and southwest coast of Alaska, from the Yukon Delta to the Alaska Peninsula, ranged from a high count of 134,904 Steller's eiders in 1992 to a low count of 54,888 Steller's eiders in 2010 (mean of 81,453, 1992 to 2012; USFWS/Larned 2012*a*). Surveys along the Alaska Peninsula during the fall molting period in 2012 to 2016 counted birds in the range of 30,407 to 70,320 Steller's eiders (mean of 50,926; USFWS/Williams et al. 2016).

The abundance and productivity of the Pacific Russia-breeding population may be highly important for the listed Alaska-breeding population if there is a high rate of exchange between the two (USFWS 2025*b*). There is observed genetic differentiation between Alaska- and Pacific Russia-breeding populations but also evidence of gene flow, which is predominantly male-mediated (Pearce et al. 2005). The listed population is dependent to some degree on the Pacific Russia population for a source of males with whom Alaska-breeding females can form pair bonds when they are co-located on the wintering grounds, and some number of females originating from the Pacific Russia-breeding population may immigrate to the Alaska-breeding population annually and vice versa (USFWS 2025*b*). Thus, immigration from the non-listed population may be a source of recruits for the Alaska-breeding population. Although we have some evidence of female breeding site fidelity and natal philopatry in the Utqiaġvik study area (see section 3.1.2.1 and USFWS 2025*b*), the amount of immigration that occurs or its importance to the Alaska-breeding population's growth rate is difficult to quantify. However, movement of individuals could be influenced by the size of the Russia-Pacific breeding population and its demographic rates, and therefore the abundance and productivity of the Russia-Pacific breeding population may ultimately affect the resilience of the Alaska-breeding population (USFWS 2025*b*).

3.1.3.4 Demographic Rates

Annual survival probability of Steller's eiders in the Pacific-wintering population has estimated using mark-recapture data from banded, molting Steller's eiders. In an analysis using data from birds captured at Izembek Lagoon during the years 1993 to 2006, apparent female survival probability was estimated as 0.86 (SE = 0.03) and apparent male survival probability as 0.87 (SE = 0.18; (Frost et al. 2013). The magnitude and direction of bias in these estimates is unknown, but the data on which these estimates are based have important caveats (USFWS 2025*b*): birds included in this analysis consisted of non-breeding and failed females, as successful females and their broods had not yet arrived at Izembek Lagoon during the capture period; the population sampled was the Pacific-wintering population, which is dominated by Russia-breeding birds, and it is unknown how applicable these estimates are to the Alaska-breeding population; and finally, the model from which these apparent survival estimates are derived does not distinguish between permanent emigration and mortality.

Two models suggest the northern subpopulation of the Alaska-breeding Steller's eider has lower survival than the Pacific-wintering population. Apparent survival was estimated for nesting female eiders captured in the Utqiaġvik area, again using mark-recapture data. During the years 1995 to 2016, apparent female survival probability was estimated as 0.78 (SE = 0.06;(Safine et al. 2020). The Safine et al. 2020 model provides the only direct estimate of annual apparent survival rate of Steller's eiders in the Alaska-breeding population; but once again, the model from which this apparent survival estimate is derived does not distinguish between permanent emigration and mortality (USFWS 2025*b*). In a separate analysis using the aerial Arctic Coastal Plain Survey data and a Bayesian state-space model framework, adult female survival probability was estimated as 0.754 (SD = 0.015; (Dunham and Grand 2017); this estimate falls within the 95% confidence interval given by the Safine et al. 2020 model.

A decrease in adult survival through time is thought to have contributed toward a long-term population decline in the Pacific-wintering population: based on birds captured on the Alaska Peninsula, there was an apparent decrease in survival from the period 1975 to 1981 (female survival = 0.946, SE: +/- 0.059; male survival = 0.874, SE: +/- 0.062); to the period 1991 to 1997 (female survival = 0.899, SE: +/- 0.032; male survival = 0.765, SE: +/- 0.044), (Flint et al. 2000). Adult survival on the wintering grounds has also been hypothesized as a contributing factor behind the decline of Steller's eiders at some European wintering sites (i.e., birds belonging to the Atlantic Russia-breeding population (Žydelis et al. 2006). Assuming Steller's eiders have a similar life history to other sea ducks, adult female survival may have a disproportionate impact on population growth rate compared to demographic parameters related to productivity (Flint 2015). The Service has assessed improving adult female survival as important to species recovery and reducing threats and protecting habitat in both breeding and non-breeding areas are identified as needed (USFWS 2021*a*).

Breeding propensity in Alaska-breeding Steller's eiders is highly variable: from 1991 to 2023, the number of nests found in the core nesting area ranged from 0 – 78 annually. Mean apparent clutch size during this period was 5.7 (range 4.8 – 6.6; SD = 1.17), and mean nest survival probability was 0.28 (SE of annual point estimates = 0.05; nest survival is defined as at least one egg hatched). Additional demographic information, including on productivity parameters (i.e., brood survival), can be found in the Species Status Assessment (USFWS 2025*b*).

3.1.4 Threats

Upon listing the Alaska-breeding population of Steller's eiders, the Service hypothesized that changes in the Bering Sea, where Steller's eiders molt and winter, and ingestion of lead shot on the Yukon-Kuskokwim Delta may have contributed to range contraction. Habitat destruction, overharvest, inadequacy of regulatory mechanisms, disease, and predation were not suspected to be factors (USFWS 2025*b*). The first iteration of the species' recovery plan identified additional stressors that may have affected current condition of the Alaska-breeding Steller's eider: increased predation pressure, hunting, exposure to oil or other contaminants near fish processing facilities in southwest Alaska, risk of collisions with fishing vessels or lighted structures, disturbance related to human activity near the core nesting area, and loss or alteration of tundra nesting habitat as a result of development (USFWS 2002*b*). The 2002 recovery plan also noted it is likely that unknown stressors in the marine environment were having an impact on the population (USFWS 2002*b*). The most recent species status assessment states the low numbers and restricted breeding range mean the listed population make it vulnerable to many threats, including natural threats such as major storms, disease, and predation (USFWS 2025*b*). The most recent recovery plan notes some threats are more easily addressed than others because they are a direct result of human activity (e.g., shooting, collisions, disturbance) and can be addressed through management actions (USFWS 2021*a*).

3.1.4.1 Habitat Loss and Degradation

Although loss or modification of habitat is not thought to have played a major role in the decline of the Alaska-breeding Steller's eider, habitat changes are considered a threat. Construction related to community infrastructure and industrial development in coastal and marine areas – including activities such as materials (e.g., gravel) extraction, dredging, and construction of roads, pads for homes or other buildings, pipelines, docks, and other infrastructure – destroys and degrades the important terrestrial habitats (i.e., nesting and brood-rearing habitat) and marine habitats (e.g., fall molting, wintering, and spring staging) of Steller's eiders (USFWS 2021*a*).

Development in proximity to villages on the Arctic Coastal Plain, and particularly Utqiaġvik, has impacted measurable quantities of Steller's eider nesting, brood-rearing, and post-breeding habitat (USFWS 2025*b*). Steller's eiders may prefer higher-relief habitats for nesting; and these areas, which are relatively scarce within the Arctic Coastal Plain breeding distribution of Steller's eiders (Miller 2023) are also more desirable for human development. Given the majority of the Arctic Coastal Plain may be of low suitability for Steller's eider nesting (Miller 2023), anthropogenic effects to nesting habitat are not trivial. Furthermore, the impact of infrastructure on ground thermal conditions can strongly enhance ongoing permafrost degradation (see 3.1.4.8), exemplified by degrading permafrost in the location of many of the active industrial sites across the Arctic Coastal Plain (Langer et al. 2023). Habitat loss in the core of Steller's eider nesting habitat is not trivial, but the overall effect of habitat loss near Utqiaġvik on resiliency of the Alaska-breeding population is unknown (USFWS 2025*b*).

Human development in coastal and marine habitats can also result in direct loss of habitats used by Steller's eiders, including through the construction of nearshore infrastructure (e.g., docks, jetties and other revetments), or result in habitat degradation through the indirect effects of development. For example, discharge from commercial seafood processors has become an increasing concern for its potential impacts to marine life, including seabirds and sea ducks. Fish waste from seafood processing plants or municipal sewage outfall could potentially harm Steller's eiders indirectly by degrading foraging habitat, and directly by exposing individuals to contaminants, disease, and increased predation (Reed and Flint 2007, USFWS 2025*b*). Generally, development in marine habitats in Alaska has a small footprint compared to the dispersed distribution of Steller's eiders, but development in important areas used by concentrations of Steller's eiders could have a greater effect to Steller's eiders through impacts to adult survival or through carry-over effects that impact breeding propensity and reproductive success. The overall effect of development in marine habitats is unknown.

3.1.4.2 Anthropogenic Disturbance

Utqiaġvik is an important human population center, and the area surrounding Utqiaġvik is the core of the Steller's eider current breeding distribution in Alaska. Therefore, this area of the Alaska-breeding Steller's eider distribution is disproportionately important to the survival and recovery of the population (USFWS 2025*b*). Human activities in and around Utqiaġvik that may disturb nesting Steller's eiders include the use of existing facilities and roads near nesting areas; on-tundra activities such as subsistence activities, tourism, recreation, and transit through nesting areas including by all-terrain vehicle (ATV), on-tundra aircraft landings, and walking; and low-level flights, including for aerial surveys (USFWS 2021*a*). Field-based, scientific research in Steller's eider nesting areas has increased in response to interest in climate change and its effects on Arctic ecosystems; these activities, including research directed at Steller's eiders, can also result in disturbance to breeding Steller's eiders. Overall, human disturbance during the breeding season can lead to reduced productivity by impacting Steller's eider breeding effort and success. The overall effect of anthropogenic disturbance in and around the core nesting areas near Utqiaġvik is thought to have a moderate effect on the population resiliency of the Alaska-breeding Steller's eider (USFWS 2025*b*).

Human activities in and near coastal and marine habitats may also disturb Steller's eiders during other periods of the annual cycle. At present, disturbance to Steller's eiders in the marine environment primarily results from human activities near coastal communities along the north coast of the Alaska Peninsula, Aleutian Islands, and western Gulf of Alaska (including Kodiak Island and the lower Cook Inlet) during the non-breeding season. Vessels used for shipping, fishing, research, and tourism transit through Steller's eider migration corridors, molting areas, and wintering areas. Steller's eiders are most likely to encounter marine vessel traffic near harbors and fish processing facilities such as those on Kodiak Island and Dutch Harbor (USFWS 2025*b*). Disturbance from hunting activities occurs near Cold Bay and Kodiak Island, areas where high levels of waterfowl sport hunting are known to occur, and throughout the non-breeding distribution during subsistence hunting activities, including bird and marine mammal harvest in areas accessed by hunters from local villages (USFWS 2025*b*). Research activities taking place in areas where Steller's eiders concentrate, including fall and spring aerial surveys at Steller's eider staging areas throughout the Alaska Peninsula, could also result in disturbance. Of greatest concern is vessel traffic or other sources of disturbance in molting areas between August and November, overlapping the period when Steller's eiders undergo their flight-feather molt and have a limited ability to move away from sources of disturbance while also being under higher energetic demands (USFWS 2025*b*).

Projected increases in vessel traffic, industrial development, and other human activities in the Bering, Chukchi, and Beaufort Seas are expected to result in increased levels of disturbance to Steller's eiders. Anthropogenic disturbance in important areas used by concentrations of Steller's eiders could have a greater effect through impacts to adult survival or through carry-over effects that impact breeding propensity and reproductive success. However, the overall effect to the Alaska-breeding population of human activities in marine habitats is unknown.

3.1.4.3 Environmental Contaminants

Steller's eiders can be exposed to contaminants by coming into direct contact with contaminants in the abiotic environment (USFWS 2025*b*) or by ingesting prey items with contaminants in their tissues (Franson 2015). In the tundra nesting areas, the primary contaminant of concern is lead, and the primary source of lead contamination is ingestion of spent shot (i.e., pellets) deposited in in wetlands nesting areas or nearshore marine waters used for foraging (USFWS 2025*b*). Lead shot has been identified as the source of harmfully elevated levels of lead in Steller's eiders (USFWS/Trust et al. 1997, Lovvorn et al. 2013, Miller et al. 2016, 2019A. Matz, USFWS, pers. comm. 2024). The effect of exposure varies, but lethal and sublethal response can occur (Hoffman 1990). Mortality resulting from lead exposure is particularly a concern for breeding females, which may have a greater level of exposure due to longer time spent in the nesting areas. Exposure to lead shot could also occur outside the nesting areas, but data to assess this are limited. Use of lead shot for waterfowl hunting appears to be declining; its use in waterfowl hunting is prohibited nationwide, and in Alaska use of lead shot is prohibited for hunting of all bird species. However, residual lead shot remaining in the environment may be accessible to waterfowl for more than 25 years (Franson et al. 1995, Flint and Schamber 2010). Overall, exposure to lead shot was identified to have a significant, negative effect on population resiliency of Steller's eiders (USFWS 2025*b*).

Industrial activities around the globe produce contaminants such as heavy metals (e.g., selenium, mercury, cadmium, copper), hydrocarbons, and persistent organic pollutants and distribute these into the environment through atmospheric, marine, and freshwater pathways (Lovvorn et al. 2013). While Steller's eiders could be exposed to these trace elements on the tundra nesting areas, most exposure probably occurs during the non-breeding season in marine areas (Lovvorn et al. 2013, Miller et al. 2016), where they may also be directly exposed to spills of petroleum and other contaminants (USFWS 2002*b*) such as organochlorine pesticides and polychlorinated biphenyls. Smaller spills of petroleum and petroleum products have affected habitat quality on a small scale throughout the range of the Alaska-breeding Steller's eider, posing some risk to individuals.

Most of the Pacific-wintering population of Steller's eiders winter in shallow, nearshore waters from the eastern Aleutians to southern Cook Inlet, Alaska, including in areas with substantial maritime traffic and/or industrial activity and other human presence, including Akutan, Sand Point, King Cove, Cold Bay, and Women's Bay. Many of these areas are occupied by large wintering or staging flocks. Exposure to oil or other contaminants (plus the effects of eutrophication; see 3.1.4.9) near fish processing facilities in southwest Alaska was identified in the 2002 species' recovery plan as a particular concern for Steller's eiders. Conservative estimates indicate at least 18,000 gallons (68,137 liters) of petroleum products were spilled from activities associated with the commercial fishing and seafood processing industry from 1995 to 2000, and at least 18,170 gallons (68,781 liters) of petroleum products are spilled annually in harbors in southwest Alaska (USFWS 2017). Much of the petroleum is spilled at Dutch Harbor, near where hundreds of Steller's eiders winter. Other areas where Steller's eiders have been observed roosting and feeding in harbors, bays, and other nearshore waters with substantial maritime traffic and/or industrial activity, including fish processing facilities, include Akutan, Sand Point, King Cove, Cold Bay, and Womens Bay. Steller's eiders sampled in southwest Alaska showed evidence of exposure to an array of organic contaminants in bays with commercial fishing and maritime activity compared to bays without (Miles et al. 2007, USFWS 2025*b*). Commercial fishing, other maritime activities, and municipal sewage effluent in areas with high coastal development could also indirectly expose Steller's eiders to contamination through contamination of prey items. For example, simultaneous to wintering Steller's eiders at Dutch Harbor showing evidence of exposure to high levels of polycyclic aromatic hydrocarbons (PAHs) or other contaminants, high concentrations of PAHs were found in blue mussels (*Mytilus trossilus*) in this area (Miles et al. 2007).

Although areas with high human use in the coastal and marine environment comprise only a small portion of the habitat used by Pacific-wintering Steller's eiders, it is plausible a large number of Steller's eiders are being exposed to significant levels of petroleum and other organic contaminants when using nearshore waters in these areas (USFWS 2002*b*, Reed and Flint 2007).

However, with the exception of lead, the effect of contaminants on population resiliency of the Alaska-breeding Steller's eider is unknown at this time (USFWS 2025*b*).

3.1.4.4 Harvest

Historically, Alaska Natives hunted Steller's eiders and their eggs for food; but many communities along the population's migration route had not been surveyed at the time of the 1997 ESA listing decision, and the total annual subsistence harvest at that time was unknown (62 FR 31748; June 11, 1997). Although not cited as a cause of the decline, the take of this species by subsistence hunters near Utqiaġvik was cited as a factor in the decision to list the Alaska-breeding population of Steller's eider (62 FR 31748). Harvest of Steller's eiders has also occurred on the Yukon-Kuskokwim Delta (CAFF 1997). In the mid-1990s, harvest was thought to be one of the threats limiting species recovery (CAFF 1997). All legal harvest of Steller's eiders in Alaska was closed in 1991.

Harvest regulations for waterfowl and other migratory birds in Alaska include two seasons: a spring-summer subsistence season (April 2 to August 31, with dates varying by management region; 50 CFR 92) and a fall-winter general hunting season (September 1 to January 26, with dates varying by zone; 50 CFR 20). When the spring-summer subsistence harvest of migratory birds in Alaska was opened by Alaska State regulations and Service policy in 2003, harvest of Steller's eiders remained prohibited. Harvest of Steller's eiders has apparently declined through time but does still occur despite the closure: an estimated 438 birds were harvested annually over the period 1980 to 1996 and 230 birds were harvested annually over the period 1993 to 2012 (Naves and Schamber 2024).

Outreach efforts to encourage compliance with harvest regulations that prohibit harvest of Steller's eiders have been conducted in the species' breeding range on the Arctic Coastal Plain by the Service, the North Slope Borough, and the Bureau of Land Management. Service-sponsored outreach efforts have also occurred on the Yukon-Kuskokwim Delta. Direct observations and discussions with hunters have confirmed some Steller's eiders are taken during subsistence hunting on the Arctic Coastal Plain. Steller's eiders sometimes fly in mixed flocks with king and common eiders (*Somateria spectabilis* and *S. mollissima*), are hard to identify, and are inadvertently shot on occasion. Specifically, hunters report that Steller's eiders staging in mixed flocks within waterbodies are subject to shooting. Direct observations by Service law enforcement staff and biologists in Utqiaġvik have documented Steller's eiders shot along roads and in hunters' possession (USFWS 2025*c*). Local knowledge suggests Steller's eiders have not been specifically targeted for subsistence on the Arctic Coastal Plain, but they may be subject to misidentification and inadvertent harvest.

A recent study of 12 years (2004 to 2015) of waterfowl harvest in rural Alaska communities derived estimates of the average annual harvest of birds and eggs by species, based on reports by rural hunters and broken down by management region and season (Naves and Schamber 2024). This study estimated an average of 202 Steller's eiders harvested annually, with harvest occurring in both spring-summer (i.e., April through August) and fall-winter (i.e., September to March; Naves and Schamber 2024).

The spring-summer subsistence harvest divides the state into 12 management regions (Figure 7); 8 of these regions overlap the distribution of Alaska-breeding Steller's eiders. Steller's eider harvest was reported in the each of these regions (annual estimates shown in parentheses): North Slope (*n* = 26), Northwest Arctic (*n* = 38), Bering Strait Mainland (*n* = 53), St. Lawrence Island-Diomede (*n* = 15), Yukon-Kuskokwim Coast (*n* = 39), Yukon-Kuskokwim Delta Inland (*n* = 1), Bristol Bay (*n* = 12), and Aleutian-Pribilof Island (*n* = 18). Additionally, an estimated 29 Steller's eider eggs were harvested per year on average: Bering Strait Mainland (*n* = 17), St. Lawrence Island-Diomede (*n* = 4), and Yukon-Kuskokwim Delta Coast (*n* = 8; Naves and Schamber 2024). Not all Steller's eiders represented in these numbers would be from the Alaska-breeding population, but birds comprising each of the two breeding populations are not distinguishable away from their breeding areas. We assume all birds harvested in the North Slope and Northwest Arctic management regions (*n* = 64) are Alaska-breeding Steller's eiders and, through abundance-based probability, most birds harvested in the remaining management regions (*n* = 138) are from the Pacific Russia-breeding population. If we assume harvest mirrors the assessed population structure of the Pacific-wintering population (i.e., 1 percent of birds harvested away from the breeding areas are from the listed population), this equates to an additional 2 birds from the Alaska-breeding population that are harvested annually (138 x 0.01 = 1.38; we round up). In other words, we estimate a total of 66 Alaska-breeding Steller's eiders are harvested annually.

We assume harvest estimates are biased low. No Steller's eiders were reported as taken during the fall-winter sport hunt, which is open to non-subsistence users, in this study (Naves and Schamber 2024). However, outside of formal reporting channels, a small number of Steller's eiders have been reported as shot by commercially guided clients during the fall-winter sport hunt at Izembek Lagoon (M. Fosado, USFWS, pers. comm. 2024). Fall sport hunters and rural subsistence hunters participating in the surveys analyzed by Naves and Schamber (2024) might be reluctant to report harvest of a species that cannot be legally hunted. Dau et al. (2000) also suggested that the low recovery rate of bands collected during their 1961-1998 banding study at Izembek Lagoon was likely related to low reporting rates resulting from fear of prosecution. Species identification issues, particularly for female eiders, also makes quantifying the harvest challenging (Naves and Schamber 2024, USFWS 2025*c*). Additionally, harvest estimates reported by Naves and Schamber (2024) do not account for wound loss (i.e., birds struck but not retrieved), which Rothe et al. (2015) estimate in sea ducks is approximately 0.30 of the total reported harvest (Rothe et al. 2015). This could equate to an additional 61 Pacific-wintering Steller's eiders harvested in Alaska annually (202 total x 0.3 wound loss = 60.6 additional birds; we round up), of which we assume 20 would be from the Alaska-breeding population (66 Alaska-breeding birds x 0.3 wound loss = 19.8; we round up). Including this additional estimated take due to wound loss in the previous calculations results in an estimated annual harvest of 86 Alaska-breeding Steller's eiders (66 + 20 = 86). We anticipate this represents an additional 1 bird harvested in the non-breeding areas (2 x 0.3 = 0.6; we round up).

While these studies and data suggest 86 Alaska-breeding Steller's eiders are harvested per year, we also recognize this rate of harvest would be unsustainable for a population estimated to be 406 individuals. The Alaska-breeding population of Steller's eider was listed as threatened under the ESA because of a perceived decline in abundance throughout their nesting range and geographic isolation from the Russian-breeding population. The geographic isolation meant the

Alaska-breeding population was a "closed population," meaning it received no augmentation or immigration from the Russian-breeding population. However, genetic studies and modeling efforts suggest there may be dispersal from the Russian breeding population (Dunham and Grand 2017). Research was conducted to estimate population viability of the Alaskan breeding population of Steller's eiders, using both an open and closed model of population process for this threatened population (Dunham and Grand 2016). Projections under a closed population model suggested this population has a 100 percent probability of extinction within 42 years. Projections under an open population model suggested that with immigration there is no probability of permanent extinction. Because of random immigration process and nonbreeding behavior, however, it is likely that this population will continue to be present in low and highly variable numbers on the breeding grounds in Alaska. Therefore, while the estimated harvest of 86 individuals per year seems incongruous with the viability of a population numbering only 406 individuals, we believe the complex population dynamics of this species suggest these calculations are plausible.

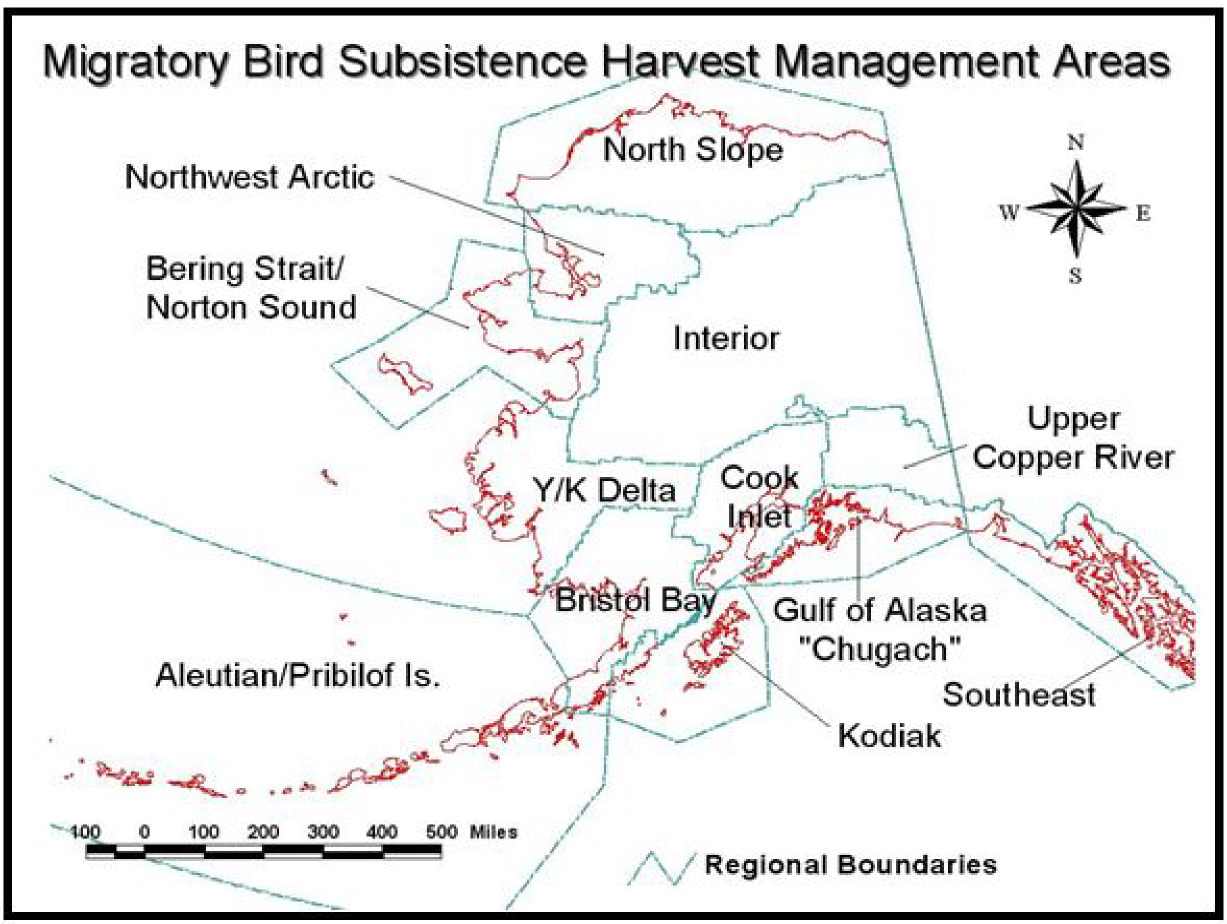

Figure 7. Regional boundaries for subsistence harvest of migratory birds. Modified from: (https://www.fws.gov/subsistence-springsummer-bird-harvest-2024-alaska).

We expect harvest of Steller's eiders and their eggs may continue at some level in the nesting, brood-rearing, and non-breeding areas, especially near areas of human use. Instances of inadvertent harvest or egging would likely be concentrated near communities with gravel infrastructure and more remote camps, and frequency of inadvertent harvest would decline with increasing distance from infrastructure, as human access becomes more difficult. Harvest of birds on the Arctic Coastal Plain (i.e., in the North Slope management region) is specifically identified as having a high effect on resiliency of the Alaska-breeding population (USFWS 2025*b*). Outside the Arctic Coastal Plain, the likelihood any individual harvested would be an Alaska-breeding bird is low, given only a small percentage of Alaska-breeding birds comprise the Pacific-wintering population (USFWS 2025*b*). However, if harvest of an Alaska-breeding bird occurred in the non-breeding distribution, the population-level effect would be essentially equivalent.

3.1.4.5 Collisions

Migratory birds are at considerable risk of collisions with human-made structures and lines (Manville 2005, Grebmeier et al. 2006), including buildings, drill rigs, towers, wind turbines, light poles, and overhead transmission lines. The tendency of Steller's eiders to fly at low altitudes puts them at risk of striking even relatively low objects in their path. Eighty-eight percent of the eiders observed in one study along the Beaufort Sea coast flew below an estimated altitude of 32 feet (9.7 meters), with well over half flying below 5 feet (1.5 meters); eiders in this area flew at a mean height of 20 feet (6 meters) above ground level and at 45 miles (72 kilometers) per hour (Day et al. 2005). The mean flight height of eider species flying past St. Lawrence Island, Alaska in the fall has been estimated as 6 feet (1.8 meters). Flock size, flight height and speed, and other variables like weather and lighting conditions affect the probability of collisions and can increase the number of eiders killed or injured during a single event. Most collisions involve one or two birds, but "bird storms" (impacting hundreds of birds at once) have been documented when vessels use bright lights during inclement nighttime weather.

Steller's eider collisions with infrastructure occur in both terrestrial and marine environments; they have been documented colliding with infrastructure that includes radio communication towers, guy wires, transmission lines, radar domes, and mobile offshore drilling units. Multiple Steller's eider power line strikes have been documented near Utqiaġvik since 1991, despite the sparseness of human structures in their nesting areas on the Arctic Coastal Plain (USFWS 2025*b*). Service records include one report from a Pilot Point resident, responsible for erecting power line (approximately 600 feet [183 meters] along the shoreline) who recalled that shortly after he put the power line up, about 150 Steller's eiders flew into it and died. Mortality in Steller's eiders belonging to the Atlantic-breeding population has also been observed due to collisions with transmission lines, specifically during transit over the isthmus connecting the island of Ekkerøy to the mainland in Varangerfjord, Norway (Øien and Aarvak 2007).

Bird species, including eiders and other sea ducks, are attracted to offshore vessels and may circle or even ground on the vessels, primarily due to the effects of light attraction and disorientation (Merkel and Johansen 2011, Ronconi et al. 2015). Risk of marine bird collisions with vessels in waters of Alaska shows seasonal patterns; collision risk increases when visibility is poor and during winter when skies are dark longer (Merkel and Johansen 2011, Kapsar et al. 2025). Risk of collisions increases in areas with high co-occurrence (i.e., spatiotemporal overlap; Kapsar et al. 2025), and marine vessels transiting through the migration corridors and molting areas pose the highest risk to Steller's eiders (USFWS 2025*b*). Vessel speed influences the likelihood of striking marine wildlife (Silber et al. 2021).

Steller's eiders have a high risk of collision with vessels because of their tendency to fly low and fast over the water (Day et al. 2004); and Steller's eider mortality has occurred due to collisions with large vessels and ship rigging, with most documented events in Alaska involving large, lighted fishing vessels at night (Labunski et al. 2022). Bright lights on fishing boats, particularly during stormy or foggy conditions, are a known hazard that can cause birds to become disoriented and land on or collide with vessels (Reed et al. 1985, Manville 2005). As with land-based infrastructure, collisions with vessels can result in injury or death to Steller's eiders and potentially to large numbers at once. Over 150 Steller's eiders were reported to have collided with the *M/V* Northern Endeavor in December 1980 in False Pass, when the fishing vessel's crab lights were illuminated on a stormy night (USFWS, Southern Alaska Field Office, unpublished data).

Current vessel traffic density is notably high along the coast of the Alaska Peninsula and Aleutian Islands (Silber et al. 2021), and we assume there will be continued increases in shipping traffic through Aleutian passes between the North Pacific and Bering Sea in response to changing oceanic conditions. However, the extent of collisions with vessels is largely unknown because data are limited; coverage by dedicated species observers is uneven in Alaska and low in some management areas and some fisheries, and we expect Steller's eiders are not always noticed or reported by observers or vessel crew. The effect of vessel collisions on the Alaska-breeding Steller's eider population is therefore difficult to quantify. The risk of Steller's eider mortality through collisions is expected to increase as infrastructure and vessel traffic increases throughout their range. Overall, collisions with man-made infrastructure are thought to have a moderate effect on the resiliency of the Alaska-breeding population of Steller's eiders (USFWS 2025*b*).

3.1.4.6 Fishing Interactions

Fishing activities can lead to direct mortality through drowning if eiders are entangled in nets, as evidenced by studies involving Steller's eiders from the Atlantic-breeding population. One study in Estonia, Lithuania assessed moderate mortality to Steller's eiders through non-target (i.e., incidental) gillnet fishery bycatch (mortality estimated at 10 to 50 individuals per winter, or approximately 3 percent of the birds wintering in this region, during 2000 to 2001 (Žydelis et al. 2006). The larger-sized mesh used in salmon fishing appears to have relatively high rates of Steller's eider bycatch (Dagys and Žydelis 2002). Fishing activities can also displace eiders from preferred habitats through disturbance (Žydelis et al. 2006).

3.1.4.7 Predation

Steller's eiders in the vicinity of developed areas have likely been impacted by elevated predator populations for two primary reasons, both which support increases in predator populations (USFWS 2025*b*): 1) human presence may increase the availability of food (e.g., landfills and marine mammal carcasses), and 2) human development may increase nesting and denning sites for avian and mammalian predators. In nesting habitats, predation is a major driver of nest failure and duckling mortality among Steller's eiders, and annual variation in nest success is likely determined by fluctuations in local predator populations or broad-scale predator dynamics

(USFWS 2025*b*). Incubating females may themselves be vulnerable to predators. Even in the larger true eiders, females incubating eggs may also be killed by snowy owls and Arctic and red foxes (*Vulpes lagopus* and *V. vulpes*); (Petersen et al. 2000). As the number of structures and anthropogenic attractants on the Arctic Coastal Plain continues to increase, elevated predator populations may reduce the reproductive success of Steller's eiders. Increased predation pressure is thought to currently have a moderate effect on resiliency of the Alaska-breeding population of Steller's eider and may be exacerbated by climate-related changes in predator-prey dynamics (see 3.1.4.8), through impacts to breeding effort and reproductive success (USFWS 2025*b*).

Steller's eiders are also vulnerable to predators during the non-breeding period. Bald eagles (*Haliaeetus leucocephalus*) are a common predator of adult Steller's eiders and have been observed to harass and prey upon Steller's eiders and other sea ducks in nearshore habitats, including at Dutch Harbor and at the Izembek Lagoon complex (Reed and Flint 2007, USFWS/Lance et al. 2007). Eagle predation upon Steller's eiders appears to increase at Kinzarof Lagoon during times when salmon are less accessible (e.g. due to late runs or freezing conditions in area streams (USFWS/Lance et al. 2007). Predation in marine areas is thought to have a moderate effect on resiliency of the Alaska-breeding population of Steller's eider (USFWS 2025*b*).

3.1.4.8 Climate Change

A wide variety of climate-related changes are occurring in terrestrial habitats across the circumpolar Arctic, including tundra areas where Steller's eiders nest and raise broods. The most prominent effects of climate change on Steller's eider habitat are likely to occur within their nesting areas and could involve both the physical environment and the biota. Impacts being observed in Alaska include changing snow conditions, earlier snowmelt, reduced sea ice, glacial retreat, warmer permafrost, changing precipitation patterns, drier landscapes, increased wildfires, and more extensive insect outbreaks (Chapin et al. 2014). The ponded habitats on which Steller's eiders rely for brood-rearing are also being impacted by climate change: together with changes in precipitation and warmer air temperatures, permafrost degradation and erosion is contributing to declines in pond area and abundance; and storm surge flooding increasing salinity in freshwater ponds and increased pond temperatures could be influencing primary productivity and invertebrate communities (USFWS 2021*a*). Changes to climate and to tundra habitats are creating cascading ecosystem changes, such as changed predator-prey dynamics (Aars and Ims 2002, Kausrud et al. 2008, Gilg et al. 2009, USFWS 2021*a*) and changed weather patterns, which could expose Steller's eiders to harsher weather or increased predation pressure during the breeding season (USFWS 2021*a*). Permafrost degradation could also result in exposure to additional contaminants. Ongoing climate warming will increase risk of contamination and mobilization of toxic substances via permafrost degradation and could further limit the availability of suitable feeding and brood rearing ponds.

Although the net impacts of climate change on Steller's eiders and their terrestrial habitats are unclear, such impacts are expected to continue unabated and could have cascading effects on the reproductive success of Steller's eiders, including by limiting the availability of suitable feeding and brood rearing ponds, disrupting current predator-prey dynamics in nesting and brood-rearing areas, and causing increased energy expenditure, which could in turn increase energy requirements and/or impact reproductive effort and success. With the exception of harsh weather events, the effect of climate-related change on the resiliency of the Alaska-breeding Steller's eider cannot be measured and is considered unknown; harsh weather during the breeding season is expected to have a moderate effect on population resiliency, through reduced breeding effort and reproductive success (USFWS 2025*b*).

A wide variety of climate-related changes are also occurring in marine habitats used by Steller's eiders throughout their distribution. Long-term data suggest the North Pacific and Arctic Oceans are experiencing a warming trend. Over large areas of the seasonally ice-free Arctic, summer sea surface temperatures have increased around 0.9° F (0.5° C) per decade from 1982 to 2017 (IPCC 2019). Historically, the climate of the Bering Sea has alternated between warm and cold years but has more recently been dominated by multi-year warm periods (Stabeno et al. 2012). Climate-induced changes in sea surface temperature may have cascading effects on the marine ecosystem, such as increasing ocean acidification negatively affecting bivalves, which may in turn lead to a decrease in availability of an important prey resource for Steller's eiders (see 3.1.4.10). This could be exacerbated by changing weather patterns in nearshore marine environments, which could expose Steller's eiders to harsher weather during the wintering and spring seasons and increase energy requirements, possibly impacting survival or physiological condition in subsequent seasons (USFWS 2021*a*).

Existing studies suggest Steller's eider survival rates may be influenced by climate variability. Model-based results by Frost et al. (2013) indicate the lowest annual survival estimates for Steller's eiders in the Pacific-wintering population during the period 1993 to 2003 coincided with a brief warming event in the PDO; and the return to cooler temperatures in the Bering Sea coincided with an increasing trend in Steller's eider survival and the highest estimated annual survival rates. However, conclusions about the effects of the PDO on Steller's eiders cannot be drawn from apparent correlation with a single climatic event (Frost et al. 2013).

The northern Pacific Ocean, including connected waters, is subject to long-term cycles in oceanic conditions (e.g., Pacific Decadal Oscillation, or PDO) and regime shifts defined by rapid changes in ecosystem structure, such as alterations to primary productivity, invertebrate populations, and fisheries, which then persist over a decadal time scale (Overland et al. 2008). Areas used by Steller's eiders for molting, wintering and spring staging along the eastern Bering Sea and Gulf of Alaska appear to be climate vulnerable. The net effect on Steller's eiders of past and present climate-related changes in the marine environment has not been adequately measured, but it appears there is high uncertainty of prey availability for Steller's eiders in molting, wintering, and spring staging areas over the next few decades (Smith et al. 2019).

3.1.4.9 Disease

Steller's eiders can be exposed to naturally occurring disease, parasites, and toxins during any part of their life cycle. Individuals are more likely to be exposed to diseases during molt and during wintering, when they concentrate in large flocks and increase their chances for bird-to-bird transmission (USFWS 2025*b*). Use of harbors where fish waste is disposed may expose them to higher rates of potentially pathogenic *Escherichia coli* and other contaminants (see 3.1.4.3). The effect of this stressor on resilience of the population of Alaska-breeding Steller's eider is unknown (USFWS 2025*b*).

3.1.4.10 Changing Prey Availability

Benthic ecosystems are vulnerable to environmental variation, and warming conditions may lead to shifts in benthic flora and fauna (Schiel et al. 2004, Grebmeier et al. 2006, Liu et al. 2019). Climate-related changes to ocean conditions could therefore lead to further changes in availability and quality of benthic prey for Steller's eiders (see 3.1.4.8 and 3.2). A recent study comparing the availability of benthic prey at Izembek Lagoon for molting Steller's eiders found significantly less bivalve and crustacean biomass, and smaller-sized bivalves and gastropods, in 2019 compared to 1998 (Maliguine et al. 2025). Because Steller's eiders increase their bivalve diet during molt (Petersen 1981, Troy and Johnson 1989, Metzner 1993) and may select for larger bivalves during this period (Petersen 1980), prey availability at Izembek Lagoon may not be as optimal for molting eiders as it has been in the past (Maliguine et al. 2025). Changes in prey availability could result in lowered body condition or survival for molting eiders and/or could result in a redistribution of eiders to molting areas with higher benthic biomass (Maliguine 2024) if suitable alternatives are available.

3.1.5 Recovery Criteria for Alaska-Breeding Steller's Eiders

The Steller's Eider Revised Recovery Plan (USFWS 2021*a*) presents research, monitoring, and management actions; such actions are re-evaluated and adjusted periodically, with the objective of population recovery so that protection under the ESA is no longer required.

When the Alaska-breeding population was listed as threatened, factors causing the decline were unknown; possible causes were identified as ingestion of lead shot present in wetland habitats and unknown changes in molting and wintering habitats in the Bering Sea. Other potential threats have been identified since listing, including in the original recovery plan (USFWS 2002*b*), including increased predation pressure, overharvest, exposure to other contaminants, risk of collision with structures and vessels, disturbance caused during human activities near the core nesting area, and loss or alteration of nesting habitats through human development. Other potential stressors have since been identified (see 3.1.4), but the causes of decline in Alaska-breeding Steller's eiders and obstacles to recovery of this population remain poorly understood.

Criteria used to determine when species are recovered are often based on historical abundance and distribution, or on the population size required to ensure that extinction risk, based on population modeling, is tolerably low. For Steller's eiders, robust information on historical abundance is lacking, and demographic parameters needed for accurate population modeling are poorly understood.

The revised 2021 Steller's eider recovery plan (USFWS 2021*a*) established recovery criteria based heavily on the viability of the species, recognizing the relationship between the Pacific Russia- and Alaska-breeding populations and the importance of the larger Pacific-wintering population. The 2021 plan offers two alternative demographic criteria, based on available information on trend of the Pacific-wintering population. In the 2021 plan, recovery criteria for the Alaska-breeding population are not wholly dependent on status of the larger Pacific-wintering population. The general concepts used to develop specific demographic metrics and thresholds for recovery criteria included:

- Over a long timeframe, the abundance of Steller's eiders in Alaska should be maintained or increase compared to that observed over the past 30 years;
- Steller's eiders should be distributed in the Utqiaġvik Ground survey area, and broadly across the Utqiaġvik Triangle and the Arctic Coastal Plain survey areas, or they should be present over a similarly wide distribution that includes areas of Alaska where they do not currently nest; and
- If the population trend of the Pacific-wintering population is unknown or is decreasing, the number of breeding Steller's eiders in Alaska, and our confidence in that number, should be higher.

The specific criteria developed from these concepts are:

1. We must be 80 percent confident the Pacific-wintering population has an abundance trend of ≥ 1.0, using at least five years of data but not exceeding a time interval of 15 years; and
2. We must be 80 percent confident that individual Steller's eiders present in the Utqiaġvik ground survey area number 50 birds or greater, individuals in the Utqiaġvik Triangle number 200 birds or greater, and individuals present across the Arctic Coastal Plain survey (excluding these two areas near Utqiaġvik) number 100 birds or greater over a 20-year timeframe; or there are greater than 350 individuals in Alaska across a wide distribution;

Or, if the Pacific-wintering population trend is unknown or declining,

3. We must be 95 percent confident that individual Steller's eiders present in the Utqiaġvik ground survey area number 75 birds or greater, individuals in the Utqiaġvik Triangle number 300 birds or greater, and individuals present across the Arctic Coastal Plain survey (excluding these two areas near Utqiaġvik) number 150 birds or greater over a 20-year timeframe.

Additionally, the recovery plan includes threats-based criteria that should be met. Threats include but not limited to ingestion of lead ammunition, mortality from shooting, bird collisions with structures, human disturbance in the breeding area, nest predation, and changes to the ecological community. Threats must be found to not affect the ability of the population to meet and maintain the demographic criteria included in the plan.

In the most recent 5-year status review (USFWS 2025*d*), the Service determined that the Alaska-breeding population of Steller's eiders continues to meet the definition of threatened, as the population has not met the demographic- and threats-based recovery criteria for delisting, as laid out in the 2021 recovery plan (USFWS 2021*a*). The population has low resiliency, as low numbers of Steller's eiders are annually present in Alaska and have highly variable vital rates, and low redundancy, as only one extant subpopulation remains with a wide but sparse distribution outside of Utqiaġvik. While the population has moderate representation – as indicated by the varied diet and habitat use of Steller's eiders, adequate genetic diversity, and wide non-breeding distribution – the population remains vulnerable to environmental stochasticity and catastrophic events. Additionally, the identified stressors to the population are likely to worsen over time in the breeding and non-breeding habitats (USFWS 2025*d*).

3.2 Critical Habitat for Steller's Eider

In 2001, the Service designated critical habitat for the Alaska-breeding population of Steller's eiders (50 CFR Part 17). The total area of designated critical habitat is 2,830 square miles (7,330 square kilometers) across five units, including: the Yukon-Kuskokwim Delta (Unit 1) for nesting; Kuskokwim Shoals (Unit 2) and Seal Islands (Unit 3) for molting and staging; and Nelson Lagoon (Unit 4) and Izembek Lagoon (Unit 5) for molting, wintering, and staging (Figure 8). The Izembek Lagoon critical habitat unit includes all waters of Izembek Lagoon, Moffett Lagoon, Applegate Cove, and Norma Bay, and waters 0.25 miles (400 meters) offshore of the Kudiakof Islands (which close the entrance to Izembek Lagoon) and adjacent mainland.

The physical or biological features essential to conservation of the species, and which may require special management considerations, were identified as Primary Constituent Elements (PCEs). For the Yukon-Kuskokwim Delta (Unit 1), the PCE includes the vegetated intertidal zone and all open water inclusions within this zone. For Units 2 through 5, the PCEs include marine waters up to 30 feet (9 meters) deep and the underlying substrate, the associated invertebrate fauna in the water column, the underlying marine benthic community, and where present, eelgrass beds and associated flora and fauna.

Units selected for designation as critical habitat areas are those where Steller's eiders consistently occur at relatively high densities, where Steller's eiders are especially vulnerable to disturbance and contamination due to flightlessness, and/or they are areas essential to species' survival and recovery given the best available data.

The physical habitat of Steller's eiders is largely unaltered from natural conditions throughout most of the species' distribution in Alaska. Human populations in most of the designated critical habitat areas are small, and development has been limited to few, widely dispersed communities and industrial centers. Developments that have physically modified small areas of Steller's eider habitat consist of infrastructure such as roads, gravel pads, docks, piers, and boat harbors, which are limited to nearshore waters immediately adjacent to communities and industrial centers. Some Steller's eiders continue to use these areas. However, management actions identified as important to species recovery include: 1) protecting breeding habitat on the Arctic Coastal Plain, particularly in areas with the highest observed nesting density; and 2) protecting habitat in marine areas, specifically in important molting, wintering, and staging areas (USFWS 2021*a*). The recovery plan also identified research aimed at predicting habitat change in the non-breeding areas and the subsequent impact of predicted change to population viability as important for management of Steller's eiders (USFWS 2021*a*).

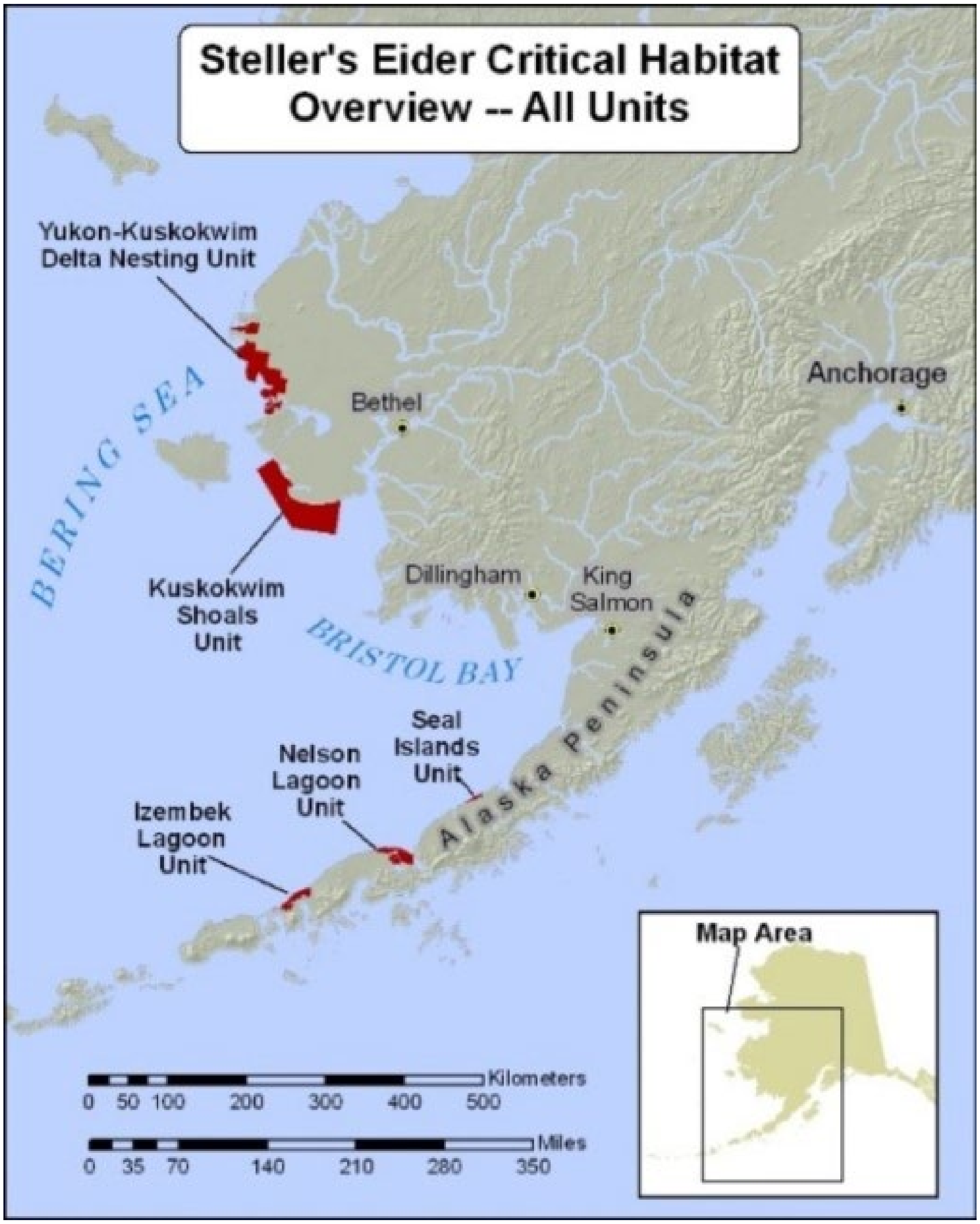

Figure 8. Map of designated critical habitat for Steller's eider.

Natural regime shifts in the northern Pacific Ocean are defined by rapid but persistent changes in ecosystem structure, including alterations to primary productivity and invertebrate populations (Overland et al. 2008). Areas used by Steller's eiders for molting, wintering and spring staging along the eastern Bering Sea and Gulf of Alaska appear to be climate vulnerable. Predicted changes in molting and spring staging areas along the eastern Bering Sea and Gulf of Alaska include increasing temperatures in areas of shallow sea water and decreased sea ice concentration (Smith et al. 2019). There is high uncertainty regarding how these projected changes may impact prey availability for Steller's eiders in their critical molting, wintering, and spring staging habitat over the next few decades: three climate models assessing the same spatial data related to environmental and forage conditions projected inconsistent effects to the biomass of benthic infauna (e.g., bivalves, amphipods, and polychaetes; marine invertebrate species used by Steller's eiders). Along the northern Alaska Peninsula, the three-model average projected a decrease in biomass of benthic invertebrates in some areas, including Izembek Lagoon, and a slight increase in other areas (Smith et al. 2019).

Prey abundance and quality are important components of the PCEs for critical habitat Units 2 through 5. Although benthic systems are vulnerable to regime shifts and other variability in marine environments (Grebmeier et al. 2006, Liu et al. 2019), the Smith et al. assessment showed some uncertainty in how projected changes in Steller's eider molting, wintering, and spring staging areas could affect prey availability for Steller's eiders, including in critical habitat areas, over the next few decades (Smith et al. 2019, USFWS 2025*b*). Climate-related changes can also affect the health of eelgrass, which are an important foundation species in many shallow water environments (see sections 1.3.4 and 5.1.3.1) and lead to reduction in spatial extent, density of eelgrass blades, and other impacts to eelgrass.

3.3 Status of the Northern Sea Otter

The northern sea otter is a marine mammal that lives in shallow marine areas along the shores of the North Pacific. Adults reach 51 inches (130 centimeters) in length and 66 pounds (30 kilograms) in weight (Kenyon 1969). They depend on fur instead of blubber for insulation (Riedman and Estes 1990). Sea otter fur consists of a sparse outer layer of guard hairs with very dense underfur (Kenyon 1969). They have a long history of being commercially harvested for their fur.

The Service recognizes three "stocks" of northern sea otters in Alaska: Southeast Alaska, Southcentral Alaska, and Southwest Alaska (USFWS 2013; Figure **9**). The term "stock" is used by the Service and the National Marine Fisheries Service in the context of managing marine mammal species under the MMPA. The southwest Alaska DPS, listed as threatened under the ESA, is the same entity as the southwest Alaska stock.

3.3.1 Listing Status

The Service listed the southwest Alaska DPS of the northern sea otter as threatened on August 9, 2005 (70 FR 46366). Sea otters forage in nearshore marine and intertidal habitat, usually remaining within a couple of miles of their established feeding grounds, where bottom depths are typically less than 300 ft (91.4 m; USFWS 2013). Critical habitat was designated in 2009 (74 FR 51988; October 8, 2009).

At the time of the 2005 final listing rule for the species, the Service estimated the southwest DPS had experienced a rapid decline in abundance of more than 50 percent since the late 1980s and consisted of approximately 42,000 sea otters. The cause of the decline was not certain, but the weight of evidence pointed to increased predation, probably by the killer whale (*Orcinus orca*; USFWS 2013).

3.3.2 Life History

Both male and female sea otters can attain sexual maturity by age three, although sexual maturation may be delayed to four or five years of age when food resources are limited (von Biela et al. 2009). Sea otters mate throughout the year, and gestation requires about six months.

Although young may be born in any season, most pups are born in late spring in Alaska. Like other marine mammals, they have only one pup during each breeding cycle. The female's maternal instinct is strong, and she seldom leaves her pup except when diving for food. When the female travels or sleeps, the pup usually rides on its mother's chest as she floats on her back. The pup may weigh 31 pounds (14 kilograms) or more when weaned. Females can produce one pup a year but may produce pups less frequently in areas where food is limited. Many sea otters live for 15 to 20 years. They usually do not migrate and seldom travel far unless an area has become overpopulated and food is scarce. The home range of individual sea otters can vary from only a few square miles to over 15 square miles (40 square kilometers; Schneider and Ballachey 2008).

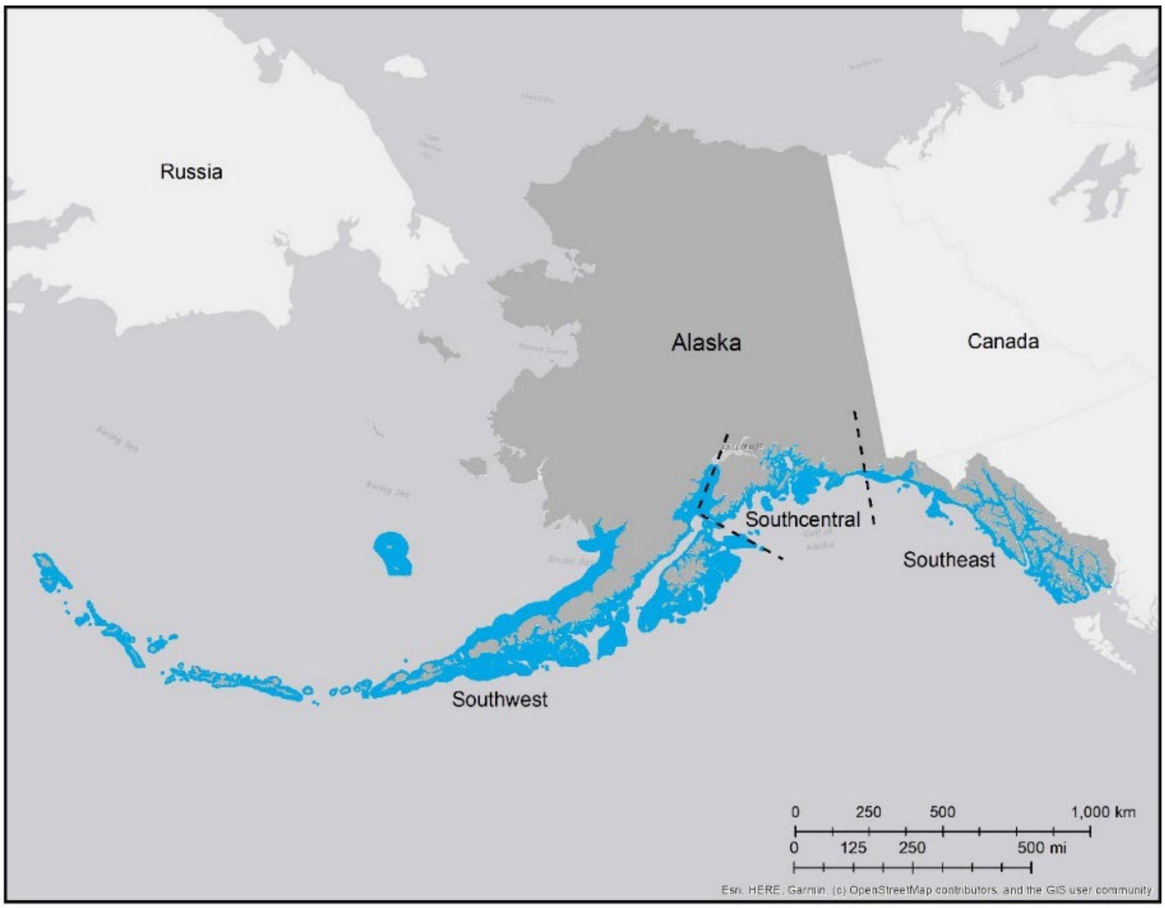

Figure 9. Northern sea otter distribution in Alaska, in blue (USFWS 2023*a*). Sea otter populations or "stocks" are delineated by dashed lines. The southwest population is listed as threatened under the ESA.

3.3.3 Diet and Habitat Use

Sea otters forage in nearshore coastal areas with rocky and soft-sediment substrates, typically close to shore in waters less than 131 feet (40 meters) depth (Estes 1980, VanBlaricom and Estes 1988). They dive to gather food (sea urchins, crabs, clams, mussels, octopuses, other marine invertebrates) from the seafloor in relatively shallow water (Riedman and Estes 1990). Distribution is largely limited by their ability to dive to the sea floor (Bodkin et al. 2004). Diving depth of sea otters is highly variable and ranges from 6 to 246 feet (2 to 75 meters) depending on the prey species pursued (Schneider and Ballachey 2008). In the wild, sea otters never eat on land. Feeding dives generally last about 60 to 90 seconds, although some otters have been observed staying underwater in excess of five minutes (Riedman and Estes 1990). They usually dive and return with several items of food, roll on their backs, place the food on their chests and eat food piece by piece using their forepaws, sometimes using a rock to crack shells.

Otters generally spend less time foraging during summer (females 8.8 hours per day, males 7.9 hours per day) than other seasons (females 10.1 to 10.5 hours per day, males 9.2 to 9.5 hours per day; Esslinger et al. 2014). Both sexes show strong preferences for diurnal foraging and adjusted their foraging effort in response to the amount of available daylight, except for female otters after they have given birth. For approximately three weeks post-partum, females switch to nocturnal foraging, possibly to reduce the risk of predation by eagles on newborn pups (Esslinger et al. 2014).

The southwest Alaska DPS primarily prey on hard-shelled invertebrates, including sea urchins (e.g., *Strongylocentrotus droebachiensis*), abalone and other marine snails (e.g., *Haliotis kamtschatkana*), crabs (e.g., *Telmessus spp*.), mussels (*Mytilus spp.),* and clams (e.g., *Saxidomus spp*.) (USFWS 2023*a*). Kelp forests provide food and habitat for many prey species.

Northern sea otters use areas of kelp forests, seagrass beds, and barrens, with habitat use often a function of prey abundance, foraging energetics, and predation pressure (Kenyon 1969, Monson et al. 2000). In addition to providing a source of prey, kelp canopy is important resting habitat on the outer coast. Kelp reduces tidal energy and provides a means of anchoring for sea otters, removing the need for repeated repositioning when sea otters are resting. It also serves as nursery habitat for adult females and their pups (Riedman and Estes 1990) and provides protection from some marine predators (Nicholson et al. 2018). Although kelp canopy is important, sea otters are known to use some areas that lack kelp.

Kelp communities are sensitive to sewage, industrial waste discharges, sedimentation and other causes of poor water and sediment quality (Coelho et al. 2000, Contreras-Porcia et al. 2023). Pollution contributes to kelp forest degradation. For example, high sedimentation from coastal run-off may bury new plant shoots. Kelp may experience reduced growth rates and reproductive success in more toxic waters and sediments. Other threats to kelp include climate change and overgrazing by fish or sea urchins.

3.3.4 Distribution

The range of the southwest Alaska DPS (Figure 10) includes the west side of Cook Inlet, the Alaska Peninsula and Bristol Bay coasts, and the Aleutian, Barren, Kodiak, and Pribilof Islands. The northern sea otter recovery plan identifies five Management Units (MUs, Figure 10) within the ESA-listed DPS: 1) Western Aleutian Islands; 2) Eastern Aleutian Islands; 3) South Alaska Peninsula; 4) Bristol Bay; and 5) Kodiak, Kamishak, Alaska Peninsula (USFWS 2013).

3.3.5 Populations and Trends

Population size estimates are periodically released in stock assessment reports. The Service's 2023 Sea Otter Stock Assessment Report provides the most current population estimates (USFWS 2023*a*). The report estimates a population size of the southwest stock at approximately

51,935 sea otters, which is slightly less than the estimated 55,000 in 2014 (USFWS 2023*a*). Population estimates are also provided for each management unit (MU; Table 1).

The status of the southwest Alaska DPS was evaluated and summarized in the Species Status Assessment (SSA), including an assessment of species viability. The SSA defines viability as the ability of the species to sustain populations over time (USFWS 2020). Indicators of viability include resiliency, redundancy, and representation. Populations with high levels of these indicators would be expected to maintain viability over a 30-year period, while low levels signify potential population declines. The SSA summarized current viability conditions by MU (USFWS 2020, Table 2).

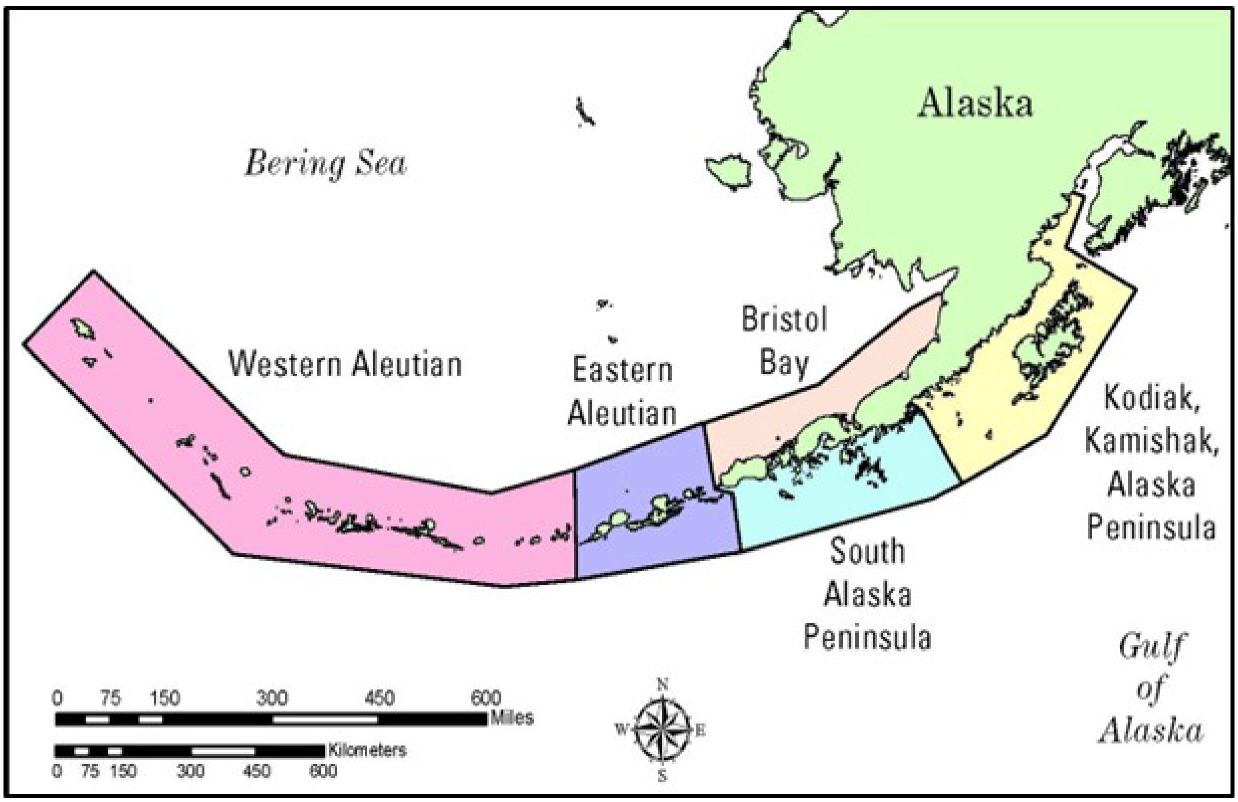

Figure 10. Southwest Alaska DPS of sea otters with management units.

3.3.5.1 Threats

Two primary threats have caused historical population declines among Alaska's sea otters. The first was overharvest during commercial hunting. The commercial sea otter fur trade peaked in the late 1800s, then waned with the decrease in availability of sea otters. Overharvest is not currently considered a threat. The second major threat is predation, probably by killer whales (*Orcinus orca*). Killer whales are generally assumed to have caused declines in the southwest Alaska DPS in the 1980s and 1990s and may still threaten sea otters in parts of their range.

3.3.5.2 Predation

Sea otters are preyed on by bald eagles (*Haliaeetus leucocephalus*), white sharks (*Carcharodon carcharias*), brown bears (*Ursus arctos)*, coyotes (*Canis latrans)*, and killer whales (*Orcinus orca*). Predation by killer whales is hypothesized to be the primary driver of the recent decline of the northern sea otter population, and it may pose a serious threat to timely recovery of sea otter populations (USFWS 2013). Transient killer whales are thought to have shifted to diets containing more sea otters following declining availability of harbor seals (*Phoca vitulina*) and Steller sea lions (*Eumetopias jubata*) during the mid- to late-20th century (Estes et al. 2009). Tinker et al. (2021) conducted a quantitative, probabilistic analysis of the degree of consistency between the available data and each of seven competing hypotheses explaining the cause of population decline and found the predation hypothesis had more than two times the support of any other hypothesis.

Table 1. Population estimates for the southwest Alaska DPS (USFWS 2023*a*).

Survey Area	Year	Population Estimate	CV	N_{MIN}	Reference
Kodiak, Kamishak, Alaska Peninsula	2014–2018	30,658	0.18	26,378	Cobb 2018, Esslinger 2020, Garlich-Miller et al. 2018, USFWS 2020
Bristol Bay	2016	9,733	1.07	4,665	Beatty et al. 2021
South Alaska Peninsula	2016	546	0.33	417	Beatty et al. 2021
Eastern Aleutians	2017	8,593	0.07	8,102	Wilson et al. 2021
Western Aleutians	2021	2,405	0.16	2,104	Tinker et al. 2023
Southwest DPS Total		**51,935**	*****	**41,666**	

*A global coefficient of variation (CV) is unavailable for the southwest stock due to the different survey methods and analytical approaches used for population assessments in each of the five Management Units.
CV = coefficient of variation
N_{MIN} = minimum population estimate

Table 2. Current viability of each northern sea otter MU.

Management Unit	Current Viability Condition
Kodiak, Kamishak, Alaska Peninsula	Moderate
Bristol Bay	Moderate
South Alaska Peninsula	Low
Eastern Aleutians	High
Western Aleutians	Low

Human-caused Mortality
Commercial harvest of northern sea otters began in the western Aleutians and peaked in the 1800s, causing significant population declines across Alaska and Canada (Bodkin 2015). This harvest declined as sea otters became rare, leaving behind small remnant populations in isolated locations (Kenyon 1969, Bodkin 2015). Harvest of sea otters is currently prohibited except by Native hunters who take sea otters for subsistence purposes. The reported harvest of sea otters in Alaska is greatest around coastal villages and can change greatly from year to year.

Annual human-caused mortality was analyzed for the southwest DPS over a four-year period 2017 through 2021, with an estimated average of 177 sea otters taken per year. This estimate is well below estimated maximum number of sea otters, not including natural mortalities, that may be removed from the stock while still allowing that stock to reach or maintain its optimum sustainable population. Data for subsistence harvest of sea otters in the southwest DPS are collected by a mandatory Marking, Tagging, and Reporting Program (MTRP) administered by the Service since 1988. Total annual subsistence harvest removals averaged 176 sea otters per year over this same 5-year period, which represents less than 1 percent of the minimum population estimate (41,666 sea otters). The subsistence harvest reporting is considered a minimum estimate, as it does not account for underreporting of harvest. The MTRP indicates they have received some anecdotal reports of illegal and unreported harvest, yet the extent to which it occurs across the DPS is unknown.

3.3.5.3 Habitat Loss
Commercial activity and construction of coastal facilities including docks, piers, boat harbors, and oil and gas facilities contribute to loss of habitat. Development areas occur near towns such as Unalaska in the Aleutian Islands and Kodiak, Alaska. Concerns associated with construction activities include increased noise and behavioral responses such as avoidance. Construction activities may generate in-water and airborne noise levels that can compromise sea otter hearing or temporarily or permanently displace sea otters from important areas. Most of the Alaskan coastline in the range of the southwest Alaska DPS is undeveloped, and habitat loss is not considered a major threat to the northern sea otter (USFWS 2013); but development in busy commercial and industrial could limit movements between local population segments.

3.3.5.4 Oil Spills and Other Contaminants
Sea otters are vulnerable to oil contamination because they rely on their fur instead of blubber for thermoregulation (Bodkin et al. 2002). Contact with oil prevents the fur from properly insulating their bodies and leads to hypothermia (Siniff et al. 1982). Oil toxicity can also be harmful to sea otters and has been documented to cause brain lesions, disorientation, liver damage, kidney failure, and damage to eyes and lungs (Peterson et al. 2003). Long-term population impacts can come from oil contamination of food resources (Dean et al. 2002, Bodkin et al. 2012). Suspension-feeding clams and mussels concentrate hydrocarbons in tissues later consumed by otters (Jewett et al. 1999).

The overall extent of impacts to the southwest Alaska DPS depends on the size and location of a spill. While large spills happen infrequently, small-scale spills (such as vessel spills) are more common. Although it is a rare event, a large-scale spill of crude oils, fuels, or other contaminants can have a significant and negative, population-level impact. For example, in 1989 a large tanker grounded in northern Prince William Sound and released 260,000 barrels of crude oil contaminating at least 1,236 miles (1,990 kilometers) of shoreline. This incident is known as the *Exxon Valdez* Oil Spill (EVOS). When the EVOS occurred, several thousand otters were killed despite rehabilitation efforts (Ballachey et al. 1994). Another spill incident occurred in December of 2004 when a 738 feet (225 meters) freighter, the *Selendang Ayu*, ran aground and broke apart near Unalaska Island in the Eastern Aleutians. The rupture resulted in the release of about 1,330 metric tons of oil and diesel. At least two sea otters were killed due to oiling from this event, but the extent to which it affected the southwest Alaska DPS of northern sea otter, and their prey, is unknown.

3.3.5.5 Disease

Sea otters are susceptible to multiple disease agents, including parasites, bacterial and viral infection, and biotoxins. Helminth parasites including tapeworm (*Cestoda*), flukes (*Trematoda*), *Nematoda*, and *Acanthacephala* species are prevalent among sea otters, including among the southwest Alaska DPS (USFWS 2020). Disease agents may have minor effects on the overall population if outbreaks are isolated and short-lived. Alternatively, pathogens and biotoxins can cause major declines by increasing morbidity and mortality or by reducing fertility or fecundity among a population segment. The Service evaluated prevalence and severity of infectious disease among the southwest Alaska DPS in the recovery plan (USFWS 2013).

Climate change is expected to increase disease prevalence among animal populations in arctic and subarctic regions through changes in spatial distribution among hosts, pathogens, and vector populations (Dudley et al. 2015). Overall, threats to the southwest Alaska DPS from exposure to disease agents are expected to increase due to climate change. However, it is uncertain what effect the increase in disease and parasites may have on the southwest Alaska DPS of northern sea otters in the future (USFWS 2020).

3.3.5.6 Climate Change

Although climate change is a global phenomenon, high latitude regions, including Alaska and the surrounding oceans, are thought to be especially sensitive to its effects (Smol et al. 2005, Schindler and Smol 2006). Data collected during the past 60 years indicate the State of Alaska has warmed more than twice as fast as the rest of the U.S., with average annual air temperature increasing by 3.1° F (1.7° C; Stewart et al. 2013). The waters within the range of the southwest Alaska DPS of northern sea otter have warmed over the last several decades and are expected to continue to warm. Projected sea surface temperature models for the Gulf of Alaska indicate a mean temperature increase of 3.1° F (1.7° C) by 2050 and 5.9° F (3.3° C) by 2080 (Dorn et al. 2017). Eighty percent of these models predicted a range of values between 2.5° F (1.4° C) and 7.0° F (3.9° C) for both time periods. The resulting temperatures appear to be within the thermal tolerances of otters and may be advantageous in terms of maintaining thermal neutrality, and the warmer trend may allow for otters to expand their range farther north due to lack of sea ice. However, increasing sea surface temperatures may result in distribution shifts, changes in recruitment dynamics, and changes in abundance of various members of benthic communities, including some prey species and other predators to those prey.

3.3.6 Recovery Criteria

The goal of the sea otter recovery plan (USFWS 2013) is to establish a framework of recovery actions that will ensure the long-term survival of the southwest Alaska DPS and control or reduce threats such that the species will no longer require the protections of the ESA. The recovery objectives include the following:

1. Achieve and maintain a self-sustaining population of sea otters in each MU.
2. Maintain enough sea otters to ensure that they are playing a functional role in their nearshore ecosystem.
3. Mitigate threats sufficiently to ensure persistence of sea otters.

The southwest Alaska DPS ranges from west to east across more than 1,500 miles (2,414 kilometers) of shoreline, and sea otters occur in several distinct habitat types. The magnitude and pattern of the population decline has varied over the range and the cause(s) of decline also likely vary regionally. To address such differences, the recovery plan identifies criteria by MU (USFWS 2013).

Specific actions to achieve recovery and delisting of the southwest Alaska DPS, specified in the recovery plan are:

4. Demographic criterion: The probability of the sea otter becoming endangered within 25 years would be less than five percent. Because of this criterion, population monitoring and population modeling are considered high priorities.
5. Ecosystem-based criterion: Greater than 50 percent of the islands need to be in the kelp- dominated state. This criterion applies to the Western Aleutians and Eastern Aleutians MUs only. Monitoring the status of the kelp forest ecosystem in these MUs is considered a high priority, as results from such monitoring will be needed to evaluate the ecosystem-based delisting criteria.
6. Threats-based criterion: Predation is considered to be the most important threat to recovery, so additional research on that threat is also a high priority. Other high-priority actions include identifying characteristics of sea otter habitat and ensuring adequate oil spill response capability exists in southwest Alaska.

The recovery plan states, "delisting may be considered when any three of the five MUs meets all of the recovery criteria specified" (USFWS 2013). Specific actions to achieve recovery are detailed in the plan.

3.4 Critical Habitat for the Southwest DPS of Sea Otter

Northern sea otter critical habitat was designated on October 8, 2009 (74 FR 51988). A total of 5,855 square miles (15,164 square kilometers) of nearshore marine environment was designated in southwest Alaska. The physical or biological features essential to conservation of the species, and which may require special management considerations, were identified as PCEs in the northern sea otter critical habitat rule (74 FR 51988). The PCEs identified for sea otter critical habitat include the following:

1. Shallow, rocky areas where marine predators are less likely to forage, which are waters less than 2 meters (6 feet) depth;
2. Nearshore waters that may provide protection or escape from marine predators, which are those within 100 meters (328 feet) from the mean high tide line;
3. Kelp forests that provide protection from marine predators, which occur in waters less than 20 meters (65 feet) depth; and
4. Prey resources in sufficient quantity and quality to support the energetic requirements of the species.

Table 3. Summary of sea otter recovery criteria listed by MU.

Criteria	**Management Unit**				
	Western Aleutian	**Eastern Aleutian**	**Bristol Bay**	**South-Alaska Peninsula**	**Kodiak, Kamishak, & Alaska Peninsula**
Demographic	< 5%	< 5%	< 5%	< 5%	< 5%
Ecosystem	>50% kelp dominated	>50% kelp dominated	None proposed	None proposed	None proposed
Threats	Threats adequately mitigated	Threats adequately mitigated	Threats adequately mitigated	Threats adequately mitigated	Threats adequately mitigated

Critical habitat for northern sea otters is divided into five MUs corresponding to the Recovery Units listed in the recovery plan: Western Aleutians; Eastern Aleutians; South Alaska Peninsula; Bristol Bay; and Kodiak, Kamishak, and Alaska Peninsula (Figure 11).

The physical habitat of northern sea otters is largely unaltered from natural conditions throughout the vast majority of the range of the southwest Alaska DPS. The human populations in most of the designated critical habitat are small, and development has been limited to the few, widely scattered towns, villages, and military installations. Developments that have physically modified sea otter habitat consist of docks, piers, and boat harbors, which are limited to nearshore waters immediately adjacent to towns, villages, and military bases. Some sea otters continue to use these sites. No trends in the condition of sea otter critical habitat are identified in the critical habitat designation, and the Service's recovery plan rates habitat loss as a low threat to recovery of the population (USFWS 2013).

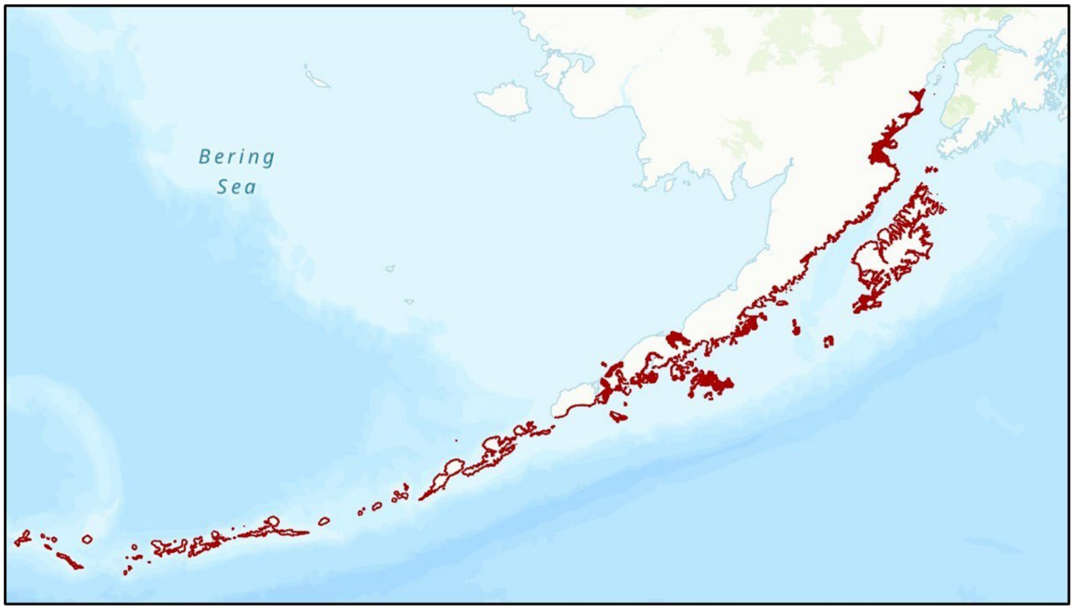

Figure 11. Designated northern sea otter critical habitat.

4 ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The impacts to listed species or designated critical habitat from federal agency activities or existing federal agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

4.1 Existing Conditions

4.1.1 Habitat

The isthmus in Izembek National Wildlife Refuge is a wetland complex that includes the interaction between uplands where the water table may be higher than the adjacent lowland containing a wetland; the isthmus serves as a divide between discharges to the north into the Bering Sea (including through tributaries to Izembek Lagoon) and to the south into Cold Bay and the Pacific Ocean (including through tributaries to Kinzarof Lagoon;(USFWS 2013*a*). Wetlands do not function as discrete features on the landscape. Wetlands and hydrologically connected uplands serve to moderate the flows in streams running into Izembek and Kinzarof Lagoons. The continually saturated condition of the Izembek and Kinzarof marsh wetlands do not allow them to absorb water, but the dense vegetation and hummocky microtopography slows runoff. The wetland vegetation promotes sediment deposition during overbank flow conditions. The marshes' vegetation binds stream banks and the shoreline against erosive high flows, reducing bank erosion and its resulting turbidity and sedimentation. These tundra system wetlands likely have moderately high primary productivity and nutrient and element cycling. We expect they export organic materials that support the lagoon ecosystem, including the migrating, staging, and wintering waterfowl and migrating shorebirds for which Izembek and Kinzarof Lagoons are known (USFWS 2013*a*). During summer, these wetlands are used as breeding and foraging habitat for waterfowl, shorebirds, songbirds, and ptarmigan. Because of the abundance of surface water, the complex interspersion of seasonal open water and vegetation, and proximity to Izembek and Kinzarof Lagoons, these wetlands support several other species of water dependent wildlife. The wetland vegetation also provides some cover and contributes detritus and invertebrates to the streams that support fish and eventually flow into the lagoons.

The largest eelgrass beds in the world are found in Izembek Lagoon (Ward et al. 1997); eelgrass is also found in Kinzarof Lagoon and Cold Bay to a lesser extent. Eelgrass, and seagrass meadows more generally, are complex systems that support a large range of organisms (e.g., bacteria, invertebrates, juvenile and adult fish, waterfowl and other birds, and marine mammals) by providing nutrients (e.g., eelgrass leaves, seeds, and rhizomes) and supporting prey species populations; providing shelter (e.g., shade, cover, spawning substrate, and attachment surfaces); and providing physical stability (e.g., by buffering water currents, holding fine-grained sediment in place) (Phillips 1984, Longstaff and Dennison 1999, Gorgula and Connell 2004, ADF&G 2010, Watanabe et al. 2016, Picard et al. 2022). Seagrasses such as eelgrass stabilize and enrich sediments and provide an important base for a complex food web. Many of the invertebrates found in eelgrass are an important food resource for other invertebrates and for fish, birds, and other wildlife species. Species groups settling in, crawling on, or clinging to blades include *Caprella* shrimp, gastropods (*Margarites* spp., *Lacuna* spp.), bivalves (*Turtonia minuta*), and polychaets (McConnaughey 1978, Metzner 1993, USGS 2019). The helmet crab (*Telmessus cheiragonus)* is one of the most prominent invertebrates in Izembek Lagoon, with an estimated abundance at almost one helmet crab per square meter in the intertidal eelgrass beds (McConnaughey 1978). This crab forages on both eelgrass and invertebrates and is fed upon by sea stars, several species of fish, sea otters, red foxes, brown bears, common ravens, diving birds, waterfowl, sandpipers, and gulls. Eelgrass productivity is dependent on many factors including water quality, turbidity, and eutrophication. They are sensitive to both human and natural disturbance.

Kelp are large brown algae (*Phaeophyta*) that live in cool, relatively shallow waters close to the shore. Kelp forests are confined to rocky coastlines where they grow in nutrient-rich, cold, shallow water that allows ample photosynthesis. They harbor a high variety and high diversity of plants and animals with many organisms using the thick blades as a safe shelter for their young from predators or rough storms. Kelp forests provide food, shelter, and protection for a large range of organisms, including seals, sea lions, sea otters, invertebrates, fish, whales, birds, and more.

Canopy-covering brown kelps are widespread along the Gulf of Alaska coastline, from Castle Cape to the southwestern tip of Unimak Island, expect for the southern side of Unimak Island (USFWS 2020). Dark brown bladed kelp is distributed along the Gulf of Alaska coastline, from Castle Cape to the southwestern tip of Unimak Island, expect for the southern side of Unimak

Island as well. Along the Bristol Bay coastline from Cape Chichagof on the north side of the Alaska Peninsula to the northwestern tip of Unimak Island, canopy-covering kelps and dark brown bladed kelp are few and scattered along the coastline (USFWS 2020).

4.1.2 Land Ownership

The action area is located between the Bering Sea and the Gulf of Alaska at the southwestern end of the Alaska Peninsula. The action area includes all lands proposed for the land exchange; the entirety of the Izembek Isthmus; Kinzarof, Moffet, and Izembek Lagoon, and the marine waterbody of Cold Bay. Land ownership is primarily mixed between Tribal, State, and Federal lands, with some privately owned lands and some acreage with split surface and subsurface mineral rights. Portions of the action area are within the Izembek State Game Refuge (Figure 12). There is some overlap between Izembek State Game Refuge and Izembek Refuge boundaries, and the ADF&G and Izembek Refuge split management of the area and resources in the area. Specifically, below mean high water, the State of Alaska manages Izembek Lagoon and other areas of overlap between the Izembek State Game Refuge and the Federally managed Izembek Refuge.

Portions of the action area and surrounding lands were first Federally protected as the Izembek National Wildlife Range in 1960, established through Public Land Order 2216 (25 FR 12599-12600) as a breeding ground and management area for all forms of wildlife and recognized by the Department of Interior as, "contain[ing] the most important concentration point for waterfowl in Alaska." In 1980, Congress redesignated the Izembek National Wildlife Range as the Izembek National Wildlife Refuge under ANILCA; concurrently, under the Wilderness Act, Congress designated 300,000 acres of Izembek Refuge as Izembek Wilderness.

4.1.3 Existing infrastructure

King Cove is located on the southeast side of the Alaska Peninsula, and vessel or land-based access to the north side of the Alaska Peninsula is currently logistically complicated for King Cove residents. Although there are roads in King Cove (including from King Cove to the Northeast Hovercraft Terminal site at the Izembek Refuge boundary) and roads in Cold Bay (including from the Cold Bay Dock to the Cold Bay airport and to a boat launch into Izembek Lagoon), there are no existing overland roads between the communities of King Cove and Cold Bay. People must take an aircraft or boat to get from one community to the other. Boat access at Cold Bay is limited to the Cold Bay Dock, where passengers either have to climb a steel ladder or be lifted to the deck of the dock via a winch system used to load/unload cargo from fishing boats (DOI/USFWS 2013*a*).

Although it may be feasible for King Cove residents to boat across Cold Bay, pull a boat out of the water, and use the road network to access the boat launch on Outer Marker Road that would allow vessel-based access to Izembek Lagoon, we assume this does not occur regularly due to logistical limitations. Boating from King Cove to the northwest side of the Alaska Peninsula would be a lengthy and difficult undertaking, requiring passage through False Pass (which is not navigable by all vessels) or boating even farther around. Given these circumstances and the lack of data regarding King Cove subsistence activities, including location of subsistence activities, we assume King Cove residents currently perform most subsistence hunting and fishing in areas on the southeastern side of the Alaska Peninsula at present.

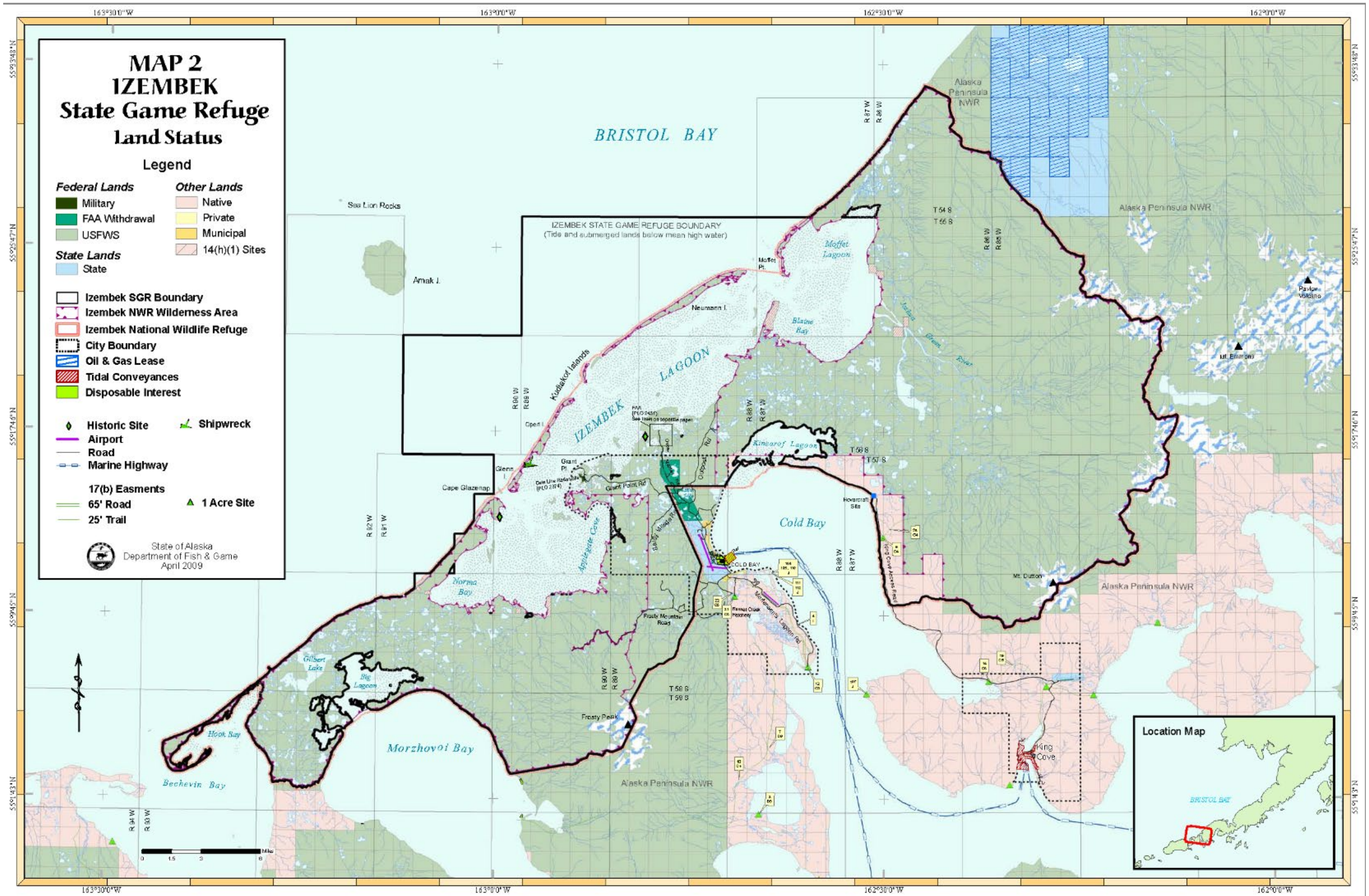

Figure 12. State Game Refuge boundary and overview of land status in the action area.

The King Cove harbor can hold 50 small vessels (up to 60 feet [18.3 meters] long) and 46 large vessels (up to 150 feet long [45.7 meters]). The deep-water pier also serves as a docking point for vessels up to 330 feet (100 meters) long, such as the state ferry, cargo ships, and cruise vessels (City of King Cove 2025). We assume some number of smaller skiff-type vessels (hard-bottomed and/or inflatable, motorized vessels) are owned by residents of King Cove, although data to quantify this number are lacking.

One of the largest fish processing facilities in Alaska is located in King Cove, although this plant was closed in 2024. The Peter Pan Seafoods cannery has the infrastructure to employ up to 500 seasonal employees; in the past, these employees tended to be non-residents (i.e., they did not meet the subsistence use qualification requirement of being a resident for 12 consecutive months). Product was typically shipped to market by boat or barge; to a lesser extent, product may also be shipped by air service from the Cold Bay Airport (after first being loaded onto a boat and transported across Cold Bay).

4.1.4 Resource Management

Prior to establishment of the Izembek Refuge, the Izembek Wildlife Range Master Plan (1969) set forth to manage this area so it would remain in as natural a condition as possible, in order to maintain its high value for wildlife (USFWS 1969, 1985). The master plan specifically noted protection of drainages as vital to the function of the range because altering natural hydrology could have serious effects to wildlife habitat, including eelgrass. The master plan emphasized the following activities must be kept to a minimum: soil disturbance, public facilities, and human activities. When re-designating this area as Izembek Refuge, Congress defined four purposes for the designation:

- i. To conserve fish and wildlife populations and habitats in their natural diversity, including but not limited to waterfowl, shorebirds, and other migratory birds, brown bears and salmonids;
- ii. To fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats;
- iii. To provide, in a manner consistent with the purposes set forth in subparagraphs (i) and (ii), the opportunity for continued subsistence use by local residents; and
- iv. To ensure, to the maximum extent practicable and in a manner consistent with the purposes set forth in paragraph (i), water quality and necessary water quantity within the refuge.

With establishment of Izembek Wilderness, Congress noted the wilderness area contained watersheds critical to Izembek Lagoon, and specifically recognized the lagoon’s eelgrass beds serve as habitat for millions of waterfowl. Congress identified designation of the Izembek Wilderness was for the purpose of protecting critically important habitat by restricting access to the lagoon. Izembek Refuge is also designated as a Wetland of International Importance (Ramsar Site Number 349, established in 1986), under the Ramsar Convention on Wetlands (Convention), an intergovernmental treaty to which the United States is a Contracting Party. This site qualifies for this Ramsar designation under six of the nine criteria agreed upon by the Convention (Ramsar 1971).

The ADF&G and Izembek Refuge share management of natural resources and use of those resources (e.g., fishing and bird hunting) in this area (Sowl et al. 2021). The State Game Refuge and Izembek Refuge share boundaries with some overlap, but some areas only managed by one entity. According to the ADF&G, the area hosts, "one of the largest eelgrass beds in the world; the State Game Refuge is known internationally for the number of waterfowl and shorebirds that feed in the Izembek Lagoon eelgrass beds during spring and fall migrations" (ADF&G 2010). The important eelgrass ecosystem provides habitat for Steller's eiders and sea otters, and other species of conservation concern are also found in this area. Due to the importance of Izembek Lagoon and its extensive eelgrass beds to multiple species of waterfowl and other wildlife, State- and federally sponsored research has been conducted actively in this area, including aerial surveys, bird banding work, and sampling and mapping of the eelgrass beds and benthic community.

The ADF&G allows activities such as recreational wildlife viewing, fishing, and hunting within the Izembek State Game Refuge (ADF&G 2010). Low intensity use is permitted by the ADF&G through Special Area Permits; "low intensity" is defined as "insignificant or inconsequential" (ADF&G 2010). Other uses of Izembek State Game Refuge could be allowed under Special Area Permit, including natural resource exploration and development. Permitted fishing includes commercial salmon seining within the lagoon and drift gillnet salmon fishing offshore of the barrier islands.

Izembek Lagoon is unique in the diversity and aggregation of waterfowl that it hosts during hunting seasons and is considered a prime waterfowl hunting location. Both subsistence and recreational sport hunting occur within the area. Some commercial guiding for the fall sport hunt also occurs within the area, as authorized by Izembek Refuge under Special Use Permits. Other allowable uses under the Special Use Permits issued by Izembek Refuge for commercially guided hunts include beachcombing, walrus viewing, and ivory hunting.

4.1.5 Waterfowl Hunting

Commercially guided hunting effort and harvest on Izembek Refuge are reported to the refuge as a condition of special use permits. Hunting targets various taxa, but waterfowl hunting is the activity overlapping areas used by Steller's eiders and northern sea otters. Commercially guided gamebird hunting, which is focused on waterfowl hunting, has increased sharply in the Izembek Refuge during the most recent 5-year period (USFWS, Izembek Refuge, unpublished data; see Figure 13). This increase reflects an increase in interest, increased availability of guides (historically there were only two; in 2010 a third guide service began operation and in 2021 a fourth guide service began operation), and a change in waterfowl hunting methods and modes of access. Specifically, hunting of waterfowl traditionally occurred from shoreline areas accessible by foot traffic; but increased use of watercraft of various types have made more areas of Izembek Lagoon, including open water areas and shallow offshore areas, available to hunters (M. Fosado, USFWS, pers. comm. 2025). Waterfowl hunting takes place from the water and from the shoreline. The Izembek Refuge issues special use permits for commercial activities, such as guided sport hunting, that access refuge lands. The refuge does not cap the number of special use permits for commercially guided hunts nor the number of client use days (hereafter, CUDs; defined as the number of days a hunter was taken on the refuge by a commercial guide; a single trip onto the refuge will contribute multiple CUDs when multiple clients are guided at once, and multiple trips by the same client on the same day will only constitute a single day) under permits it issues (M. Fosado, pers. comm 2025).

Non-guided sport hunting, including of waterfowl, also occurs in this area on both State and Federal lands. Hunters may access the area on foot or via private boats or vessels, which may be transported on the State Ferry or rented locally. Except for guided hunts, the Refuge does not issue permits for hunting, and data on sport and subsistence hunting effort and harvest are not available through any formal reporting channels. However, the trends in commercially guided hunting generally align with anecdotal observations of increased hunting on Izembek Refuge generally since 2020 (M. Fosado, pers. comm. 2025).

During the fall through winter months, subsistence and non-subsistence users can harvest waterfowl; the sport hunt is open during October through mid-December for ducks and sea ducks and October through November for brant. The Spring-summer subsistence harvest is only open to qualified Alaska residents (i.e., residents of rural communities who have maintained residency for 12 consecutive months). This hunt occurs in the Central Unit of the Aleutian-Pribilof Islands management region during April 2 to June 15 and July 16 to August 31; however, there is a black brant season closure at Izembek and Moffet Lagoons during August 16 to 31 (50 FR 92; 2025 regs). Harvest of Steller's eiders is prohibited in both hunts.

4.1.6 Fishing

Commercial fishing is the primary economic activity in the region. Sand Point is home to the largest fishing fleet in the Aleutian chain (City of Sand Point 2014), while other communities within the region, including King Cove, also have strong ties to commercial fishing. Fish processing facilities exist within the region in the communities of False Pass, King Cove, Sand Point, and Chignik.

Generally, salmon fishing occurs in this region from June through August. The action area is included within commercial finfish fisheries management area "M" (Figure 14). During 2023 and 2024, there were 392 and 390 (respectively) eligible commercial salmon permits in management area M, with 275 and 235 commercial landings (ADF&G unpubl. data). This represents a decline in commercial fishing activity in this management area; during the late 1970s to approximately mid-1990s, approximately 350 to greater than 400 commercial permits were fished. A change in management strategies for the South Unimak and Shumagin Island sub areas (Keyse et al. 2024) could have contributed to the decline in fishing effort in this management area.

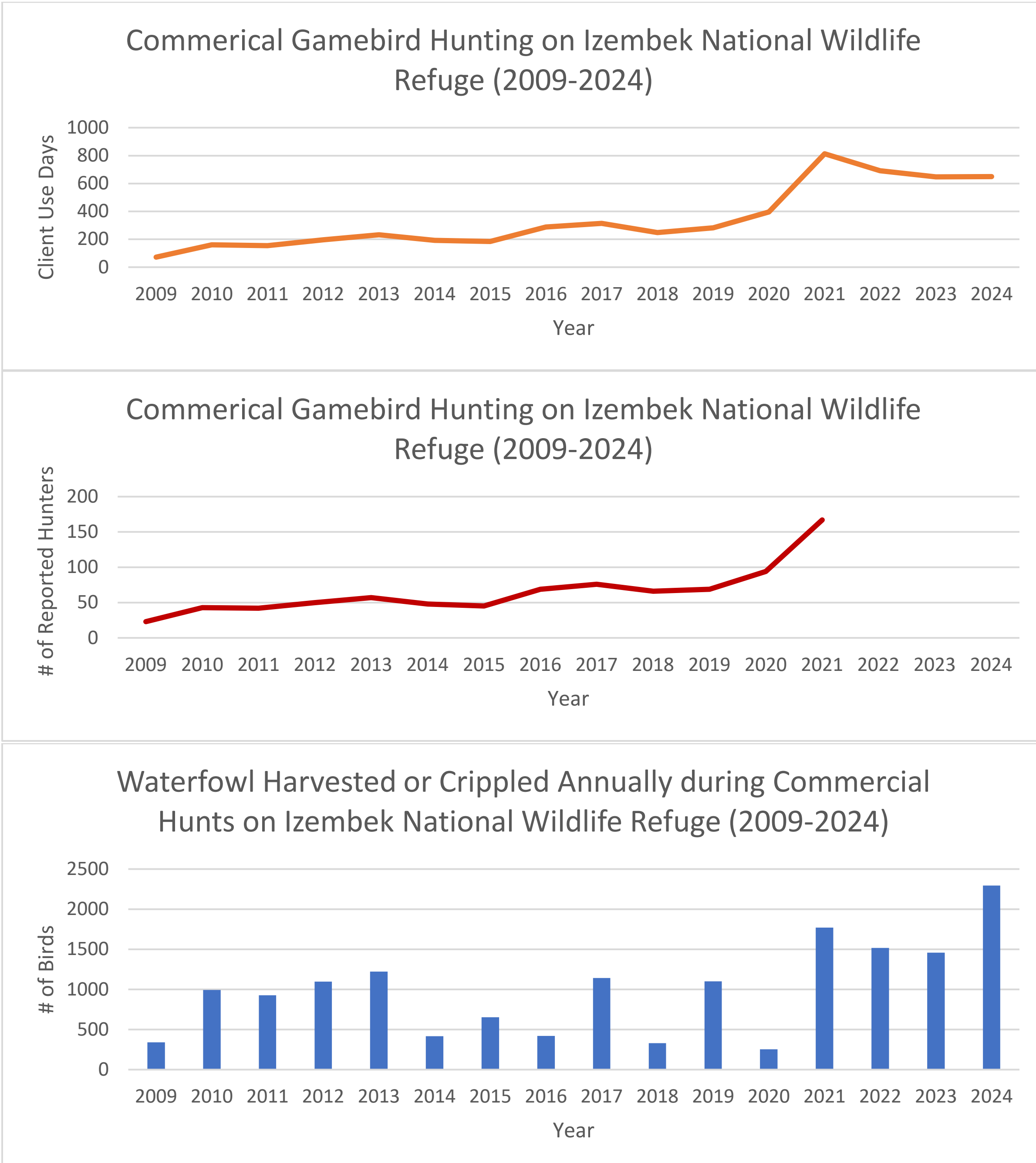

Figure 13. CUDs (top panel; CUDs are the number of days a hunter was taken on the refuge by a commercial guide, so a single trip onto the refuge will contribute multiple CUDs when multiple clients are guided at once, and multiple trips by the same client on the same day will only constitute a single day); number of hunters per year (middle panel; data were not available for 2022-2024); and waterfowl harvested or crippled annually (bottom panel), as reported during commercially guided gamebird hunting on Izembek Refuge. These data include upland gamebird hunting efforts, although those efforts are usually combined with waterfowl hunting. Source: USFWS, Izembek Refuge, unpublished data.

All reported commercial harvest in management area M during 2023 and 2024 occurred in the "North Peninsula" and "South Peninsula" sub areas. Within management area M, commercial fishing is permitted and has been reported within portions of the action area, including within Izembek Lagoon and Moffet Lagoon (Figure 15). Fifteen to 22 commercial fishing permit holders fished the Northwestern District of Area M (which includes Izembek Lagoon) in 2023 and 2024 respectively. In 2023, these included 5 purse seiners, 10 drift gillnets, and 0 set gillnets; in 2024, these included 4 purse seiners, 17 drift gillnets, and 1 set gillnet (ADF&G unpublished data). Drift gillnets are not allowed within Izembek and Moffet Lagoons but are allowed in Bristol Bay, just offshore of the barrier islands that enclose the lagoon; the other gear types are allowed within the lagoon system. At least 90 commercial fishing vessels operate out of King Cove (Bernton and Herz 2025). Best available information from 2017 suggests 50 commercial fishing vessels and one recreational vessel are registered in King Cove, and 16 commercial fishing vessels and no recreational vessels are registered in Cold Bay (BoatInfoWorld 2017).

Subsistence fishing activities also occur within the action area, although exact locations of these activities are not available. A majority of eligible households in Cold Bay and King Cove participate in subsistence activities, including fishing (primarily for salmon). In 1992, there were 158 eligible households in King Cove, which increased to 172 eligible households in 2016; there were also 32 eligible households in Cold Bay in 2016 (ADF&G 2025). The number of subsistence fishing permits issued in both communities has declined through time; in 1992, 61 subsistence fishing permits were issued in King Cove, increasing to 68 in 2003 then decreasing to approximately 26 by 2016 and 16 by 2023 (ADF&G unpublished data). In 2007, there were 31 permits issued in Cold Bay, declining to approximately 19 by 2016 and 9 by 2023 (ADF&G unpublished data). This declining trend could reflect the tie between commercial fishing and subsistence fishing activities and the implementation of a limited entry permit system in management area M, with fewer commercial fishing permits held by local residents.

4.1.7 Motorized Use

Cold Bay, Kinzarof Lagoon, and the Izembek Isthmus lay between the communities of King Cove and Cold Bay. In the past, Izembek Lagoon, the isthmus, and more remote parts of Izembek Refuge were accessed by hiking or boating from nearby communities, often on multi-day trips (USFWS/Williams 2023). Izembek Lagoon is currently accessed via wheeled, fixed-wing aircraft landing on unimproved beaches, and by boat via an unimproved boat ramp connected to the Cold Bay road network, or via passage from Bristol Bay through a gap in the barrier islands. Motorized travel occurs in this area along old military roads and trails, and unsanctioned motorized travel has substantially increased in the action area in areas without preexisting trails. This is particularly noticeable within the east Izembek Wilderness area, as access roads and other infrastructure have expanded from the local communities and made the isthmus more accessible for off-road travel via unsanctioned motorized modes (see Figure 16; USFWS/Williams 2023).

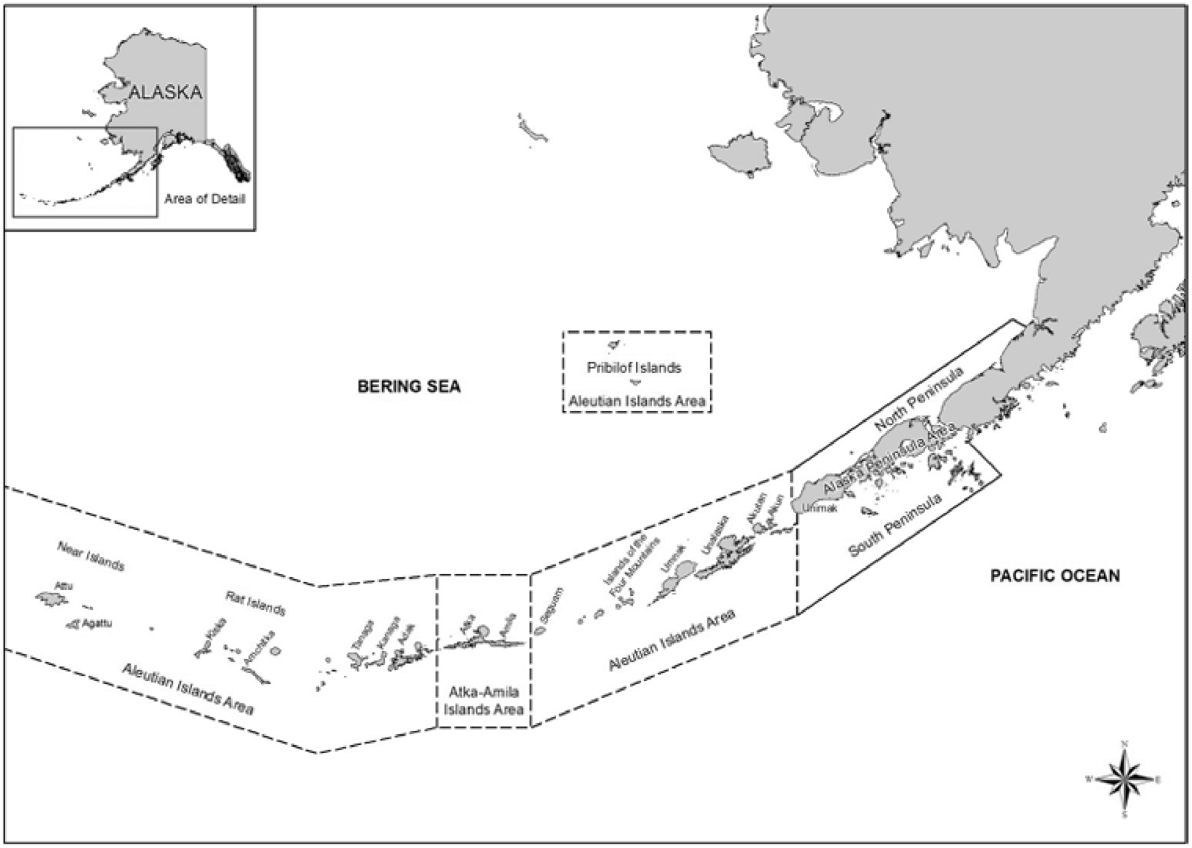

Figure 14. Map of the Aleutian Islands, Atka-Amlia Islands, and Alaska Peninsula Management Areas for commercial finfish fisheries, also known as "Area M." Map from: https://www.adfg.alaska.gov/static/applications/dcfnewsrelease/1642226461.pdf

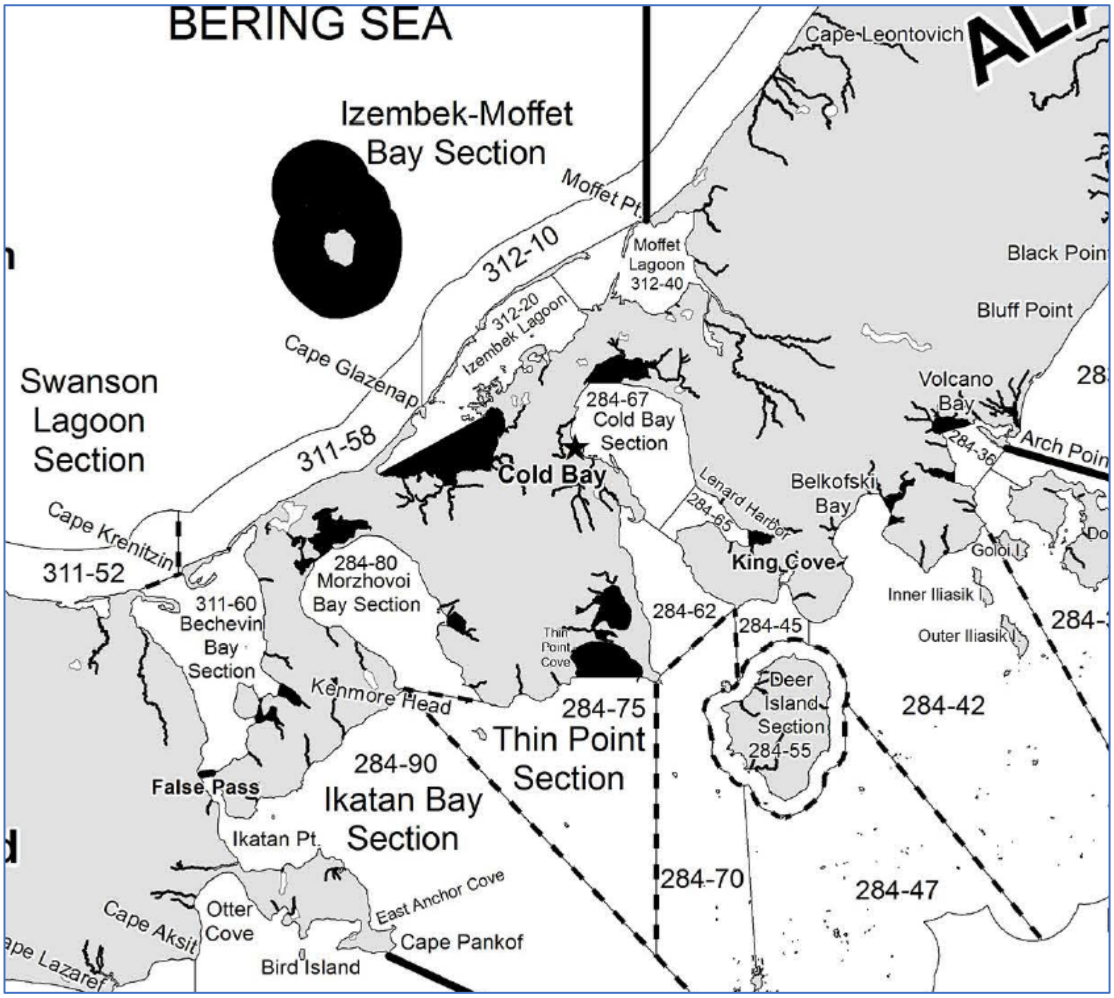

Figure 15. Commercial Finfish Fishing within the Alaska Peninsula Management Area, zoomed in to those waters surrounding the action area. Areas where commercial fishing is not permitted are depicted as black polygons. Larger map available from ADF&G: https://www.adfg.alaska.gov/static/fishing/pdfs/commercial/akpeninsula_stat_map.pdf

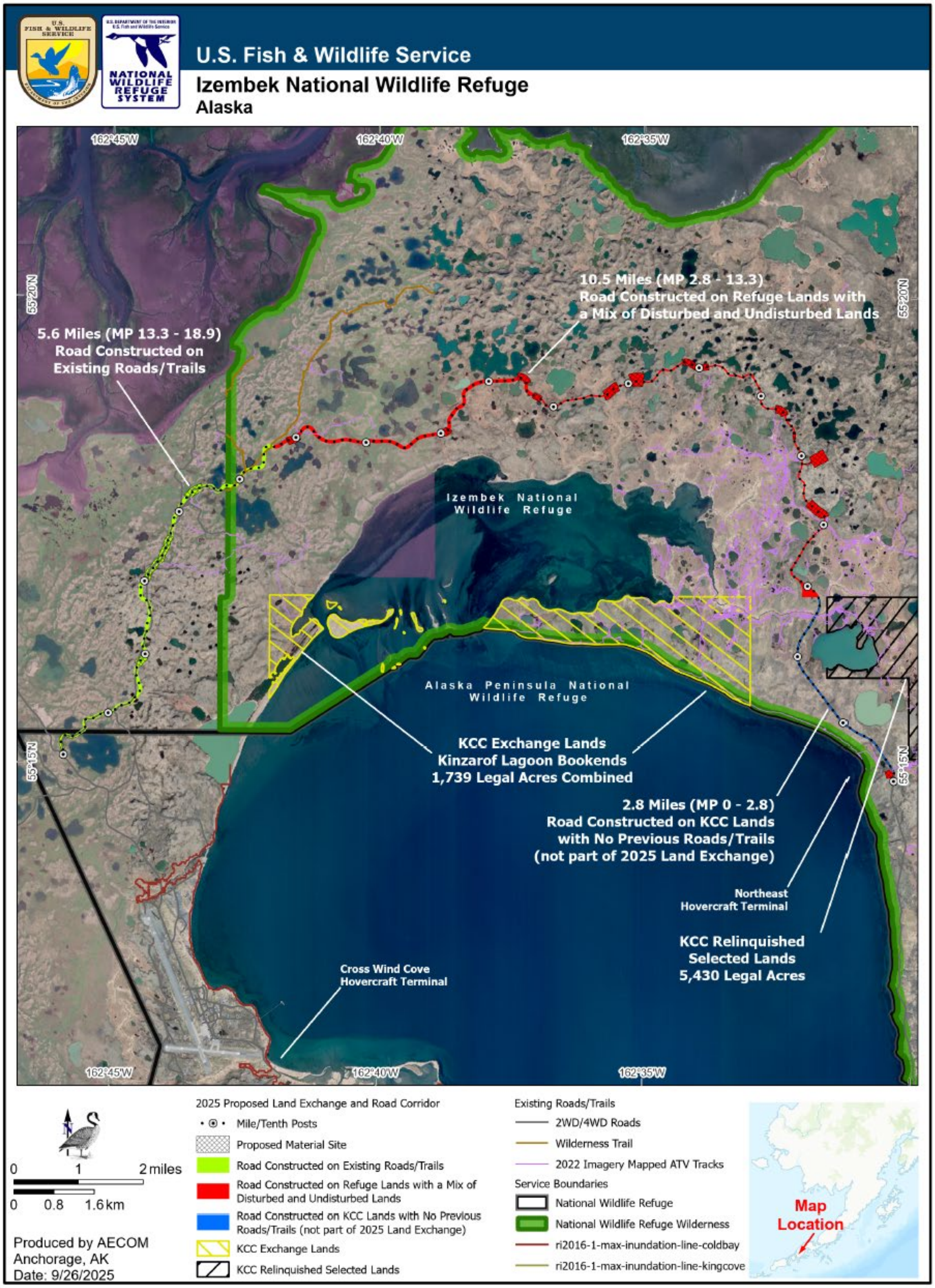

Figure 16. Proposed road corridor and existing roads and trails (shown in purple).

With establishment of the Fort Randall Air Base in 1941 (USFWS 2003), the military developed a road network around the base, which continues to be used extensively by Cold Bay residents for access to hunting, fishing, and other activities. Vehicles began crossing over land during World War II; and non-military, off-road vehicles have continued to cross the isthmus using these old military trails. Motorized vehicle use within the Izembek Refuge has generally been confined to existing roads and trails, and until recently consisted of irregular and isolated occurrences of off-road use through the tundra (USFWS 2003).

A recent, substantial increase in unsanctioned, off-road vehicle trails on the east side of Cold Bay, within the Izembek Refuge boundary and into Izembek Wilderness, followed construction of the 17.2-mile (27.7 kilometer) King Cove extension, a road from the community of King Cove to the northeast terminal at approximately the Izembek Refuge boundary. A comparison of trails mapped from 2004 imagery to trails mapped in 2022 imagery shows an approximately 7.1 times (i.e., 714 percent) increase in length of unsanctioned, off-road trails (17.3 miles [27.9 kilometers] in 2004 versus 140.8 miles [226.6 kilometers] in 2022). In the limited portions of the refuge where roads have facilitated off-road access, trails and trail scars crisscross the landscape. We expect off-road use is highest during peak periods of subsistence activities (e.g., hunting, berry/plant gathering), which is expected to overlap the presence of Steller's eiders in the late summer and fall.

Although motorized, off-road travel is generally not allowed within the Izembek Refuge, the ADF&G may allow ATV use below mean high water of Izembek Lagoon under an individual Special Area Permit. In addition, the State allows use of certain motorized vessels (e.g., skiffs, fishing vessels, and inflatable boats) within Izembek Lagoon under a general permit. The Izembek State Game Refuge Plan notes, "impacts to refuge habitat and disturbance and displacement of waterfowl from increasing boat traffic, particularly from large horsepower outboard engines, shallow draft boats, and commercial fishing boats have been identified as a growing concern" (ADF&G 2010).

4.1.8 Noise

Current sound levels in the action area are assumed to be very low, given the general lack of significant human activity in most of the area. Ambient noise levels within the Izembek Refuge are estimated as 40 to 50 A-weighted decibels (dBA) and depend on specific location and wind and wave conditions (USFWS 2025*a*). Activities that add to the background noise environment include commercial fishing, air transportation from Cold Bay Airport and King Cove Airport, and commercial fishing and seafood processing in the City of King Cove. Human-made noises include boats, hunting activities, aircraft access to and from the Cold Bay Airport, aircraft access by sports hunters and recreationists, all-terrain vehicles, and snow machine travel. These noise sources are generally temporary and intermittent.

4.1.9 Izembek Complex Resources of Concern

The unique value and high function of the holistic Izembek Complex underpins multiple Federal, State, and international management designations in the action area. Steller's eiders, sea otters, and eelgrass ecosystems are the top three priority Resources of Concern identified by the Izembek Refuge (Sowl et al. 2021). Izembek Lagoon has one of the largest eelgrass beds in the world, with eelgrass covering approximately 40 to 47 percent of the lagoon (Figure 17). Kinzarof

Lagoon also has extensive eelgrass cover (Ward et al. 2022). Izembek Lagoon has recently experienced a loss of eelgrass habitat (Douglas et al. 2024); future loss might be mitigated by protecting the physical and biological characteristics that help sustain eelgrass in this region (Hogrefe et al. 2014).

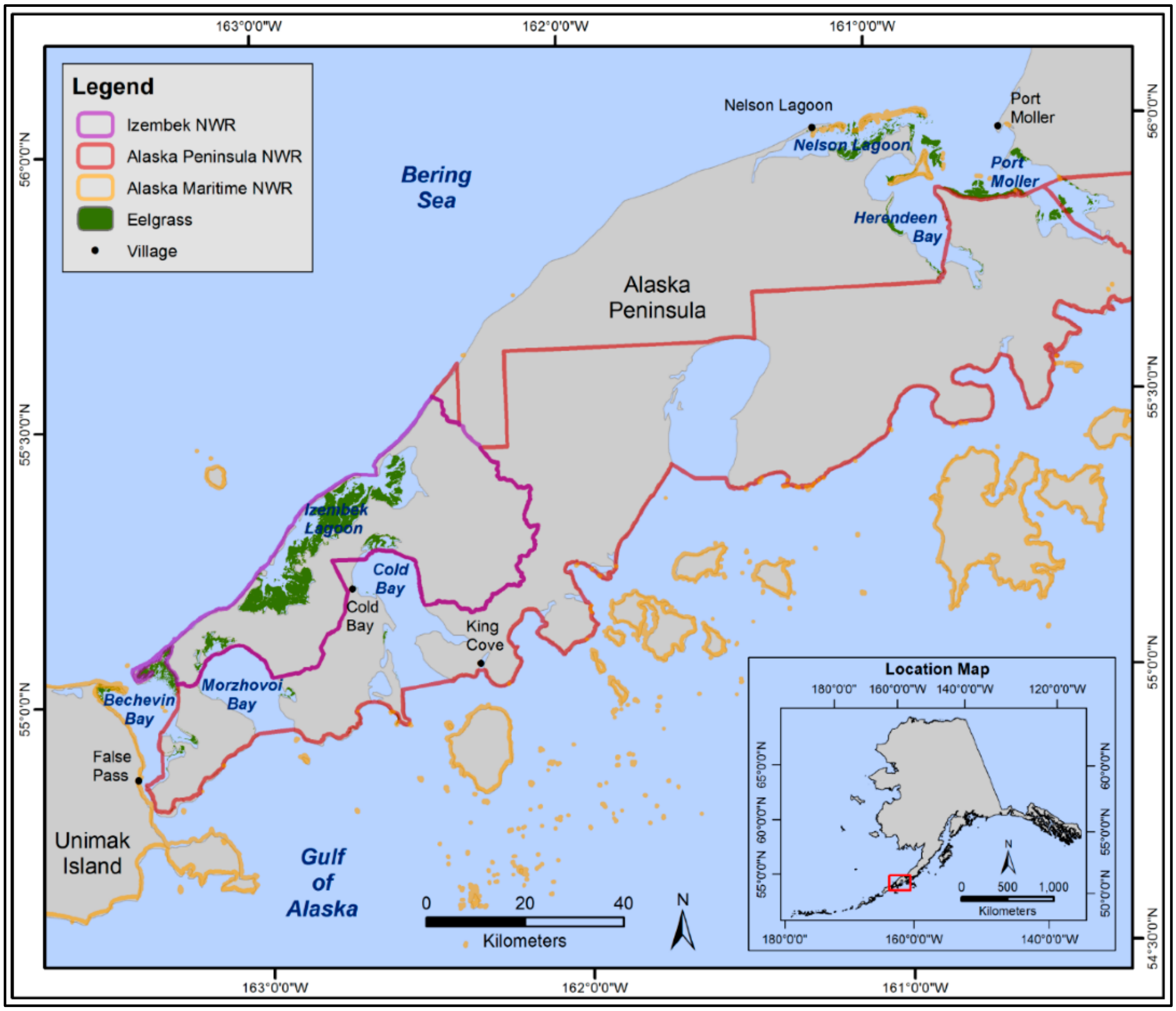

Figure 17. Distribution of eelgrass (*Zostera marina*) at Izembek Refuge (Hogrefe et al. 2014).

4.1.10 Past Use

The City of Cold Bay and surrounding area has experienced various military activities over approximately the last century. Thornbrough Air Force Base (originally Fort Randall Army Airfield) was built during World War II and eventually redeveloped into the current Cold Bay Airport. In the early 1900s, the U.S. Coast Guard established a lighthouse and Long Range Navigation stations at Cape Sarichef and Scotch Cap on the southwest coast of Unimak Island, just south of Cold Bay. In the late 1950s, the U.S. Air Force constructed Distant Early Warning facilities at Cape Sarichef (USFWS 2004*a*). These sites are no longer active but remain in military ownership.

Most contaminants identified within the Izembek Refuge and surrounding region are associated with past military use. Previous military activity left behind abandoned military housing and other debris, including unexploded ordnances (USFWS 2004*a*). An unexploded ordnance was discovered on Izembek Refuge as recently as 2023 (Greenly 2023).

Contaminated sites are catalogued by the Alaska Department of Environmental Conservation (ADEC). The ADEC catalog does not identify contaminated sites within the proposed road corridor or in other lands proposed for exchange (ADEC 2025). In 2025, environmental site assessments were conducted on the proposed exchange lands for the Refuge and KCC to identify conditions indicative of releases or threatened releases of hazardous substances, pollutants, contaminants, petroleum or petroleum products, and controlled substances to identify and evaluate recognized environmental conditions affecting the properties (ChemTrack Alaska 2025a, 2025b). These assessments used aerial photograph surveys, well surveys, and review of agency databases; however, they did not include on-site reconnaissance. No recognized environmental conditions were identified for the exchange lands; the assessment recommended further evaluation of formerly used defense site areas on the Refuge lands to be transferred to KCC, specifically to include a survey for unexploded ordnance, prior to ground disturbance.

Of the four water sources preliminarily identified for use during road construction and maintenance, one (Blinn Lake) is reported by the ADOT&PF to be contaminated with per- and polyfluoroalkyl substances (PFAS; A. Williams, USFWS, pers. comm 2024). This 150-acre (60.7-hectare) lake is unconnected to anadromous waters and is not currently a point-source for PFAS to enter the local wetland complex and connected lagoon systems. Given its status as potentially contaminated with PFAS, Blinn Lake was subsequently removed as a potential water source for this project.

4.2 Status of Steller's Eider within the Action Area

The Izembek Lagoon complex (i.e., Izembek, Moffet, and Kinzarof Lagoons and Cold Bay; "Izembek Complex") provides important habitat for Steller's eiders during the molting and wintering period; during these periods, Steller's eiders undergo complete flight feather regrowth and conduct foraging, resting, and pair bonding and courtship behavior. A small number of Steller's eiders have also been known to remain along the Alaska Peninsula during the summer months, with a few individuals spending the summer at Izembek Lagoon.

Note the literature typically references Steller's eiders in "Izembek Lagoon," which is also the naming convention used in this biological opinion in section 3.1.2. Generally, any mention of Izembek Lagoon could be inclusive of all waterbodies in the Izembek Complex; for example, most surveys that documented Steller's eiders in Izembek, Moffet, and Kinzarof Lagoons and Cold Bay would have lumped all locations into "Izembek Lagoon." Here, in "Status of the Steller's Eider within the Action Area," use of "Izembek Lagoon" refers to the combined Izembek and Moffet Lagoons, the joined waterbodies in this complex that receive highest use by Steller's eiders. However, the entire Izembek Complex appears to be important to supporting Steller's eiders in this region (see especially 4.2.2). Steller's eiders may rely on full access to and use of the Izembek Complex during winter or other times of the year with extreme weather events, in part because Izembek and Kinzarof Lagoons experience opposite prevailing winds and distinct tidal cycles.

4.2.1 Fall molting period

Large numbers of Steller's eiders use the Izembek Complex (i.e., primarily Izembek Lagoon but also Kinzarof Lagoon) for their primary remigial molt (Petersen 1981, USFWS 1986, USFWS/Dau 1999, Rosenberg et al. 2014) during August through October (Petersen 1980, Rosenberg et al. 2014, Martin et al. 2015). Studies in the late 1970s noted spatial separation of age classes and sexes during molt, and Izembek Lagoon was deemed the most important molting site for adult female Steller's eiders (Petersen 1981). Izembek Lagoon was also one of the important molting sites for adult male Steller's eiders during this period (Petersen 1980, 1981).

Information on molt migration is limited to one study (Martin et al. 2015) that tracked 13 individuals (7 males, 6 females) from Alaska-breeding grounds to molting areas in 2000 and 2001. Based on this relatively small sample, 7 of the 13 birds (53 percent) marked in Alaska during the breeding season near Utqiaġvik molted at Kuskokwim Shoals, suggesting that Alaska-breeding birds may disproportionately use this molting area over other molting areas. Five of the 13 marked birds (39 percent) used the greater Alaska Peninsula area (including Nelson Lagoon, Izembek Lagoon, Port Moller, and the Seal Islands) during molt, with 1 bird (8 percent) using Izembek Lagoon. The broad distribution of marked birds throughout the wintering range in southwest Alaska suggests that the Alaska-breeding population does not segregate from the Russian-Pacific breeding population in winter.

During 1975 to 2016, individuals counted in the Izembek Complex represented 20 to 34 percent of all Steller's eiders found on the Alaska Peninsula during the fall molting period during (USFWS/Wilson 2019). Historical data provide a high peak count of just over 90,000 and mean peak count of just over 60,000 Steller's eiders using the Izembek Complex (USFWS 1986). Historical numbers of Steller's eiders using the Izembek Complex during fall molt are noticeably greater than contemporary numbers. Long-term data on Steller's eider numbers are available from an annual survey designed to target Pacific brant (*Branta bernicla*). A recent analysis of these data gives an all-year average of 18,592 Steller's eiders present in Izembek Lagoon during the fall molting period (annual estimate ranging from 3,892 to 78,645 during 1976 to 2018), with the most recent 10-year average being 5,866 (annual estimate ranging from 3,892 to 9,742 during 2009 to 2018; (USFWS/Wilson 2019). Assuming Alaska-breeding Steller's eiders comprise approximately 1 percent of the Pacific-wintering population, using the most recent 10-year average, approximately 59 Steller's eiders (with a range of 39 to 97) from the listed population could use the Izembek Complex for their fall remigial molt. These estimates are based on data collected during September 23 to October 31 each year, and therefore earlier-molting Steller's eider groups (e.g., subadults, non-breeders and failed breeders, and possibly even breeding males) may not be accounted for in these estimates. These data do provide a reasonable estimate for the typical peak period of Steller's eider molt.

For comparison, the number of Steller's eiders that may be using the Izembek Complex during fall molt can also be calculated with data from the most recent Steller's eider-specific fall surveys along the Alaska Peninsula, which counted 30,407 to 70,320 (average of 50,926) birds annually using the Alaska Peninsula and 2,585 to 7,155 (average of 4,840) using Izembek Lagoon, during 2012 to 2016 (USFWS/Williams et al. 2016). These surveys found between 5.5 and 16.1 percent of Alaska Peninsula Steller's eiders used Izembek Lagoon. Assuming Alaska-breeding Steller's eiders comprise approximately 1 percent of the Pacific-wintering population, approximately 26 to 72 (average of 48) Steller's eiders from the listed population could use the Izembek Complex for their fall remigial molt. However, these photographic surveys occurred in late August and early September, when successful breeding females would not yet have arrived on their molting grounds. While this survey method provides an estimate of Steller's eiders molting early in the fall period, these totals likely underestimate the total number of birds from the Alaska-breeding population that use Izembek Lagoon for molting habitat throughout the fall.

Using a combination of these two survey methodologies, we can estimate a range for Steller's eider presence during their molting period. We calculate at least 26 to 97 Alaska-Breeding Steller's eiders (6.4 to 23.9 percent of the listed population) may use Izembek Lagoon during their molting period. Both survey methods likely underestimate the total use by Alaska-breeding eiders because they only cover portions of the total molt. The upper end of this range would capture use by successful breeding females but would exclude early molting adults (unsuccessful breeders and early dispersing adults). Based on these combined methodologies, we expect the number of Alaska-breeding Steller's eiders using Izembek Lagoon to molt to average approximately 48 to 59 individuals (11.8 to 14.5 percent of the Alaska-breeding population); the total could be higher than 97 individuals during high count years. We do not have comprehensive survey data to better refine our estimates.

Although peak counts of Steller's eiders using the Izembek Complex show annual variability, the long-term data show an apparent declining trend in the fall population of Steller's eiders at the Izembek Complex (0.948, 95% CI: 0.938-0.958; Figure 18). However, there is no apparent trend in the most recent 10-year period (0.956, 95% CI: 0.888 to 1.024; USFWS/Wilson 2019).

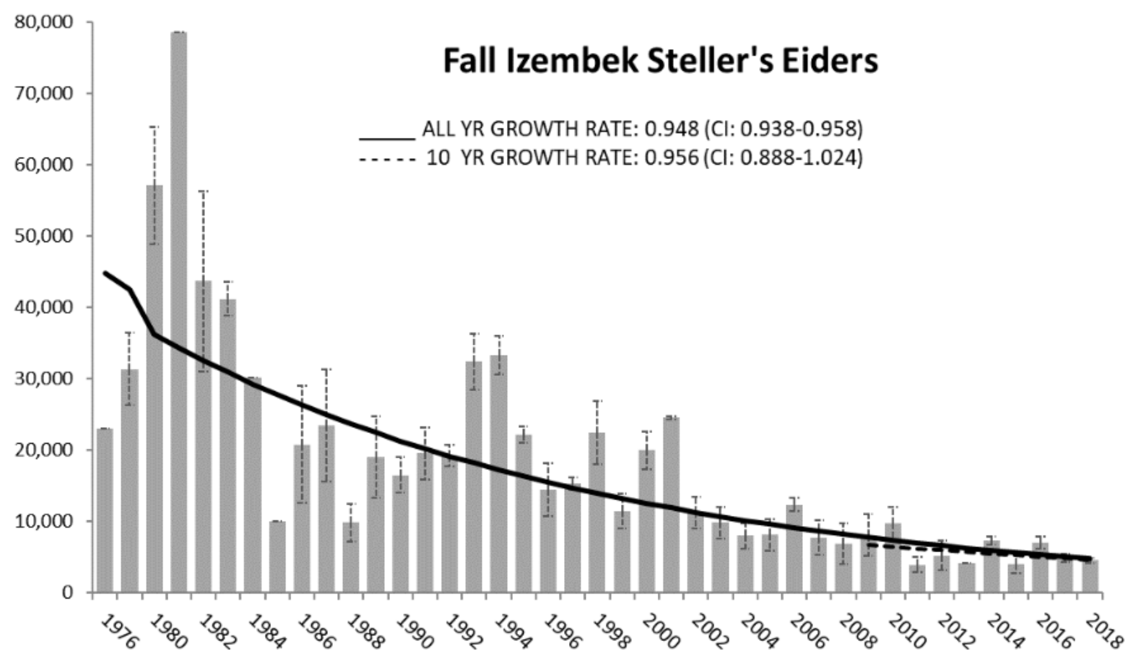

Figure 18. Long-term trend in the number of Steller's eiders present at the Izembek Lagoon complex during the fall molting period (USFWS/Wilson 2019).

4.2.2 Wintering

Wintering locations provide important foraging and resting habitat; pair bonding and courtship behavior also begins in these locations during late winter and is completed prior to departure to the breeding grounds (Laubhan and Metzner 1999, Flint et al. 2000, Fredrickson 2001, Martin et al. 2015). Steller's eiders are assumed to show strong wintering site fidelity, since they are regularly observed in traditionally used areas and rarely seen outside these areas (Žydelis et al. 2006). The Izembek Complex is one of the major wintering areas for Steller's eiders, with large concentrations in Izembek Lagoon and connected waters but also Kinzarof Lagoon and Cold Bay. A large number of birds that molt in Izembek Lagoon will remain for the winter (i.e., January to April) to continue feeding in the shallow, intertidal, eelgrass-dominated habitats (C. Dau, USFWS, unpublished data); and some individuals that molt at more northerly sites may spend at least a portion of the wintering period in the Izembek Complex (Martin et al. 2015).

Winter distribution of Steller's eiders throughout the Izembek Complex and the greater Alaska Peninsula region is strongly influenced by winter weather conditions and icing conditions in the shallow lagoon system (USFWS/Trust et al. 1997, Laubhan and Metzner 1999). Steller's eider use of Kinzarof Lagoon and Cold Bay increases when surface waters freeze at Izembek Lagoon (as little as 10 percent ice cover); and when Izembek Lagoon's intertidal flats freeze to the bottom, access to these ice-free sites becomes increasingly important for eiders to maintain access to prey resources (Laubhan and Metzner 1999). Use of these deeper water sites declines again in April, during the spring staging period (Laubhan and Metzner 1999), when Izembek Lagoon becomes ice-free.

Historical numbers of Steller's eiders overwintering at Izembek Lagoon were counted in the tens of thousands (Dau, USFWS, unpublished data). More recent estimates are available from data collected during winter brant surveys, with the most recent 5 survey years counting 16,735 to 24,062 Steller's eiders in the Izembek Complex (USFWS/Wilson and Larned 2020, 2021, 2022, 2023, 2024). Winter counts can show high variability due to interannual variability in weather conditions, but the long-term average (1981 to 2024) is 20,100 Steller's eiders wintering in the Izembek Complex (95% CI: 17,666 to 24,252); and this estimate appears relatively stable over time (USFWS/Wilson and Larned 2024:202).

Assuming Alaska-breeding Steller's eiders comprise approximately 1 percent of the Pacific-wintering population, we estimate the number of Alaska-breeding Steller's eiders that could overwinter in the Izembek Complex (and perform important courtship and pair bonding behaviors in this location) is 177 to 243 birds, or approximately 20 to 60 percent of the listed population.

4.2.3 Spring Staging

Numbers of Steller's eiders using the Izembek Complex may increase during spring staging, as birds wintering in more southern areas begin to move north. In 2011, 94 percent of total Steller's eiders observed between the Yukon-Kuskokwim Delta and the southwest tip of the Alaska Peninsula were counted in the Alaska Peninsula region, with 51 percent staging in the vicinity of Cold Bay during the survey period (USFWS/Larned 2012*b*). Historically, the combined number of Steller's eiders aggregating in the Izembek Complex and the greater Cold Bay area during peak staging in April numbered approximately 100,000 (Jones 1965). Spring goose surveys have counted up to 79,000 Steller's eiders at Izembek Lagoon in late April/early May (USFWS/Dau 1999); and in the most recent available dataset, approximately 38,000 Steller's eiders were counted in the vicinity of Cold Bay (37,000 in the Izembek Complex) during April 2011 (USFWS/Larned 2012*b*). Overall totals of spring-staging Steller's eiders counted in 2011 in southwest Alaska were close to the 1992 to 2011 average but were but were 35 percent higher than the 2010 estimate and 20 percent higher than the 2012 estimate (USFWS/Larned 2012*b*, *a*).

Numbers of Steller's eiders counted during spring staging are influenced by icing conditions and can be highly variable both within and between seasons (USFWS/Larned 2012*b*), which makes it difficult to estimate how many Steller's eiders might be staging in the Izembek Complex during the spring period. Given that some or all individuals from the Pacific-wintering population that overwinter in the Cold Bay area or locations farther south could stage in the Izembek Complex as they move northward during spring migration, we assume more Steller's eiders could use the Izembek Complex during spring staging than molt in this location. The 1992 to 2011 average of Steller's eiders staging in southwest Alaska during spring surveys was approximately 82,000 birds (USFWS/Larned 2012*a*). If we assume up to half of these birds staged in the Izembek Complex in any given year, as seen during the 2011 survey, an estimated 41,000 Steller's eiders could use the Izembek Complex during the spring period. Further assuming Alaska-breeding Steller's eiders comprise approximately 1 percent of any given aggregation of Pacific-wintering birds, the majority of Steller's eiders from the listed population could use the Izembek Complex during spring migration and staging.

4.2.4 Ongoing Activities and Threats in the Action Area

4.2.4.1 Harvest of Steller's Eiders

Steller's eiders and hunters may overlap in the action area during the fall sport hunt of waterfowl, during the spring-summer subsistence harvest of migratory birds, and during other subsistence activities occurring along the coastline and in marine habitats when birds may be opportunistically harvested. Although harvest of Steller's eiders is prohibited, during hunting activities that overlap Steller's eiders in space and time, individuals may be unintentionally targeted and shot. ADF&G subsistence harvest records demonstrate *Somateria* eiders and other sea duck species as well as geese are harvested in Cold Bay and King Cove (ADF&G 2025). Harvest of Steller's eiders has been reported in voluntary surveys completed by some communities within and near the action area (Naves and Schamber 2024).

Based on data reported by rural hunters and assessed by Naves and Schamber (2024), we assume an average of 2 Alaska-breeding Steller's eiders are harvested in the non-breeding areas of Alaska annually, in addition to an estimated 64 birds harvested in the 2 management regions of the Arctic Coastal Plain (the North Slope and Northwest Arctic) where we assume all Steller's eiders belong to the Alaska-breeding population (for an estimated total of 66 birds annually; see section 3.1.4.4). Accounting for wound loss, an estimated 86 Alaska-breeding Steller's eiders might be harvested annually during subsistence hunting, with 3 total harvested across the non-breeding range. Based on an estimate of 2 to 3 Alaska-breeding Steller's eiders harvested across the non-breeding range and the proportions of Steller's eider harvest reported across the subsistence management regions (again see section 3.1.4.4), we estimate a minimum of 1 Alaska-breeding Steller's eider could be harvested every 2 to 3 years at present during subsistence hunting in the two management regions overlapping the action area, Bristol Bay and

Aleutian-Pribilof (harvesting 6 and 69 percent of Steller's eiders respectively). We estimate this rate of harvest as follows: 2 eiders x 0.15 combined proportion of harvest = 0.30; 3 x 0.15 = 0.45; this amounts to less than 1 eider per year; because you cannot harvest a proportion of an eider without killing the whole eider, we divide to predict rate of harvesting 1 eider [1 / 0.30 = 3.33; 1 / 0.45 = 2.22 but round down to whole numbers]. Some additional but unknown level of Steller's eider hunting mortality occurs at Izembek Lagoon during the fall sport hunt but is not captured in formal reporting processes (M. Fosado, USFWS, pers. comm. 2024).

4.2.4.2 Sport and Subsistence Hunting of Other Waterfowl Species

The fall sport hunt for waterfowl, for which Izembek Lagoon is a prime location, overlaps the flightless molt for Steller's eiders. Among the species targeted in the hunt are Pacific brant, emperor geese (*Chen canagicus*, when open for hunting by regulation), Canada/cackling geese (*Branta canadensis*/*B. hutchinsii*), and sea ducks. Commercial hunting operators guide sport hunting clients targeting waterfowl during the fall hunting period in this area. Non-guided sport hunting of waterfowl also occurs in this area during fall, and waterfowl harvest by subsistence hunters occurs in fall through spring. Subsistence hunters target similar species as sport hunters. The period open for subsistence hunting of waterfowl overlaps all three periods of the annual cycle when Steller's eiders concentrate in the Izembek Complex.

Waterfowl hunting in the area primarily occurs in Izembek Lagoon, is both land- and boat-based, and mostly occurs nearshore (Stillman et al. 2021). Because land- and boat-based hunting generally occur within a few kilometers of the shore, disturbance of waterfowl from hunting is typically concentrated in the nearshore areas and not as prevalent throughout a majority of Izembek Lagoon (Stillman et al. 2021). Land-based hunting originates from the existing road network, with overland travel on foot, or can rely on ATV travel along the shoreline of Izembek Lagoon. Some targeted hunting of sea ducks and geese occurs offshore within Izembek Lagoon, taking place from boats and from the barrier islands enclosing the lagoon. Human-induced disturbance to waterfowl in Izembek Lagoon has been documented from hunting during fall and spring, with disturbance events occurring more frequently closer to road-based access points (Stillman et al. 2021). The area where waterfowl hunting occurs has expanded beyond the historically hunted locations; areas waterfowl previously used as refugia for resting are now more accessible due to changed hunting methods and means of access (M. Fosado, USFWS pers. comm. 2025).

Waterfowl hunting has increased within the Izembek Complex; a threefold times increase has been estimated over a 20-year period during the 1990s to 2010s (Leach et al. 2017); and commercial hunting on Izembek Refuge has also increased, with hunting effort from 2009 to 2024 indicating an additional threefold increase (as measured by CUDs tracked by Izembek Refuge staff; see section 4.1.5). The number of guided sport hunters has also increased; the increasing trend was a slow increase until it spiked from approximately 94 in 2020 to 167 in 2021 (167/94 = 1.8-fold increase), with an increase in the number of commercial guides. CUDs have averaged approximately 640 annually in the last 5 years, with a stable or slightly declining trend since 2021 (see Figure 13; USFWS, unpubl. data). CUDs do not represent non-guided hunts and are assumed to underestimate total commercially supported hunting effort: commercial operators without refuge-issued special use permits rent trucks and hunting equipment to "independent" sport hunters to enable their use of the existing but limited road network to access hunting areas on State and Federal lands (Cold Bay Outfitters 2017). However, these data on CUDs also include hunting activity outside of Steller's eider usage areas and even some entirely outside the Izembek Complex, which may somewhat mute this discrepancy.

During a study at Izembek Lagoon in the 1980s, hunting activity that led to waterfowl disturbance occurred at a rate of 0.02 to 0.14 events per hour (averaging 0.06 events per hour; Ward et al. 1994). This estimate was derived during a year where hunting effort was assessed as approximately 60 percent below the average; we therefore estimate hunting activity in a typical year would have resulted in 0.06 to 0.15 disturbance events to waterfowl per hour. Based on increasing trends in commercially guided waterfowl hunting activity since the 1990s, we consider the observed threefold increase from historical levels to be a reasonable proxy for current waterfowl hunting activity in Izembek Lagoon. Using the data from Ward et al. (1994) and applying this threefold increase in activity, we estimate current hunting-caused disturbance to waterfowl at Izembek Lagoon currently ranges from 0.18 to 0.45 events per hour. This estimate is based on best available information but does not capture some additional level of hunting activity that targets non-waterfowl species (e.g., large game hunting); it is unclear the extent to which hunting of non-waterfowl taxa would overlap with areas used by Steller's eiders, whereas we are confident most waterfowl hunting would overlap their areas of use. For the purposes of understanding the disturbance effects of hunting on Steller's eiders, we consider subsistence harvest activities to have similar effects to fall sport hunting.

4.2.4.3 Marine Vessel Activity and Fisheries

During a study at Izembek Lagoon in the 1980s, vessel activity that led to waterfowl disturbance occurred at a rate of 0.02 to 0.05 events per hour (based on Ward et al. 1994 and following our assumptions in 4.2.4.2 related to low and high years of activity, assuming most observed vessel activity was related to hunting). This brant study may not be representative of year-round vessel activity in Izembek Lagoon and the corresponding rates of disturbance to waterfowl. This study took place only during the legal hunting season and therefore measured vessel activity during only a portion of the year. Vessel activity could be less outside the legal hunting period or could be the same or higher as activities shift throughout the year. For example, we expect commercial and subsistence fishing activities and their associated vessel traffic in Izembek Lagoon are not represented in this dataset. We do not have a way to directly measure current fishing activity or other vessel uses in this location. Therefore, the information provided by the brant study serves as the best available proxy to measure current baseline vessel activity in Izembek Lagoon overall.

Hunters access Izembek Lagoon for waterfowl hunting by boat and overland, and we assume equal access between these two modes. Therefore, we consider a 1.5-fold increase from historical levels to be a reasonable proxy for current vessel-based activity in Izembek Lagoon, based on the increase in commercially guided activity (3/2 = 1.5; see section 4.2.4.2). Vessel-caused disturbance was measured separately from hunter-caused disturbance in the Ward et al. (1994) brant study, and we assume was a measurement of reactions to vessel movement and presence (as opposed to humans and gunshots). We estimate vessel-caused disturbance to waterfowl at Izembek Lagoon currently ranges from 0.03 to 0.075 events per hour.

The Bristol Bay coastline of the Alaska Peninsula includes several small communities whose population totals approximately 300 people (State of Alaska 2025). The human population along the southern Alaska Peninsula is concentrated in the communities of King Cove and Sand Point, with 866 residents and 600 residents, respectively (State of Alaska 2025). Commercial fishing is the primary economic activity in the region (see section 4.1.6). Incidental fisheries bycatch is a known threat to Steller's eiders (see sections 3.1.4.6). Bycatch risk varies by gear type, with the most dangerous gear type for Steller's eiders being gillnets like those used in the salmon gillnet fishery in Alaska (Dietrich et al. 2025). Bycatch risk increases in proportion to fishing effort and numbers of eiders overlapping in space and time.

Drift and set gillnet fishing both occur in fisheries management areas overlapping the action area (see section 4.1.6), but data are not available to quantify the risk of bycatch to Steller's eiders in relation to fishing effort. Because we know Steller's eiders are vulnerable to bycatch (see section 3.1.4.6) and we expect gillnet fishing and Steller's eiders overlap in the action area, a lack of reports of Steller's eiders being incidentally caught in gillnets may be a product, at least in part, of a lack of dedicated observers to report on bycatch. Most documented interactions with Steller's eiders are self-reported, and many fisher persons do not self-report for various reasons. Bycatch information overall appears to be especially limited for the Alaska Peninsula compared to other areas of Alaska; for example, the South Unimak fishery may have been monitored for bycatch only during 1990 (Dietrich et al. 2025). We assume rate of Steller's eider bycatch is similar to bycatch rates for other *Anatidae* (i.e., diving duck) species. *Anatidae* species accounted for up to 14 percent of bird bycatch in the Alaska salmon gillnet fishery during 1990 to 2013 (Dietrich et al. 2025). Therefore, some number of Steller's eiders may be injured or killed by fishing operations each year, although we cannot estimate the current rate of Steller's eider bycatch within the action area.

4.2.4.4 Collisions

Steller's eiders have a high risk of collision with marine- and land-based infrastructure because of their tendency to fly low and fast over the water (Day et al. 2004). Although typically we would expect only a few Steller's eiders to be impacted during any one event, collisions can result in injury and mortality of large numbers of Steller's eiders at once. Over 150 Steller's eiders were reported to have collided with the *M/V* Northern Endeavor in December 1980 in False Pass, an area near the Izembek Complex, when the fishing vessel's crab lights were illuminated on a stormy night (USFWS, Southern Alaska Field Office, unpublished data). In a land-based event in the Cold Bay area in December 1983, 38 Steller's eiders were killed by a radar screen at the Distant Early Warning Line Site (USFWS, Southern Alaska Fish and Wildlife Field Office, unpublished data).

Other marine vessel interactions that have led to collisions have been documented within Area M, the fisheries management area overlapping the action area, including at locations near the action area (Table 4). In 2020, collision with three Steller's eiders and take of one (after, assumed to be an Alaska-breeding Steller's eider) was reported by a fishing vessel operating in Bristol Bay, transiting at night along the Alaska Peninsula, near Cape Krenitzen to the north of False Pass (NMFS 2020). Two additional reports with unknown locations are included in Table 4 because they could have overlapped the action area. Vessels operating in Steller's eider habitats also run the risk of striking eiders with the boat propeller or hull, causing injury or death. These incidents would add to the overall picture of mortality of Steller's eiders and other marine birds depicted in Table 4, but they largely go unobserved. The best estimate we have for rate of Steller's eider collisions and strike with marine vessels in and near the action area is estimated as 7 birds per year (159 birds / 23 years = 6.9). If we consider only a typical year (i.e., remove the event at False Pass that led to strike of 150 birds at once), the rate would be 0.47 birds per year, or 1 bird every 2 years. If we consider only a typical year (i.e., remove the event at False Pass that led to strike of 150 birds at once) and also assume Steller's eiders collide at the same rate as other eiders, we estimate 0.47 to 1.33 birds per year, or 1 to 4 birds every 3 years (9 birds / 29 years = 0.31; 4 birds / 3 years = 1.33).

When mortality of a Steller's eider occurs within areas where the Alaska-breeding and Pacific Russia-breeding populations mix, such as Izembek Lagoon, we recognize any individual Steller's eider could belong to the Alaska-breeding population. Through abundance-based probability, most birds injured or killed by vessel strike in Izembek Lagoon would belong to the Pacific Russia-breeding population. Assuming risk of injury or mortality affecting an Alaska-breeding bird mirrors the assessed population structure of the Pacific-wintering population (i.e., 1 percent of birds in this area are from the listed population), this would equate to a current collision rate of 0.01 to 0.04 Alaska-breeding Steller's eiders per year at the southern end of the Alaska Peninsula.

There have been multiple reports of collisions by Steller's eider (n = 44 birds total) and other sea ducks and marine-dependent goose species (n = 165+ birds total) with immobile vertical structures near the action area (Table 5; USFWS 2004, unpubl. data). These reports have included collisions with buildings, towers, antennae, and the rigging of immobile vessels. The best estimate we have for rate of Steller's eider collisions with vertical infrastructure near the action area is estimated as 3 birds per year (44 birds / 19 years = 2.3; we round up). If we consider only a typical year (i.e., remove the event at King Cove that led to strike of 38 birds) and assume Steller's eiders collide at the same rate as other eiders, we estimate 0.32 to 0.33 birds per year, or 1 bird every 3 years (6 birds / 19 years = 0.32; 15 birds / 46 years = 0.33).

An estimated 6,000 to 41,000 Steller's eiders use the Izembek Complex during the fall through spring. Birds aggregated in the Izembek Complex are the majority of Steller's eiders in the southern Alaska Peninsula region. We estimate a very small fraction of the local population, at most 0.022 percent, is killed or injured by vessels each year (0.47 / 6,000 = 0.00008 x 100 = 0.008 percent; 1.33 / 6,000 = 0.00022 x 100 = 0.022 percent) and an additional very small fraction, at most 0.005 percent, is killed or injured by vertical infrastructure each year (0.32 / 6,000 = 0.00005 x 100 = 0.005 percent). Therefore, based on best available data, we expect collision risk to individual Steller's from vessels and vertical infrastructure is presently very low in and near the action area. However, the reported collisions in Table 4 and Table 5 are not comprehensive of all injury and mortality that likely resulted to Steller's eiders or proxy species from collisions with vessels and infrastructure. Detection of collision-injured or -killed birds depends on human presence in the area (Rabie et al. 2024), willingness to report, and other factors such as carcass persistence (Borner et al. 2017). We assume the lack of reporting means our estimate of risk to any individual Steller's eider is low.

4.3 Status of Designated Critical Habitat for Steller's Eider within the Action Area

The Izembek Lagoon critical habitat unit includes all waters of Izembek Lagoon, Moffett Lagoon, Applegate Cove, and Norma Bay, and waters 0.25 mile (400 meters) offshore of the Kudiakof Islands and adjacent mainland (Figure 19).

The shallow, protected waters of this critical habitat unit are noted as especially important to Steller's eiders during their complete flight feather molt (Petersen 1981, Laubhan and Metzner 1999). Izembek Lagoon is one of the traditional, primary molting areas for the species (Petersen 1981, USFWS/Wilk et al. 1986, Rosenberg et al. 2014) and continues to be used by large numbers of Steller's eiders (USFWS/Wilson 2019). The Izembek Lagoon critical habitat unit also provides important wintering and spring staging habitat for Steller's eiders.

The geographic location of this unit contributes to its importance for spring staging: located on the southwestern end of the Alaska Peninsula, Izembek Lagoon is ice-free earlier than lagoons and embayments situated on the central and northern Alaska Peninsula and more northern coastlines; the north-facing aspect of Izembek Lagoon also means it is better-sheltered from Bering Sea storms than are south-facing lagoons elsewhere along Bristol Bay and the coastline of western Alaska (King and Dau 1981*a*).

For the Izembek Lagoon critical habitat unit, the PCEs/PBFs essential to conservation of the species include 1) marine waters up to 30 feet (9 meters) deep and the underlying substrate, 2) the associated invertebrate fauna in the water column, 3) the underlying marine benthic community, and 4) eelgrass beds and associated flora and fauna. Eelgrass beds are found throughout the lagoon (Figure 20) and support a rich and diverse food supply for Steller's eiders (Metzner 1993). Spatial extent of eelgrass beds in Izembek Lagoon remained relatively unchanged during 1978 to 2006 (Ward et al. 2022), while over the period 2006 to 2020 there was a measurable loss of approximately 10 square miles (25 square kilometers) of eelgrass (Douglas et al. 2024). However, the eelgrass beds of Izembek Lagoon remain important, and this is the only location in the Bering Sea where eelgrass grows in both subtidal and intertidal locations (Phillips et al. 1983). Thus, the eelgrass-associated macroinvertebrate community on which Steller's eiders rely are available at varying depths during both high and low tides (Laubhan and Metzner 1999). While in most locations, Steller's eiders primarily forage at low tide for increased access to prey (Petersen 1981), they are able to forage at all tidal cycles in the Izembek Lagoon critical habitat unit (Laubhan and Metzner 1999).

The diet of Steller's eiders foraging in Izembek Lagoon includes diverse taxa belonging to four main invertebrate groups: *Crustacea*, *Bivalvia*, *Gastropoda*, and *Polychaeta* (Metzner 1993). There is some evidence this benthic community might be shifting through time, from a bivalve-dominated to polychaete-dominated community (Maliguine et al. 2025). In a recent study comparing benthic invertebrate samples in Izembek Lagoon in two sample years (2019 and 1998), the occurrence of bivalves and gastropods – prey items preferentially used by molting eiders – did not appear to have changed significantly. However, there was a significant reduction in total biomass of bivalves and crustaceans, and the mean size of bivalves and gastropods was also significantly smaller, in 2019 compared to 1998. These data suggest Izembek Lagoon might provide less optimal foraging conditions for Steller's eiders, particularly during molt, than in the past (Maliguine et al. 2025). As a result, eiders may experience reduced energetics, body condition, or survival; they may also, instead, redistribute to more favorable foraging locations. While Izembek Lagoon was previously found to be one of the most important molting locations for Steller's eiders (Peterson 1981), Nelson Lagoon, further northeast on the Alaska Peninsula, is currently considered to be the most important area for molting (USFWS/Williams et al. 2016), suggesting some redistribution has occurred.

Table 4. Reported interactions between marine vessels and Steller's eiders or either eider species, which resulted in collisions in waters near the southern end of the Alaska Peninsula.

Date	Vessel Type	Number by species	Location	Notes
1980 Dec.	Collision with fishing vessel	Estimated 150 Steller's eiders	False Pass (North side)	Crab lights illuminated, stormy night
1991 Feb.	Collision with State Protection Patrol vessel	2 Steller's eiders	Unknown	Vessel lights illuminated
1997 Feb.	Collision with marine vessel	2 Steller's eiders	Unknown	**One bird struck vessel on Feb. 14, second bird struck vessel on Feb. 15.
2020 March	Collision with commercial fishing vessel	3 Steller's eiders, 2 recovered and released	Near False Pass	Occurred while vessel was participating in the pollock fishery
Other species				
2000 Nov.	Collision with marine vessel	1 common eider	Unknown	On deck with a gash in chest. Rough weather the night before
2001 Feb.	Collision with marine vessel	2 King eider	Unknown	Night, male and female found dead on deck, collision obviously occurred
2003 Feb.	Collision with marine vessel	1 King eider	Unknown	Adak vessel observer on roof, crew says bird has been there for a week

Table 5. Reported strikes with terrestrial infrastructure or immobile vessels near the action area.

Date	Species	Number	Location
Steller's eiders reported colliding with structures on land			
4/5/1975	Steller's Eider	1	Adult male struck wire at State Shop
12/5/1982	Steller's Eider	1	Adult male struck FAA antenna at airport
12/5/1982	Steller's Eider	2	Adult females struck Pen Hair hanger lights
12/30/1983	Steller's Eider	38	Killed by radar screen at Distant Early Warning Line Site
2/6/1992	Steller's Eider	1	Struck NWS balloon launch building
12/6/1994	Steller's Eider	1	Struck N. side of MAR radar dome
	Total	**44**	
Other sea duck and marine goose species reported colliding with structures on land			
1/3/1949	King Eider	1	Adult male hit building at airport
3/26/1962	King Eider	6	Strike at beacon tower
2/28/1963	King Eider	1	Adult male strike on Volcano Club building
10/26/1976	Brant	150	King Cove-Struck ship rigging and cannery
10/26/1976	Emperor Goose	unk.	King Cove-Struck ship rigging and cannery
12/7/1981	King Eider	1	Unknown collision location
1/20/1983	King Eider	2	Adult male & female hit FWS hanger
3/8/1984	King Eider	1	Adult male struck antenna at GP USAF Site
4/12/1993	King Eider	1	Collision with FSS building antenna
1/9/1994	King Eider	1	Collision with FSS building antenna
3/29/1995	King Eider	1	Russell Creek Hatchery
	Total	**165+**	

Despite apparent change, the Izembek Lagoon critical habitat unit continues to host large numbers of Steller's eiders during the fall through spring months. The final rule designating critical habitat for Steller's eider (50 CFR Part 17) states areas essential to species' recovery are those used regularly by greater than 5,000 Steller's eiders and occasionally used by greater than 10,000 Steller's eiders, where use by individuals from the Alaska-breeding population has been documented. An estimated 6,000 to 24,000 Steller's eiders might currently use Izembek Lagoon during the molting period, an estimated 17,666 to 24,252 Steller's eiders might winter here, and an estimated 41,000 Steller's eiders could use the Izembek Complex during spring migration and staging. Based on best available data from satellite transmitter-tagged individuals and band recoveries, some of these birds would be Alaska-breeding Steller's eiders. Therefore, despite a reduction since the 1970s in the number of birds using Izembek Lagoon (see 4.2), and despite evidence of some ecological change in the eelgrass community in this critical habitat unit, Izembek Lagoon continues to meet the criteria laid forth.

4.3.1 Ongoing Activities Affecting Steller's Eider Critical Habitat

Past and ongoing impacts that modify and reduce the quality of PCEs to provide habitat and prey include fishing, hunting, ATVs and trails, contamination, and marine vessels (e.g., skiffs, fishing vessels, and inflatable boats) within Izembek Lagoon. Under State general permits, users are allowed to use certain motorized vessels (e.g., skiffs, fishing vessels, and inflatable boats) within Izembek Lagoon. ATVs, marine motors, and fishing gear can cause mechanical destruction of eelgrass (e.g., from outboard motors cutting blades) and increased sedimentation. Sedimentation and turbidity impact marine waters and marine plants such as eelgrass through decreasing sunlight or physical influence of particulate matter (Longstaff and Dennison 1999, Gorgula and Connell 2004, Watanabe et al. 2016, Picard et al. 2022). Benthic communities, including invertebrate fauna that are important in Steller's eider diet, may experience reduced growth rates and reproductive success in more toxic waters and sediments.

Benthic communities can be sensitive to pollution, sedimentation, and turbidity. Pollution from non-point and point sources including sewage, seafood waste disposal, and coastal runoff may contribute to degradation of marine waters, the benthic substrate, and marine plants. For example, high sedimentation from coastal run-off may bury flora and fauna. In addition, there are ongoing impacts of sedimentation from military roads, motorized trails, and marine vessel use in shallow water.

Past military use has contributed to various contaminants in the area. One example is the White Alice Communication Site, near Grant Point, along the nearshore of Izembek Lagoon (Hazard ID: 2826; ADEC 2025). This site is associated with previous Air Force activity. The structure was demolished between 1987 to 1988, but diesel range organics detected at the site remained above ADEC cleanup levels until 2006. According to ADEC, multiple active contaminated sites remain along the coast of community of Cold Bay, two of which are related to past military use. These contaminants include a hydrocarbon seep and diesel range organics. Preliminary environmental site assessments of the proposed Refuge and KCC exchange lands were conducted in 2025, documenting no recognized environmental conditions (ChemTrack Alaska 2025); however, this assessment did not include on-site assessments and recommended further evaluation of the formerly used defense site areas on the Refuge lands to be transferred to KCC, specifically the need for a survey for unexploded ordnance, prior to ground disturbance.

4.4 Status of the Southwest DPS of Sea Otters within the Action Area

The action area includes the isthmus of land situated between the Bristol Bay MU and the South Alaska Peninsula MU (Figure 21). The Bristol Bay MU to the north side of the action area includes sea otters within Izembek Lagoon. The south side of the action area, near Kinzarof Lagoon, is within the South Alaska Peninsula MU.

4.4.1 Management Units

4.4.1.1 Bristol Bay MU

The 1990s population decline in Bristol Bay was significant, although less severe than those of the South Alaska Peninsula. Results from the survey in 2000 indicated declines of 27 to 49 percent, compared with estimates from 1986 when Bristol Bay had an estimated 6,474 to 9,215 otters (Burn and Doroff 2005). Overall populations in the Bristol Bay MU showed evidence of recovery during the period 2000 and 2016. The 2016 survey estimated total sea otter abundance at 9,733 sea otters, up from 4,728 in 2000 (Brueggeman et al. 1988, Burn and Doroff 2005). The 2016 density estimate of 2.12 otters/mile^2 (1 otter/hectare, 0.82 otters/kilometer^2) indicates a moderate population size (Beatty et al. 2021).

Sea otters usually have small home ranges and are restricted to nearshore waters, but the shallow waters of the Bering Sea continental shelf allow otters on the northern side of the Alaska Peninsula to be more mobile and pelagic in their behavior, and they range up to 30 miles (50 kilometers) offshore (Kenyon and King 1965, Schneider 1976). Little is known about the movements of these otters, but there appears to be seasonal changes in sea otter distribution at Port Moller-Herendeen Bay and at Izembek Lagoon (USFWS 2004*a*).

4.4.1.2 South Alaska Peninsula MU

The South Alaska Peninsula MU experienced drastic sea otter declines in the 1990s and currently contains relatively few sea otters (Beatty et al. 2021). Population estimates in 1986 ranged from 13,900 to 17,500 otters (Brueggeman et al. 1988, Burn and Doroff 2005), but only 1,005 otters were estimated in 2001 (Burn and Doroff 2005). The most recent surveys in 2016, estimated 546 otters with a density of 0.16 otters/mile^2 (0.06 per hectare, 0.06 otters/kilometer^2) which indicates a relatively low population size (Beatty et al. 2021). Differences between the 2001 and 2016 estimates may be due to different survey and analysis techniques, but the decrease after 1986 is too large to be attributed to anything other than a substantial population decline (USFWS 2020). The consistently low numbers indicate the population has not recovered from the declines of the 1990s that led to listing under the ESA.

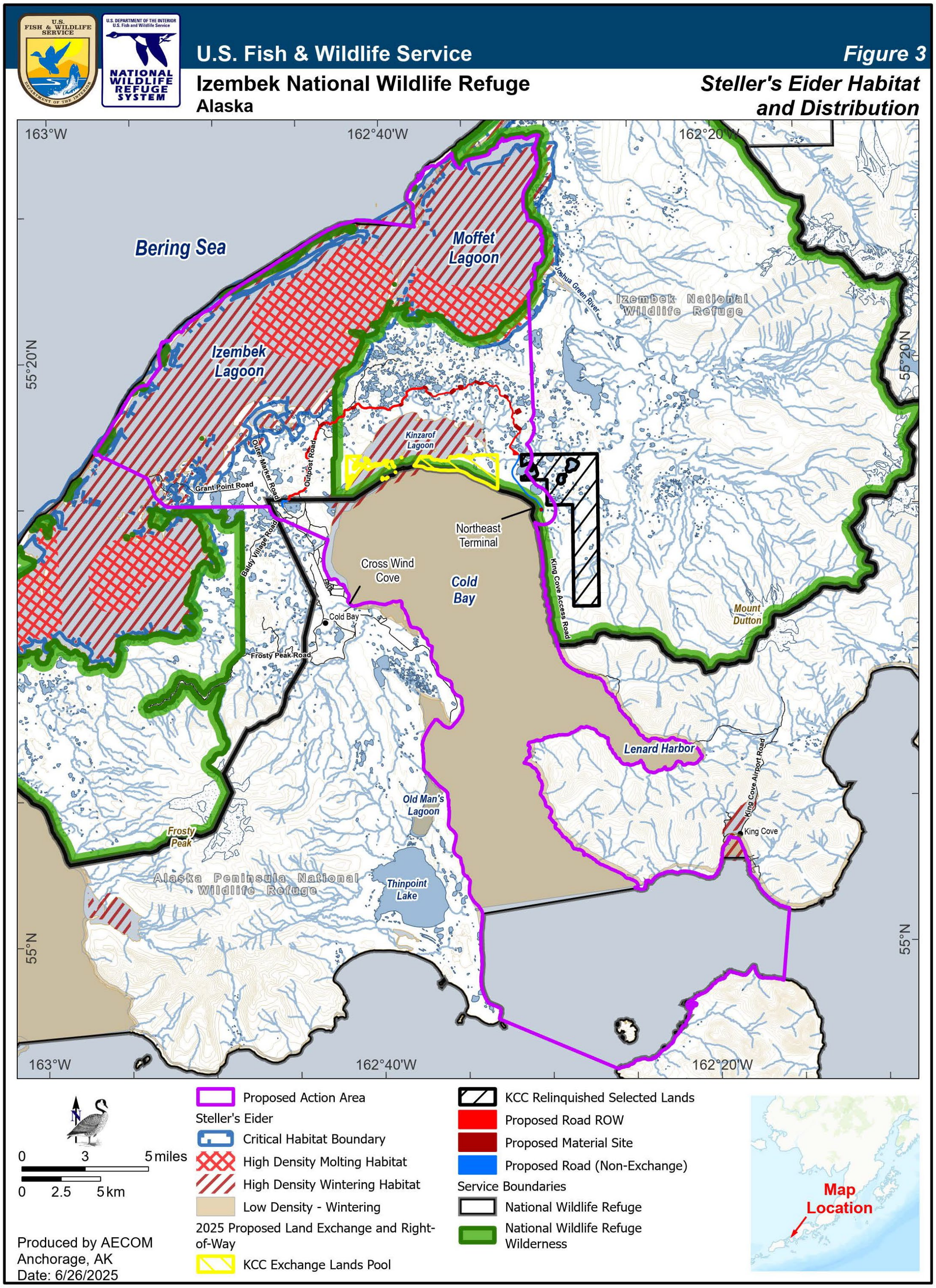

Figure 19. Status of Designated Critical Habitat for Steller's Eider within the Action Area.

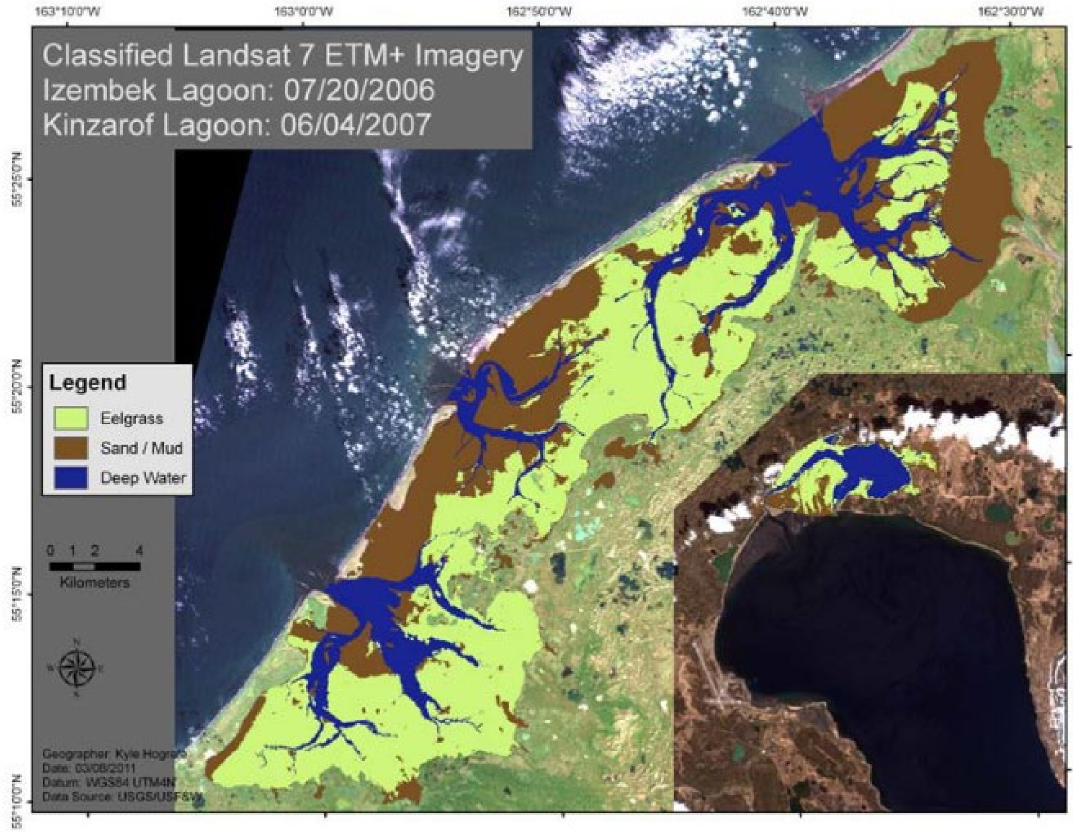

Figure 20. Landsat imagery showing mapped distribution of eelgrass at Izembek Lagoon and Kinzarof Lagoon, Alaska, during 2007 to 2010. From Ward et al. (2002).

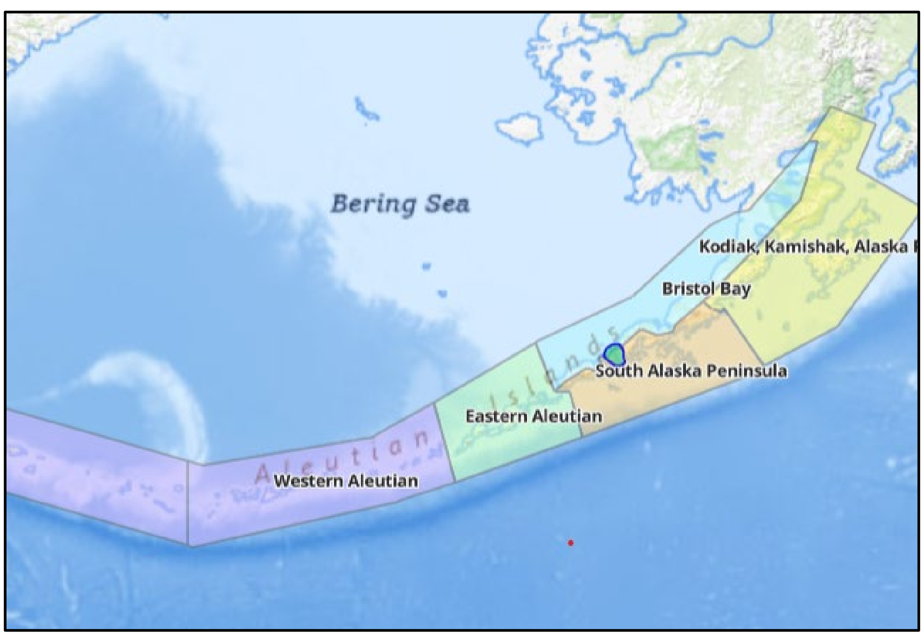

Figure 21. Action area situated between the Bristol Bay MU and the South Alaska Peninsula MU of the southwest DPS sea otters.

4.4.2 Habitat Use in the Action Area

Izembek Lagoon, Kinzarof Lagoon, and Cold Bay provide important nearshore habitat for sea otters. Nearshore habitat provides shelter from predators, protection from storms, and access to prey (USFWS 2023*a*). Izembek Lagoon supports a high proportion of mothers with young and may provide important natal habitat for sea otters (USFWS 2004*a*). Kelp is used by mother sea otters to anchor pups while the mother dives for prey. Pups on water float but may be easy targets for eagles, pup fur has been found in eagle nests near coastal areas (Rechsteiner et al. 2018). Seagrass and kelp in the lagoons provide habitat for prey species. The helmet crab (*Telmessus cheiragonus*), an important food source for otters, is abundant in Izembek Lagoon (Sowl et al. 2021). Potential sea otter habitat in Izembek Lagoon is extensive in the shallow water, soft sediment shelf that extends offshore approximately 13 miles (20.9 kilometers) to Amak Island (Doroff and Roy 1999). During an aerial survey in August 1999, it was estimated 615 sea otters occupied Izembek Lagoon (Doroff and Roy 1999). Sea otters are also counted incidental to spring and fall waterfowl surveys in southwestern Alaska, and the maximum number of sea otters counted in Izembek at one time was 1,070 (unpubl. data, Izembek NWR).

Upper Cold Bay and Kinzarof Lagoon are high-density northern sea otter areas with concentrations highest near the entrance to Kinzarof Lagoon (USACE 2003). Nearly half the regional population (False Pass to Seal Cape) uses these areas. Sand and gravel islands and spits near the entrance to Kinzarof Lagoon provide haulouts for up to 200 northern sea otters at a time during the ice-free part of the year (USACE 2003), although otters use the area year-round. This is an important foraging habitat for northern sea otters, and one survey found that *Telmessus* crab was the most common macro-invertebrate surveyed in Kinzarof Lagoon and were more common than in Izembek. Gastropods and *Caprella* shrimp were also found but mussels were absent (Ward et al. 2022). 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).

Sea otters tolerate severe ice and weather conditions if they have access to open water to forage. Their dense fur provide insulation from cold waters. Numerous sea otters use Izembek Lagoon during the winter, and a large number of these otters haul out on the shore ice, ice floes, or the barrier islands of the lagoon (USFWS 2004*a*). During extreme cold weather events, however, rapid ice formation may prevent sea otters from accessing open water to forage, resulting in substantial mortality and behavioral changes (Schneider and Faro 1975). Periodically, sea otters have become stranded or entrapped in ice-free pools surrounded by pack ice or have attempted inland crossings over the Alaska Peninsula (USFWS 2004*a*).

4.4.3 Ongoing Activities and Threats in the Action Area

Threats to recovery of the southwest Alaska DPS of northern sea otter were summarized in the Status of the Species section. These factors include predation, disease, subsistence harvest, habitat loss, oil spills and other contaminants, and climate change. Threats in the action area typically mirror those previously described for range-wide threats to the species, and include the following: marine vessel traffic, fisheries, wastewater discharges and runoff, and noise.

4.4.3.1 Marine Vessel Activity and Fisheries

The Bristol Bay MU includes several small communities whose population totals approximately 300 people (State of Alaska 2025). Commercial fishing is the primary economic activity in the region. Within the MU, there are fish processing facilities in Egegik and Port Moller.

The human population of the South Alaska Peninsula MU is concentrated in the communities of King Cove and Sand Point, with approximately 800 residents and 600 residents, respectively (State of Alaska 2025). Sand Point is home to the largest fishing fleet in the Aleutian chain (City of Sand Point 2014), while other communities within the region also have strong ties to commercial fishing. There are several fish processing facilities within the MU, in the communities of False Pass, King Cove, Sand Point, and Chignik.

Fisheries bycatch was identified as a threat to northern sea otters in the recovery plan (USFWS 2013). Most documented fisheries interactions with northern sea otters are self-reported, so it is unknown how many otters are injured or killed by fishing operations each year. These self-reported fisheries interactions average less than one otter per year, and between 2017 and 2021, there were no reported mortality or serious injury events in Alaska commercial fisheries for the southwest Alaska stock of northern sea otters (USFWS 2023*a*). Based on reports of interactions, otters are more likely to be impacted by the set gillnet fisheries in the region than by other fisheries such as purse seine and trawl fisheries. However, set gillnet fishing does not tend to occur in the rocky nearshore areas preferred by sea otters, which might reduce the likelihood of sea otters interacting with fishing gear (Funk 2003). Within Izembek Lagoon, permitted fishing includes commercial salmon seining.

The South Unimak fishery, which includes Cold Bay, was monitored for bycatch in 1991. In this area there were 373 observed driftnet sets, of which 8 sets (or 2.1 percent of observed sets) resulted in a sea otter net encounter (net encounter = mammal observed within 32.8 feet [10 meters] of active driftnet, includes entanglements). None of those encounters resulted in sea otter entanglement or injury (NMFS 1991). However, the driftnet bycatch information for Prince William Sound does show sea otter entanglement that year; of 3,166 observed sets, there were 92 sea otter net encounters (2.9 percent of observed sets), and 8 of those resulted in entanglement but no mortality (NMFS 1991).

Boats operating in sea otter habitat run the risk of disturbing sea otters, displacing sea otters, or striking otters with the boat propeller or hull causing injury or death. The likelihood of vessel strikes is primarily related to vessel speed (Vanderlaan and Taggart 2007), and most documented vessel strikes of sea otters involve small, fast-moving vessels (USFWS 2020). We do not have a way to directly measure current fishing activity or other vessel uses in this location. We derive an estimate of current vessel activity from a study conducted at Izembek Lagoon in the 1980s (Ward et al. 1994). In the 1980s, brant responded to vessel events (e.g., vessel movements) at a rate of 0.02 to 0.05 events per hour (Ward et al. 1994). We assume brant responded to some but not all vessels in Izembek Lagoon, and the reaction rate reported in that study therefore gives a minimum measure of vessel activity in the lagoon during the study period. Although sea otters are not expected to show the same responses or response rate to vessels as waterfowl, information provided by the Ward et al. (1994) study serves as the best available proxy to measure baseline vessel activity in Izembek Lagoon overall. We consider a 1.5-fold increase from historical levels to be a reasonable proxy for current vessel activity in Izembek Lagoon, see section 4.2.4.3). We therefore estimate vessel activity occurs in Izembek Lagoon at a minimum rate of 0.03 to 0.075 events per hour. This rate measures the activity of small vessels used during waterfowl hunting, in areas overlapping sea otter distribution in Izembek Lagoon. There is currently no published, peer-reviewed estimate of annual northern sea otter deaths attributed to vessel strike. The Service does maintain a stranding program to track stranding information and cause of death, but due to the limited spatial extent of the stranding program outside of Kachemak Bay in the southcentral population, the total injury/mortality related to vessel strikes is unknown for the southwest DPS. However, we can use existing reports and published data to extrapolate an estimated rate of vessel strike mortality for northern sea otters across Alaska.

Data from southern sea otter mortality reports from 1998 to 2013 (Kreuder et al. 2003, USGS and California Department of Fish and Game, unpublished data cited in 77 FR 59211–59220, September 26, 2012) indicate a rate of vessel strike mortality in California of 2.6 sea otters per year, or about 0.1 percent of the population size (84 FR 10224-10251 March 19, 2019). Applying 0.1 percent to the entire Alaska population of northern sea otters (51,935 individuals) results in an estimate of 52 sea otters per year killed by vessel strike (51,935 x 0.001 = 51.9). This is a reasonable estimate of vessel strikes that occur across the state given the amount of vessel traffic occurring across the range of northern sea otters. If we assume, based on previous observations, there would be 1,000 northern sea otters in Izembek at most, we can then use 0.1 percent to estimate a current rate of vessel strike mortality in Izembek Lagoon. This results in an estimate of 1 sea otter per year that is expected to die by vessel strike in Izembek Lagoon. If we assume there would be 250 sea otters in Kinzarof Lagoon at most, then we estimate the mortality rate by vessel strike would be 0.25 sea otters per year or 1 sea otter every 4 years (1 year ÷ 0.25 sea otters per year = 4 years). It is important to note that this calculation is not based on peer reviewed estimates, does not account for vessel traffic specifics and that mortality reports likely do not represent an unbiased sample with respect to cause of death because carcass deposition and retrieval are dependent on carcass size, location, wind, currents, predation, and other factors. However, this represents a best approximation of what is reasonably certain given lack of data and information. These estimates represent a current baseline for vessel strike, and do not account for reasonably certain increases in vessel traffic due to the road.

4.4.3.2 Harvest

Coastal-dwelling Alaska Natives are legally allowed to harvest sea otters for subsistence use or for creating and selling authentic handicrafts or clothing. Reported harvest of northern sea otters is generally minimal with the exception of Kodiak Island, where most reported sea otter harvest occurs. The number of sea otters taken during subsistence harvest is considered to be sustainable and have little population impacts (USFWS 2020). However, impacts to specific MUs, particularly those with smaller populations sizes like the South Alaska Peninsula MU, have not generally been considered.

From 2014 to 2024, a total of 25 sea otters were reported harvested from the community of Cold Bay and a total of 30 sea otters were reported harvested from the community of King Cove (C. Solano, USFWS, pers. comm. 2025; from MTRP data). During this time, annual harvest ranged from zero to nine sea otters in Cold Bay (average of 2.5 sea otters per year), and zero to seven in King Cove (average of 3 sea otters per year). These were reported as harvested in Cold Bay, Kinzarof Lagoon, or in and around King Cove Lagoon and thus were harvested from the South Alaska Peninsula MU. Reports indicate only three sea otters have been harvested from Izembek Lagoon, in 2000, 2013, and 2015 (C. Solano, USFWS, pers. comm. 2025).

4.5 Status of Designated Critical Habitat for the Southwest DPS of Sea Otters within the Action Area

The action area overlaps with two MUs of designated northern sea otter critical habitat - Bristol Bay MU and South Alaska Peninsula MU. The Bristol Bay MU is further divided into subunits and only the Izembek Lagoon Subunit is located in the action area (Figure 22).

The majority of the Bristol Bay MU coast is exposed except for the large bays (Ugashik, Port Heiden, Herendeen, and Bechevin bays) and Izembek Lagoon. Canopy-covering kelps and dark brown bladed kelp are few and scattered along the coastline. The Izembek Lagoon Subunit consists of an estimated 130 square miles (337 square kilometers) of the nearshore marine environment within the Izembek Lagoon and Moffett Lagoon systems. Sea otters are known to frequent the lagoon system and regularly haul out on the islands and sandbars that form the northern boundary of these systems, such as Glen, Operl, and Neumann Islands (74 FR 51988). Large numbers of otters have also been observed hauling out along the edges of the sea ice within the lagoon in winter. The Izembek Lagoon subunit contains most of the identified PCEs (1, 2, and 4). While Izembek Lagoon does not contain kelp forests (PCE 3), it does contain small bands of patchy and continuous soft brown kelp (*Laminaria*) species, primarily in Norma Bay and Applegate Cove (NOAA 2025). Prey species (PCE 4) such as gastropods, clams, crabs, and mussels are known to occur in Izembek Lagoon (Tippery 2013, Ward et al. 2022).

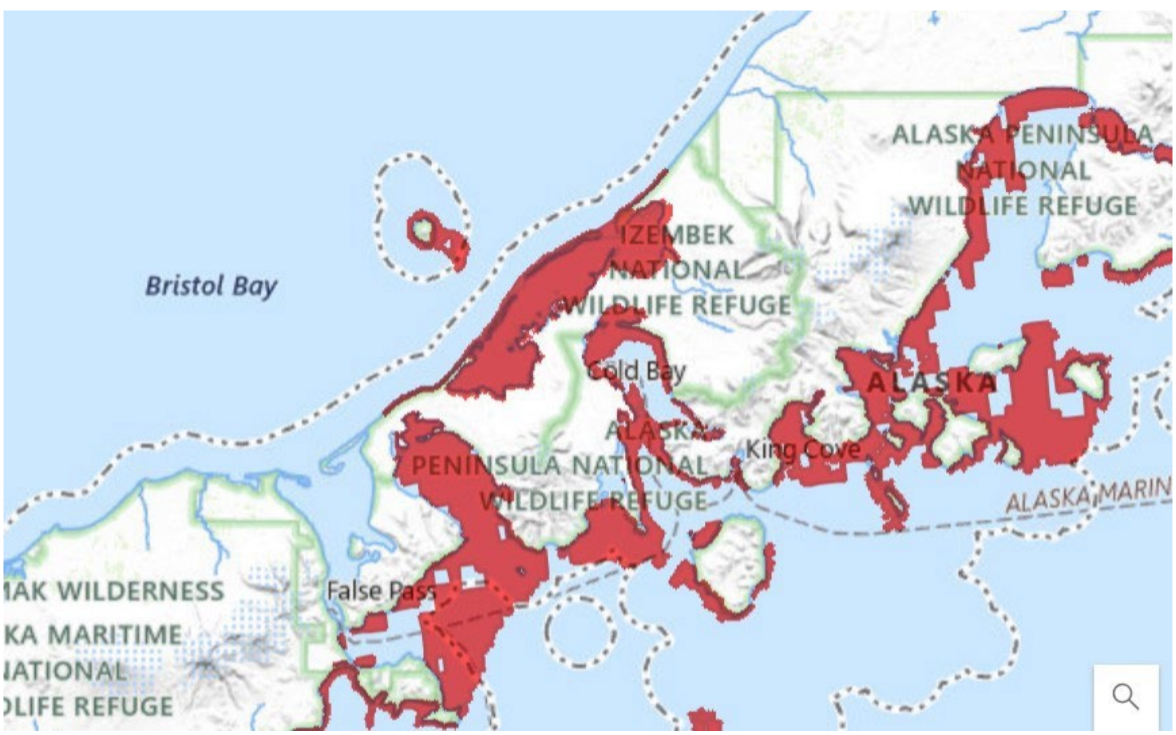

Figure 22. Sea otter critical habitat (in red) within the action area.

The South Alaska Peninsula MU consists of an estimated 1,909 square miles (4,946 square kilometers), collectively, of the nearshore marine waters ranging from the mean high tide line to the 65.6-foot (20-meter) depth contour as well as waters occurring within 328.1 feet (100 meters) of the mean high tide line. Canopy-covering brown kelps are widespread throughout the South Alaska Peninsula MU expect for the southern side of Unimak Island. Dark brown bladed kelp is distributed throughout the MU expect for the southern side of Unimak Island as well. The South Alaska Peninsula MU contains all the identified PCEs. Within Kinzarof Lagoon, small bands of patchy and continuous soft brown kelp (*Laminaria*) are present. The nearshore habitat of Cold Bay is lined with patchy and continuous bands of soft brown kelp (*Laminaria*) species and dragon kelp (*Eularia fistulosa*) species (NOAA 2025). Continuous, and patchy eelgrass (*Zostera marina*) habitat also occurs around much of Cold Bay (NOAA 2025). Prey species (PCE 4) such as crab and gastropods are known to occur in Kinzarof Lagoon.

Kelp communities are sensitive to pollution, sedimentation, and turbidity. Pollution from non-point and point sources including sewage, seafood waste disposal, and coastal runoff may contribute to kelp forest degradation. For example, high sedimentation from coastal run-off may bury new plant shoots. Sedimentation and turbidity also impact kelp through decreasing sunlight or physical influence of particulate matter (Longstaff and Dennison 1999, Gorgula and Connell 2004, Watanabe et al. 2016, Picard et al. 2022). Kelp may then experience reduced growth rates and reproductive success in more toxic waters and sediments. Studies on microscopic stages of kelp suggest that kelp is sensitive to sewage, industrial waste discharges, and other causes of poor water and sediment quality (Coelho et al. 2000, Contreras-Porcia et al. 2023). Other threats to kelp include climate change and overgrazing by fish or sea urchins.

Past and ongoing impacts that modify and reduce the quality of PCEs to provide habitat, prey, and shelter from predators include fishing, hunting, ATVs and trails, contamination, and marine vessels (e.g., skiffs, fishing vessels, and inflatable boats) within Izembek Lagoon and Kinzarof Lagoon. Under State general permits, users are allowed to use certain motorized vessels (e.g., skiffs, fishing vessels, and inflatable boats) within Izembek Lagoon. Use of ATVs, marine motors, and fishing gear causes increased sedimentation and turbidity into the surrounding wetlands, leading to reduced quantity or quality of nearby kelp communities. In addition, there are similar ongoing impacts of sedimentation to kelp from military roads, motorized trails, marine vessel use in shallow water and mud flats, and dock construction.

Past military use has contributed to various contaminants in the area. One example is the White Alice Communication Site, near Grant Point, along the nearshore of Izembek Lagoon (Hazard ID: 2826; ADEC 2025). This site is associated with previous Air Force Activity. The structure was demolished between 1987 to 1988, but diesel range organics detected at the site remained above ADEC cleanup levels until 2006. According to ADEC, multiple active contaminated sites remain along the coast of community of Cold Bay, two of which are related to past military use. These contaminants include a hydrocarbon seep and diesel range organics.

4.6 Past and Present Consultations

Past and present actions, their effects on listed species and designated critical habitat, and the levels of anticipated take have also been considered in the environmental baseline. Table 6 summarizes the past and present Federal projects in the Action Area that have already undergone section 7 consultation. We include consultations that overlap with the action area or have ongoing effects to individuals from both listed species that may overlap with the action area; the estimated take of Steller's eiders and northern sea otters is presented. There are no past or current consultations that anticipated adverse effects to designated critical habitat for either species in the Action Area. Some projects had discreet take estimates for the entirety of the proposed action relevant to the consultation, while others had estimates of annually occurring take. For Steller's eiders, we considered any consultation affecting the listed Alaska-breeding population as potentially overlapping with and therefore affecting individuals that occur in the action area analyzed in this consultation; inclusion of these activities that may occur outside the geographic scope (and therefore outside the environmental baseline) of the action area for this consultation provide context for the environmental conditions currently experienced by individuals occurring in this action area. For northern sea otters, only two consultations overlap with the management units relevant to the action area analyzed in this consultation. Two consultations including northern sea otter take estimates, demarked with an asterisk (*), are not relevant to the two management units overlapping the action area. These consultations were included in Table 6 due to their relevancy to Steller's eiders.

Based on past and current consultations, annual ongoing take of Alaska-breeding Steller's eiders is up to 12 nests (11.16 per year rounded up) and up to 10 individuals (9.84 per year rounded up). For northern sea otters, up to 1,100 sea otters may be captured and treated in rehabilitation centers per year; of these, up to 200 individuals may suffer injury or death during treatment, almost exclusively from their pre-existing medical condition that required veterinary treatment; this anticipated take includes a large geographic range that is inclusive of the action area under current consideration, but may also include areas outside of this action area. These totals for sea otters include individuals from all five management units, and only a portion of this total would apply to the management units overlapping the action area.

Table 6. Past and present actions within the Action Area and the levels of anticipated take. Two consultations demarked with an asterisk (*) present take estimates for northern sea otters that are part of a management unit that is not relevant to this current consultation.

Date of Consultation	Name of Project	Project Years	Estimated take of Northern Sea Otters	Estimated take of Steller's Eiders
11/21/2003	Barrow Landfill	Until 2058	N/A	1 nest annually
10/3/2007	MMS and BP Alaska - Liberty Development Project	100 years	N/A	1 nest
5/8/2012	BOEM Beaufort and Chukchi Sea Planning Area Oil and Gas Lease and Activities	35 years	N/A	1 individual
5/25/2012	FHWA Barrow Roads Improvement Project	50 years	N/A	22 nests
3/30/2015	Oil and Gas Activities Associated with Chukchi Sea Lease Sale 193	20 years	N/A	1 individual
4/30/2015	East Barrow Shareholder Lot Roads	50 years	N/A	2 nests total and 1 individual annually
5/22/2019	BOEM - Cook Inlet Oil and Gas Lease Sale 244*	5 years	20 individuals disturbed annually* 9 individuals killed or injured total*	8 individuals
3/13/2020	Coastal Plain Oil and Gas Leasing Program for Arctic National Wildlife Refuge	135 years	N/A	1 individual
3/24/2021	EPA and NMFS permits for Alaska Groundfish Fisheries	2021-2025	N/A	3 individuals

Date of Consultation	Name of Project	Project Years	Estimated take of Northern Sea Otters	Estimated take of Steller's Eiders
5/7/2021	Construction and Operation of a Harbor at Little South America, Unalaska, Alaska	50 years	N/A	6 individuals
2/21/2023	U.S. Air Force (USAF) Remote Installation Remedial Activity	2023-2035	N/A	1 nest
4/26/2023	NOAA Office of Coast Survey Hydrographic Surveys	2 years	N/A	3 individuals
8/25/2023	BOEM - Cook Inlet Oil and Gas Lease Sale 258*	5 years	60 individuals disturbed annually* 6 individuals injured or killed total*	3 individuals
10/30/2023	International Wildlife Research Permit for Sea Otter Recovery Actions	5 years	1,000 individuals captured and treated 200 individuals injured or killed	N/A
4/17/2024	Regional Recovery Permit for USFWS Activities	5 years	N/A	2 individuals
5/1/2024	National Science Foundation (NSF) Andresen research	2024-2027	N/A	4 nests
5/1/2024	USFWS Shorebird Breeding Ecology Studies near Utqiaġvik	2024-2026	N/A	7 nests
5/23/2025	NMFS Alaska Fisheries Science Center Research Activities	5 years	N/A	3 individuals

Date of Consultation	Name of Project	Project Years	Estimated take of Northern Sea Otters	Estimated take of Steller's Eiders
3/13/2025	USFWS Managing Migratory Bird Subsistence Hunting in Alaska: Regulations for the 2025 Spring/Summer Harvest	2025	N/A	3 individuals
5/2/2025	Alaska SeaLife Center Recovery Permit	5 years	100 individuals captured and treated	N/A
6/23/2025	Office of Marine and Aviation Operations (OMAO) Vessels Operations in U.S. Waters	2023-2038	N/A	2 individuals
7/31/2025	BLM National Petroleum Reserve-Alaska (NPR-A) Integrated Activity Plan (IAP)	70 years	N/A	1 to 6 nests annually

5 EFFECTS OF THE ACTION

In accordance with 50 CFR 402.02, effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of all other activities that are caused by the proposed action but are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action.

We do not expect any effects to Alaska-breeding Steller's eiders, the southwest distinct population segment of northern sea otters, and their designated critical habitats solely from the land exchange. However, we do expect consequences to these resources from other activities that would be caused by or would not otherwise occur but for the land exchange. These other activities include construction, maintenance, and use (including activities conducted by private parties) of a new road along the Izembek Isthmus to connect the communities of King Cove and Cold Bay (see Section 1.4).

5.1 Beneficial Effects

Considering the habitats on the surface estate that would be placed into Federal ownership are not used by Steller's eiders and sea otters (USFWS 2025*a*), we do not anticipate any directly beneficial effects of the land exchange to Alaska-breeding Steller's eiders or the southwest DPS of northern sea otters. We lack information needed to characterize any beneficial indirect effects to these species.

5.2 Steller's Eider

We do not expect adverse effects from the Federal action of conducting the land exchange itself; however, we do anticipate adverse effects from other reasonably certain to occur actions and activities that are related to the land exchange, including construction of a proposed road. A lack of details for the proposed road project means we do not have a clear depiction of activities that would produce stressors such as in-air noise, nor the magnitude of those stressors and the resulting effects; therefore, we make reasonable assumptions based on the given scope of activities and information currently available. Project initiation would require authorization from the U.S. Army Corps of Engineers due to impacts to Water of the United States pursuant to the Clean Water Act. The road project would also require further environmental analysis, requiring specific project details, prior to issuance of permits and project initiation. Our analysis herein does not depend on any commitments that may or may not be made under future actions.

The consequence of most concern to Steller's eiders is the increased access to and human use of Izembek Lagoon that would be afforded through use of the proposed road. We expect adverse effects to Steller's eiders, which congregate in large numbers in the lagoon, and their habitats.

Steller's eiders are more limited in their use of Kinzarof Lagoon and Cold Bay; and although habitats within these sites become increasingly important for eiders during winter icing conditions in the shallower Izembek Lagoon, both waterbodies are already accessible for human use from both Cold Bay and King Cove.

Only a small proportion (approximately 1 percent) of all individuals molting, wintering, or staging during spring migration at Izembek Complex, primarily within Izembek Lagoon, are Alaska-breeding Steller's eiders; the current population estimate for the listed entity is 406 individuals (see section 4.2 for detailed discussion and estimates). We estimate that historically, 60 to 240 Alaska-breeding Steller's eiders (or 15 to 59 percent of the total population of the listed entity) may have used the action area for fall molting. Based on data from the past 10 years, we estimate an average of 48 to 59 Alaska-Breeding Steller's eiders (11.8 to 14.5 percent of the Alaska-breeding population) with a reasonable range of 26 to 97 individuals (6.4 to 23.9 percent of the listed population) may use Izembek Lagoon during their molting period. The number of Alaska-breeding Steller's eiders using Izembek Lagoon could be higher than 97 individuals during high count years. Following molt, we estimate 167 to 240 Alaska-breeding Steller's eiders over-winter in the Izembek Complex based on the most recent 5 survey years. Use of the Izembek complex for spring staging can vary considerable between years, depending on ice and weather conditions. However, based on observations from 1992 through 2012, we estimate the majority of Steller's eiders from the listed population could use the action area for staging at some point during their spring migration. A few individuals that skip breeding might over-summer in the area.

For the purpose of evaluating consequences of the action to the listed population, the Service recognizes any individual Steller's eider could belong to the Alaska breeding population, although the probability is roughly 1 percent with respect to each individual. In the analysis below, the contemplated effects broadly apply to all Steller's eiders in the action area, with only 1 percent of those being from the listed Alaska-breeding population. When we refer to Steller's eiders, we are inclusive of all Pacific wintering individuals, combining both the Russian-Pacific population and the Alaska-breeding population. We do not expect any difference in the relative likelihood of effects occurring to individuals between the two breeding populations; therefore, all reasonably certain to occur effects apply equally to all Steller's eiders regardless from which breeding population they come, relative to their proportion of the total Pacific-wintering population. We specify in our analysis what the expected effects are to the Alaska-breeding Steller's eider only when enumerating a specific number of individuals.

5.2.1 Disturbance

A review of thousands of publications found the following patterns in how waterfowl respond to disturbance (Korschgen and Dahlgren 1992): most disturbance events are caused by human activities on the water (primarily, boating, angling, hunting) and by aircraft; waterfowl responding to these activities may be disturbed by loud noises, rapid movements, and visible features; there is a social effect in response, with large flocks reacting to disturbance more than small flocks; diving ducks and geese are especially vulnerable to disturbance; and repeated disturbances can exclude waterfowl from foraging in preferred habitats and lead to shifts in local site use or permanent emigration out of the area. Flocks of Steller's eiders are easily disturbed during flighted and non-flighted periods (McKinney 1965; D. Safine, USFWS, pers. comm. 2021). The amount of disturbance to Steller's eiders resulting from increased access to the Izembek Isthmus and increased human presence in and near preferred Steller's eider habitats within Izembek Lagoon and other areas of the Izembek Complex would depend on the number of humans using the area; the specific activities occurring and their duration, frequency, and intensity; accessibility of eiders and their habitats during these activities; time of year; and other factors that are difficult to predict and assess.

In multiple studies in Izembek Lagoon, human-induced disturbance to waterfowl has been documented from hunting and boating (Ward et al. 1994, Stillman et al. 2021), with disturbance events corresponding with the legal waterfowl hunting periods (fall and spring; Stillman et al. 2021); most subsistence hunting and fishing activities would overlap the period when Steller's eiders are present. Disturbance events documented as causing responses in waterfowl at Izembek Lagoon occurred more frequently in areas closer to road-based access points than in portions of the lagoon farther from roadways (Stillman et al. 2021). Pacific brant, a small marine goose that overwinters in Izembek Lagoon, serve as a good proxy for how Steller's eiders might respond to disturbance. Like Steller's eiders, brant migrate to stage and molt in lagoon systems and other protected coastal waters, where barrier islands provide predator refugia and where eelgrass, sedges, and algae are plentiful (Cornell Lab of Ornithology 2025). Both species often use similar habitats (primarily eelgrass beds) and portions of the Izembek complex. However, Steller's eiders primarily form distinct, dense, single species flocks, so we don't expect extensive spatial overlap between the species.

An observational study aimed at documenting the responses of Pacific brant at Izembek Lagoon to natural and human caused disturbance (Ward et al. 1994) can be used as a proxy for how Steller's eiders, which share similar habitat use and distribution to brant in this location, might respond. Flocks responded to 67 percent of the observed disturbance events (n = 1,576; all sources combined). Brant flocks became alert in response to 54 percent of human-associated events and took flight in response to 31 percent; hunting, boating, and helicopters caused the greatest proportion of flocks to depart the study area. Disturbances caused most individuals (greater than or equal to 60 percent) in a flock to respond; and individuals spent 2.2 percent of their time responding to disturbance and 1 percent of their time fleeing the disturbance (Ward et al. 1994). The social behavior of flocks means most individuals within the flock will respond to a perceived threat in accordance with only a few, more startle-prone individuals; and larger flocks tend to exhibit a greater response (Korschgen and Dahlgren 1992, Ward et al. 1994, Knapton et al. 2000, Merkel et al. 2009).

Activities that cause eiders to become vigilant or move away from preferred sites (or "patches" of habitat) in Izembek Lagoon by swimming, diving, or flying would increase energy expenditure and disrupt foraging or resting during the molting, wintering, and spring staging periods. Non-breeding waterfowl generally minimize their time in flight and maximize their time feeding (Korschgen and Dahlgren 1992), and disturbance events that change the balance of their activity budget would have time and energy costs (Stillman et al. 2021). Steller's eiders exist at the edge of their energetic range (Goudie and Ankney 1986). At all times of year, Steller's eiders have low flexibility in their daily time budget and their energy reserves to accommodate foraging disruptions, especially during energy-demanding periods (Laubhan and Metzner 1999, Ouellet et al. 2013). In non-breeding Steller's eiders, foraging comprises approximately one-third to one-half of daily activities (Laubhan and Metzner 1999); rest, including to digest hard-shelled prey, comprises an important component of daily activities and during molt, should comprise most of the remaining daily time budget (Hohman et al. 1992, Ouellet et al. 2013). Molt is particularly energetically costly, and we predict disturbance would have higher fitness consequences during this period. Fleeing in response to disturbance would also be physically challenging for flightless Steller’s eiders; they could not respond by flying and also have impaired diving ability during molt (Howell et al. 2003, Savard and Petersen 2015). Swimming and diving would also have high energy costs. Diving is thought to be too energetically costly for Steller’s eiders to perform regularly during molt (Petersen 1981).

The importance of access to prey and the consequences of increased energy expense during molt (Savard and Petersen 2015, Maliguine et al. 2025) demonstrate that disruptions to resting and foraging could have consequences to individual physiological condition and, if disruptions are frequent or severe enough, would impact survival of Steller’s eiders. Further, Steller’s eiders molting in the Izembek Complex might be challenged to meet their energetic requirements (Hollmén et al. 2022, Maliguine et al. 2025) even without human-caused disturbance leading to foraging interruptions/reduced rest and increased energy expenditure. Disturbance to Steller’s eiders at Izembek Lagoon in the spring could disrupt important courtship and pair-bonding behaviors that occur in the wintering areas. Effects to individual physiological condition or disruption of courtship and pair-bonding, which occurs during the winter, would also have carryover effects in subsequent seasons. Here, we analyze the expected frequency and magnitude of disturbance events and assess the likelihood of these causing significant biological effects to Alaska-breeding Steller’s eiders.

Pacific brant is also a good proxy species for the Steller's eider in terms of their time budget and energy budgets during staging and migration. They are both relatively small species in their respective taxonomic groups, Steller's eiders being a small sea duck and brant a small goose. Both arctic species breed in lowland tundra wetlands, far from their molting areas in Izembek Lagoon (USFWS 2019, Maliguine 2024, USFWS/Wilson et al. 2025) and rely on energy reserves to survive the molt through wintering period, subsequently migrate in spring, and successfully reproduce the following year. Models that incorporate empirical observations of disturbance events in Izembek Lagoon predict nearly all brant within Izembek Lagoon should survive the fall through spring periods at the current level of disturbance, estimated as less than one event per hour. This rate of disturbance is a combination of natural plus human-induced events, primarily bald eagle presence plus hunting and boating activities (Stillman et al. 2021). The models predict brant would increase their feeding time as the combined rate of human and natural disturbance events increases, and an increase in all disturbance events (both natural and human caused) of 1.3 times or more would likely reduce survival. The model further suggested increases in human disturbance alone of up to five times current rates would not affect survival or emigration, suggesting natural disturbance is a more significant driver of the response. This model-based analysis could not account for finer-scale variations in predation risk or prey abundance and quality within Izembek Lagoon, the energy and time costs to brant of traveling between habitat patches following disturbance events, and the unidentified factors that underpin traditional uses of the Izembek Complex by waterfowl. Like Steller’s eiders, Pacific brant in the Izembek Complex are at the edge of their metabolic limits, spending all or nearly all their time feeding, and cannot increase foraging effort to compensate for disruptions and/or the increased energy expenditure of fleeing (Stillman et al. 2021).

Human-caused disturbance can reduce the effective carrying capacity of important non-breeding habitats used by high concentrations of waterfowl (Knapton et al. 2000). Except during the flightless molt period, Steller's eiders would be able to emigrate out of the Izembek Complex in the face of increased and chronic disturbance. However, there are few alternative ice-free eelgrass sites in proximity; birds would have to move 62 miles (100 kilometers) south in the Gulf of Alaska to access patchier eelgrass or greater than 311 miles (500 kilometers) away to find sizeable eelgrass beds (Stillman et al. 2021). Therefore, even faced with a substantial increase in the magnitude of disturbance events and/or repeated and prolonged disturbance, we expect most birds would remain in the Izembek Complex within a given season. Some number of Steller's eiders might find refugia within Izembek Lagoon because the relatively low gradient of this waterbody results in shallow water farther offshore (USFWS/Lance et al. 2007). However, similar to the high degree of site fidelity Steller's eiders show to their molting lagoon between years, within their molting lagoon Steller's eiders may show preferential use of specific habitat patches, returning to these locations repeatedly following disturbance events (Flint et al. 2000). Preference for specific patches may be partially due to the benefits of familiarity with available resources and shelter (Hohman et al. 1992) or could reflect quality. We therefore expect a high degree of fidelity to Izembek Lagoon and to specific areas within this lagoon would expose Steller's eiders to cumulative disturbance effects during repeated or prolonged events near their preferred habitat patches.

5.2.1.1 Construction and Road Use

Noise levels would increase during construction of the proposed road, and disturbance to Steller's eiders would occur if in-air noise occurs in close enough proximity. Barge landings and equipment and materials staging would occur in or near Steller's eider habitats within the nearshore environment of Cold Bay. Site work planned during the summer months, would have little temporal overlap with Steller's eiders, which mostly use Cold Bay habitats during winter months. However, site work that extends into the fall months would overlap the time of year large, dense aggregations of Steller's eiders are present in the Izembek Complex, undertaking wing feather molt. Most individuals use Izembek Lagoon during this time, but some number of individuals also molt in Kinzarof Lagoon (see section 4.2.1) and use Cold Bay habitats, with use documented beginning in October (Laubhan and Metzner 1999).

At the closest point, the road would be located 0.5 to 1 mile (0.8 to 1.6 kilometers) from Kinzarof Lagoon, 0.7 mile (1.1 kilometers) from Izembek Lagoon, and 1.7 miles (2.7 kilometers) from Moffet Lagoon. Given these distances, basic sound analyses predict noise from most construction equipment and construction activities would attenuate to just above background levels, at most, before reaching areas used by Steller's eiders (USFWS 2025*a*). The biological assessment estimates noise levels from construction would be approximately 58.5 dBA at 0.38 mile (0.61 kilometer) from the source, with the exception of activities with high-decibel, impulsive noise (e.g., blasting for material site development, pile driving for bridge construction). Blasting, which would be associated with material site development, is estimated to produce noise levels of 94 dBA at 50 feet (15 meters); the closest material site to Kinzarof Lagoon is 0.33 mile (0.53 kilometer), and the closest material site to Izembek Lagoon is 0.7 mile (1.13 kilometers). Pile driving, which would take place for installation of a bridge over Southeast Kinzarof Stream, is estimated at 101 dBA at 50 feet (15 meters; USFWS 2025*a*). The proposed bridge would be installed approximately 1.3 miles (2 kilometers) northeast of Kinzarof Lagoon and over 5 miles (8 kilometers) from Izembek Lagoon. Although dBAs are weighted for human hearing and may not be applicable to how Steller's eiders experience sound, we do not expect blasting and pile driving will exceed ambient noise at either Kinzarof or Izembek Lagoons. We lack information needed to predict the exact noise levels that would reach either lagoon; however, the draft biological assessment predicts noise levels from blasting would be similar to the sound of a gunshot, as experienced from either lagoon. We do not know whether vibratory or impact pile driving would be used; for purposes of this analysis, we assume impact pile driving and predict each impact would also be perceived similarly to the sound of a gunshot by birds in the nearest shore areas in either lagoon. Detonation of unexploded ordnances could also be encountered during construction, with similar noise levels to blasting; however, because we cannot be reasonably certain unexploded ordnance would be encountered, we do not carry this activity forward in our analysis.

If Steller's eiders are present during pile driving and blasting, we anticipate some individuals in the nearshore areas of Kinzarof and Izembek Lagoons would be within hearing range, and all of these individuals would experience disturbance effects. We expect effects to Steller's eiders would be a temporary behavioral response (ranging from vigilance to escape responses that include swimming, diving, or flying away from the area) and/or temporary displacement of individuals or groups. Individuals or groups may repeatedly flush from the area with prolonged or repeated disturbance (i.e., chronic disturbance) and/or may not return until pile driving and blasting cease. Based on very basic sound analyses provided in the draft biological assessment and the distance from proposed infrastructure, we assume the effects of noise from blasting and pile driving would be similar to the effects of noise from gunshots (see section 5.2.1.3 for detailed discussion of the disturbance effects of gunshots). Expected adverse effects include disruption of normal behaviors and some individuals or flocks attempting to flee by flying or diving. When these responses occur during period of high energy demands (such as during molt), we expect the result to cause additional energy stress would reduce fitness and survival probability.

Noise associated with ongoing road maintenance and use by vehicles transiting between the communities of King Cove and Cold Bay would have similar sources and effects as construction-related noise; in addition, use of the road would involve some level of regular vehicle traffic transiting between the communities of King Cove and Cold Bay. Ambient noise levels produced by road use would depend on weather conditions, types and speeds of vehicles, and other factors. Given the low levels of projected daily traffic, noise would be of short duration and intermittent, and basic sound analyses predict noise from vehicle traffic would be only slightly perceptible above background levels to Steller's eiders using nearshore habitats and possibly imperceptible to birds farther offshore (USFWS 2025*a*).

Given the expected reactions of Steller's eiders to gunshots (based on the reactions of Pacific brant), we expect noise disturbance due to blasting and pile driving would affect most Steller's eiders within hearing range. Although these activities would be episodic during construction (i.e., are not expected to last throughout the construction window), they would be recurrent. Construction during the summer months would disrupt, at most, a few over-summering individuals; if fall migrating/pre-molting birds arrive in the Izembek Complex during active construction, increasingly large numbers would be exposed to limited, temporary, and periodic disturbance that would result in adverse effects ranging from behavioral responses to displacement. Responses would include some level of time and energetic costs to Steller's eiders through disruptions to foraging and resting and time spent fleeing the source, and the effects of pile driving and blasting would accumulate during the active period of these activities. We expect blasting and pile driving noise to result in disturbance of Steller's eiders within hearing range, leading to behavioral responses that include alert behaviors and fleeing, and to temporary displacement. This disruption of normal behaviors, including breeding, feeding, and sheltering, would be episodic and temporary in nature and would occur during only a portion of each year in the anticipated 2-year construction window. Noise associated with road maintenance and use would be year-round and would occur for the life of the road (i.e., 50 years), but we expect only episodic blasting for continued material site development would cause disturbance to eiders during this period. If Steller's eiders were present within hearing range during blasting, we expect they would experience disturbance-related effects similar to those expected during construction, but these would again be temporary.

Limiting activities involving blasting and pile driving to periods outside the molting season (i.e., limited to May through mid-August) would reduce the likelihood of these impacts. These effects are reasonably certain to occur because there are currently no proposed timing restrictions or other methods to mitigate the impacts.

5.2.1.2 Vessel-based Disturbance

Vessel traffic in Cold Bay would increase slightly for dedicated barge transport of construction equipment and materials during the May through November construction window. Steller's eider presence in Cold Bay and the connected Kinzarof Lagoon is relatively low during the summer months, but barging activities during the fall months would overlap the time of year Steller's eiders are present in the Izembek Complex, undertaking wing feather molt. Most individuals use Izembek Lagoon during this time, but some number of individuals also molt in Kinzarof Lagoon and could be present in Cold Bay (see section 4.2.1). If Steller's eiders were encountered during barging within the action area, they would experience periodic but temporary and limited disturbance that results in effects ranging from a behavioral response to displacement.

Constructing a road along the Izembek Isthmus would facilitate access for the community of King Cove to boat launches along the existing Cold Bay road network. We do not expect this access would result in a measurable increase in vessel use of Kinzarof Lagoon and Cold Bay, as these systems are already accessible to both communities. It is reasonably certain road access would result in increased vessel traffic and vessel-based activities in Izembek Lagoon, including during periods of the year when Steller's eiders are present in large flocks that include flightless, molting individuals. The amount of disturbance to Steller's eiders resulting from increased vessel use of Izembek Lagoon, which would be afforded by the road between King Cove and Cold Bay, would depend on the number of additional vessels using the area; the specific activities occurring and their duration, frequency, and intensity; accessibility of eiders and their habitats during these activities; time of year; and other factors that are difficult to predict and assess. In the absence of better data, we assume the increase in vessel activities in Izembek Lagoon would be proportionate to relative community size. Information on number of boats owned in each community (Cold Bay and King Cove) is not available, but we expect boat ownership would be proportional to number of households in each community.

In 2020, there were 165 households in King Cove compared to 21 households in Cold Bay (USCB 2020*a,b*). This represents an approximate 8 times increase in subsistence eligible households that may access Izembek Lagoon after construction of the proposed road (165 ÷ 21 = 7.9). The U.S. Coast Guard (Duffy et al. 2020) reports 32.2 percent of Alaskan households own boats. We expect boat ownership to be higher in coastal and rural communities, where boat use is critical to local transportation and both recreational and subsistence activities. We assume boat ownership is relatively high in King Cove, as this is a coastal, marine-dependent community with strong ties to fishing and other water-based subsistence activities, so we assume one boat for every two households. Therefore, assuming all households that own boats in King Cove take advantage of the new road providing access to Izembek Lagoon, we estimate an approximately four-fold increase in vessels that would be able to access Izembek Lagoon consequent to construction of the road (7.9 ÷ 2 = 3.95, rounded up to 4).

We recognize that not all boat owners in King Cove are necessarily engaged in subsistence use – although data from ADF&G (ADF&G 2025) indicate 38 percent of eligible households attempt to harvest migratory birds and 75 percent attempt to harvest salmon (the two subsistence resources for which access to Izembek Lagoon would be most desired). We also acknowledge not every boat owner in King Cove would trailer their vessel to Izembek Lagoon. Furthermore, not every vessel trip would lead to disturbance. However, because access to Izembek Lagoon would present a valuable new opportunity for subsistence harvest, we use this fourfold increase as our expected upper bounds for changes in vessel disturbance rates following construction of the road.

We assume the majority of boat use in Izembek Lagoon is for the purposes of subsistence and sport hunting (see also section 5.2.2 for further discussion of subsistence activities). Based on subsistence harvest data from 2016 (ADF&G 2025), participation in attempted waterfowl harvest was similar comparing households in King Cove (38.5 percent) and Cold Bay (39.1 percent). However, the mean weight of harvested waterfowl was substantially higher in Cold Bay (32.6 pounds [14.8 kilograms] per household) compared to King Cove (21.1 pounds [9.6 kilograms] per household). We attribute this discrepancy to the difference in access to Izembek Lagoon, which provides the greatest abundance and diversity of waterfowl in the Izembek Complex. If a new road provides King Cove with access to Izembek Lagoon, we expect this will be a primary location to make up the discrepancy in waterfowl harvest. If we use the 54 percent difference in total harvest as a measure of potential interest, we project approximately 50 percent of King Cove boat owners will access Izembek Lagoon at minimum. So, using the previously calculated upper bounds of a fourfold increase in boat use, we determine the lower bounds of this increase to be 50 percent of that value, or a twofold increase. Therefore, we conclude the projected increase in boat-based disturbance in Izembek Lagoon will be between twofold and fourfold consequent to construction of the road.

Because Steller's eiders aggregate in flocks numbering in the tens of thousands in this lagoon, we assume any vessel trip during times of year eiders are present would have overlap with Steller's eiders and assume risk of disturbance is commensurate with the rate of increased vessel activity. We therefore are reasonably certain that boat-based disturbance will increase from current baseline conditions. While we cannot estimate the precise proportion of boat owners that will attempt to access Izembek Lagoon, we used available data to estimate the risk of disturbance to Steller's eiders would increase between two times and four times above baseline levels.

Although Steller's eiders commonly overwinter in areas of high vessel traffic (e.g., Womens Bay, Unalaska Bay), they are sensitive to vessel traffic in some locations, including Izembek Lagoon (McKinney 1965; Ward et al. 1994; D. Safine, USFWS, pers. comm. 2021). Vessel-related disturbance can cause Steller's eiders to pause or cease foraging and resting (also impacting courtship and pair bonding behaviors) and to respond with vigilance or fleeing. The following behavioral responses have been observed in molting eiders at Izembek Lagoon: at up to 0.25 mile (400 meters) distance, molting birds typically react to vessel traffic by swimming slowly away; birds swim faster if the vessel approaches; and at close distances (165 to 300 feet [50 to 100 meters]), molting Steller's eiders will exhibit high stress and dive to move away from the perceived threat (D. Safine, USFWS, pers. comm 2021). These response distances are similar to those documented in an observational study on Pacific brant at Izembek Lagoon. This study, aimed at documenting the responses of brant to disturbance (Ward et al. 1994), showed vessels elicited a greater response than the average event, with 94 percent of individuals within an affected flock responding, 75 percent of flocks taking flight, and 77 percent of responding flocks leaving the area. Larger flocks of waterfowl and diving ducks appear to have a greater response to disturbance than smaller flocks (Ward et al. 1994, Knapton et al. 2000). Similarly, flocks of Steller's eiders respond at greater distances and more frequently than individual birds (D. Safine, USFWS, pers. comm 2021). Outside the molting period, when birds are flighted, behavioral responses to disturbance would include flying. Brant serve as a proxy for how Steller's eiders might respond to vessels since these two species use similar habitats and geographic areas of the lagoons.

Based on the brant study, we estimate the current level of vessel traffic in the lagoon results in disturbance at a rate of 0.03 to 0.075 events per hour (see section 4.2.4.3). We calculated lower and upper bounds for the increased vessel-caused disturbance we expect as a result of the proposed action, based on the range of disturbance rates estimated during years with low versus average hunting activity at Izembek. We assume vessel use during this period was primarily by hunters. Consequent to road access on the Izembek Isthmus, which would facilitate access to the existing gravel boat launch for additional boaters, we predict between a twofold and a fourfold increase in vessel traffic in Izembek Lagoon above current levels (comprised of people conducting subsistence hunting and fishing and other activities), which would lead to Steller's eiders experiencing between 0.06 to 0.15 vessel-related disturbance events per hour at the lower bounds and 0.12 to 0.3 vessel-related disturbance events per hour at the upper bounds.

Like Steller's eiders, Pacific brant in the Izembek Complex are at the edge of their metabolic limits, spending all or nearly all their time feeding, and cannot increase foraging effort to compensate for disruptions and/or the increased energy expenditure of fleeing (Stillman et al. 2021). This work indicated an increase in all forms of disturbance (both natural and human caused) of 1.3 times current levels were predicted to have survival consequences in brant; however, natural forms of disturbance were the largest factor driving this effect. When looking at only human caused disturbance (removing the natural caused sources from the analysis), increases in human caused disturbance of up to five times current levels were not expected to affect survival (Stillman et al. 2021). The brant study took place only during the legal hunting season and therefore may not represent year-round vessel activity in Izembek Lagoon and corresponding rates of disturbance to waterfowl. Activity could be less outside the hunting period, but other vessel uses could also increase; for example, we assume commercial and subsistence fishing activities in Izembek Lagoon were not represented in this dataset. We do not have a way to measure current subsistence fishing activity or other vessel uses in this location or predict how subsistence fishing and many other vessel-based activities might change in Izembek Lagoon consequent to construction of the proposed road. Therefore, the information provided by a study during the legal waterfowl hunting period serves as the best available proxy to measure current baseline and reasonably estimate an increase for vessel use in this location overall.

At Izembek Lagoon, we predict responses of Steller's eiders to vessels and vessel-based activities (e.g., to motor noise, human shouts) would average approximately 3 to 4 minutes per event; prolonged or repeated disturbance (i.e., chronic disturbance) would cause birds to flush from the area for longer and longer periods (as in common eiders; Merkel et al. 2009), and birds may not return until disturbance ceases. Vessel-related disturbance events accumulate to comprise a measurable portion of the daily time budget for individual Steller's eiders. In non-breeding common eiders using a shallow bay in Greenland, disturbance by vessels was observed to seriously affect eider feeding activity (Merkel et al. 2009). While undisturbed common eiders spent 43 to 66 percent of daylight hours feeding, as the number of boats increased in the area, birds decreased their time feeding and spent increasingly more time swimming or flying. Disturbance also affected resting and social behaviors. Vessel disturbance at levels of 1 to 3 boats per hour resulted in approximately 20 percent of time spent flying or swimming for any individual common eider. In common eiders, flocks of more than 100 birds were more likely to experience foraging disruptions. Repeated disturbances had a cumulative effect; birds that were recently disturbed (within the past hour) were two times less likely to continue feeding; and birds disturbed three times within one hour were observed to cease foraging, instead allocating time to vigilance or to movement behaviors (Merkel et al. 2009).

Brant at Izembek Lagoon showed a consistent, prolonged response to vessels; when they responded by fleeing, flight lasted an average of 2.87 minutes. The duration of the flight response is likely an underestimate because flocks frequently left the study area when hunting triggered a flight response. Brant that were disrupted but did not flee (i.e., showed vigilance) averaged longer responses (3.7 minutes per event). We predict Steller's eiders would show a similar response. While not all Steller's eiders would be disturbed by 100 percent of vessel-related disturbance events in and near Izembek Lagoon, we expect some number would be disturbed by most vessel activity in this location. Based on the estimated range in rates of disturbance and the proportion of overall disturbance attributed to vessels, each individual brant in Izembek Lagoon fled vessel-caused disturbance for a mean of 2.4 to 6.1 seconds per hour in the late 1980s; total disruptions to each individual (accounting for time spent in vigilance) were estimated as 4.2 to 10.4 seconds per hour (as derived from Ward et al. 1994). Now, we expect individual birds are interrupted by vessel for 6.2 to 15.6 seconds per hour, with 3.7 to 9.1 seconds per hour spent fleeing in response to vessels (representing a 1.5-fold increase). Consequent to construction of the proposed road, we expect individuals would be disrupted from normal activities for between 12.5 to 31.2 seconds per hour at the lower bounds (a twofold increase) and between 25.0 to 62.4 seconds per hour at the upper bounds (a fourfold increase); and between 7.3 to 18.3 seconds per hour spent fleeing at the lower bounds up to between 14.6 to

36.5 seconds spent fleeing at the upper bounds. Therefore, we estimate all individual Steller's eiders at Izembek Lagoon would spend up to 0.7 to 1.7 percent of their time budget responding to increased vessel activity (25.0 seconds / 60 = 0.42 minutes, 0.42 / 60 minutes in 1 hour = 0.007; 62.4 seconds / 60 = 1.04 minutes, 1.04 / 60 minutes in 1 hour = 0.017), and 0.4 to 1 percent of their time budget fleeing (14.6 seconds / 60 = 0.24 minutes, 0.24 / 60 minutes in 1 hour = 0.004; 36.5 seconds / 60 = 0.608 minutes, 0.608 / 60 minutes in 1 hour = 0.010). Prolonged or repeated disturbance (i.e., chronic disturbance) would cause birds to respond for incrementally longer periods, and birds that are able may flee the area and not return until disturbance ceases. We expect at most an increase above baseline conditions in disturbance disrupting feeding and other maintenance behaviors of up to 47 seconds per hour and disturbance resulting in flight of up to 27 seconds per hour. We do not anticipate this change will have significant impacts to individual fitness such that it would lead to reduced survival.

Steller's eiders are considered to have overall low flexibility in their daily time budget and their energy reserves to accommodate foraging disruptions, especially during energy-demanding periods (Laubhan and Metzner 1999, Ouellet et al. 2013). However, they may be able to accommodate some level of disruption to their normal activities. One study of Steller's eiders in the Izembek Complex showed differences in daily time budgets between eiders foraging in Izembek Lagoon versus Cold Bay. During winter, eiders in Cold Bay spent approximately 12.2 percent more time feeding than eiders in Izembek Lagoon (Laubhan and Metzner 1999). This extra time feeding likely reflected increased energetic costs in Cold Bay (eiders in Cold Bay spent more time in locomotion and less time resting) and/or lower prey value in this water body. Extra feeding time could have tradeoffs; in this study, it was correlated with a reduction in "comfort" activities (e.g., preening, which is an important part of maintaining feather waterproofing and insulating qualities). The ability of eiders to accommodate foraging disruptions or increased energetic costs may be lower now than in the 1980s, as quality and abundance of prey in the Izembek Complex has changed (Maliguine et al. 2025; see section 4.3).

In summary, we expect construction of a road along the Izembek Isthmus would increase vessel use in areas used by large numbers of Steller's eiders. Responses to vessel activities would include some level of time and energetic costs to Steller's eiders through disruptions to foraging and resting and time spent fleeing the source. Each disturbance event would be temporary in nature, but the effects of vessel-based disturbance would be chronic and would accumulate during the open-water season of vessel use. In some years, vessel use would be year-round. Based on the 1980s study (Ward et al. 1994), we expect an individual Steller's eider would be able to accommodate a 0.7 to 1.7 percent reduction in normal behaviors, expected as a result of the predicted disturbance rates, by increasing their feeding time. We expect disturbance from increased vessel use in Izembek Lagoon would persist over a long timeframe (e.g., as long as the gravel road remains passable for vehicles trailering boats, projected to be 50 years).

5.2.1.3 Sport and Subsistence Hunting of Waterfowl

Human-induced disturbance to waterfowl in Izembek Lagoon has been documented from hunting, with disturbance events occurring more frequently closer to road-based access points (Stillman et al. 2021). We expect a road that enables vehicular travel in closer proximity to Izembek Lagoon would result in increased hunting activities reflecting increased harvest activities by local residents participating in subsistence use (either during the spring-summer subsistence season or the fall-winter general hunting season) plus increased hunting from non-resident hunters during the fall-winter sport hunting season. Hunting of Pacific brant, emperor geese, and other legal species occurs from both shoreline-based locations and from boats on-the-water. Although most hunting activities in Izembek Lagoon occur in nearshore areas (Stillman et al. 2021), no part of Izembek Lagoon is inaccessible to hunting given current modes of access and hunting methods. Therefore, we expect no part of the lagoon would offer a certain refugia, and hunting in the lagoon would put Steller's eiders at risk of repeated disturbance, including through visual impacts of hunting activities, the impulsive noise of guns shot into flocks, and the social effects of flock responses.

One limitation to the services currently offered by commercial operators during waterfowl sport hunting is the number of clients they can transport to Izembek Lagoon via motorized modes of travel, including by boat and ATV. We assume relieving some of the logistical constraints for commercial guides and clients, through construction of a road that improves overland motorized access and shortens walking distances, would result in increased interest and participation in hunting. Recent capacity improvements (see section 4.2.4.2) resulted in a 105 percent increase in CUDs by sport hunters between 2020 and 2021; however, subsequent years demonstrated a stable or slightly declining trend based on CUDs (see Figure 13, section 4.1.5). We predict construction of a road would result in an increase of sport hunters (guided and unguided) at Izembek Refuge and the lagoon. If improved access causes additional interest in hunting, an increase in guiding services or unguided hunts, may follow a pattern similar to the increase observed from 2020 to 2021. Based on best available data, we estimate an increase of between 64 and 105 percent sport-hunting activity, as measured in CUDs, above the current levels reported in 2024 (see Appendix A for details on these calculations). While these numbers do not include sport hunters that do not participate in guided hunts, we assume guided sport hunting represents the majority of non-subsistence based hunting pressure and these data are a reasonable estimate for future impacts (see section 5.2.2 for detailed discussion).

Izembek Lagoon is a prime waterfowl hunting location because it hosts large, dense aggregations of waterfowl species that are unique in Alaska. Based on traditional harvest by King Cove residents of ducks and geese in Kinzarof Lagoon and embayments along the southeastern coast of the Alaska Peninsula (Langdon 1982, Braund et al. 1986, Fall et al. 1993), where we expect greater effort is needed to harvest waterfowl, it is reasonably certain this community will also participate in waterfowl hunting at Izembek Lagoon with improved overland and boat-based access. We used 2016 subsistence harvest data to estimate current subsistence use of the Izembek Complex area. Using these extrapolated estimates of current subsistence use, we projected future subsistence activities in Izembek Lagoon based on two scenarios: 1) subsistence users harvesting waterfowl from King Cove would shift 100 percent of their efforts to Izembek Lagoon, and 2) 54 percent of subsistence harvest activities from King Cove would shift to Izembek Lagoon (see Appendix A for detailed discussion on these calculations). We therefore expect a minimum of a 4.2-fold and a maximum of a 7.0-fold increase in subsistence hunting in Izembek Lagoon consequent to construction of the road. Although this increase represents our best estimate for the number of additional subsistence activities in Izembek Lagoon after construction of the road, we acknowledge this is an imperfect estimate of future subsistence use. The population of King Cove could change through time (and increase or decrease); and the rate of increase we estimate here does not capture differences in hunting effort, which we assume varies by individual and may not be the same between the two communities.

Like vessel-based disturbance, hunting disturbance is expected to result in behavioral responses by Steller's eiders, primarily causing them to pause or cease foraging and resting (but also impacting courtship and pair bonding behaviors) and to respond with vigilance or fleeing.

Based on responses of brant, we estimate current hunting activity in Izembek Lagoon results in hunting-caused disturbance at a rate of 0.18 to 0.45 events per hour (see section 4.2.4.2). Consequent to road access on the Izembek Isthmus, we predict between a 2.3- and a 3.2-fold increase in all hunting activities (combined subsistence use and sport hunting) at Izembek Lagoon above current levels (see Appendix A for detailed discussion of these calculations). An increase in disturbance of 5 times current levels was predicted to have no effect on survival or emigration of Pacific brant at Izembek Lagoon (Stillman et al. 2021). Using Pacific brant as a proxy for the response by Steller's eiders, we predict the projected increase in hunting disturbance of 2.3 to 3.2 times the current levels will have no effect on survival of eiders, on average within the population. It is reasonable to expect that disturbance pressures will vary by location in the lagoon and by individual. Therefore, we expect some proportion of individual Alaska-breeding Steller's eiders will experience higher rates of disturbance leading to reduced fitness, negatively affecting individual survival and/or reproductive success. We assume in some years, effects to individuals could have population-level consequences through effects such as reduced breeding propensity.

We calculated expected lower and upper bounds for the increased hunting-caused disturbance we expect as a result of the proposed action, based on the range of disturbance rates estimated during years with low versus average hunting activity. We predict construction of a road across the Izembek Isthmus would lead to 0.4 to 1.4 hunting-related disturbance events to Steller's eiders per hour (e.g., one event would be, for example, one shot fired; 0.18 x 2.3 at the low end and 0.45 x 3.2 at the upper end). In larger-bodied snow geese (*Chen carulescens*), which should have higher energy reserves than Steller's eiders, two disturbances per hour at non-breeding staging areas caused energy deficits that they could not make up for through increased feeding (Belanger and Bedard 1990). The expected rate of hunter-caused disruptions to foraging and resting behaviors combined with increased energetic costs of responding would fall below the levels predicted to cause energy deficits in snow geese. While we do not have a similar calculation for equivalent impacts to Steller's eiders and acknowledge these increases in disturbance would impact the ability of Steller's eiders to meet their energetic demands, especially during molt, we expect only a small proportion of Steller's eiders in Izembek Lagoon will suffer effects of this magnitude.

Due to the similarity of distribution and habitat use between Steller's eiders and Pacific brant at Izembek Lagoon, Pacific brant responses to hunting disturbance in this location are a reasonable proxy for how Steller's eiders would respond and what the magnitude of that response would be. Brant responses to hunting activity at Izembek Lagoon were consistent and prolonged, with an average of 90 percent of individuals in the brant flock having a response and 82 percent taking flight (out of 65 percent of flocks having a response and 39 percent of flocks responding in flight) for an average flight duration of 96 seconds (Ward et al. 1994). The duration of the flight response is likely an underestimate because flocks frequently left the study area when hunting triggered a flight response. Brant that were disrupted but did not flee (i.e., showed vigilance) averaged longer responses (139.1 seconds per event). Prolonged or repeated disturbance (i.e., chronic disturbance) would cause birds to respond for incrementally longer periods, and birds that are able may flee the area and not return until disturbance ceases. The amount of disruption to normal behaviors estimated here would have high energetic costs. While not all Steller's eiders would be disturbed by 100 percent of hunting-related disturbance events in and near Izembek Lagoon, some number would be disturbed by most waterfowl hunting activities in this location because waterfowl hunting targets species with which Steller's eiders associate. At Izembek Lagoon, brant first alerted to hunters on land at distances of 0.93 mile (1.5 kilometers; Ward et al. 1994); while the disturbance distance for boats was not reported, it seems reasonable to expect it was greater than the distance to hunters and potentially similar to the distance to aircraft (1.6 miles or 2.6 kilometers). Thus, a large proportion of birds in any given area of the lagoon would be impacted by hunting on-shore or on-the-water.

We expect hunting-related disturbance events would add up to a measurable portion of the daily time budget for Steller's eiders, which have low energy reserves and a limited ability increase time spent foraging in a day (Laubhan and Metzner 1999, Ouellet et al. 2013). Based on the plausible range in rates of disturbance and the proportion of overall disturbance attributed to hunting-related activities, each individual brant in Izembek Lagoon fled hunter-caused disturbance for a mean of 2.0 to 5.1 seconds per hour in the late 1980s; total disruptions to each individual (accounting for time spent in vigilance) were estimated as 6.9 to 17.2 seconds per hour (as derived from Ward et al. 1994). After converting these data to current conditions as described in section 4.2.4.2, we expect individual birds are currently interrupted for 20.6 to 51.6 seconds per hour, with 6.1 to 15.2 seconds per hour spent fleeing during the hunting season (representing a threefold increase). Consequent to construction of the proposed road, we expect individuals would be disrupted from normal activities (e.g., foraging, preening, bathing, resting, etc.) for between 13.4 and 33.5 seconds (0.2 and 0.6 minutes) per hour at the lower bounds to 45.4 and 113.5 seconds (0.8 and 1.9 minutes) per hour at the upper bounds, with time spent in flight between 19.5 and 48.8 seconds (0.3 and 0.8 minutes) per hour at the lower bounds and 66.0 and 165.0 seconds (1.1 and 2.8 minutes) per hour at the upper bounds (see Appendix B for detailed discussion of these calculations). Therefore, we estimate all individual Steller's eiders at Izembek Lagoon would spend 0.4 to 1.4 percent of their time (using the lower end of the lower bounds and the upper end of the upper bounds; see Appendix B) budget responding to hunting activity by fleeing.

Steller's eiders are considered to have overall low flexibility in their daily time budget and their energy reserves to accommodate foraging disruptions, especially during energy-demanding periods (Laubhan and Metzner 1999, Ouellet et al. 2013). However, one study of Steller's eiders in the Izembek Complex during the 1980s suggest they may be able to accommodate some level of disruption to their normal activities; this study showed Steller's eiders might be able to feed for approximately 12.2 percent more time by reducing certain other activities (e.g., resting and comfort activities; Laubhan and Metzner 1999). We have no evidence Steller's eiders can accommodate disturbance that causes more than a 12.2 percent change in normal behaviors. Further, quality and abundance of prey in the Izembek Complex appears to be lower now than during this study (Maliguine et al. 2025; see section 4.3). We assume Steller's eiders have not already increased their feeding effort in the Izembek Complex to make up for lower prey quality. Based on the 1980s study, we expect Steller's eiders may be able to accommodate hunting-based disruptions if those activities approximate projected ranges we have calculated. It is reasonable to expect that disturbance pressures will vary by location in the lagoon and by individual. Therefore, we expect some proportion of individual Alaska-breeding Steller's eiders will experience higher rates of disturbance that would lead to reduced fitness, negatively affecting survival and/or reproductive success.

In summary, it is reasonably certain construction of a road along the Izembek Isthmus would increase waterfowl hunting pressure in areas used by large numbers of Steller's eiders. Responses to hunting activities would include some level of time and energetic costs to Steller's eiders through disruptions to foraging and resting and time spent fleeing the source. Each disturbance event would be temporary in nature, but disturbance from hunting would be chronic during the legal hunting seasons and effects to Steller's eiders would accumulate. Hunting-related disturbance to Steller's eiders is expected to be of sufficient frequency that it would cause adverse effects to some individuals through disruptions to normal behaviors that leads to time costs and energy deficits. We expect on average individuals would be disrupted from normal activities for 1.1 to 2.8 minutes per hour, with 0.3 to 0.8 minutes per hour spent fleeing, depending on whether the average hunter in any given year represents low effort (the low end of our predicted range) or approaches the historical average (the high end of our predicted range). Therefore, we calculate all individual Steller's eiders at Izembek Lagoon would spend 1.3 to 4.6 percent of their time budget responding to hunting activity and 0.4 to 1.4 percent of their time budget fleeing.

We expect hunting-based disturbance would result in behavioral effects to Steller's eiders within Izembek Lagoon, ranging from alert behaviors to fleeing, and/or would cause temporary displacement. We expect in some years with hunting activity near the lower bound of the expected range, individual Steller's eiders would be able to accommodate overall disruptions. However, in years where the activity of individual hunters approaches the historical average, we expect the time costs and energy deficits to individuals would lead to physiological impacts that result in reduced fitness and/or survival for some proportion of the population using the Izembek Complex. In both low and high hunting effort years, reductions in other activities to accommodate extra feeding time could have secondary effects to Steller's eiders related to tradeoffs, but we are unable to assess the magnitude of these effects.

Therefore, based on use of Izembek Lagoon and the behavior of Steller's eiders, due to the expected increase in waterfowl hunting alone, most Steller's eiders in Izembek Lagoon would experience increased disturbance, and in some years effects of disturbance would lead to lowered individual physiological condition that subsequently reduces survival and future productivity. Disturbance that displaces birds from preferred sites within the Izembek Complex, causes a redistribution of Steller's eiders away from the area or affects pair-bonding and courtship behaviors would have secondary impacts that would also affect future breeding propensity and reproductive success. The effects to Steller's eiders of increased hunting activity in Izembek Lagoon would persist for the foreseeable future, as we expect hunters will continue to travel along the road via trucks and ATVs beyond the period of active maintenance, as long as the surface remains passable), would impact all individuals to some extent, and in some years would affect large numbers of birds at once. During fall through spring, 6,000 to 41,000 Steller's eiders use Izembek Lagoon, and we assume 1 percent of these birds belong to the Alaska-breeding population (which is estimated as 406 birds). The estimated numbers of Alaska-breeding Steller's eiders that use the affected portion of the action area during fall through spring (up to nearly all of the population) make it reasonably certain these effects would affect a substantial portion (up to all) of the listed entity during high impact years. Hunter-caused disturbance effects would be additive to existing stressors (e.g., a reduction in prey quality and abundance at Izembek Lagoon) and to other stressors anticipated in the Izembek Complex consequent to the proposed action.

5.2.1.4 Off-road Vehicles

Access provided by construction of a road along the Izembek Isthmus would result in increased off-road use of Izembek Refuge, including through increased incursions by off-road vehicular traffic (as seen elsewhere along the regional road network; see 4.1.3 and Figure 13). Off-road vehicle traffic, including snowmachines (i.e., snowmobiles) and ATVs, is expected to originate from both Cold Bay and King Cove; and off-road incursions onto the tundra would occur between the road embankment and Izembek Lagoon. Although Cold Bay residents have a limited road network by which they can access a small portion of the Izembek Isthmus and Izembek Lagoon via overland travel, King Cove residents do not currently have an easy way to access Izembek Lagoon. Some increased use of the isthmus between the road and the Kinzarof Lagoon coastline is possible, although Kinzarof Lagoon is currently accessible from the road network originating from both Cold Bay and King Cove.

Based on established patterns of off-road use along the existing road network, including unsanctioned motorized travel into the refuge, we project a sevenfold increase (or 714 percent increase) in off-road vehicular trails consequent to construction of the proposed road (see section 5.3.1) and anticipate a proportionate increase in off-road traffic. Since ATV travel is allowable along the shoreline of Izembek Lagoon by State-issued, individual special use permits, and since some unpermitted use is expected as suggested by existing use patterns combined with low levels of law enforcement in this region (M. Fosado, USFWS, pers. comm. 2024), we assume ATV traffic would occur along the shoreline of the lagoon in proximity to areas used by Steller's eiders. At Izembek Lagoon, Pacific brant first alerted to land-based hunters at distances of 0.93 mile (1.5 kilometers; Ward et al. 1994). Therefore, we assume off-road, motorized travel will occur close enough to flocks of flighted and flightless birds to cause disturbance effects to Steller's eiders.

In the absence of better data, we assume snowmachine and ATV traffic have similar noise levels as motorcycles, which measure 90 dBA at 25 feet (USFWS 2013*a*). At a distance of 0.62 mile (1 kilometer), motorcycle engine noise measures approximately 20 decibels and can be distinguished from background levels in most natural environments (Goldfarb 2023). Therefore, although we lack information needed to predict the exact noise levels that would reach either lagoon from off-road vehicle use, we assume engine noise from use of snowmachines and ATVs on the isthmus within 0.62 mile (1 kilometer) of the shoreline would exceed ambient noise levels at both Kinzarof and Izembek Lagoons and would be detected by waterfowl near the shoreline; noise generated at closer distances to the shoreline would penetrate the lagoon environment. Not all eiders would be disturbed by 100 percent of off-road travel via ATV or snowmachine use along shorelines. However, during seasons eiders are present in the Izembek Complex, we expect any eiders in nearshore areas would be disturbed by any snowmachine or ATV trip within 0.93 mile (1.5 kilometers) of shoreline and that any trip along the shoreline would disturb eiders at distances of up to 0.93 mile (1.5 kilometers) offshore. We assume off-road routes would be expected to connect between the road embankment and the shoreline of both Izembek and Kinzarof Lagoons; travelers would then have access to travel along the shorelines when engaged in activities accessing Izembek Lagoon or when seeking a direct route that is most conveniently accessed along the shoreline (see Figure 16 and Figure 23).

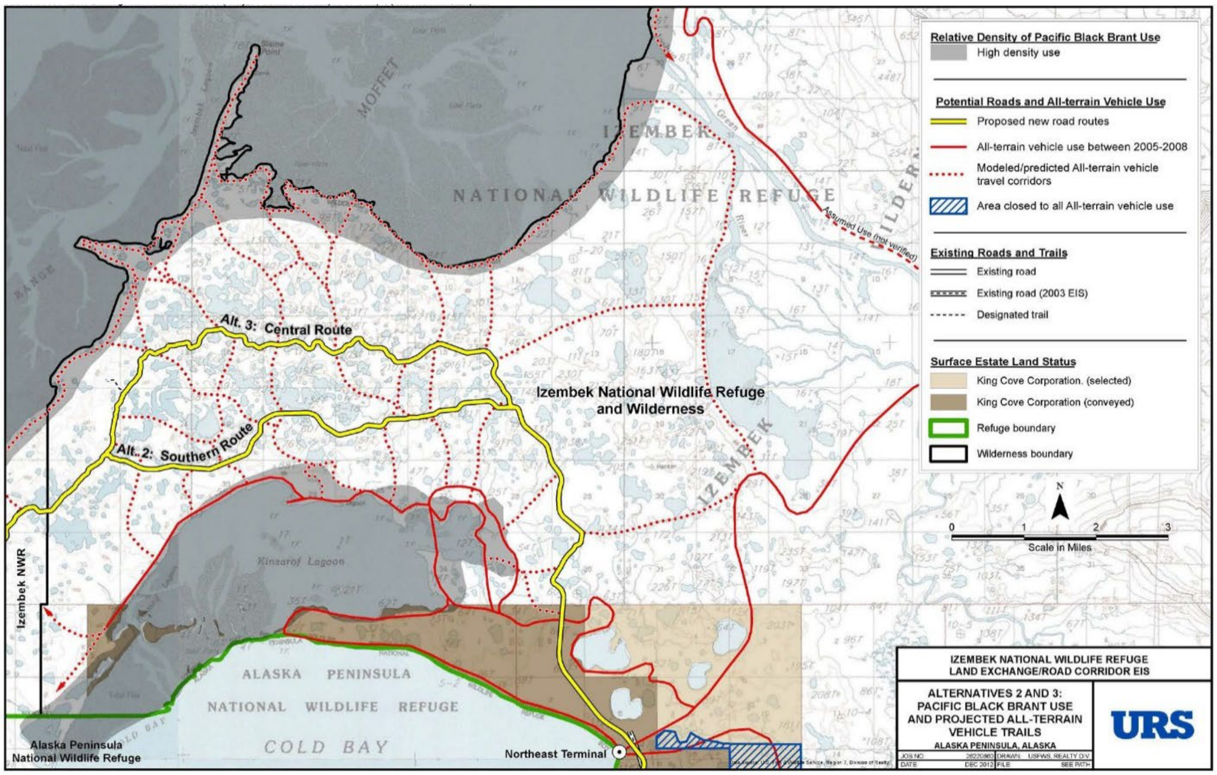

Figure 23. Modeled predictions of ATV use along the Izembek Peninsula and in Izembek Refuge, consequent to construction of two routes under consideration in 2012. The "Alt 2. Southern Route" closely matches the route proposed in the current action under consideration. Figure from USFWS 2013*a*.

We expect Steller's eiders would exhibit similar behavioral responses in the presence of snowmachines and ATVs as they do vessels (see 5.2.1.2). These responses would include increased vigilance and fleeing through swimming, diving, and (outside of molt) flying away from the area. At Izembek Lagoon, we predict responses of Steller's eiders to snowmachines and ATVs would average approximately 3.4 minutes per event; prolonged or repeated disturbance (i.e., chronic disturbance) would cause birds to flush from the area for longer and longer periods (as in common eiders; Merkel et al. 2009), and birds may not return until disturbance ceases.

We cannot quantify the current baseline level of off-road vehicle trips that occur during seasons in which eiders aggregate in the lagoon. Based on existing patterns of ATV incursions into Izembek Refuge following construction of the King Cove extension to the northeast terminal (see section 4.1.7), we assume use would be 7.1 times greater than current levels. The study of Pacific brant responses to disturbance during the 1980s did not characterize disturbance by off-road, overland vehicle traffic. Therefore, we are unable to estimate a current rate of disturbance to Steller's eiders or predict the future rate. We anticipate that all Steller's eiders using Izembek Lagoon would experience an increase in disturbance above the current baseline through increased off-road vehicle use. We lack the observational data needed to estimate how the time budget of an individual Steller's eiders would change in response to disruptions by snowmachines and ATVs.

We expect increased snowmachine and ATV use is reasonably certain to occur and would be of sufficient frequency during sensitive periods – particularly during molt – that this source of disturbance would cause adverse effects to individuals through disruptions to normal behaviors. We estimate a sevenfold increase in ATV use. Where motorized travel occurs close enough to the marine environment, Steller's eiders would be affected. We anticipate disturbance rates would be less than those assumed for waterfowl hunting. The increased disturbance and resulting effects of off-road vehicle use are expected to persist for the foreseeable future (as long as the gravel road remains passable by off-road vehicles, expected to be 50 years).

5.2.2 Harvest of Steller's Eiders

An estimated 15 to 59 percent of Alaska-breeding Steller's eiders use Izembek Lagoon during the fall, and 44 to nearly 100 percent of Alaska-breeding Steller's eiders use Izembek Lagoon during the spring (see sections 4.2.1 through 4.2.3). Therefore, hunting of waterfowl in the action area (including current baseline and the expected increase in hunting activity as a consequence of the proposed action) would spatiotemporally overlap 15 to nearly 100 percent of Alaska-breeding Steller's eiders. Although hunting of Steller's eiders is not legal, the presence of Steller's eiders in areas used by hunters, especially waterfowl hunters, during fall through spring exposes birds to potential inadvertent or intentional harvest. Female Steller's eiders are particularly difficult to distinguish from other duck species that are commonly hunted, such as long-tailed ducks (*Clangula hyemalis*), black scoters (*Melanitta americana*), and harlequin ducks (*Histrionicus histrionicus*). When mortality of a Steller's eider occurs within areas where the Alaska-breeding and Pacific Russia-breeding populations mix, such as Izembek Lagoon, we recognize any individual Steller's eider could belong to the Alaska-breeding population.

While shooting of waterfowl (and thus potentially eiders) is unlikely to take place from the road (because of the distance of the road to most waterfowl habitats and because it is illegal to shoot from drivable surfaces of any road in Alaska), a road constructed along the isthmus would facilitate easier overland access (on foot or via ATV) to the shoreline of Izembek Lagoon; and this increased access is reasonably certain to increase shoreline-based hunting pressure on waterfowl. We expect the increased number of hunters accessing the Izembek Lagoon shoreline would include resident hunters participating in subsistence or sport hunting and non-resident sport hunters and would originate from both Cold Bay (a combination of sport hunters and subsistence users) and King Cove (subsistence users). King Cove residents do not currently have an easy way to access Izembek Lagoon for vessel-based activities, and we expect a road along the isthmus would also facilitate access from King Cove to boat launches along the existing Cold Bay road network, leading to an increase in vessel-based subsistence hunting in Izembek Lagoon.

Mortality of Alaska-breeding Steller's eiders does occur during subsistence and sport hunting; during waterfowl hunting, we assume the likelihood of harvesting Steller's eiders is the same for any individual sport hunter as for any individual subsistence hunter. Based on the study by Naves and Schamber 2024, we estimate 86 Alaska-breeding Steller's eiders are harvested annually during subsistence hunting throughout Alaska (on average, accounting for wound loss; see section 3.1.4.4). We estimate 3 of these are harvested in the non-breeding areas (also see section 3.1.4.4). These numbers are based on voluntary reporting by subsistence users, and some additional but unknown level of take occurs, including by sport hunters at Izembek Lagoon (see sections 3.1.4.4 and 4.2.4). We expect vulnerability of Alaska-breeding Steller's eiders to hunting mortality will increase with increased waterfowl hunting activities in areas where they aggregate.

We estimate the harvest of Steller's eiders that currently occurs at Izembek Lagoon based on the proportion of overall harvest reported by Naves and Schamber for each subsistence management region during 2004 to 2015 (see section 3.1.4.4). Because 9 percent of overall subsistence harvest reports were from the Bristol Bay management region, we assume if 2 to 3 Alaska-breeding Steller's eiders are harvested per year in the non-breeding areas (see section 3.1.4.4), a minimum of 1 Alaska-breeding Steller's eider is harvested every 3.7 to 5.5 years in the Bristol Bay management region (at a rate of 0.18 to 0.27 per year [2 x 0.09 = 0.18; 3 x 0.09 = 0.27; this amounts to less than 1 eider per year, so we divide to predict rate of harvesting 1 eider]).

Harvest data are not available at the community scale, and not all communities within a given management region participated in the surveys informing this study; furthermore, all reporting within participating communities was voluntary. Therefore, we assume the estimates derived from this study represent a minimum harvest level (Naves and Schamber 2024). Although the surveys did not characterize where harvest occurred, we assume harvest of Steller's eiders is most likely to occur near areas with high numbers of eiders (e.g., for the Bristol Bay management region, within or near the Seal Islands, Nelson Lagoon, and Izembek Lagoon critical habitat units). We assume hunting activities within these areas would be proportionate to the human population in communities with access to these areas. The communities with eligible subsistence users that have access to these three critical habitat units are Port Heiden, Nelson Lagoon, and Cold Bay. Therefore, as a consequence of the proposed action, we assume increased harvest of Alaska-breeding Steller's eiders would occur and would be proportionate to the change in number of subsistence hunters that would have access to Izembek Lagoon following road construction. The current population of King Cove (866 residents) is roughly 3.6 times the combined average populations of Port Heiden, Nelson Lagoon, and Cold Bay during 2004 to 2015 (the period assessed by Naves and Schamber 2024; community population estimates based on U.S. Census data during 2004 to 2015). We therefore estimate new access to Izembek Lagoon for a community the size of King Cove would result in 1 additional Alaska-breeding Steller's eider harvested per every 1 to 1.5 years (3.6 x 0.18 = 0.648; 3.6 x 0.27 = 0.972; this amounts to less than 1 eider per year, so we divide to predict rate of harvesting 1 eider). Although we recognize there are differences between the communities that would influence harvest (e.g., including differences in propensity to harvest waterfowl), these derived numbers are the best available data to characterize the expected increase in subsistence harvest that would occur with increased access.

There is demonstrated interest in waterfowl hunting in Izembek Lagoon by sport hunters that do not reside locally, and our best measurements of this are the number of hunters participating in commercially guided hunts. The number of sport hunters participating in guided waterfowl hunts increased gradually from 23 to 94 during 2009 to 2020, then spiked to 167 hunters in 2021. Accessibility of Izembek Lagoon for non-resident hunters is currently a limiting factor, and the spike occurred when one of the three commercial guides operating out of Cold Bay increased their services (e.g., boats and ATVs available to transport clients) and an additional fourth commercial guide began operations. We use the proportional change from 2020 to 2021, a reflection of reduced logistical constraints (i.e., increased access for hunters), as a proxy for the increased access that would be afforded by the road. We assume construction of the road would lead to a similar increase of sport hunters in this area (167/94 = 1.78; 167 x 1.78 = 297), for 130 additional sport hunters per year hunting waterfowl in Izembek Lagoon (297 – 167 = 130). This increase in sport hunters is 0.97 times the combined populations of Nelson Lagoon, Port Heiden, and Cold Bay. Applying the same logic as for increased subsistence hunting access, we estimate this increase in non-resident sport hunters accessing Izembek Lagoon would result in 1 additional Alaska-breeding Steller's eider harvested every 3.8 to 5.7 years (0.97 x 0.18 = 0.175; 0.97 x 0.27 = 0.2621; this amounts to less than 1 listed eider per year, so we divide to predict rate of harvesting 1 eider). We recognize not all residents of local communities participate in subsistence hunting of waterfowl, whereas this is a focus of sport hunters visiting Izembek Lagoon. However, whereas subsistence hunting can take place during the spring and fall (equating to approximately 9 months, depending on target species), sport hunting is only allowed during fall (for up to 4 months, again depending on species; see section 4.1.4). Therefore, sport hunters are assumed to have 44 percent fewer hunting opportunities than subsistence hunters. Despite the difference in proportion of each group that would participate in hunting and recognizing hunting patterns and total time dedicated to hunting may differ between sport and subsistence hunters, this serves as our best available proxy.

It is reasonably certain construction of a road along the Izembek Isthmus would increase waterfowl hunting pressure in areas used by large numbers of Steller's eiders, increasing mortality risk to Alaska-breeding Steller's eiders from shooting, and resulting in adverse effects through shooting mortality of a small number of Steller's eiders; we estimate increases in subsistence harvest will result 1 bird killed every 1 to 1.5 years and increases in sport hunting will result in 1 bird killed every 3.8 to 5.7 years, above baseline levels consequent to road construction. Combining these totals results in an estimate 1 additional bird killed per year (an annual average of 0.83 eiders via subsistence and 0.22 eiders via sport hunting). Any resulting mortality would be additive to harvest levels the population already experiences. We currently estimate ongoing harvest of 86 Alaska-breeding Steller's eiders annually (see section 3.1.4.4). An increase of 1 additional individual per year is a relatively small increase over baseline conditions. Furthermore, one individual is a relatively small proportion of the population of Alaska-breeding Steller's eiders, currently estimated to be 406 birds. Therefore, we do not expect any population level impacts from this change in harvest rates.

5.2.3 Vessel Strike and Collision Risk

Bird species, including eiders and other sea ducks, are attracted to vessels and may circle or even ground on the vessels, primarily due to the effects of light attraction and disorientation (Merkel and Johansen 2011, Ronconi et al. 2015). Steller's eiders have a high collision risk because of their tendency to fly low and fast over the water (Day et al. 2004). Vessels operating in Steller's eider habitats also run the risk of striking eiders with the boat propeller or hull and causing injury or death. Vessel speed influences the likelihood of striking marine wildlife (Silber et al. 2021). Collisions with vessels and vessel strike can result in injury or death to Steller's eiders and potentially to large numbers at once.

Vessel traffic in Cold Bay would increase only slightly for dedicated barge transport of construction equipment and materials during the May through November construction window. Barges, pulled by tugboats, would be used to deliver equipment and materials to the project site via landing sites at the Northeast Terminal and Cross Wind Cove in Cold Bay. Barging activities occurring in summer months would temporally overlap relatively few if any Steller's eiders. Barging activities during the fall months would overlap the time of year Steller's eiders are present in the Izembek Complex, undertaking wing feather molt. Most individuals use Izembek Lagoon during this time, but some number of individuals also molt in Kinzarof Lagoon and could be present in Cold Bay. The slow speed at which barges typically operate (less than 10 knots) reduces the likelihood of strike. KCC and ADOT&PF have proposed to adopt a number of avoidance and minimization measures as part of any future road application. Additional measures may be implemented by responsible parties during road construction and maintenance to further reduce the risk of vessel collisions or strike, but we currently lack sufficient information to determine any resulting change in effects and do not rely on such measures in this effects analysis.

Increased vessel traffic is also expected in Izembek Lagoon following construction of the road. We expect the increased use would primarily be from small vessels associated with subsistence activities. The expected small size of these vessels reduces the likelihood they would be lighted, thereby reducing the likelihood of Steller's eiders flying into the vessels through attraction and disorientation. However, an increase in small vessel activity in Izembek Lagoon would increase spatial overlap between vessels and large numbers of Steller's eiders, which would increase the risk of vessel strikes. These small vessels operate at higher speeds, which also adds to risk. As for vessel-based disturbance, the amount of increased collision risk to Steller's eiders resulting from increased vessel use of Izembek Lagoon would depend on the number of additional vessels using the area; the specific activities occurring and their duration, frequency, and intensity; accessibility of eiders and their habitats during these activities; time of year; vessel speed; and other factors that are difficult to predict and assess. In the absence of better data, we use the estimated increase in vessels for subsistence purposes as a proxy for increase in strike. Therefore, we estimate between a twofold and fourfold increase in the risk of vessel strike to Steller's eiders (see section 5.2.1.3 for discussion on the anticipated change in vessel activity in Izembek Lagoon).

The best estimate we have for the current rate of collisions and strike of Alaska-breeding Steller's eiders with marine vessels in and near the action area (i.e., on the southern end of the Alaska Peninsula) is estimated as 0.01 to 0.04 birds per year. Best available data supports this rate as representing a typical year and not a year with unusual mortality events (e.g., this rate excludes the 150 eiders killed during a single night in 1980 near False Pass). We assume birds killed on the southern end of the Alaska Peninsula would belong to the local population concentrating in Izembek Lagoon and further assume this collision rate and associated risk of injury or mortality to any individual bird in the local population would be even across the southern Alaska Peninsula (and actually may be higher in Izembek Lagoon, where there are relatively higher numbers of Steller's eiders). We do not have data on rates of collision in Izembek Lagoon specifically; nor do we have a measurement of vessel traffic rates in Izembek Lagoon or the southern Alaska Peninsula region overall (including for periods with reported collisions). We predict one additional eider will suffer injury or death caused by vessel collision every 6.25 to 50 years, based on the range we anticipate for an increase in vessel activity (Table 7). We acknowledge not all risk would lead to strike. However, this estimate captures only the potential increase in vessel activity related to subsistence hunting and does not include vessels used for other activities. We do not expect increased risk in strike for Steller's eiders in Kinzarof Lagoon or Cold Bay, since these areas are already accessible to King Cove residents by boat.

Therefore, it is reasonably certain construction of a road along the Izembek Isthmus would increase vessel use in areas used by large numbers of Steller's eiders, increasing injury and mortality risk to Alaska-breeding Steller's eiders through vessel strike. The effects to Alaska-breeding Steller's eiders of increased mortality resulting from vessel collisions in Izembek Lagoon would persist for the foreseeable future.

Table 7. Estimated change in vessel strikes of Steller's eiders under two scenarios for increase in vessel activity in Izembek Lagoon: a twofold increase and a fourfold increase.

	Low End		High End	
	Birds per Year	Years per Bird	Birds per Year	Years per Bird
Current Estimate	0.01	100	0.04	25
Twofold increase (x2)	0.02	50	0.08	12.5
Fourfold increase (x4)	0.04	25	0.16	6.25

5.2.4 Habitat Loss and Degradation

Construction of the road embankment would result in the loss of approximately 161 acres (65.2 hectares) of undisturbed fish and wildlife habitat along the Izembek Isthmus, plus 22 acres (8.9 hectares) of lands with some level of existing anthropogenic disturbance (e.g., related to trails; USFWS 2025*a*). The road would also cross multiple streams and wetlands, with plans for installation of 71 drainage structures (USFWS 2024*a*, 2025*a*). Some disruption to surface and subsurface flows are expected. Disruption of surface water flow in uplands would impact both surface and subsurface flows, with the latter being an equally important component of wetland hydrology because groundwater may be the primary source of water in a lowland wetland. Water for construction and future maintenance would be derived from local sources and would have additional effects. Construction of roadways in pristine (i.e., undisturbed) landscapes causes an abrupt step-change in ecosystems by providing a conduit for people, plants, animals, pathogens, contaminants, and off-road access (Povoroznyuk et al. 2022). Roads change the physical conditions on and adjacent to the road embankment, and these changes have consequences that persist beyond the period of construction (Trombulak and Frissell 2000). A review of 58 publications that assessed the spatial influence of road impacts (including changes in animal abundance, density and population size; modification in animal behavior; reductions of species richness and diversity, changes of landscape patterns, facilitation of resource extraction and hunting; noise increase) found that 100 percent of these impacts were observed within 0.6 mile (1 kilometer) of the road and 39 percent were observed within 1.2 miles (2 kilometers) of the road (Ibisch et al. 2016). Portions of the proposed road would fall within this distance of areas used by Steller's eiders, with the road ranging from 0.5 to 1 mile (0.8 to 1.6 kilometers) from Kinzarof Lagoon and 0.7 mile (1.1 kilometers) from Izembek Lagoon at the closest point. However, the spatial extent of road impacts varies by road type, traffic volume, surrounding habitat, landscape, terrain features, seasons, weather conditions, and time (Ibisch et al. 2016). While impacts are consistently observed within 0.6 mile (1 kilometer), they are not limited to this distance. The downstream effects of the proposed road to wetland habitats along the Izembek Isthmus may extend beyond this distance, given local hydrology and the interconnectedness of habitats (including the lagoon systems) in the action area.

A new road bisects the landscape, which in turn leads to a bisected distribution of snow and water flow patterns, modifying the hydrology by changing the connectivity between lands, wetlands, rivers, and lakes (Povoroznyuk et al. 2022) and disrupting surface-water flow (Trombulak and Frissell 2000). Linear infrastructure such as roads has additional hydrological effects including channeling, impeding and intercepting flows, interruption of ephemeral stream flow, and increasing ponding and erosion (Povoroznyuk et al. 2022). Roads further disrupt the natural environment through impacts to soil density, temperature, soil water content, light, dust, and patterns of run-off and sedimentation (Trombulak and Frissell 2000).

Direct effects on hydrologic resources and processes expected during construction of the proposed road include stream crossings and infill of wetlands along the corridor and exposure of water resources to localized, temporary sediment discharges from disturbance during excavation and construction activities. Indirect effects during construction would include increased sediment load from stream shoreline disturbance and discharge of excavated material during construction of drainage structures, both affecting water quality. Increased sediment loads would continue to move through the system once hydrologic process are reestablished within each stream (i.e., after construction is complete). Effects from road use and maintenance include increased sediment load from road runoff, pollution from vehicles, and increased ATV use into adjacent areas. Off-road vehicle use through the Izembek Refuge would further impact wetland function in this area (USFWS 2025*a*). Specific effects of sedimentation and turbidity are discussed below, in section 5.2.3.1.

In summary, road construction and use would result in permanent ecological change resulting from direct and indirect effects to habitats along the isthmus, which would have cascading effects to adjacent marine areas. Previous conclusions by the Service support that a high level of permanent ecological degradation to habitat would occur from the construction of a road through Izembek Refuge (DOI/USFWS 2013*b*). The lagoons on either side of the isthmus are hydrologically connected through surface and subsurface flow (see sections 1.3 and 4.1.1), and changes to water quantity and quality flowing into these lagoons would lead to impacts to habitats and resources used by Steller's eiders. However, without more specifics about the road construction and a more quantitative understanding of geomorphology and hydrology on the isthmus, we cannot be reasonably certain effects to Steller's eiders through habitat degradation from road construction would cause injury.

5.2.4.1 Turbidity and Sedimentation

Road construction and maintenance, materials excavation, and increased off-road vehicle use (and resulting impacts to the landscape) would contribute to surface runoff and increase sediment loading and turbidity in the surrounding freshwater and marine environments. Road construction commonly also constrains distributary channels that would otherwise migrate through time, which can lead to channel incisions, diminished habitats, and changes in the plant communities (van Proosdij et al. 2009, Limpinsel et al. 2023). Off-road traffic, such as ATVs, would establish routes away from the roadway into adjacent areas of Izembek Refuge, resulting in pioneering trails and damage to habitats along the isthmus (see Figure 24). These routes would cause soil compaction and erosion and increase sedimentation into nearby waterbodies. We estimated the increase in off-road vehicle trails if a new 18.9-mile (30.4-kilometer) road were constructed between King Cove and Cold Bay, based on existing patterns of ATV incursions into Izembek Refuge following construction of the King Cove extension to the northeast terminal (see section 4.1.7). We expect a sevenfold increase, as calculated from the observed increase in unsanctioned, off-road vehicular trails of 123.5 miles (198.7 kilometers; see Figure 16), following construction of the 17.2-mile (27.7-kilometer) King Cove extension (USFWS/Williams 2023). The King Cove extension would connect with the proposed new road. Using the King Cove extension and its associated network of unsanctioned trails as a surrogate, we estimate 7.18 miles (11 kilometers) of new, unsanctioned off-road vehicular trails would be expected per new mile (1.6 kilometers) of proposed road. Because 5.6 miles of the new road would be built on existing trails and roads, we do not expect that portion to experience a significant change in off-road vehicle use. We therefore anticipate approximately 95.5 miles (153.7 kilometers) of new off-road vehicular trails will impact the Izembek Isthmus with construction of 13.3 miles (21.4 kilometers) of road in areas without current roads or trails, assuming similar patterns of access, terrain, and enforcement.

Sedimentation and related effects would be highest during construction and would continue during road maintenance and use and after the road is no longer in service, due to continued ATV use for as long as a gravel structure remained to support such use. There are multiple ways for sediment to mobilize into waterbodies, including through channel erosion and by dust generated from development activities or use of the roadway. Sediment inputs from development activities can impact water quality and reduce the abundance, taxonomic richness, and diversity of aquatic communities.

Fugitive dust from road construction and routine vehicle traffic along roadways is a common source of sediment deposition to the surrounding environment, affecting nearby vegetation and adjacent water sources. Dust reduces vegetation productivity, alters species composition in wetlands, and may eventually flow into nearby waterways. Fugitive dust associated with road construction and use would be expected to spread well beyond the road corridor; the distance is difficult to predict because it depends on factors that include local weather patterns and traffic speeds.

Figure 24. Where road access has made portions of Izembek Refuge accessible, unsanctioned off-road trails and trail scars crisscross the landscape at high density, affecting soils, hydrology, and water quality in the impacted area. Photo credit: Gerrit Vyn.

Freshwater and marine wetlands slow runoff, moderate stream flows, and provide important wildlife habitats, such as nesting and escape cover. For example, eelgrass beds not only provide an abundant macroinvertebrate community, but also provides sheltered (i.e., low wave energy) locations where large flocks of Steller's eider and other waterfowl congregate to rest and find protection from predators in large numbers. These wetland functions are reduced by roads and the associated use of ATVs. We expect riparian areas and wetlands connected with streams that are paralleled or crossed by ATVs would experience a loss of vegetation, bank erosion, a reduction in water quality, and increased transport of sediment to coastal wetlands and eelgrass beds in the action area. Shrub vegetation, coupled with a harsh climate and slow rates of recovery for soils and vegetation, predispose the action area to erosion (USFWS 2013*a*); this, combined with impacts from the road and ATV use would result in immediate and severe degradation of wetland habitats. Degradation would persist as long as overland ATV use and scars from this ATV use continue.

Seagrasses are important primary producers in nearshore environments (Ramus 1992, Waycott et al. 2009, Barbier et al. 2011, Murphy et al. 2021) that can be impacted indirectly when sediment is delivered by streams and rivers into the marine environment. Eelgrass is critical to the ecological community present in Izembek Lagoon and nearshore areas of Kinzarof Lagoon and Cold Bay; it provides food, habitat, and key ecological services (Murphy et al. 2000, Orth et al.

2006, Tippery 2013, Limpinsel et al. 2023). Steller's eiders depend on the eelgrass beds of the Izembek Complex as a source of abundant, high-quality prey (see section 5.3).

Eelgrass is the dominant seagrass in Alaska (Limpinsel et al. 2023). However, eelgrass communities like those found in Izembek Lagoon have been on the decline (Keser et al. 2003, Pihl et al. 2006), largely as a result of development activities (Orth et al. 2006, Boudouresque et al. 2009). Die-offs in affected seagrass areas are known to occur when development activities increase sedimentation and cause a subsequent increase in phytoplankton blooms (Hauxwell et al. 2003, Lotze et al. 2006). Additionally, increases in turbidity can deprive seagrass communities of available light, inhibiting leaf growth and increasing seagrass mortality (Moore et al. 1997, Longstaff and Dennison 1999, Terrados et al. 1999, Zabarte-Maeztu et al. 2020, Picard et al. 2022). The biodiversity and abundance within ecosystems become impaired as eelgrass is lost (Reed and Hovel 2006).

Macroinvertebrates, which serve as a bridge between trophic levels and are crucial components of aquatic ecosystems, are also impacted by sedimentation and other changes to water quality. We expect displaced sediment, resulting from road construction and maintenance and consequent overland ATV use on the Izembek Isthmus, would impact water quality, negatively affecting the benthic macroinvertebrate prey species Steller's eiders rely on. Some macroinvertebrates prefer specific substrate types and are sensitive to the accumulation of fine sediments on the bottom surface (Burdon et al. 2013, Bylak and Kukuła 2022). Suspended sediments can also affect filtration systems and other vulnerable body parts, and normal function is disrupted when individuals change behavioral responses to avoid damage and protect themselves (Jones et al. 2012). Macroinvertebrates may also detach from the substrate and drift downstream, and this behavioral response to unsuitable conditions can increase when suspended sediments are abundant (Culp et al. 1986, Doeg and Milledge 1991, Bylak and Kukuła 2022). Steller's eiders are thought to exist at the edge of their energetic range (Goudie and Ankney 1986), making them sensitive to habitat changes that affect their local food resources.

Physical and behavioral effects to macroinvertebrate prey from increased sedimentation and reduced water quality would result in shifts in the quantity, quality, and distribution of Steller's eider prey and would lead to Steller's eiders expending more energy while foraging in the Izembek Complex, including if they are forced to forage more hours or travel farther in search of prey. Prey distribution shifts in the Izembek Complex would lead to shifts in Steller's eider site use. Such shifts would be temporary in response to most construction activities; but the road itself would be a permanent feature on the landscape, and effects related to changes in local hydrology (e.g., through water impoundment or channel incision) or runoff would exist for the life of the road. Similarly, effects related to road maintenance and use (e.g., fugitive dust) and overland incursions by ATV use would be long-term. The amount and scale of effects to prey species would depend on the magnitude of sedimentation to the lagoons.

While we can be reasonably certain sedimentation and turbidity will increase in local area streams and wetlands, the rate of increase and the magnitude of sediment loading into the environment (including Izembek and Kinzarof Lagoons) are hard to predict. Downstream effects would be largest in streams where upstream disturbance is the greatest (e.g., in areas of bridge construction, culvert installation, or material site excavation). Large sediment loads in streams with high flow rates, which transport more sediment, would be deposited in the nearshore environment of the connected lagoon or bay, and would affect areas where Steller's eiders forage and seek refuge. Effects from sedimentation during construction would be minimized to a certain extent, given the road would have to meet general construction requirements, including a Stormwater Pollution Prevention Plan (SWPPP).

Preliminary design of the proposed road has identified 71 drainage structures (1 bridge over a large stream near Milepoint 2.6, 7 culverts/pipe arches or small bridges to cross small streams, and 63 cross-drainage culverts) would be required. The bridge would be built over Southeast Kinzarof Stream (Anadromous Waters Catalog #283-34-10700; ADF&G 2024). Based on a preliminary proposed route, the road would cross four other streams that are currently identified as anadromous (Anadromous Waters Catalog #s 283-34-10600, 283-34-10500, 283-34-10500-2031, 283-34-10430; ADF&G 2024). KCC agreed to use and implement the Service's "Culvert Design Guidelines for Ecological Function" for culverts in five identified anadromous streams, which will help reduce sedimentation during construction and maintain connectivity for fish passage. Retaining natural vegetation and minimizing use of riprap will also help reduce bank erosion and sedimentation in those anadromous streams. There is no current commitment to apply these measures to the other 66 stream crossings.

Sedimentation resulting from road use and increased overland ATV travel would be harder to minimize but is also difficult to quantify. However, we calculated a reasonable increase in trails related to ATV transgressions into Izembek Refuge that we might expect with additional miles of road constructed. We assume the rate of increase of trails (seven times existing levels) would approximate the increase in magnitude of erosion and sedimentation into surrounding waterbodies from ongoing ATV use.

In summary, we expect some level of increased sedimentation and turbidity is reasonably certain to occur in the action area. We estimate a sevenfold increase in sedimentation from increased ATV use alone. Where such increases in sedimentation enter the marine environment, eelgrass growth would be impaired and prey species Steller's eiders depend on would be affected. The impacts of sedimentation and turbidity resulting from the proposed road would be additive to existing stressors on eelgrass habitat and macroinvertebrate prey within the Izembek Complex (see 3.1.4.3 and 3.1.4.10). We anticipate the proposed conservation measures (i.e., the SWPPP and Culvert Design Guidelines for Ecological Function) will reduce the potential for sedimentation (only during road construction); however, given the impacts that have already been documented from increased off-road vehicle use associated with the 17.2-mile (27.7-kilometer) King Cove extension road (e.g., Figure 23; see section 4.1.7), the anticipated additional increase in off-road vehicle traffic, and the anticipated ongoing use of the proposed road, we expect adverse impacts to nearby eelgrass habitat and associated macroinvertebrate prey. Despite reasonable certainty that nearshore habitats used by Steller's eiders will be degraded, we cannot determine the magnitude of these effects in terms of a biological response by eiders.

5.2.5 Environmental Contaminants

The use of heavy equipment during construction or maintenance, increased vessel traffic during and after road construction, and increased vehicular traffic (i.e., road vehicles, ATVs, and snowmachines along the road corridor or along the isthmus in Izembek Refuge)) would increase the risk of hazardous materials release to the environment. It is reasonably certain some amount of hazardous materials release would occur, through accidental fuel and oil spills. There is a low risk the project would result in a large spill of petroleum hydrocarbons or other contaminants, but there is a high probability small spills will occur periodically. Some effects of hazardous materials release could be minimized by responsible parties during road construction and maintenance, but our effects analysis does not rely on this due to lack of an identified road applicant. Some number of small spills to the roadway or off-road environment would persist; when the source of a spill is not known (often the case with accidental spills), there may not be a responsible party to be liable for containment and cleanup or the costs associated with the containment, cleanup, and damages resulting from the spill. Best practices and spill response measures that would be incorporated into roadway construction and maintenance have not yet been identified by the action agency (the Service) or potential applicants (currently anticipated to be the Aleutians East Borough or the State of Alaska, ADOT&PF). However, we expect the road would have to meet general construction requirements from the State, including a SWPPP, which will reduce the risk of contaminants entering the marine environment through stormwater runoff.

Contaminants entering marine environments, including through post-construction stormwater runoff or snowmelt or through direct spills during off-road and on-water activities, would impair water quality, thereby adversely affecting Steller's eiders and their habitat and prey resources. Where smaller spills of petroleum and petroleum products have occurred, Steller's eider habitat quality has been impacted at a small scale (USFWS 2025*b*). Pathways of effect to individual Steller's eiders involve direct contact with contaminants in the abiotic environment (USFWS 2025*b*) or ingestion of contaminated prey items (Franson 2015). Direct exposure to petroleum hydrocarbons may affect an individual eider's ability to thermoregulate, and polyaromatic hydrocarbons may be toxic to an individual eider if ingested during preening or by consumption of contaminated prey (USFWS 2025*b*). Effects from spills and pollution to Steller's eider habitat and prey are discussed in section 3.1.4.3. In summary, there is potential for spills of hazardous materials during road construction, maintenance, and use and during off-road or on-water travel, would have detrimental impacts to Steller's eider habitat and prey species. While Steller's eiders are vulnerable to the effects of oil spills and other sources of contamination at an individual and population level (depending on variables such as size and location of the spill), we expect few listed eiders would encounter spilled contaminants as an effect of the proposed action because: 1) most spills are preventable and 2) if accidental spills occurred, they would most likely be of low volume and localized. A contaminants spill in important and/or high-use areas would be expected to encounter some number of individual Steller's eiders and would result in substantial impacts to Steller's eiders at the population level if the spill occurred during (or persisted into) times of the year high numbers of Steller's eiders are present and/or if prey resources became contaminated. Large contaminants spills are not expected to occur consequent to the proposed action. Small spills, which are considered reasonably certain, are expected to remain localized and affect, at most, only a few eiders or a small area containing prey resources. Small spills would therefore not be expected to have a population-level effect.

Increased hunting and fishing activities along the Izembek Isthmus and in Izembek Lagoon may also result in the deposition of lead shot or lead fishing sinkers into wetland and marine habitats. Lead introduced into these habitats can remain accessible to Steller's eiders for the long-term

(Franson et al. 1995, Flint and Schamber 2010). The effect of exposure to lead, including lead from shot, varies; but lethal and sublethal response can occur in Steller's eiders (Hoffman 1990, USFWS 2025*b*). While increased hunting of waterfowl or other wildlife could result in some increase in lead loading to the local area, use of lead shot for waterfowl hunting is prohibited nationwide, and in Alaska use of lead shot is prohibited for hunting of all migratory game bird species and overall appears to be declining. Lead shot does not appear to be sold in Cold Bay presently. It is unknown whether any type of ammunition is sold locally in King Cove or whether residents purchase their ammunition elsewhere (M. Fosado, USFWS, pers. comm. 2025). At this time, we have no information with which to assess the likelihood that use of lead shot occurs and would increase during hunting activities at Izembek Lagoon and along the isthmus. Lead fishing sinkers are widely used in Alaska, and their use during recreational or subsistence fishing would also contribute to lead loading in the marine environment. If exposure of Alaska-breeding eiders to lead increases through increased hunting and fishing activities, we expect there would be significant, negative effects to individual fitness and to the resiliency of the Alaska-breeding population (USFWS 2025*b*). However, effects would depend on background lead levels in the action area and the rate of increase, which are both unknown. It is not reasonably certain that the activities resulting from the proposed action would cause lead to be deposited in or near Steller's eider habitat at rates sufficient to impact listed eiders.

Roads can also lead to chemical changes to the surrounding environment, mainly through introducing heavy metals, salt, organic materials, ozone, and nutrients (Trombulak and Frissell 2000). While studies indicate contamination declines within 65.6 feet (20 meters) of the road, elevated levels of heavy metals often occur 656 feet (200 meters) or more from the road (Trombulak and Frissell 2000). It has been demonstrated that when these metals reach aquatic environment the transportation rates increase (Gjessing et al. 1984), which is relevant and concerning in a wetland system such as Izembek Refuge. Once fixed to soils, metals and other persistent chemicals can be transported to aquatic systems by wind, water, or gravity (Trombulak and Frissell 2000). Road dust is a common vector for chemical transport. In a subarctic lake system in Canada, lakes 1 kilometer from the highway were chemically distinct (higher calcium and conductivity) from lakes greater distances away (Zhu et al. 2019). The proposed road would be a single lane gravel road. We do not have data to predict the volume of traffic that will occur subsequent to road construction. However, based on the small sizes of the two communities, we expect this volume to be relatively low. Due to the limited volume of traffic combined with the distance to the aquatic environments used by Steller's eiders, we expect the risk of chemicals from the road affecting Steller's eiders to be minimal.

5.2.6 Other Sources of Mortality

We considered the potential for the action to increase effects to Steller's eiders through other sources of mortality. We dismissed the following as not reasonably certain to occur as a consequence of the proposed action: increased rate of collisions with elevated infrastructure or vehicles, increased rate of incidental fisheries bycatch, and increased effects from trash entering the marine environment (e.g., entanglement with fishing line, increased predation risk as a result of predator attraction).

Construction of a road to connect the communities of King Cove and Cold Bay could lead to other development along the road corridor, including of elevated/vertical infrastructure such as telecommunication lines, power transmission lines, and towers. Steller's eiders have been injured and killed in collisions with this type of infrastructure, including in and near the action area. Overhead transmission lines may be especially risky (USFWS 2025*b*). Overhead lines constructed in coastal environments are known to cause mortality of Steller's eiders on the Alaska Peninsula (USFWS/Russell 2004); and elsewhere, overhead lines constructed on a marine isthmus were specifically documented as high risk to Steller's eiders (Øien and Aarvak 2007). The isthmus is presently free of elevated infrastructure and artificial lighting, including lighting related to vehicle traffic. Steller's eiders shift across the isthmus between Izembek and Kinzarof Lagoons, particularly during storm events, in part because these waterbodies experience opposite prevailing winds and distinct tidal cycles. Steller's eiders wintering in Izembek Lagoon are also known to move across the isthmus to Kinzarof Lagoon and Cold Bay to maintain access to prey resources when Izembek Lagoon experiences icing conditions (USFWS/Trust et al. 1997, Laubhan and Metzner 1999). In addition, Steller's eiders may move between primary wintering sites and secondary wintering sites and have been documented moving between sites along the southeastern coast of the Alaska Peninsula and sites along the Bristol Bay coast of the Alaska Peninsula, including Izembek Lagoon (Martin et al. 2015). This transition between sites would include low-level flights across the isthmus, during periods of poor weather and reduced natural light conditions that result in reduced visibility of elevated infrastructure. Any artificial light along the isthmus – including lighted infrastructure and headlights associated with vehicular traffic – would be a measurable change in this light-free location. Birds using the Izembek Complex are assumed not to be habituated to artificial lights. Although there is potential for additional infrastructure development to occur with improved access, we cannot be reasonably certain this development would occur as a consequence of the road; there are no current plans for vertical structures or lighting and the ADOT&PF has indicated they currently have no plans to incorporate that infrastructure into any future road project. Vehicle traffic is expected to be low volume (USFWS 2025*a*) and therefore would not be a continuous source of potential attraction. We also lack evidence Steller's eiders are (and therefore would be) attracted to vehicle headlights and at risk of striking vehicles during overland flights. Therefore, we do not anticipate a significant risk of collisions with vertical structures or vehicles using a future road.

Construction of a road could result in a re-opening of the seafood processing plant in King Cove. The seafood processing plant was closed in January 2024, but this closure was stated as temporary. Construction of a road between the facility and the Cold Bay Airport has been identified as a less expensive means of transporting fresh seafood to market than shipping product via boat (City of King Cove Resolution 94-26, 1994; Laverty 2020). The State of Alaska is a major investor in the Peter Pan Seafood plant (Bernton and Herz 2025); with a road in place, the economic viability of the facility would improve, increasing the likelihood of the plant reopening. If the seafood processing plant were to reopen, we expect it would result in increased traffic between King Cove and Cold Bay. Operation/use of the road has already been analyzed in section 5.2.1.1. There are no stated plans to reopen the seafood processing plant; therefore, we cannot be reasonably certain this will be an effect.

Construction of the road is expected to result in general increased use of the Izembek Isthmus for recreation and subsistence (berry-picking, fishing, etc.). These actions, singly or in combination, are not expected to contribute to meaningful disturbance of ESA-listed species or to increased levels of contaminants and pollution entering the nearby environment.

The ADF&G allows fishing within Izembek Lagoon, including commercial salmon seining, as well as drift gillnet salmon fishing offshore of the barrier islands (see section 4.1.6 for discussion of the current environmental baseline related to fishing activities). Subsistence fishing is also allowed within the lagoon, including set gillnet fishing. Salmon gillnet fishing has a documented high risk of entangling and drowning marine birds like Steller's eiders; however, gillnet fishing is limited to areas outside of the barrier islands. Based on data from 2023 and 2024, there are only four or five operators conducting salmon seining in Izembek Lagoon. If road access leads to increased fishing activities within Izembek Lagoon, which could include additional salmon seining, exposure of Steller's eiders to this risk would increase. We expect that improved access to Izembek Lagoon would result in some increased use by residents from King Cove. However, current facilities providing vessel access to Izembek Lagoon are limited to an unimproved public boat launch. We do not expect the construction of a road would result in a significant increase in commercial use of Izembek Lagoon, with the anticipated increase in fishing activity mainly expected to be from residential/sport fishing. We do not expect this change to result in meaningful impacts to Steller's eiders beyond the vessel-caused disturbance previously analyzed in section 5.2.3.

Increased fishing and other human activity within Izembek Lagoon and along the isthmus would also increase the potential for trash to accumulate in the local environment and enter the marine environment, including from the roadway and vessels using the lagoons and bay due to the typically windy conditions in this region. Direct effects to Steller's eiders may include ingestion and entanglement (e.g., with fishing line). Predator attraction to the local area through improper disposal of trash, including carcasses of fish and wildlife, would increase predation risk to individual Steller's eiders. In areas where Steller's eiders are attracted to prey or other resources, elevated predator communities effectively become an ecological trap (Reed and Flint 2007), with noticeable consequences at the population level. Human activity has occurred in the Izembek Complex for decades. There is no evidence that trash is currently affecting Steller's eiders in the action area. While we cannot characterize the level of trash that would enter the environment, we expect the level of trash entering the system from road use to be small because the road is a single lane at least 0.5 mile from the lagoons at the closest points and is expected to receive a relatively low volume of traffic, given the small size of the two connected communities. In the aquatic environments of the Izembek Complex, both human use and eider presence are dispersed throughout the large area; any introduced trash has a small likelihood of overlapping areas used by eiders. Therefore, although the proposed action is likely to result in increased human activity, which in turn is expected to result in an increase in trash being introduced to the environment, we have no evidence to lead us to believe that adverse effects to Steller's eiders from trash are a reasonably certain to occur effect of the action.

5.2.7 Effects on Recovery

The ESA requires a recovery plan to incorporate, to the maximum extent practicable, "objective, measurable criteria which, when met, would result in a determination, in accordance with the provisions of this section, that the species be removed from the list [of endangered and threatened wildlife]…" (16 USC1533(f)(1)(B)(ii)). The 2021 recovery plan for Alaska-breeding Steller's eider identifies criteria that, when met, indicate the point at which reclassification under the ESA should be considered. It includes abundance and population trend criteria for the

Pacific-wintering population of Steller's eiders and population threshold criteria for the Alaska-breeding Steller's eiders and Pacific-wintering Steller's eiders (i.e., a minimum number that should be present on Alaska's Arctic Coastal Plain nesting area over a 20-year period; USFWS 2021*a*). The recovery plan also requires population-level threats must not detract from the demographic criteria and identifies some of these threats: threats include but are not limited to ingestion of lead ammunition, mortality from shooting, and bird collisions with human infrastructure (USFWS 2021*a*). The recovery plan notes some threats, such as disturbance, can be affected by management actions; other threats may not be under our direct control, and the plan specifies management actions that should be taken to reduce threats (USFWS 2021*a*).

The demographic criteria for recovery of Alaska-breeding Steller's eiders require that the minimum number of Alaska-breeding Steller's eiders present in the nesting area be maintained or increased over the long-term, compared to the numbers observed over the past 30 years. The recovery plan requires the number of breeding Steller's eiders in Alaska, and our confidence in that number, should be higher if the abundance and trend of the Pacific-wintering population of Steller's eiders is unknown or if the trend is known to be decreasing. The recovery criteria for Alaska-breeding Steller's eiders were previously described in section 3.1.5. The Alaska-breeding population is estimated as a mean of 406 total individuals (95% CI = 207.67 – 750.02, over the period 2007 to 2024), and the population size and trend of the Pacific-wintering population of Steller's eiders is currently unknown (see section 3.1.3).

Direct injury and mortality of some Alaska-breeding Steller's eiders is expected, primarily resulting from activities facilitated by increased access to Izembek Lagoon, which will increase risk of exposure to known threats identified in the recovery plan (including harvest and vessel collisions; see sections 5.2.2 and 5.2.3). We expect an increase in the risk of vessel strike to Steller's eiders within Izembek Lagoon would result in up to 1 Alaska-breeding Steller's eiders removed from the population every 6.25 to 50 years over the life of the road (e.g., over 50 years; or up to 8 birds). We expect an increase in the risk of inadvertent harvest of Steller's eiders during waterfowl hunting would result in up to 1 Alaska-breeding Steller's eider per year removed from the population for the foreseeable future (e.g., over the life of the road and decades beyond). Assuming there are approximately 406 Alaska-breeding Steller's eiders, this would represent a loss of only a fraction of 1 percent (i.e., less than 1 percent) of the population per year. The recovery plan specifies management actions should increase or maintain the rate of adult survival, including by reducing shooting mortality (management action 1) and by reducing collisions with vessels (management action 4; USFWS 2021*a*). Although the action considered herein would not contribute positively toward recovery goals, we do not anticipate the annual, direct loss of Steller's eiders consequent to this action would result in a noticeable reduction in the numbers of Alaska-breeding Steller's eiders present on the Arctic Coastal Plain.

In summary, we would not anticipate measurable population impacts from the loss of 58 individual Alaska-breeding Steller's eiders (from collisions with vessels and inadvertent harvest) over the projected 50-year life of the road.

5.3 Designated Critical Habitat for Steller's Eider

The proposed land exchange would occur near an important, high-density Steller's eider concentration area that is designated as critical habitat (Unit 5: Izembek Lagoon). No critical habitat would be conveyed out of Federal ownership, and the lands that could be conveyed from KCC to the United States government and the lands relinquished by KCC are all outside critical habitat. However, the land exchange is reasonably certain to result in the construction and operation of a single-lane gravel road along the Izembek Isthmus, to connect the communities of King Cove and Cold Bay.

The Izembek Lagoon critical habitat unit was designated due to its importance for molting, wintering, and staging (see sections 3.2 and 4.3). This critical habitat unit includes all waters of Izembek Lagoon, Moffett Lagoon, Applegate Cove, and Norma Bay, and waters 0.25 mile (400 meters) offshore of the Kudiakof Islands and adjacent mainland. The PCEs identified for Izembek Lagoon include 1) marine waters up to 30 feet (9 meters) deep and the underlying substrate, 2) the associated invertebrate fauna in the water column, 3) the underlying marine benthic community, and 4) where present, eelgrass beds and associated flora and fauna.

This effects discussion evaluates effects that are reasonably certain to occur to Steller's eider critical habitat from the construction, maintenance, and use of a new road through Izembek Refuge to connect the communities of King Cove and Cold Bay. We also consider activities that would occur in Izembek Lagoon and on the Izembek Isthmus consequent to the new road.

5.3.1 Turbidity and Sedimentation

In-stream work during construction, including pile driving and culvert placement, would increase turbidity in the immediate project area and affect downstream waterbodies through connected waterways and surface water sheetflow. Construction, maintenance, and use of the road, which includes activities like excavation, would also increase sediment loading to the surrounding freshwater and marine environments. Sedimentation and turbidity are expected to be mostly temporary and localized during construction activities (especially with the implementation of a SWPPP), but any downstream effects that reach the lagoon system would result in changes in water quality and the condition (e.g., size, quality, abundance) of benthic macroinvertebrate prey by decreasing sunlight important to health of their host habitat (eelgrass) or through physical influence of particulate matter on the macroinvertebrates themselves (Longstaff and Dennison 1999, Gorgula and Connell 2004, Watanabe et al. 2016, Picard et al. 2022). If reductions in prey condition are large enough, this would lead to reduced nutritional or energetic value of prey available to Steller's eiders in at least portions of the Izembek Lagoon critical habitat unit. Sedimentation would impact a small portion of Steller's eider designated critical habitat, specifically PCEs closest to the shoreline and to areas where streams discharge into the lagoons. Therefore, we expect eelgrass beds and macroinvertebrates in areas closest to where freshwater streams discharge into Izembek Lagoon would experience some reduction in quality and/or quantity during construction of the road, but these effects to Steller's eider critical habitat PCEs would be localized and temporary.

Road use and maintenance and subsequent activities associated with increased access, such as off-road use of ATVs, would also contribute to sedimentation and turbidity following construction and would persist for the life of the road (and ATV-caused effects would presumably persist well beyond this). See section 5.2.4.1 for discussion on the effects of sediment inputs from development activities on Steller's eider prey and habitat that correspond to critical habitat PCEs (i.e., marine waters and benthic substrate in nearshore habitats, prey species in the water column and in the benthos, and eelgrass beds and their associated flora and fauna). The downstream effects of turbidity and sedimentation related to road use and associated activities would continue for the life of the road (projected to be 50 years) but are expected to be localized, impacting a small portion of Steller's eider designated critical habitat, specifically PCEs closest to the shoreline and to areas where streams discharge into the lagoons. We expect impacts would affect marine waters and eelgrass beds or macroinvertebrate prey closest to where freshwater streams meet the lagoon, and they would experience reduced quantity and/or quality where degraded instream inputs occur.

We calculated the increase in ATV-caused trails we expect would result from transgressions onto the isthmus with a substantial increase in miles of road constructed (see section 5.3.1) and considered this as a proxy for one source of increased sedimentation and turbidity. We estimated the increase in extent of off-road vehicle traffic would be sevenfold: following construction of the 17.2-mile (27.7-kilometer) King Cove extension, the Refuge documented an increase in off-road vehicular trails of 123.5 miles (198.7 kilometers). The King Cove extension would connect with the proposed new road. Using the King Cove extension and its associated network of unsanctioned trails as a surrogate, we estimate 7.2 miles [11 kilometers] of new, off-road vehicular trails would be expected per new 1 mile section [1.6 kilometers] of proposed road. We therefore anticipate approximately 135.5 miles [218 kilometers] of new off-road vehicular trails will impact the Izembek Refuge, primarily concentrated along the isthmus, with construction of 18.9 miles (30.4 kilometers) of road, assuming similar patterns of access, terrain, and enforcement. ATV use and other off-road vehicular travel have been demonstrated to cause increased erosion and sedimentation. These effects are reasonably certain to reduce the quantity and/or quality of marine invertebrates, marine benthic communities, and eelgrass habitat where degraded instream inputs occur, although we do not have the data available to determine the magnitude of these impacts.

We lack data to calculate the specific area of critical habitat that would experience increased sedimentation and turbidity and the magnitude of this effect (e.g., how much eelgrass would be lost or the area over which eelgrass blade density would decrease and by how much and the extent to which macroinvertebrate biomass would decrease). However, we expect the proportion of affected critical habitat to be small, because these effects would only occur in the portions of the nearshore environment receiving freshwater inputs. This effect would persist for the life of the road and beyond, and a decrease in quantity and quality of eelgrass habitat and macroinvertebrate prey would be expected in a localized area of this critical habitat unit, closest to areas where freshwater streams enter the lagoon.

5.3.2 Accidental Spills and other Environmental Contaminants

The use of heavy equipment during construction and the subsequent increase in vessel traffic and vehicle traffic (on and off the roadway) would increase the risk of accidental fuel and oil spills, with direct and indirect effects to Steller's eider critical habitat. Contaminants and petroleum hydrocarbons that enter the marine environment would impact prey resources, eelgrass, and other physical habitat features they contact. Oil can be toxic to invertebrates or impact them through smothering or by altering feeding rates or shell formation (USFWS 2004*b*). Invertebrates may accumulate high levels of contaminants that can be passed on to predators, such as Steller's eiders. Marine plants respond variably to oiling, but spills may lead to die-offs for some species.

Oil can prevent the germination and growth of marine plants, but most vegetation appears to recover after cleanup (USFWS 2004*b*). Response and cleanup activities can also create habitat damage, including through mechanical impacts to benthic substrates or additions of chemical treatments (e.g., dispersants). Oil can remain in the environment long after a spill event, in the subsurface sediments under gravel shorelines and in soft substrates, affecting nearshore habitats longer than pelagic or offshore habitats.
There is a low risk the project would result in a large spill of petroleum hydrocarbons or other contaminants. The risk of small spills would be low during road construction, and implementation of a SWPPP will reduce the risk of contaminants entering the environment through stormwater runoff. The risk of small spills could also be reduced during operational road use and maintenance through implementation of best management practices and policies to prevent negligence or accidents; however, there are currently no identified responsible parties to commit to these best management practices and policies and to undertake response in the event of a spill. Our effects analysis therefore does not rely on mitigation through best management practices.

There is a high probability of small spills during road use and related off-road and on-water activities. Eelgrass that is exposed to spills may experience die-offs in localized habitat patches at a small scale. Oil spills would affect any macroinvertebrates (prey species for Steller's eiders) directly encountered, through toxicity or physical effects, or indirectly through effects to the habitats and substrates on which macroinvertebrates rely. Oil can remain in the environment long after a spill event, in the subsurface sediments under gravel shorelines and in soft substrates, affecting nearshore habitats longer than pelagic or offshore habitats. Most vegetation affected by oil spills would be expected to recover after some amount of time, and most macroinvertebrate communities would subsequently also recover (although we would expect the permanent loss of some individuals). It is difficult to characterize small, accidental spills and the rates at which they would occur or to measure the likely magnitude of effect, given this effect would be patchy and would therefore depend on several unknown variables. However, the risk of small spills would persist for the foreseeable future.

5.3.3 Habitat Loss and Degradation

No direct loss of Steller's eider critical habitat is expected through placement of fill for construction of the road embankment. However, construction of the road embankment and its associated activities (e.g., pile driving for a stream crossing, material site development, use of local water sources for compaction) would indirectly alter habitat in the action area through disruption to surface and subsurface flows (see section 5.2.4 for discussion on how roads alter landscapes). Ongoing maintenance and use of the road, and activities made possible by presence of the road (e.g., increased off-road ATV use), would result in permanent ecological change along the Izembek Isthmus, causing indirect effects to the connected lagoon system and changes to eelgrass beds and prey species. These effects would be primarily related to changes in water quality through sedimentation and turbidity, and to a lesser extent through contamination caused by accidental spills and runoff. See sections 5.2.4.1 and 5.3.1 for discussion on the expected effects of turbidity and sedimentation related to road construction and use.

We lack data to calculate the specific area of critical habitat that would experience increased sedimentation and turbidity and the magnitude of this effect (e.g., how much eelgrass would be lost or the area over which eelgrass blade density would decrease and by how much and the extent to which macroinvertebrate biomass would decrease). However, we expect the proportion of affected critical habitat to be small, because these effects would only occur in the portions of the nearshore environment receiving freshwater inputs. Therefore, a decrease in quantity and quality of eelgrass habitat and macroinvertebrate prey would be expected only in a localized area of this critical habitat unit, closest to areas where freshwater streams enter the lagoon. It is not possible to measure the degree to which eelgrass and macroinvertebrate prey would be impacted by accidental spills of unknown quantity and location. Any spills that do occur are expected to be small, which minimizes the expected magnitude of any effects.

Changes are already occurring in Izembek Lagoon (see sections 3.2 and 4.3) and have resulted in impacts to PCEs: a loss of 10 square miles (25 square kilometers) of eelgrass during 2006 to 2020 (Douglas et al. 2024) and an apparent reduction in the total biomass and size of certain macroinvertebrates on which Steller's eiders rely (based on prey samples in 2019 compared to 1998; Maliguine et al. 2025). Construction, road use and maintenance, ATV-related impacts, and other activities that cause increased sediment loading or introduce contaminants to the lagoon and impact eelgrass and macroinvertebrate would be additive to existing stressors that are not currently well understood. We expect these additive effects to be limited to the nearshore portions of the Izembek complex, where freshwater inputs occur; these affected areas amount to only a small fraction of the total area of designated critical habitat.

5.4 Southwest DPS of Northern Sea Otters

Northern sea otters do not regularly use the terrestrial habitats included in the proposed land exchange. They occur in nearshore and estuarine environments adjacent to the parcels and occasionally may come ashore to rest or escape predators.

We do not expect any effects to the southwest distinct population segment of northern sea otters solely from the land exchange. However, we do expect consequences to these resources from other activities that would be reasonably certain to occur as a result of the land exchange. These other activities include construction, maintenance, and use of a new road along the Izembek Isthmus to connect the communities of King Cove and Cold Bay (see Section 1.4).

5.4.1 Disturbance

5.4.1.1 Noise Disturbance

Road construction, road maintenance, and road use would increase noise levels. In-air noise generated from construction, pile driving, blasting, or other loud activities would impact sea otters. The road from the Northeast Terminal across the Izembek isthmus would range from 0.5 to 1 mile (0.8 to 1.6 kilometers) from Kinzarof Lagoon, 0.7 mile (1.1 kilometers) from Izembek Lagoon at the closest point, and 1.7 miles (2.7 kilometers) from Moffet Lagoon at the closest point. Basic sound analysis estimated that noise from most construction equipment would be just above the background noise level at Kinzarof Lagoon at a distance of a 0.5 mile (0.8 kilometer) and would be indistinguishable from Kinzarof Lagoon background levels at about 1 mile (1.6 kilometers) away (USFWS 2025*a*). Pile driving associated with bridge construction over Southeast Kinzarof stream and blasting activities associated with material sites are expected to exceed ambient noise levels. Detonation of unexploded ordnances would also exceed ambient noise levels and likely have similar noise impacts as blasting. After construction of the road, there would be an increase in noise levels to the surrounding environment from the road throughout the year, depending on weather conditions, types and speeds of vehicles, and other factors. Increased vessel traffic in Izembek Lagoon after road construction would also increase noise levels in the action area, both in-air and in-water. Sea otters can become habituated to noise quickly (Davis et al. 1988), but their sensitivity to anthropogenic activities may be influenced by the overall level of human activity within their range. In locations that lack frequent human activity, sea otters appear to have a lower threshold for disturbance (Udevitz et al. 1995).

Exposure to high levels of sound is known to cause changes in behavior, masking of communications, temporary or permanent changes in hearing sensitivity, discomfort, and injury to sea otters. Individual sea otter reactions to high levels of sound would depend on numerous factors including its prior exposure to the activity, its need to be in the area, its physiological status, and the location, timing, frequency, intensity, and duration of the encounter. Construction activities that mask vocalizations or other important acoustic information for sea otters present in the action area would affect communication among individuals since sea otters, especially mothers and pups, use sound for communication in air (McShane et al. 1995) or affect their ability to receive information from their environment such as monitoring underwater sound to avoid predators (Davis et al. 1987, Erbe et al. 2019). Temporary disturbance of sea otters or localized displacement reactions are the most likely effects to occur from noise exposure.

Sound moves faster through water than it does in air; therefore, noise becomes less loud faster in air than if traveling in water. This means that the area of potential disturbance for in-air noise is less than that for in-water noise. Since pile-driving would occur inland, no in-water noise would be generated in the marine environment and only in-air noise would be of concern for sea otters. While we do not currently know the means, methods, materials, and equipment for pile-driving activities, the Service has estimated effects to sea otters from in-air noise generated by pile driving for another project. The Service determined the maximum distance at which there is no longer a potential for disturbance to sea otters was 72 feet (22 meters) from pile-driving (USFWS 2023*b*). Given that pile driving for the proposed bridge would occur approximately 1.3 miles (2 kilometers) northeast of Kinzarof Lagoon and over 5 miles (8 kilometers) from Izembek Lagoon, effects to sea otters from in-air noise generated by pile driving would be unlikely. However, previous estimates were based on project specifics (number of days of activity, density of sea otters in the area, sound level, pile size, and sound source) so this estimate serves only as a proxy.

Use of the road is also expected to increase noise levels in the action area. Basic sound analyses predict noise from vehicle traffic would be only slightly perceptible above background levels to northern sea otters using nearshore habitats in northern Kinzarof Lagoon and portions of Izembek Lagoon (USFWS 2025*a*). Given the low levels of projected daily traffic, noise associated with road use would be of short duration and intermittent but would occur for the life of the road. Because these traffic-caused noise impacts are expected to be of low magnitude and duration, we do not expect measurable biological effects to Alaska-breeding Steller’s eiders.

5.4.1.2 Vessel Traffic and other Human Disturbance

Vessel traffic in Cold Bay would increase slightly for dedicated barge transport of construction equipment and materials during the May through November construction window. Barges, pulled by tugboats, would be used to deliver materials to the project site via the existing hovercraft ramps at the Northeast Terminal and Cross Wind Cove. Northern sea otters within Kinzarof Lagoon or Cold Bay would be disturbed by barging activities during construction if vessels approach within distances at which sea otters typically respond. Vessels adhering to the minimum distances laid out in the conservation measures are expected to avoid disturbing sea otters. We expect northern sea otter in Izembek Lagoon to be disturbed by an increase in small vessel activity for hunting, subsistence, and recreation once a road is constructed. Sea otters would also be disturbed from other increased human activity in the area. For example, a road constructed along the isthmus would facilitate easier overland access (on foot or via ATV) to the shoreline of Izembek or Kinzarof Lagoons; we expect this increased access to increase shoreline-based hunting. Sea otters disturbed by gunshot or human presence would likely exhibit startle responses and move away from noise sources, but such behavioral responses are not expected to significantly disrupt normal behavioral patterns.

Constructing a road along the Izembek Isthmus would facilitate access for the community of King Cove to boat launches along the existing Cold Bay road network. This access is unlikely to result in a measurable increase in vessel use of Kinzarof Lagoon and Cold Bay, as these systems are already accessible to both communities. It is reasonably certain road access would result in increased vessel traffic and vessel-based activities in Izembek Lagoon, overlapping nearshore habitats used by sea otters.

We estimate vessel activity currently occurs in Izembek Lagoon at a minimum rate of 0.03 to 0.075 events per hour (see section 4.2.4.3). This rate measures the activity of small vessels used during waterfowl hunting, in areas overlapping sea otter distribution in Izembek Lagoon. In the absence of better data, we assume the increase in vessel activities in Izembek Lagoon would be proportionate to relative community size. We expect boat ownership would be proportional to number of households in each community; therefore, vessel activity in Izembek Lagoon would be expected to increase between twofold and fourfold, resulting in a minimum activity rate of 0.06 to 0.3 vessel events per hour (see section 5.2.1.2 for a discussion quantifying the anticipated increase in vessel activity in Izembek Lagoon). The amount of disturbance to sea otters resulting from increased vessel use of Izembek Lagoon, which would be afforded by the road between King Cove and Cold Bay, would depend on the specific activities occurring and their duration, frequency, and intensity; accessibility of otters and their habitats during these activities; and other factors that are difficult to predict and assess. In the absence of better data, we assume the increase in vessel activities in Izembek Lagoon would be proportionate to relative community size. Information on number of boats owned in each community (Cold Bay and King Cove) is not available, but we expect boat ownership would be proportional to number of households in each community. Based on the anticipated increase in vessel activity, we expect the projected increase in boat-based disturbance in Izembek Lagoon would be between twofold and fourfold over current baseline, consequent to construction of the road. Sea otters using Izembek Lagoon would experience an increase in vessel-based disturbance, and this disturbance effect would continue for the life of the road.

Boats operating in sea otter habitat risk disturbing sea otters. Sea otters are vulnerable to disturbance by vessel traffic, especially female otters with pups or when congregating in rafts. Reactions to vessel activity include increased alertness, increased vocalizations, vacating the area, or diving. Sea otter populations in Alaska have been observed avoiding areas with heavy vessel traffic and then returning to those areas during seasons of less traffic (Garshelis and Garshelis 1984). A sea otter's response to disturbance depends on numerous factors including, but not limited to, a sea otters previous experience with vessels, intensity and duration of the disturbance, and distance from the disturbance. Large or repeated reactions lead to amplified impacts, including induced stress, separations of sea otter pups from their mother, and energy deficits (Barrett et al. 2025).

Sea otters have a high resting metabolic rate to supplement thermoregulation and keep warm because they lack a layer of blubber (a thick layer of fat under the skin) and depend only on their fur. This combination results in high rates of heat loss and low capacity for energy storage, and thus high energetic costs to maintain body temperature. Sea otter resting metabolic rates are about three times greater than predicted for their size. This means sea otters must eat approximately 20 to 25 percent of their body weight each day (Davis et al. 1988). To meet these demands, sea otters spend up to 45 percent of their time feeding and much of the rest of their time resting to reduce energy costs (Yeates et al. 2007, Thometz et al 2014). Disturbances disrupt normal behaviors which impact a sea otters energetic balance. This can occur in one of three primary ways – causing a response in a previously resting sea otter (e.g., a resting sea otter dives), altering the behavior of an active sea otter (e.g., a foraging sea otter moves from a preferred foraging site), and secondary effects (e.g., increased foraging at a later time, multiple disturbance events, or other consequences from the initial sea otter reaction). Energetic costs of human disturbance to adult sea otters are estimated to range from 3.9 percent to 7.2 percent for one day (Barrett et al. 2025). These estimates were calculated based on southern sea otter behavior in California and depended upon numerous factors. However, these estimates indicate cumulative energy expense over time would likely be substantial for affected individuals, with health consequences especially for an already energy-stressed sea otter.

Fitness and energetic consequences of human disturbance are important at the individual level. Whether these effects translate into population level impacts is less clear and depends on the scale at which disturbance occurs and the extent of any secondary effects on animals in undisturbed areas (Gill 2007). For example, in cases where animals respond to increased human presence by redistributing to new locations, the impact on the population will depend on whether the increased densities at these new sites result in reduced individual survival or fecundity (Gill 2007).

We do not have estimates on current rates of disturbance to sea otters in Izembek or Kinzarof Lagoons. However, we expect the increase in risk of disturbance to be proportionate to the increase in human activities, including sport hunting, subsistence hunting, vessel use, and ATV use, in the lagoons or along the shorelines. Recent capacity improvements (see section 4.2.4.2) resulted in an increase in sport hunting between 2020 and 2021; however, subsequent years demonstrated a stable or slightly declining trend based on CUDs (see Figure 13, section 4.1.5). We predict construction of the road would lead to an increase of sport hunters in Izembek Refuge and Izembek Lagoon (see section 5.2.2 for further explanation). We expect the improved access afforded by the road will result in additional interest in hunting; therefore, we anticipate an increase in guiding services or unguided hunts, following a pattern similar to trend data from 2020 to 2021. Based on best available data, derived from reporting requirements of the special use permits commercial operators need before accessing to Izembek Refuge (or Izembek Lagoon through the refuge), we estimate an increase in sport hunting activity between 64 and 105 percent above current levels (see section 5.2.1.3 and Appendix A for further discussion on how these values were calculated). Such increases would contribute to increased risk of disturbance to sea otters through noise, gunshot, visual disturbance, etc.

We predict the increase in subsistence hunting at Izembek Lagoon would be proportionate to the human population of Cold Bay (the subsistence community that currently has access to Izembek Lagoon) versus the population of King Cove, which currently does not have easy boat- or land-based access to the lagoon. Based on 2016 data on subsistence use (ADF&G 2025), we projected an equivalent current level of subsistence activity (see section 5.2.1.3 and Appendix A for further discussion). We assume with the increased potential for access to Izembek Lagoon afforded by a new road, some or all subsistence users in King Cove will take advantage of this access and shift some or all of their subsistence harvest activities to Izembek Lagoon and potentially away from other areas of the Izembek Complex. Using current subsistence harvest use rates (see section 5.2.1.3 and Appendix A for further discussion), we calculated an expected increase in CUD-equivalents for subsistence use to be between 638 and 1,182 CUDs consequent to the construction of the road. Although an imperfect estimate, this increase represents our best estimate for number of additional people and their CUD-equivalent activity that would occur in Izembek Lagoon for subsistence hunting after construction of the road. We acknowledge the population of King Cove could change through time (and increase or decrease); we further acknowledge the estimated rate of subsistence harvest activity is likely to vary by individual and therefore may not be the same between the two communities. Increases in subsistence hunting would also contribute to increased disturbance to sea otters through noise, gunshot, visual disturbance, etc.

When combining all waterfowl hunting activities (i.e., both subsistence harvest and fall sport hunting), we expect an increase of between 2.3 and 3.2 times the amount of disturbance in Izembek Lagoon following construction of the road. While this is a substantial total, the majority of this increase would be focused on waterfowl and not on pursuing and harvesting sea otters. We expect most sea otters using Izembek Lagoon would experience these disturbance effects but anticipate they would be of shorter frequency, duration, and intensity compared to Steller's eiders and other waterfowl.

We estimate between a twofold and fourfold increase in the risk of disturbance to northern sea otters from increased vessel traffic (see section 5.2.1.2 for a complete discussion on our calculations for increases in vessel-based disturbance). Additionally, we expect ATV activity to increase approximately seven times above current levels in the action area (assuming increases in ATV traffic are proportional to the expected increase in new off-road vehicle trails; see section 4.1.7). Such increases in ATV traffic also increase the risk of disturbance to sea otters. Disturbance from increased ATV use in the action area include visual or noise disturbance and would also depend on proximity to nearshore habitats and conditions that affect noise levels, such as weather conditions.

These predicted increases in human activity in the action area indicate that sea otters would experience increases in disturbance from multiple sources. While not all sea otters would be disturbed by each event, it is expected that a high proportion of sea otters would experience disturbance at some point in time from increased activity. Given that waterfowl hunting occurs from shoreline-based locations and from boats on the water, and no part of Izembek Lagoon is inaccessible to hunting given current modes of access and hunting methods, sea otters in any part of the lagoon may experience disturbance. Sea otters that experience increased disturbance are expected to exhibit one of three primary responses. Sea otters may leave the area so they are no longer disturbed, stay in the area but acclimate to the disturbance, or stay in the area and experience increased stress. It is reasonably certain that any sea otters that do not acclimate or move away would experience adverse effects. Mothers, who experience reduced body condition due to pup rearing demands (Thometz et al 2014), and other energy-stressed individuals would be most likely to experience the consequences of increased stressed and energy costs due to disturbance. While we expect most sea otters to leave the area or acclimate to the increased disturbance levels, sea otters that stay but do not acclimate could experience repeated disruption of normal behaviors causing increased stress and energy deficits, leading to decreased fitness, survival probability, and reproductive success, for those individuals. Alternatively, these animals that remain in the area may be more tolerant of those human activities and they may not experience meaningful biological effects. Overall, we expect few if any sea otters will suffer reduced fitness, survival probability, and/or reproductive success.

5.4.2 Vessel Strike and Collision Risk

Boats operating in sea otter habitat run the risk of striking them with the boat propeller or hull causing injury or death. The likelihood of vessel strikes is primarily related to vessel speed (Vanderlaan and Taggart 2007) and most documented vessel strikes of sea otters involve small, fast-moving vessels (USFWS 2020). Barges typically move at slow speeds (less than 10 knots), which reduces the likelihood of sea otter strike. Additionally, project specific vessels will adhere to the Service's guidance for vessel operators (see Conservation Measures) which will reduce likelihood of strike and disturbance to sea otters in Cold Bay, and therefore we do not expect project specific vessels to strike sea otters. However, we expect the increase in small vessel activity in Izembek Lagoon after road construction would increase the likelihood for vessel traffic disturbance and strike to sea otters for the lifetime of the road.

Increased vessel traffic is expected in Izembek Lagoon following construction of the road. We expect the increased use would primarily be from small vessels associated with subsistence activities. An increase in small vessel activity in Izembek Lagoon would increase spatial overlap between vessels and large numbers of sea otters, which would increase the risk of vessel strikes. These small vessels operate at higher speeds, which also adds to risk. As for vessel-based disturbance, the amount of increased collision risk to sea otters resulting from increased vessel use of Izembek Lagoon would depend on the number of additional vessels using the area; the specific activities occurring and their duration, frequency, and intensity; accessibility of otters and their habitats during these activities; time of year; vessel speed; and other factors that are difficult to predict and assess. In the absence of better data, we use the estimated increase in vessels for subsistence purposes as a proxy for increase in strike – this is the predominant source of the expected increase in vessel use following construction of the road. Therefore, we estimate up to two to four northern sea otters would be injured or killed via vessel strike per year in Izembek Lagoon after the road is constructed (1 sea otter per year multiplied by 2 or 4; see section 5.2.1.2 for discussion on the anticipated change in vessel activity in Izembek Lagoon).

Although not all risk would lead to strike, this represents our best estimate based on available information. Additionally, this only accounts for the potential increase in vessel activity from subsistence hunters and does not include other activities. We do not calculate an expected increase for Kinzarof Lagoon since this area is already accessible to King Cove residents by boat.

5.4.3 Environmental Contaminants and Pollution

The use of heavy equipment during construction or maintenance, increased vessel traffic during and after road construction, and increased vehicular traffic along the road corridor (i.e., road vehicles, ATVs, and snowmachines) or along the previously remote coastline of Izembek Lagoon would increase the risk of accidental fuel and oil spills. Contaminants entering marine environments, including through stormwater runoff or snowmelt, would impair water quality and adversely affect sea otters and their habitat. Exposure to petroleum hydrocarbons may affect a sea otter's ability to thermoregulate (Lipscomb et al. 1994), and polyaromatic hydrocarbons may be toxic to sea otters if ingested during preening or by consumption of contaminated prey (Johnson and Garshelis 1995). Contamination of sea otter fur eliminates the air layer between the fur and skin that keeps sea otters dry and warm, since they lack a layer of blubber (a thick fat layer under the skin), and it affects the top layer of fur that wicks away water. This allows water to penetrate the skin and reduces insulation. If sea otters are unable to maintain normal body temperature, they would become hypothermic which has consequences that include death (Davis et al. 1988). Effects from spills and pollution to sea otter habitat and prey are discussed in section 5.6.2.

It is reasonably certain some amount of hazardous materials release would occur, through accidental fuel and oil spills. There is a low risk the project would result in a large spill of petroleum hydrocarbons or other contaminants, but there is a high probability small spills will occur periodically. Some of the potential effects of hazardous materials release could be minimized by responsible parties during road construction and maintenance, but no pertinent mitigation measures have been incorporated into the proposed action. Some number of small spills to the roadway or off-road environment would persist; when the source of a spill is not known (often the case with accidental spills), there may not be a responsible party to contain and/or cleanup the spill. Best practices and spill response measures that would be incorporated into roadway construction and maintenance have not yet been identified by the action agency (the Service) or potential applicants (the Aleutians East Borough or the State of Alaska, ADOT&PF). One exception is the road would have to meet general construction requirements from the State, including a SWPPP, which will reduce the risk of contaminants entering the marine environment through stormwater runoff. While sea otters are vulnerable to the effects of oil spills and other sources of contamination, we expect few sea otters would encounter spilled contaminants as an effect of the proposed action because: 1) most spills are preventable and 2) if accidental spills occurred, they would most likely be of low volume and localized. A contaminants spill in important and/or high-use areas would be expected to encounter some number of individual and result in substantial impacts to sea otters if any were present and/or if prey resources became contaminated. Large contaminants spills are not expected to occur consequent to the proposed action. Small spills, which are considered reasonably certain, would likely remain localized and affect, at most, only a few sea otters or a small area containing prey resources. Small spills would therefore not be expected to have a population-level effect.

Increased fishing and other human activity within Izembek Lagoon and along the isthmus would also increase the potential for trash to accumulate in the local environment and enter the marine environment, including from the roadway and vessels using the lagoons and bay due to the typically windy conditions in this region. Effects to sea otters may include ingestion and entanglement (e.g., fishing line). There is no evidence that trash is currently affecting sea otters in the action area. While we cannot characterize the level of trash that would enter the environment, we expect the level of trash entering the system from road use to be small because the road is a single lane at least 0.5 mile from the lagoons at the closest points and is expected to receive a relatively low volume of traffic, given the small size of the two connected communities. In the aquatic environments of the Izembek Complex, both human use and sea otter presence are dispersed throughout the large area; any introduced trash has a small likelihood of overlapping areas used by otters. Therefore, although the proposed action is likely to result in increased human activity, which in turn is expected to result in an increase in trash being introduced to the environment, we have no evidence to lead us to believe that adverse effects to northern sea otters from trash are a reasonably certain to occur effect of the action.

5.4.4 Habitat Loss and Degradation

Construction of the road embankment would result in loss of approximately 161 acres (65.2 hectares) of undisturbed fish and wildlife habitat along the Izembek Isthmus plus 22 acres (8.9 hectares) of lands with some level of existing anthropogenic disturbance (e.g., related to trails; USFWS 2025*a*); the road would also cross multiple streams and wetlands, with plans for installation of 71 drainage structures (USFWS 2024*a*, 2025*a*). Some disruption to surface and subsurface flows are expected. Water for construction and future maintenance would be derived from local sources and would have additional effects. See section 5.2.4 for a full discussion on the effects to habitat from constructing a road in a largely undisturbed landscape.

A review of 58 publications that assessed the spatial influence of road impacts (including changes in animal abundance, density and population size; modification in animal behavior; reductions of species richness and diversity, changes of landscape patterns, facilitation of resource extraction and hunting; noise increase) found that these impacts were observed 100 percent of the time within 0.6 miles (1 kilometer) of the road and were observed 39 percent pf the time within 1.2 miles (2 kilometers) of the road (Ibisch et al. 2016). Portions of the proposed road would fall within this distance of marine and lagoon habitats used by northern sea otters, with the road ranging from 0.5 to 1 mile (0.8 to 1.6 kilometers) from Kinzarof Lagoon and 0.7 mile (1.1 kilometer) from Izembek Lagoon at the closest point. However the spatial extent of road impacts varies by road type, traffic volume, surrounding habitat, landscape, terrain features, seasons, weather conditions, and time (Ibisch et al. 2016). While impacts are consistently observed within 0.6 mile (1 kilometer), they are not limited to this distance. The downstream effects of the proposed road to wetland habitats along the isthmus may extend beyond this distance, given local hydrology and the interconnectedness of habitats (including the lagoon systems) in the action area.

In summary, road construction and use would result in permanent ecological change, resulting from direct and indirect effects to habitats along the isthmus, which would have cascading effects to adjacent marine areas. Previous conclusions by the Service support that a high level of permanent ecological degradation to habitat would occur from the construction of a road through Izembek Refuge (DOI/USFWS 2013*b*). The lagoons on either side of the isthmus are hydrologically connected through surface and subsurface flow (see sections 1.3 and 4.1.1), and changes to water quantity and quality flowing into these lagoons would lead to impacts to habitats and resources used by northern sea otters

5.4.4.1 Turbidity and Sedimentation

Road construction and maintenance, materials excavation, and increased off road vehicle trail use contribute to road runoff and increase sediment loading and turbidity in the surrounding freshwater and marine environments. Road construction can also constrain distributary channels that would otherwise migrate through time, which can lead to channel incisions, diminished habitats, and changes in the plant communities (van Proosdij et al. 2009, Limpinsel et al. 2023). Off-road traffic, such as ATVs, would establish routes away from the roadway into adjacent areas of Izembek Refuge, resulting in pioneering trails and damage to habitats along the isthmus. These routes would cause soil compaction and erosion and increase sedimentation into nearby waterbodies. Sedimentation and related effects would be highest during construction and would continue during road maintenance and use. There are multiple ways for sediment to mobilize into waterbodies, including through channel erosion and by dust generated from development activities or use of the roadway. Sediment inputs from development activities can impact water quality and reduce the abundance, taxonomic richness, and diversity of aquatic communities. See section 5.2.4.1 for discussion on the effects of sediment inputs from development activities on nearshore habitats, wetlands, eelgrass, and macroinvertebrates.

Wetlands slow runoff, moderate stream flows, and provide important habitats, such as nesting and escape cover. For example, eelgrass beds and kelp not only provide an abundant macroinvertebrate community, but also provide sheltered (i.e., low wave energy) and shallow locations where northern sea otters congregate to rest and avoid large marine predators such as orcas. These wetland functions are reduced by roads and the associated use of ATVs. Riparian areas and wetlands connected with streams that are paralleled or crossed by ATVs experience a loss of vegetation, bank erosion, a reduction in water quality, and transport of sediment to coastal wetlands and eelgrass beds. Shrub vegetation, coupled with a harsh climate and slow rates of recovery for soils and vegetation, predispose the action area to erosion (DOI/USFWS 2013*a*); this, combined with impacts from the road and ATV use would result in immediate and severe degradation of wetland habitats.

Seaweeds, such as kelp, provide nursery habitat, feeding grounds, and shelter for aquatic organisms, like macroinvertebrates, and help to stabilize the water column from changes in nutrient concentrations and suspended sediments (Dayton et al. 1984, Duarte 1995, Watanabe et al. 2016). Kelp forests are also important habitat to sea otters, offering foraging, resting, and nursery habitat. Increased sedimentation impacts kelp by reducing substrate availability and light required for photosynthesis, inhibiting spore attachment and early-stage growth, and can lead to increased scour and subsequent mortality (Coelho et al. 2000, Watanabe et al. 2016, Picard et al. 2022). Sediment-tolerant turf algae can outcompete kelp where sediment deposition occurs, further changing the composition of nearshore aquatic communities (Connell et al. 2008, Moy and Christie 2012, Filbee-Dexter and Wernberg 2018, Picard et al. 2022). Changes in kelp communities due to sedimentation would reduce macroinvertebrate prey availability and suitable habitat for otters in the area. Sea otters may expend more energy in search of prey or suitable habitat. In cases where large tracts of kelp are impacted, sea otters may shift in distribution.

We expect physical and behavioral effects to macroinvertebrate prey from increased sedimentation and reduced water quality would result in shifts in distribution of sea otter prey and lead to sea otters expending more energy while foraging, including if they are forced to forage more hours or travel farther in search of prey. Prey distribution shifts are expected to be temporary in response to most construction activities; but the road itself would be a permanent feature on the landscape, and effects related to changes in local hydrology (e.g., through water impoundment or channel incision) or runoff are expected to exist for the life of the road. Similarly, effects related to road maintenance and use (e.g., fugitive dust, runoff of small spills of hazardous materials) would be long-term. The amount and scale of effects to prey species would depend on the magnitude of sedimentation and thus are difficult to predict.

Sedimentation from road use and increased human use of the area would be harder to minimize but is also difficult to quantify. However, we calculated a reasonable increase in trails/ATV transgressions we might expect onto the isthmus with additional miles of road constructed and assume that the rate of increase of trails would approximate the increase in magnitude of erosion and sedimentation into surrounding waterbodies from ATV use. We estimated the expected increase in off-road vehicle trails if a new 18.9-mile (30.4 km) road were constructed between King Cove and Cold Bay, using the sevenfold increase observed in the Williams (2023) report as a scaling reference. Using the King Cove extension and its associated network of unsanctioned trails as a surrogate, we estimate 7.18 miles (11 kilometers) of new, unsanctioned off-road vehicular trails would be expected per new mile (1.6 kilometers) of proposed road. We therefore anticipate approximately 135.5 miles (218 kilometers) of new off-road vehicular trails will impact the Izembek Isthmus with construction of 18.9 miles (30.4 kilometers) of road, assuming similar patterns of access, terrain, and enforcement.

In summary, we expect some level of increased sedimentation is reasonably certain to occur. We estimate a sevenfold increase in sedimentation from increased ATV use alone. Such increases in sedimentation would impair eelgrass and kelp growth in nearshore areas receiving affected inputs and these impairments would also affect prey species northern sea otters depend on. Similarly, we expect turbidity to increase in the action area, as well as the potential for spills of hazardous materials during road construction, maintenance, and use, resulting in detrimental impacts to northern sea otter habitat and prey species. It is also important to note that sedimentation, turbidity, and contamination impacts resulting from the proposed road would contribute to existing stressors on eelgrass and kelp habitat and macroinvertebrate prey within the Izembek Complex (see 3.1.4.3 and 3.1.4.10). We anticipate the proposed conservation measures (i.e., the SWPPP and Culvert Design Guidelines for Ecological Function) will reduce some sedimentation (only during road construction) and spills of hazardous materials; however, given the impacts that have already been documented from increased off-road vehicle use associated with the 17.2-mile (27.7-kilometer) King Cove extension road (e.g., Figure 24; see section 4.1.7) and the anticipated ongoing use of the proposed road, adverse impacts to nearby eelgrass and kelp habitat and associated macroinvertebrate prey are expected into the foreseeable future. Such impacts are expected to reduce the function and availability of some nearshore habitat to sea otters.

5.4.5 Human Interactions

Harvest of sea otters in the action area may increase as a result of road construction. King Cove residents do not currently have an easy way to access Izembek Lagoon for vessel-based activities, and we expect a road along the isthmus would also facilitate access from King Cove to boat launches along the existing Cold Bay road network, leading to an increase in vessel-based subsistence hunting in Izembek Lagoon. Therefore, as a consequence of the proposed action, we assume increased harvest of northern sea otters would occur and would be proportional to the change in number of subsistence hunters that would have access to Izembek Lagoon following road construction. In 2016, 1.1 percent of King Cove households attempted to harvest sea otters (but were unsuccessful) and in 1992, 2.7 percent households attempted and successfully harvested 8 sea otters (ADF&G 2025). Given this information, we can be reasonably certain that 2 households might attempt to harvest sea otters in Izembek in any given year and be successful due to higher numbers of sea otters in that lagoon. Based on the numbers harvested from King Cove residents in 1992 (ADF&G 2025) and between 2014 to 2024 (MTRP data), we would expect up to approximately 8 sea otters harvested from Izembek Lagoon in a year. We do not expect 8 individuals would be harvested every year since there are years with no reported harvest and the average number of sea otters harvested between 2014 and 2024 was 3. However, it is hard to predict whether subsistence hunters would hunt exclusively in Izembek Lagoon, continue to harvest around King Cove, Cold Bay, and Kinzarof Lagoon, or harvest in multiple areas. The road would also allow increased access by Alaska Native hunters to the sea otters using Kinzarof Lagoon, either by foot or via ATVs (DOI/USFWS 2013*a*), potentially increasing the number of sea otters that are harvested; however, Kinzarof Lagoon is already relatively easily accessible by boat.

While northern sea otters do not typically move across land, they have been observed moving across the Izembek isthmus (USFWS 2004*a*). The road, traffic, and associated activities would create a barrier to movement between the lagoons. The extent of impacts from the road and traffic as a behavioral barrier to sea otters and collision risk factor is not known but would occur through chronic disturbance, energetic costs, stress, and possible avoidance. While these impacts are plausible, we lack sufficient information regarding sea otter crossings of the isthmus (i.e., how often it occurs, how many individuals attempt crossing, understanding the conditions under which they may cross, etc.) to determine they would be reasonably certain.

5.4.6 Effects on Recovery

The recovery objectives and criteria for northern sea otters are discussed in Section 3.3.7; there are three main objectives identified in the sea otter recovery plan (USFWS 2013). The plan also breaks down recovery criteria by MU and states that each MU will be evaluated for delisting criteria independently. Delisting should be considered when three of the five MUs meet all the recovery criteria (but not if any MU meets the criteria for uplisting described in the recovery plan). According to the most recent 5-year review (USFWS 2021*b*), the recovery criteria have not been met.

The first recovery objective for sea otters is to "achieve and maintain a self-sustaining population of sea otters in each MU." Given its relatively low population size, the South Alaska Peninsula MU has low resiliency and may not meet this criterion long-term. However, we do not expect effects of the action to detract from this goal since we do not expect any sea otters to be removed from the South Alaska Peninsula MU as a consequence of the action. The Bristol Bay MU has a moderate population size and thus has more resiliency to withstand cumulative impacts over time. We expect an increase in human activity after the road is constructed would increase the risk of vessel strike to sea otters within Izembek Lagoon, which would result in up to four sea otters a year removed from the Bristol Bay MU due to vessel strike over the life of the road. We also expect an increase in sea otter harvest in Izembek Lagoon (up to 8 sea otters harvested a year). These effects would be unlikely to cause a noticeable reduction in listed sea otter abundance within the MU given the current MU size (9,733 sea otters) or across their range, given the current total population size (51,935 sea otters). Thus, we do not expect that this effect would preclude attainment of the first recovery objective. We do not currently have evidence to suggest that this effect combined with the baseline and cumulative effects would make this objective unachievable.

The second recovery objective is to "maintain enough sea otters to ensure that they are playing a functional role in their nearshore ecosystem." Since we expect relatively few sea otters to be removed from the population, effects of the proposed action would not preclude attainment of this objective.

The third recovery objective for sea otters is to "mitigate threats sufficiently to ensure persistence of sea otters." Effects of the action would not affect the persistence of either MU, with only a few sea otters a year expected to be permanently removed from the Bristol Bay MU. Therefore, the proposed action would not prevent achievement of this recovery objective.

In summary, we would not anticipate measurable population impacts from the loss of up to four sea otters a year (from collisions with vessels after the road is constructed) and small increases in harvest over the life of the road. Our evaluation indicates the proposed action is not expected to reduce the ability to achieve any of the three recovery objectives.

5.5 Designated Critical Habitat for Northern Sea Otters

The Kinzarof Lagoon KCC Exchange Lands occur adjacent to an important high density sea otter concentration area that is designated critical habitat (Unit 3: South Alaska Peninsula) in Kinzarof Lagoon and northern Cold Bay. Activities associated with the establishment of a road corridor would also occur in or adjacent to the designated critical habitat unit in Izembek Lagoon (Unit 4: Bristol Bay). The change in land ownership will not have any effect on what areas meet the definition of critical habitat for northern sea otters. In other words, the critical habitat designation will not change based on this transfer of land.

5.5.1 Turbidity and Sedimentation

Road construction and maintenance, materials excavation, and increased off road vehicle trail use contribute to road runoff and increase sediment loading and turbidity in the surrounding freshwater and marine environments. Road construction can also constrain distributary channels that would otherwise migrate through time, which can lead to channel incisions, diminished habitats, and changes in the plant communities (van Proosdij et al. 2009, Limpinsel et al. 2023). Off-road traffic, such as ATVs, would establish routes away from the roadway into adjacent areas of Izembek Refuge, resulting in pioneering trails and damage to habitats along the isthmus.

These routes would cause soil compaction and erosion and increase sedimentation into nearby waterbodies. Sedimentation and related effects would be highest during construction and would continue during road maintenance and use. There are multiple ways for sediment to mobilize into waterbodies, including through channel erosion and by dust generated from development activities or use of the roadway. Sediment inputs from development activities can impact water quality and reduce the abundance, taxonomic richness, and diversity of aquatic communities. See section 5.2.4.1 for discussion on the effects of sediment inputs from development activities on nearshore habitats, wetlands, eelgrass, and macroinvertebrates.

Turbidity and sedimentation are expected to be mostly temporary and localized during construction activities (especially with the implementation of a SWPPP), but they would cause displacement of benthic macroinvertebrate prey species and/or result in changes to the condition (e.g., size, quality, abundance) of prey and impact kelp communities in the immediate area by decreasing sunlight or through physical influence of particulate matter (Longstaff and Dennison 1999, Gorgula and Connell 2004, Watanabe et al. 2016, Picard et al. 2022). If reductions in prey condition are large enough, this would lead to reduced nutritional or energetic value to northern sea otters.

Road use and maintenance and activities associated with increased access, such as off-road use of ATVs, would also contribute to sedimentation and turbidity after construction and presumably for the life of the road. We estimate a sevenfold increase in sedimentation from increased ATV use alone. Such increases in sedimentation are reasonably certain to reduce the quantity and/or quality of marine invertebrates, marine benthic communities, and kelp and eelgrass habitat where degraded instream inputs occur. The downstream effects of turbidity and sedimentation related to road use and associated activities are expected to impact a small portion of sea otter designated critical habitat. However, these areas of critical habitat in Izembek and Kinzarof Lagoons and upper Cold Bay are especially important due to high productivity and high density of PCEs. Impacts resulting from the proposed road would contribute to existing stressors on eelgrass and kelp habitat and macroinvertebrate prey within the Izembek Complex (see 3.1.4.3 and 3.1.4.10). We anticipate that the proposed conservation measures (i.e., the SWPPP and Culvert Design Guidelines for Ecological Function) will reduce the potential for sedimentation (only during road construction) and spills of hazardous materials; however, given the impacts that have already been documented from increased off-road vehicle use associated with the 17.2-mile (27.7-kilometer) King Cove extension road (e.g., Figure 23; see section 4.1.7) and the anticipated ongoing use of the proposed road, we expect a reduction in the quantity and/or quality of marine invertebrates, marine benthic communities, and eelgrass or kelp habitats where degraded instream inputs enter the lagoon. We expect this effect would persist for the foreseeable future.

5.5.2 Accidental Spills and Other Environmental Contaminants

The use of heavy equipment during construction, increased vessel traffic, and increased vehicle traffic (i.e., ATVs, snowmachines, cars) would increase the risk of accidental fuel and oil spills. Contaminants and petroleum hydrocarbons that enter the marine environment would impact prey resources, kelp, eelgrass, and other physical habitat features they contact. Oil can be toxic to invertebrates or impact them through smothering or by altering feeding rates or shell formation (USFWS 2004*b*). Invertebrates may accumulate high levels of contaminants that can be passed on to predators, such as sea otters. Marine algae and seaweed respond variably to oil, but spills may lead to die-offs for some species. Oil can prevent the germination and growth of marine plants, including kelp, but most vegetation appears to recover after cleanup (USFWS 2004*b*). Oil can remain in the environment long after a spill event, in the subsurface sediments under gravel shorelines and in soft substrates, affecting nearshore habitats longer than pelagic or offshore habitats.

There is a low risk the project would result in a large spill of petroleum hydrocarbons or other contaminants. The risk of small spills should be low during road construction; implementation of a SWPPP will reduce the risk of contaminants entering the environment through stormwater runoff. The risk of small spills could also be reduced during operational road use and maintenance due to use of best management practices and policies to prevent negligence or accidents, but there are currently no identified responsible parties to commit to these best management practices and policies and to undertake response in the event of a spill. Our effects analysis therefore does not rely on mitigation through best management practices. There is a high probability of small spills during road use and related off-road and on-water activities.

Eelgrass and kelp that is exposed to spills would experience die-offs in localized habitat patches at a small scale. Oil spills would affect any macroinvertebrates (prey species for sea otters) directly encountered, through toxicity or physical effects, or indirectly through effects to the habitats and substrates on which macroinvertebrates rely. Oil can remain in the environment long after a spill event, in the subsurface sediments under gravel shorelines and in soft substrates, affecting nearshore habitats longer than pelagic or offshore habitats. Most vegetation affected by oil spills would recover after some amount of time, and most macroinvertebrate communities would subsequently also recover (although we would expect the permanent loss of some individuals). It is difficult to characterize small, accidental spills and the rates at which they would occur or to measure the likely magnitude of effect, given this effect would be patchy and would therefore depend on several unknown variables. However, the risk of small spills would persist for the duration of road maintenance and use into the foreseeable future and therefore we expect at least small, localized effects to eelgrass, including reduced growth and die-offs caused by small, discrete spill events. We expect most of these effects to be in the nearshore marine environments where freshwater inputs occur although spills from vessels could occur farther from shore, depending on their location when a spill.

5.5.3 Habitat Loss and Degradation

No direct loss of northern sea otter critical habitat is expected through placement of fill for construction of the road embankment. However, construction of the road embankment and its associated activities (e.g., pile driving for a stream crossing, material site development, use of local water sources for compaction) would alter the habitat through disruption to surface and subsurface flows (see section 5.2.4 for discussion on how roads alter landscapes). Ongoing maintenance and use of the road, and activities made possible by presence of the road (e.g., increased off-road ATV use) would result in permanent ecological change along the Izembek Isthmus, causing indirect effects to the connected lagoon system and changes to eelgrass beds, kelp, and benthic prey species. We expect a reduction in the quantity and/or quality of marine invertebrates, marine benthic communities, and eelgrass or kelp habitats as a consequence of habitat loss and degradation and that such effects would persist into the foreseeable future.

5.6 Summary of Effects of the Action

We do not expect any effects to Alaska-breeding Steller's eiders, the southwest distinct population segment of northern sea otters, and their designated critical habitats solely from the land exchange. However, we do expect consequences to these resources from other activities that would be caused by the land exchange. These other activities include construction, maintenance, and use (including activities conducted by private parties) of a new road along the Izembek Isthmus to connect the communities of King Cove and Cold Bay (see Section 1.4).

5.6.1 Summary of Effects of the Action on the Alaska-Breeding Steller's Eider

For Alaska-breeding Steller's eiders, the effects of the action are:

- Disturbance caused by road construction activities
  - We expect all individuals using the using the nearshore aquatic environments of the Izembek Complex will experience noise-related disturbance caused by construction activities. We expect these effects to be in the form of infrequent and temporary disruption of normal behaviors.
- Disturbance caused by increased vessel activity
  - We expect all individuals using the Izembek Complex will experience vessel-caused disturbance. On average, we calculate the effect to be a 0.7 to 1.7 percent reduction in normal behaviors.
- Disturbance caused by an increase in hunting activities
  - We expect all individuals using the Izembek Complex will experience hunting related disturbance. On average, we calculate the effect to be a 1.7 to 6.0 percent combined reduction in normal behaviors. We expect this to be in the form of a 1.3 to 4.6 percent reduction of time caused by increased vigilance behaviors and a 0.4 to 1.4 percent reduction of time caused by fleeing.
- Disturbance caused by an increase in off-road vehicle use
  - We expect all individuals using the nearshore aquatic environments of the Izembek Complex will experience disturbance caused by off-road vehicle use.
- Injury or death caused by an increase in hunting activities resulting in inadvertent harvest
  - We expect 1 Alaska-breeding Steller's eider to be killed per year as a result of subsistence and sport hunting activities.
- Injury or death caused by vessel strike
  - We expect 1 Alaska-breeding Steller's eider to be killed every 6.25 to 50 years as a result of vessel strike.
- Contaminants
  - We expect most spills would be small, remain localized, and affect, at most, only a few eiders or a small area containing prey resources. We expect individuals exposed to contaminants to suffer reduced fitness that would result in decreased survival probability.

5.6.2 Summary of Effects of the Action on Designated Critical Habitat for the Alaska-Breeding Steller's Eider

For critical habitat designated for Alaska-breeding Steller's eiders, the effects of the action are:

- Turbidity and sedimentation
  - We expect a reduction in the quantity and/or quality of marine invertebrates, marine benthic communities, and eelgrass habitats where degraded instream

inputs enter Izembek Lagoon. We expect this effect would be limited to a small proportion of designated critical habitat and would persist for the foreseeable future.

- Accidental spills and other environmental contaminants
    - We expect reduced growth and die-offs of eelgrass and macroinvertebrate species caused by small, discrete spill events. We expect this effect would be limited to a small proportion of designated critical habitat and would persist for the foreseeable future.
- Habitat loss and degradation
    - We expect construction of the road would result in permanent ecological change along the Izembek Isthmus, including changes in water quantity and quality into Izembek Lagoon. We expect this to reduce the quantity and/or quality of nearshore marine invertebrates, marine benthic communities, and eelgrass habitats through habitat loss and degradation. We expect this effect would be limited to a small proportion of designated critical habitat and would persist for the foreseeable future.

5.6.3 Summary of Effects of the Action on Southwest Alaska DPS of Northern Sea Otter

For the Southwest Alaska DPS of northern sea otters, the effects of the action are:

- Disturbance from increased vessel activity, hunting, and off-road vehicle use
    - While not all sea otters would be disturbed by each event, we expect that a high proportion of sea otters in the Izembek Complex would experience disturbance at some point in time from increased activity.
    - We expect a disruption of normal behaviors that would lead to increased stress and energy deficits and therefore reduced fitness for a small number of individuals, such as mothers with pups.
- Injury or death caused by vessel strike
    - We expect up to 2 to 4 northern sea otters would be injured or killed via vessel strike per year in Izembek Lagoon due to increased vessel activity after the construction of the road.
- Injury or death caused by exposure to contaminants
    - We conclude most spills would be small, remain localized, and affect, at most, only a few otters or a small area containing kelp or prey resources. We expect individuals exposed to contaminants to suffer reduced fitness that would result in decreased survival probability.
- Injury or death caused by harvest
    - We expect up to approximately an additional 8 sea otters above current baseline will be harvested from Izembek Lagoon in a year.

5.6.4 Summary of Effects of the Action on Designated Critical Habitat for the Southwest Alaska DPS of Northern Sea Otter

For critical habitat designated for Southwest Alaska DPS of northern sea otter, the effects of the action are:

- Turbidity and sedimentation
    - We expect a reduction in the quantity and/or quality of marine invertebrates, marine benthic communities, and kelp habitats where degraded instream inputs

enter Izembek or Kinzarof lagoons. We expect this effect would be limited to a small proportion of designated critical habitat and would persist for the foreseeable future.

- Accidental spills and other environmental contaminants
  - We expect reduced growth and die-offs of kelp and macroinvertebrate species caused by small, discrete spill events. We expect this effect would be limited to a small proportion of designated critical habitat and would persist for the foreseeable future.
- Habitat loss and degradation
  - We expect construction of the road would result in permanent ecological change along the Izembek Isthmus, including changes in water quantity and quality into the lagoons. We expect this to reduce the quantity and/or quality of nearshore marine invertebrates, marine benthic communities, and kelp habitats as a consequence of habitat loss and degradation. We expect this effect would be limited to a small proportion of designated critical habitat and would persist for the foreseeable future.

6 CUMULATIVE EFFECTS

Under the ESA, cumulative effects are those “effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area” considered in this biological opinion. Future Federal actions that are unrelated to the Project are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

It is expected the future State, Tribal, local, or private actions that are reasonably certain to occur within the action area will be similar to those described in the Environmental Baseline (Section 4 of this biological opinion). Those actions include but are not limited to marine vessel activity, fisheries, pollution, noise, and coastal zone development.

The MMPA permits Alaska Natives to harvest sea otters for subsistence purposes, or for the purposes of creating authentic Native handicrafts and clothing, provided this is accomplished in a non-wasteful manner. The best available scientific information indicates the subsistence harvest by Alaska Natives has not had a major impact on the southwest Alaska DPS of the northern sea otter (USFWS 2013). Continued and increased subsistence harvest (see section 5.5.4) of sea otters in the action area is reasonably certain to occur, pursuant to the MMPA, in the foreseeable future; sea otters harvested by subsistence users would be removed from the population and therefore unavailable for future breeding and reproduction. In addition to subsistence harvest of sea otters, households eligible to participate in subsistence fishing activities have increased (see section 4.1.3) and are reasonably certain to continue to increase.

Below mean high water, the State of Alaska manages Izembek Lagoon and other areas of overlap between the Izembek State Game Refuge and the Federally managed Izembek Refuge. Certain activities within the lagoon would not require Federal authorization. One of these is use of certain motorized vessels (e.g., skiffs, fishing vessels, and inflatable boats), allowable in Izembek

Lagoon under a State general permit (Special Area Permit SA25-II-0079-GP). Use of vehicles, including ATVs, below mean high water is allowable by the State under individual Special Area Permits through the ADF&G. The use of motorized vessels can directly affect ESA-listed species through visual or noise disturbance. Indirect affects to species would occur through damage to seagrass or other aquatic vegetation by vessel propellers.

The State of Alaska Division of Oil and Gas has identified oil and gas prospecting and development as an appropriate use of this area; although protections are granted to Izembek State Game Refuge, surface entry in Izembek State Game Refuge for seismic surveys is allowable on a case-by-case basis. Surface entry on non-Federal lands may not require a Federal action but would still have impacts to listed species and their critical habitat in this area. We have considered the potential for these activities; however, there are no historic or ongoing activities of this type, and no known plans to conduct such activities in the future. Therefore, we conclude that oil and gas prospecting and development is not reasonably certain to occur within the action area.

In summary, we anticipate the scope and scale of industry development, marine traffic, and subsistence and recreational pursuits in the action area will at minimum continue at current levels and may experience small increases in the future. We expect the overall cumulative effects of future State or private activities to be consistent with the current state described in the Environmental Baseline.

7 CONCLUSION

Section 7(a)(2) of the ESA requires that federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. The conclusion section presents the Service's opinion regarding whether the effects of the action and cumulative effects, when added to the environmental baseline and considered in light of the status of the species or critical habitat, are likely to jeopardize the continued existence of the species or result in destruction or adverse modification of critical habitat. It is the Service's biological opinion that the Proposed Action is not likely to jeopardize the continued existence of the Alaska-breeding Steller's eider or southwest DPS northern sea otter, and is not likely to destroy or adversely modify designated critical habitat for the Alaska-breeding Steller's eider or southwest DPS northern sea otter.

"Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species. The following analysis relies on four components: (1) Status of the Species, (2) Environmental Baseline, (3) Effects of the Action, and (4) Cumulative Effects.

The destruction/adverse modification analysis relies on the same four components as the jeopardy analysis: (1) Status of Critical Habitat, (2) Environmental Baseline, (3) Effects of the Action, and (4) Cumulative Effects. For purposes of making the destruction or adverse modification determination, the effects of the proposed federal action, together with any cumulative effects, are evaluated to determine if the critical habitat range wide would remain functional (or retain the current ability for the PCEs to be functionally re-established in areas of currently unsuitable but capable habitat) to serve its intended conservation/recovery role for the species.

The conclusions of this biological opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any conservation measures that were incorporated into the project design.

7.1 Steller's Eider

The proposed action, a land exchange, would not directly impact Alaska-breeding Steller's eiders. However, the proposed action would cause the construction of a road and increased access in a portion of the action area (Izembek Lagoon) after construction. We expect the primary effects to Alaska-breeding Steller's eiders would result from disturbance caused by increased human activity in the marine and shoreline environments. We also expect a few individuals would be killed or injured via vessel strike and hunting (inadvertently, both via subsistence use and sport hunting).

We do not expect many Alaska-breeding Steller's eiders would be permanently removed from the population as a result of activities that are reasonably certain to occur and would not occur but for the proposed action. We expect an increase in the risk of vessel strike to Steller's eiders within Izembek Lagoon would result in up to 1 Alaska-breeding Steller's eiders removed from the population every 6.25 to 50 years over the life of the road (e.g., a period of 50 years; or up to 8 birds over the same period). We do not expect the proposed action to cause an increase in other vertical structures and therefore do not expect any additional collision risk beyond that caused by vessels. Therefore, we expect collision risk to individual Steller's from vessels and vertical infrastructure to remain very low in and near the action area when this calculated small increase in vessel collisions is combined with environmental baseline levels (see section 4.2.4.4). We expect an increase in the risk of inadvertent harvest of Steller's eiders during waterfowl hunting would result in up to 1 Alaska-breeding Steller's eider per year removed from the population for the foreseeable future (e.g., over the life of the road and decades beyond). It would be difficult to measure any change in population numbers resulting solely from the disturbance, injury, or mortality of listed Alaska-breeding Steller's eiders caused by the effects of the action; however, we expect this total to be few if any on an annual basis. Assuming there are approximately 406 Alaska-breeding Steller's eiders (as discussed in the Status of the Species), this would represent a loss of only a fraction of 1 percent (i.e., less than 1 percent) of the population per year. Loss of these individuals would be additive to the ongoing effects anticipated in other biological opinions (see section 4.6) and to numbers currently inadvertently taken each year during hunting of waterfowl (see section 3.1.4.4). The change expected from the effects of the proposed action is small compared to the ongoing effects discussed in the Environmental Baseline and the additive impact of the additional losses is not expected to have an appreciable impact on the overall numbers of Alaska-breeding Steller's eiders.

We expect minimal impact to Alaska-breeding Steller's eider reproduction as a result of the effects of the proposed action. Steller's eiders do not nest in the action area; therefore, we expect no direct loss of reproductive success. We expect only a small number of individuals will be killed, injured, or suffer sufficient reduction in fitness to have decreased survival, resulting in minimal change to the breeding population. Disturbance in wintering and spring staging areas may disrupt courtship behaviors, potentially reducing pair formation or reproductive timing. However, we expect the maximum change in disturbance levels (i.e., disruption of normal behaviors, which includes courtship in addition to feeding, preening, bathing, etc.) to amount to 2.7 minutes per hour (see Appendix B, Table B-3). This increase is additive to the environmental baseline conditions, with the result being a total in disturbance impacts amounting to 3.8 minutes per hour, which represents only 6.3 percent of their overall time budget. We do not expect this small increase in disturbance time and total disturbance time to result in a significant reduction in courtship behavior for the population. Overall, we anticipate activities associated with the proposed action will result in a minor reduction in reproduction and productivity, through the loss of a small number of individuals and a minimal disruption of courtship behaviors; these changes are not expected to result in an appreciable reduction in reproduction for the Alaska-breeding Steller's eider.

Human activities resulting from the proposed project may result in local changes to the species' distribution. We expect eiders to shift away from areas of human activity, particularly from areas where hunting occurs. The Izembek Complex is one of several key sites for Steller's eider molting and wintering along the Alaska Peninsula and Aleutian Islands. We expect the project to lead to increases in human activity in the action area. However, all activities evaluated are already ongoing, as described in the Environmental Baseline; we anticipate only moderate increases in these activities, proportional to the level of increased access. Hunting (both subsistence and sport), fishing, and other vessel use have occurred through the Izembek Complex for decades. Despite these activities, Steller's eiders, including the Alaska-breeding population, continue to consistently use the action area for molting, wintering, and spring staging. We do not expect the increase in activities caused by the project to result in any measurable change in eider use of the action area. Because we expect changes to distribution to be limited only to local shifts within the Izembek Complex, we do not anticipate the short-term disturbance of Steller's eiders due to human activities and vessels will appreciably change the distribution of the population as a whole.

The natural recovery rate of Steller's eiders is not known. Long-lived species with low annual fecundity have a relatively slow recovery rate compared to short-lived species with high annual fecundity. Given the Steller's eider's observed low fecundity (i.e., small clutch sizes, high variability in nesting attempts, and generally low nest success) (Quakenbush et al. 1995), the recovery rate for this species is believed to be quite slow. We expect most, if not all, Steller's eiders in Izembek Lagoon would experience adverse effects in at least some years. However, we anticipate only a small number of individuals will suffer injury or death; as discussed above, the anticipated losses would represent only a fraction of 1 percent (i.e., less than 1 percent) of the population per year. Furthermore, we expect only a small proportion will suffer a reduction in reproductive success. Based on the minimal extent of these expected effects, we do not anticipate this will have an appreciable reduction on the likelihood of recovery of the species.

When considering effects from the proposed action in combination with cumulative effects, any future activities with the potential for significant effects are likely to have a Federal nexus and therefore will require a separate section 7 consultation. Other smaller scale activities, which may not have a Federal nexus, are likely to have minor impacts on Alaska-breeding Steller's eiders and therefore would not make a significant contribution to cumulative effects.

Jeopardy Conclusion: Our jeopardy analysis relied on four components: (1) Status of the Species, (2) Environmental Baseline, (3) Effects of the Action, and (4) Cumulative Effects. After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Alaska-breeding Steller's eider.

7.2 Steller's Eider Designated Critical Habitat

The proposed action, a land exchange, would not directly impact designated critical habitat for the Alaska-breeding Steller's eider. The associated proposed road construction would alter some critical habitat in the action area. Disturbance to PCEs during construction, through sedimentation and turbidity, would be localized and mostly temporary. Construction of the road would also permanently alter local hydrology, modifying input into Izembek Lagoon and affecting the associated PCEs (eelgrass, marine waters and benthic substrates, and macroinvertebrate prey species). After road construction, we expect ongoing impacts to PCEs (eelgrass, the water column and benthic substrates, and macroinvertebrate prey species) for the foreseeable future. Contaminants are expected to be introduced to the system through accidental, small spills; the exact quantity and location of these spills cannot be predicted. This increase in effects, combined with ongoing threats identified in the baseline, would increase the overall stress on PCEs in the Izembek Lagoon critical habitat unit, decreasing the quantity and quality of eelgrass and macroinvertebrate prey species in localized areas of Izembek Lagoon. These effects would be additive to existing stressors on PCEs in Izembek Lagoon, which have resulted in a measurable loss of eelgrass habitat and a measurable reduction in the overall biomass of certain invertebrate prey species on which eiders rely. However, the combined effects to PCEs would affect a relatively small portion of overall critical habitat and would not reduce the ability of Alaska-breeding Steller's eider critical habitat, as a whole, to provide for the recovery of Alaska-breeding Steller's eiders. Therefore, appreciable permanent adverse impacts to habitat are not expected.

After reviewing the current status of the critical habitat of Alaska-breeding Steller's eiders, the environmental baseline of critical habitat for the action area, the effects of the proposed action on critical habitat, and the cumulative effects, it is the Service's biological opinion that proposed action is not likely to result in the destruction or adverse modification of critical habitat of the Alaska-breeding Steller's eider.

7.3 Southwest Alaska DPS of Northern Sea Otter

The proposed action, a land exchange, would not directly impact sea otters. However, construction of the road and increased access of the area after construction would impact sea otters. We expect the primary effects to sea otters would be disturbance via behavioral changes caused by increased human and vessel activity after road construction, and harm via vessel strike due to increased vessel traffic after the road is built. We expect impacts to habitat would also affect sea otters.

We do not expect many sea otters would be permanently removed from the population by the effects of the action and that the number of individuals permanently removed would be relatively small compared to the entire population. We estimate up to four sea otters a year from the Bristol Bay MU would experience injury or death via vessel strike after the road is constructed for the foreseeable future. We also estimate a small number of sea otters would experience disturbance from increased human activities after the road is constructed (see section 5.5.1), although this number is expected to be low relative to the number of sea otters in the action area. The number of sea otters that would experience disturbance is expected to decrease over time as individuals move from the area or acclimate to new levels of disturbance. Therefore, we do not expect any appreciable change in population numbers from the disturbance, injury, or mortality of listed sea otters caused by project activities.

We expect some mothers with pups would be affected by activities reasonably certain to occur as a result of and would not otherwise occur but for the proposed action if they are unable to leave the area or acclimate to increased disturbance and therefore experience increased and repeated stress. We expect only a small number of mothers would be affected and that any impact to reproduction would not be measurable. Population level changes to sea otter reproduction are not expected to occur or would be small enough they would be difficult to measure due to the relatively high number of sea otters in the action area. We do not expect an appreciable reduction in reproduction for the southwest DPS of norther sea otters.

The effects of the action are unlikely to impact the distribution of the southwest DPS of northern sea otters because they are widely distributed across the southwest Alaska DPS. Any impacts to distribution would be localized, limited to Izembek Lagoon, Kinzarof Lagoon, and/or Cold Bay and attributable to sea otter avoidance of the action area due to increased disturbance.

The relatively small number of listed sea otters disturbed or injured or killed by increased use of the action area is not expected to affect the recovery of the southwest Alaska DPS of northern sea otters due to their relatively high abundance and wide distribution across their range. We expect most, if not all, disturbance, injury, or death to sea otters would occur in Izembek Lagoon in the Bristol Bay MU, which has a moderate population size and thus has more resiliency to withstand impacts over time. We do not anticipate effects to the South Alaska Peninsula MU, which has a small population size and low resiliency, because most impacts would occur outside of this MU. Therefore, we do not expect effects of the proposed action to be large enough to appreciably detract from the recovery objectives and criteria for the entire southwest Alaska DPS of northern sea otter.

Jeopardy Conclusion: Our jeopardy analysis relied on four components: (1) Status of the Species, (2) Environmental Baseline, (3) Effects of the Action, and (4) Cumulative Effects. After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is our biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the southwest DPS of northern sea otter.

7.4 Designated Critical Habitat for Northern Sea Otters

The proposed action, a land exchange, would not directly impact designated critical habitat for the southwest DPS of northern sea otters. The expected road construction would alter some critical habitat in the action area. Disturbance to PCEs during construction, through sedimentation and turbidity, would be localized and mostly temporary. Construction of the road would also permanently alter local hydrology, modifying input into the lagoons and affecting the associated PCEs (kelp and macroinvertebrate prey species). After road construction, we expect ongoing impacts to PCEs from sedimentation and turbidity for the foreseeable future. This increase in effects combined with ongoing threats identified in the baseline (i.e., climate change, existing contaminated sites, ongoing human activities that contribute to sedimentation, etc.) would increase the overall stress on PCEs and decrease the quantity and quality of PCEs in the action area. However, these effects are expected to primarily be temporary and affect only a small proportion of designated critical habitat in either unit. We anticipate the combined effects to PCEs would not reduce the ability of critical habitat as a whole to provide for the recovery of northern sea otters as effects of the action would affect a relatively small portion of overall critical habitat limited to Izembek Lagoon, Kinzarof Lagoon, and Cold Bay (see Figures 11 and 22). Therefore, we do not expect an appreciable diminishment of critical habitat.

After reviewing the current status of the critical habitat of northern sea otter, the environmental baseline of critical habitat for the action area, the effects of the proposed action on critical habitat, and the cumulative effects, it is the Service's biological opinion that proposed action is not likely to result in the destruction or adverse modification of critical habitat of the southwest DPS of northern sea otter.

8 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Incidental take refers to takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The Service does not anticipate any incidental take as that term is defined for purposes of consultation pursuant to section 7 of the ESA. Per that definition, incidental take can only result from the conduct of the Federal agency or applicant. Here, the Federal agency's (the Service's National Wildlife Refuge System, Alaska Region) conduct would be limited to entering into a land exchange that would not, by itself, cause any effects to listed species, much less take of listed species. The land exchange involves conveyances of property and does not authorize KCC or anyone else to construct a road. Nor would any take result from the conduct of an applicant. For the purposes of ESA section 7 consultation, "[a]pplicant refers to any person, as defined in section 3(13) of the Act, who requires formal approval or authorization from a Federal agency as a prerequisite to conducting the action." 50 CFR 402.02. No party has been granted applicant status in this consultation. No application to construct a road has been submitted, and the expectation is that the Aleutians East Borough or the State of Alaska, ADOT&PF, which are not parties to the proposed land exchange, would file any such application in the future. The Service expects that constructing a road through the proposed route, with its wetlands and stream crossings, would require one or more permits from one or more Federal agencies, including the U.S. Army Corps of Engineers. Whoever applies for such permit in the future would qualify as the applicant for the purposes of a subsequent ESA section 7 consultation initiated by the U.S. Army Corps of Engineers or other Federal agency.

9 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The Service's National Wildlife Refuge System, Alaska Region and any identified applicant for the future road development should work with the Service to develop and implement strategies to avoid and minimize disturbance, harassment, and harm to ESA-listed species.
2. The Service's National Wildlife Refuge System, Alaska Region or the project applicant or their agents should ensure barges avoid traveling north of a straight line between the Northeast Terminal and Cross Wind Cove terminals.
3. The Service's National Wildlife Refuge System, Alaska Region or the project applicant or their agents should avoid placing vertical structures (e.g., temporary construction facilities) within 1 mile [1.6 kilometers] of coast or within 0.5 mile [0.8 kilometers] of water bodies in areas where such structures do not already exist (i.e., structures should be co-located in areas of existing infrastructure in either Cold Bay or King Cove). Construction of vertical structures should be avoided along the road corridor along the full length of the isthmus to reduce risk of Steller's eider collisions during flight regardless of distance from shore. If vertical structures are required along the isthmus, the Service's National Wildlife Refuge System, Alaska Region should work with the project applicant and with the Southern Alaska Fish and Wildlife Field Office to ensure design incorporates best practices (e.g., bird flight diverters to promote visibility of overhead lines, lighting standards to reduce light attraction and disorientation).
4. The Service's National Wildlife Refuge System, Alaska Region should work with the project applicant to designate the action area as a lead-free zone to reduce impacts on Steller's eiders and Steller's eider critical habitat from lead ammunition and lead fishing sinkers.
5. The Service's National Wildlife Refuge System, Alaska Region should work with the project applicant to install stations for the disposal of fishing line, to reduce entanglement risk to listed species related to improper disposal.
6. The Service's National Wildlife Refuge System, Alaska Region should implement programs and monitoring to reduce the risk of harvest to Steller's eiders. These measures may include: 1) a commitment to continued education, outreach, and communication in

rural communities – including communities near the action area – regarding conservation of Steller's eiders, monitoring for dead and injured Steller's eiders, documentation of lead shot available for sale, and continued outreach with subsistence hunters through distribution of educational materials and contact through virtual and public meetings; 2) continued support of biological monitoring for Steller's eiders via aerial and ground surveys of their molting and wintering habitat in Izembek; and 3) the presence of Service Office of Law Enforcement agents commensurate with perceived risk of Steller's eider harvest to verify compliance with the regulations, including the prohibition against lead shot, and the authority of the Service's Regional Director to prescribe emergency regulations (i.e., closure of subsistence regulations) in the event that substantial harvest of Steller's eiders is indicated.

7. The Service's National Wildlife Refuge System, Alaska Region or the project applicant should extend habitat conservation measures (conservation measure #3) to all stream crossings to protect critical habitat for Alaska-breeding Steller's eiders and southwest DPS northern sea otters.
8. The Service's National Wildlife Refuge System, Alaska Region should work with the project applicant or their agent(s) to implement standard recommendations for preventing bird-vessel strike in the marine environment (https://www.fws.gov/service/technical-assistance-prevent-bird-vessel-strike-alaska-marine-environment). This includes ensuring that the trespass of light into nearby habitats is minimized using construction time restrictions, down shielding or directional lighting, and low intensity lighting and that any project-related vessels keep deck lighting to a minimum, and shield lights to direct illumination inboard and downward to the extent possible while still maintaining compliance with navigation rules, reduce outward-radiating light, and avoid red steady-state lighting on vessels to decrease the potential for Steller's eider strikes. Vessel windows should be shaded to the extent practicable when indoor spaces must be lit at night.
9. The Service's National Wildlife Refuge System, Alaska Region or the project applicant should ensure trained Protected Species Observers (PSOs) are present during barging activities within Cold Bay to avoid impacting ESA-listed species in the area.
10. The Service's National Wildlife Refuge System, Alaska Region or the project applicant should ensure, to the maximum extent practicable, blasting and pile driving occur only over summer (April through July), outside of the prime molting, staging, and overwintering seasons (August through April for Steller's eiders) to avoid impacts during critical life stages of Steller's eiders. If blasting must occur during the times of year Steller's eiders are present, methods effective for dampening the noise effects (i.e., to reduce the distance over which noise travels) should be used. If pile driving must occur during times of year Steller's eiders are present, vibratory pile driving methods (rather than impact driving methods) should be used to the maximum extent practicable.
11. The Service's National Wildlife Refuge System, Alaska Region or the project applicant should ensure, through mandatory implementation of mitigation measures, project vessels do not throw trash or other debris overboard, thereby reducing the potential for marine mammal entanglement.
12. The National Wildlife Refuge System, Alaska Region should work with the project applicant or their agent(s) to develop a Fish and Wildlife Protection Plan and a Marine

Mammal Protection Plan to help alleviate impacts of human disturbance associated with construction, operation, and maintenance of the road.

13. The Service's National Wildlife Refuge System, Alaska Region or the project applicant or their agent(s) should develop an Erosion and Sediment Control Plan, a Hazardous Material and Petroleum Product Control Plan (including steps to take in the discovery of unexploded ordnance), and a Fuel Handling and Spill Response Plan to reduce potential impacts to listed species and their critical habitat during construction. As part of an Erosion and Sediment Control Plan effects from erosion to critical habitat should be avoided and minimized. Erosion control measures that have minimal additional habitat impacts (e.g., weed-free gravel, weed-free erosion control materials, and erosion control materials without plastic; https://plants.alaska.gov/invasives/weed-free.htm) should be used to prevent sedimentation into waterways that may otherwise impact wetland and marine habitat.
14. The Service's National Wildlife Refuge System, Alaska Region or the project applicant or their agent(s) should control dust during road construction or road maintenance. A non-toxic dust palliative should be added to the road surface to prevent fugitive dust during operations.
15. The Service's National Wildlife Refuge System, Alaska Region or the project applicant or their agent(s) should avoid use of contaminated materials that can impact ESA listed species and their habitats. Prior to development of material sites or use of water sources, soil and gravel sources and water should be periodically tested for potential historical contamination. If heavy metal or other regulated contaminants are detected within soil sources, they should not be excavated or used on the road.
16. The Service's National Wildlife Refuge System, Alaska Region or the project applicant or their agent(s) should ensure waste is disposed of properly. Solid or putrescible waste generated during the proposed action activities should be removed or otherwise disposed of in a method approved by Alaska Department of Environmental Conservation. Efforts should be made to prevent bears, bald eagles, and other wildlife from being attracted to or having access to food or garbage during construction and operation of the road. Take is not anticipated under the proposed action.
17. The Service should be notified within 3 working days upon locating a dead, injured or sick endangered or threatened species specimen within the action area (50 CFR 402.14(i)(1)(v)). The finding of dead specimens does not imply enforcement proceedings pursuant to the ESA. Initial notification should be made to the nearest Service Law Enforcement Office at 1-800-858-7621 and by telephone and in writing to the Southern Alaska Fish and Wildlife Field Office (907-271-2888 and ak_fisheries@fws.gov). The report should include the date, time, precise location of the injured animal or carcass, a photograph, cause of death or injury, if known, and any other pertinent information. Care should be taken in handling sick or injured specimens to preserve biological materials in the best possible state for later analysis of cause of death, if that occurs. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed. If the carcass is reasonably fresh (not in an advanced state of decay), a reasonable effort should be made to recover it and keep in cold storage (refrigerated or frozen, wrapped in paper and not plastic) until the Southern Alaska Fish and Wildlife Field Office can be contacted.

18. If an injured or sick northern sea otter or Steller's eider is observed, call the Alaska Sea Life Center stranded animal hotline at 1-888-774-7325. Then inform the Service at 1-800-858-7621.

We request notification of the implementation of any conservation recommendations for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats.

10 REINITIATION NOTICE

This concludes formal consultation on the Izembek Refuge land exchange for a proposed road corridor. As provided in 50 CFR 402.16, reinitiation of consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this biological opinion or written concurrence; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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APPENDIX A. CALCULATIONS TO DETERMINE RELATIVE INCREASE IN WATERFOWL HARVEST ACTIVITIES FOR SPORT HUNTING AND SUBSISTENCE HARVEST AT IZEMBEK NATIONAL WILDLIFE REFUGE

Preliminary analysis suggested construction of a new road connecting King Cove and Cold Bay, Alaska, would result in increased access for hunting activities in Izembek Lagoon. To best quantify the frequency and magnitude of this threat, we needed to calculate current use and to project reasonably certain future use.

Increase in sport hunting

We used client use days (CUDs) as a measurement for waterfowl exposure to disturbance. CUDs are the number of days a hunter was taken on the refuge by a commercial guide, so a single trip onto the refuge will contribute multiple CUDs when multiple clients are guided at once, and multiple trips by the same client on the same day will only constitute a single day. CUDs provide a measure of effort, which is a better assessment of how likely eiders could be exposed to hunting activity than is just the number of hunters present.

We observed a notable increase in CUDs from 2020 to 2021, from 396 to 813, representing an increase of 417 hunter days, or a 105 percent increase (Figure A-1, Table A-1). This increase was likely caused by several factors: 1) a new guide service began operation in 2021, increasing the total number of guides from three to four (USFWS, Izembek Refuge, unpublished data); 2) guide services continued to shift to use of vessel-based hunting rather than shoreline-based hunting, improving logistics and access (M. Fosado, USFWS, pers. comm. 2025); and 3) there was likely an increase in interest in hunting and improvement in logistics following a reduction in travel restrictions as the country adjusted to the global pandemic experienced in 2020 – national data demonstrate a substantial increase and participation in outdoor recreation from 2020 to 2021 (BEA 2023).

We note that CUDs decreased in 2022, following the spike observed in 2021; therefore, we recognize use of the 2021 data point to calculate projected future changes in sport hunting likely results in a higher-end estimate. The 2021 data also may potentially be an outlier – data for the following 3 years (2022 through 2024), declined to an annual average of 663 CUDs. We conclude this may be the lower bounds of the hunter activity increase following 2021's changes to access, noted above; therefore, we use the 2022 to 2024 average of 663 CUDs as our lower bounds for projecting future increases in CUDs.

Our most recent data available to estimate current CUDs is from 2024; we have no reason to believe this was an anomalous year, and conclude it is a reasonable estimate of current activity. Thus, we use the 2024 total of CUDs, 649, as our baseline level for calculating future activity.

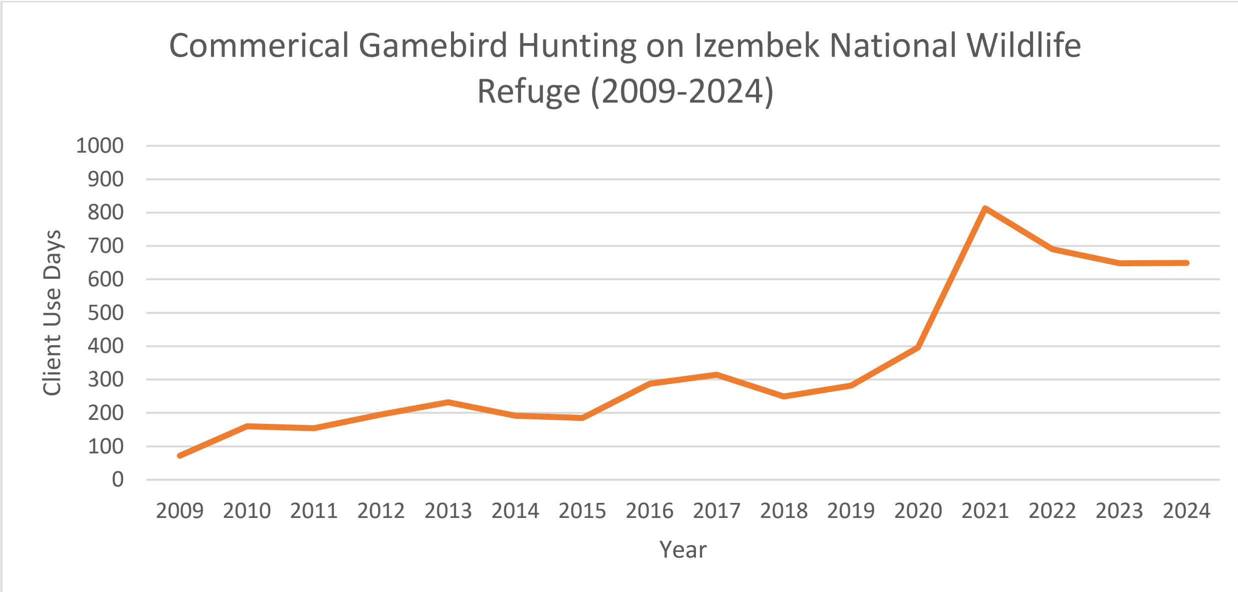

Figure A-1. Client Use Days over time, as reported during commercially guided gamebird hunting on Izembek Refuge. These data include upland gamebird hunting efforts, although those efforts are usually combined with waterfowl hunting. Source: USFWS, Izembek Refuge, unpublished data.

Table A-1. Annual reported CUDs, number of hunters, and birds harvested, as reported during commercially guided hunting on Izembek Refuge. No data were available for the number of hunters for 2022 to 2024. These data include upland gamebird hunting efforts, although those efforts are usually combined with waterfowl hunting. Source: USFWS, Izembek Refuge, unpublished data.

Year	CUD	# Hunters	Birds Harvested	Birds per CUD
2009	72	23	326	4.5
2010	160	43	904	5.7
2011	154	42	770	5.0
2012	196	50	1,001	5.1
2013	232	57	1,041	4.5
2014	192	48	382	2.0
2015	185	45	647	3.5
2016	288	69	421	1.5
2017	315	76	1,123	3.6
2018	249	66	325	1.3
2019	282	69	1,072	3.8
2020	396	94	254	0.6
2021	813	167	1,695	2.1
2022	691	—	1,469	2.1
2023	648	—	1,367	2.1
2024	649	—	2,012	3.1

To calculate our projected future increase of CUDs, we calculated the relative percent increase for each of these two bounds, upper and lower, and multiplied it by our current baseline value from 2024:

- Upper bounds =

$$2024\ CUDs + ([2021\ CUDs \div 2020\ CUDs] * 2024\ CUDs) = projected\ future\ CUDs$$

2024 CUDs = 649   2021 CUDs = 831   2020 CUDs = 396

2021 CUDs ÷ 2020 CUDs = 831 ÷ 396 = 2.05

$$649 + (2.05 * 649) = \mathbf{1,330}$$

- Lower bounds =

$$2024\ CUDs + ([average\ of\ 2022to2024\ CUDs \div 2020\ CUDs] * 2024\ CUDs) = projected\ future\ CUDs$$

2024 CUDs = 649   average 2022to2024 CUDs = 663   2020 CUDs = 396

average 2022to2024 CUDs ÷ 2020 CUDs = 663 ÷ 396 = 1.67

$$649 + (1.67 * 649) = \mathbf{1,084}$$

RESULT: Following construction of the road, we conclude the anticipated level of sport hunting activity will be between 1,084 and 1,330 CUDs annually, increased above the current baseline level of 649 CUDs observed in 2024.

Assumptions:

- We assume the increase in CUDs resulting from increased access following road construction will mirror the increase in CUDs observed due to more guides and better equipment/technology that have occurred from 2019 to present.
- We assume Cold Bay has the infrastructure capacity to support an increase in sport hunting guide services.
- We assume the 2024 level of 649 CUDs is a reasonable approximation of the baseline for current use.

Increase in subsistence use

While we have data reporting the volume, in weight, of game harvested through subsistence use in 2016 (Tables A-2 and A-3), we lack data on the level of activity/effort currently made by subsistence users in Cold Bay or King Cove. This makes it difficult to directly compare subsistence harvest activity to sport hunting activity and know what the relative changes will be for each; we do not have a quantification of these two activities in the same units of measure.

Based on available data, we determined a method to calculate a subsistence use equivalent to the CUDs reported for sport hunters. Using the reported weight of subsistence harvest by resource category (USFWS/Wentworth 2007) and then dividing that by the average weight of that resource category, we can determine the number of individual birds harvested. If we assume the effort to harvest a bird is relatively the same for sport hunters and subsistence users, we can then use the reported birds per CUD for sport hunters and apply the same division factor to calculate the final CUD-equivalent for subsistence uses.

Table A-2. Reported subsistence harvest activity in Cold Bay and King Cove during 2016. The number of households and population for each community represent the number of each responding to the subsistence survey. Numbers in parentheses represent the total number of households and individuals in each community in 2016. Percent attempting to harvest and percent harvesting at the proportion of responding households engaged in harvest of each resource. Percent of total harvest reports how much each resource contributed to total harvest of all subsistence resources, in pounds. Source: ADF&G 2025: CSIS.

Community Name	Resource Name	Households	Population	Percent Attempting to Harvest	Percent Harvesting	Percent Of Total Harvest
Cold Bay	All Migratory Birds	23 (32)	45 (63)	39.13%	34.78%	7.19%
King Cove	All Migratory Birds	91 (172)	279 (527)	38.46%	34.07%	2.32%
Cold Bay	Ducks	23 (32)	45 (63)	26.09%	13.04%	1.36%
King Cove	Ducks	91 (172)	279 (527)	19.78%	16.48%	0.54%
Cold Bay	Brant	23 (32)	45 (63)	39.13%	34.78%	3.77%
King Cove	Brant	91 (172)	279 (527)	28.57%	25.27%	0.81%
Cold Bay	Canada Goose	23 (32)	45 (63)	26.09%	26.09%	1.98%
King Cove	Canada Goose	91 (172)	279 (527)	20.88%	18.68%	0.82%

Table A-3. Reported subsistence harvest activity in Cold Bay and King Cove during 2016. Estimated total and upper and lower bounds determined by ADF&G (ADF&G 2025: CSI).

Community Name	Resource Name	Est Total Pounds Harvested	Lower Pounds Harvested	Upper Pounds Harvested
Cold Bay	All Migratory Birds	1,042.9	749.6	1,651.3
King Cove	All Migratory Birds	3,630.7	2,304.8	4,956.7
Cold Bay	Ducks	197.1	141.7	364.2
King Cove	Ducks	842.5	445.7	1,411.0
Cold Bay	Brant	546.9	393.1	844.1
King Cove	Brant	1,268.2	830.2	1,706.1
Cold Bay	Canada Goose	287.4	206.6	449.0
King Cove	Canada Goose	1,278.4	750.8	1,806.0

To calculate the number of birds harvested, we used three categories from the 2016 ADF&G data: Ducks (general category including all species of ducks), Pacific brant, and Canada geese. We include the broad category of "Migratory Birds" in Tables A-2 and A-3 to give further context of total subsistence harvest of birds. Combined, ducks, brant, and Canada geese account for 90 percent or more of the total migratory bird harvest.

In Cold Bay in 2016, the estimated total pounds of the following waterfowl species were harvested (paratheses include ADF&G estimates for lower and upper pounds harvested):

- Ducks: 197.1 lbs. (141.7 to 364.2)
- Brant: 547.0 lbs. (393.1 to 844.1)
- Canada geese: 287.4 lbs. (206.6 to 449.0)

Using the 'unidentified ducks' average weight of 2.00 pounds (lbs.), the black brant weight of 3.04 lbs., and the Taverner's Canada goose weight of 5.30 lbs., we get the following number of birds harvested by Cold Bay in 2016:

- Ducks: 197.1 ÷ 2.00 = 98.5 lbs. (70.8 to 182.1)
- Brant: 547.0 ÷ 3.04 = 179.9 lbs. (129.3 to 277.7)
- Canada geese: 287.4 ÷ 5.3 = 54.232 lbs. (39.0 to 84.7)

Using the estimate of the number of birds harvested (332.7 = 98.5 ducks + 179.9 brant + 54.2 Canada geese) and dividing that by the population size of Cold Bay in 2016 (62.6), we end up with 5.3 birds per person. From the sport hunting data, the number of birds per CUD in 2016 was 1.5 (see Table A-1). Dividing 5.3 birds by 1.5 birds per CUD, we end up with an average of 3.5 CUDs per person in Cold Bay in 2016.

The current population in Cold Bay is 56. Assuming harvest effort is similar now as it was in 2016, multiplying 56 people by 3.5 CUDs per person, we end up with a total of 198.4 CUDs for Cold Bay. See Table A-4.

In King Cove in 2016, the following estimated total pounds of the following waterfowl species were harvested (paratheses include estimates for lower and upper pounds harvested):

- Ducks: 842.5 lbs. (445.7 to 1,411.0)
- Brant: 1,268.2 lbs. (830.2 to 1,706.1)
- Canada geese: 1,278.4 lbs. (750.8 to 1,806.0)

Using the 'unidentified ducks' average weight of 2.00 lbs., the black brant weight of 3.04 lbs., and the Taverner's Canada goose weight of 5.30 lbs., we get the following number of birds harvested:

- Ducks: 842.5 ÷ 2.00 = 421.3 (222.9 to 705.5)
- Brant: 1,268.2 ÷ 3.04 = 417.2 (273.1 to 564.2)
- Canada geese: 1,278.4 ÷ 5.3 = 241.2 (141.6 to 340.8)

Using the estimate of the number of birds harvested (1,079.6 = 421.3 ducks + 417.2 brant + 241.2 Canada geese) and dividing that by the population size of King Cove in 2016 (527.3), we end up with 2.047 birds per person. From the sport hunting data, the average number of birds per CUD in 2016 was 1.5 (see Table A-1). Dividing 2.047 birds by 1.5 birds per CUD, we end up with 1.36 CUDs per person in King Cove in 2016.

The current population in King Cove is 866. Assuming harvest effort is similar now as it was in 2016, multiplying 866 people by 1.36 CUDs per person, we end up with a total of 1,181.80 CUDs for Cold Bay. See Table A-5.

Conclusion: If we assume King Cove's subsistence use shifts entirely to Izembek Lagoon, then we would expect an increase in 1,182 CUDs post-road construction.

Assumptions:

- Pounds per bird is appropriate to get at number of birds harvested.
- We only used ducks, Pacific brant, and Canada geese. We assume this adequately captures relative subsistence harvest effort, based on these three waterfowl categories accounting for more than 90 percent of total migratory bird use.
- We assume subsistence harvest levels in Cold Bay will remain unchanged following road construction
- We assume CUDs for sport hunting are comparable to CUDs for subsistence hunting
- We assume the 2016 subsistence harvest levels were representative of a normal year and that the effort in 2016 is relatively the same effort per person now.

- We are making general assumptions of potential changes in where King Cove shifts subsistence use (i.e., switches between 54 and 100 percent of their subsistence effort to Izembek Lagoon).

Table A-4. Calculating CUD-equivalents for Cold Bay, based on 2016 harvest data (ADF&G 2025: CSI).

Cold Bay				
Species / Taxon	**Estimated amount harvested (lbs.)**	**Reported / lower amount harvested (lbs.)**	**Upper harvested amount (lbs.)**	**Pounds per bird**
Ducks	197.1	141.7	364.2	2.0
Brant	547.0	393.1	844.1	3.0
Canada geese	287.4	206.6	449.0	5.3
Species / Taxon	**Estimated amount harvested (#)**	**Reported / lower amount harvested (#)**	**Upper harvested amount (#)**	
Ducks	98.6	70.9	182.1	
Brant	179.9	129.3	277.7	
Canada geese	54.2	39.0	84.7	
Total harvest	332.7	239.1	544.5	
Population size (2016)	62.6			
Population size (current)	56			
Change in population	89.5%			
Total harvest (current)	297.6	213.9	487.1	
CUD equivalent	**198.4**	**142.6**	**324.7**	Birds/CUD 1.5

Table A-5. Calculating CUD-equivalents for King Cove, based on 2016 harvest data (ADF&G 2025: CSI).

King Cove					
Species / Taxon	**Estimated amount harvested (lbs.)**	**Reported / lower amount harvested (lbs.)**	**Upper harvested amount (lbs.)**	**Pounds per bird**	
Ducks	842.5	445.7	1,411.0	2.0	
Brant	1,268.2	830.2	1,706.1	3.0	
Canada geese	1,278.4	750.8	1,803.0	5.3	
Species / Taxon	**Estimated amount harvested (#)**	**Reported / lower amount harvested (#)**	**Upper harvested amount (#)**		
Ducks	421.3	222.9	705.5		
Brant	417.2	273.1	561.2		
Canada geese	241.2	141.7	340.2		
Total harvest	1,079.6	637.6	1,606.9		
Population size (2016)	527.3				
Population size (current)	866				
Change in population	164.2%				
Total harvest (current)	1,773.1	1,047.2	2,639.1		
CUD equivalent	**1,182.1**	**698.1**	**1,759.4**	Birds/CUD	1.5

Calculating total change in hunting activities in Izembek Lagoon

Using the projected change, including upper and lower bounds, for both sport hunting and subsistence harvest, we can calculate the anticipated range of potential increase for all hunting related activities in Izembek Lagoon following construction of the road. To do so, we compare the current activity rates to the range of future activity rates, both in CUDs and CUD-equivalents. We conclude it is reasonably certain Izembek Lagoon will experience between 3.2 times and 2.3 times more hunting-related activity consequent to road construction (see Table A-6).

Summary for all harvest:

- Current CUDs = 649 CUDs from sport hunting + 198 CUDs from Cold Bay community for subsistence = 847 CUDs total
- Post road construction CUDs, upper bounds = 1,330 CUDs from sport hunting + 198 CUDs from Cold Bay community for subsistence + 1,182 CUDs from King Cove community for subsistence = 2,711 CUDs total
- Post road construction CUDs, lower bounds = 1,084 CUDs from sport hunting + 198 CUDs from Cold Bay community for subsistence + 638 CUDs from King Cove community for subsistence = 1,921 CUDs total
- Proportional increase in CUDs, upper bounds = 2,711 CUDs post road construction ÷ 847 CUDs currently = 3.2x increase
- Proportional increase in CUDs, upper bounds = 1,921 CUDs post road construction ÷ 847 CUDs currently = 2.3x increase

Table A-6. Calculating total change in hunting activities in Izembek Lagoon.

	Current CUD	Expected Increase	Future Upper CUD	Future Lower CUD
Sport	649	2.05x	1,330	
Sport	649	1.67x		1,084
Cold Bay	198	none	198	198
King Cove	0	+current	1,182	
King Cove	0	+54% of current		638
TOTAL	**847**		**2,711**	**1,921**
Proportional Change			**3.2x**	**2.3x**

APPENDIX B. QUANTIFYING INCREASED DISTURBANCE RATES IN IZEMBEK LAGOON FOLLOWING ROAD CONSTRUCTION

Quantifying Current and Future Disturbance Caused by Hunting

Historical Hunting Disturbance

A disturbance study of Pacific black brant from 1985 to 1987 found hunting caused an average of 0.06 +/- 0.01 disturbance events per hour within Izembek Lagoon (Ward et al. 1994). When exposed to hunters and hunting activity, many flocks exhibited a behavioral response, ranging from increased vigilance (64.4 percent) via flight (39.2 percent). When disturbed by hunting in the lagoon, an average of 90.0 +/- 2.9 percent of individuals in disturbed brant flocks had a flight response, with an average flight duration of 96.0 +/- 18.3 seconds. While hunting, as well as boating, did not contribute greatly to the overall interruption time of the study, these activities elicited a consistent and prolonged response from brant, with 75 percent of the flocks leaving the study area in response to hunting.

The study period of 1985 to 1987 occurred during a low period of human activity at Izembek Lagoon, when hunting was closed for emperor geese and bag limits were lowered from 4 to 2 brant. It is estimated that these restrictions resulted in an approximately 60 percent decline in waterfowl hunting activity at Izembek Lagoon during the study period (Ward et al. 1994).

Pacific black brant (*Branta bernicla nigricans*) is a good proxy species for the Steller's eider in terms of their time budget and energy budgets during staging and migration. They are both relatively small species in their respective taxonomic groups Steller's eiders being a small sea duck and brant a small goose. Both are arctic species that rely on energy reserves to survive molt/winter and migrate in spring to reproduce the following year. Both species breed in lowland tundra wetlands and molt in Izembek Lagoon (Maliguine 2024), as indicated in aerial surveys (USFWS 2019, Wilson et al. 2025). Like eiders, brant migrate to staging sites to molt in coastal waters and lagoon systems, where the barrier islands provide predator refugia and where eelgrass, sedges, and algae are plentiful (Cornell Lab of Ornithology 2025)

Using these data and accounting for 1985 to 1987 having an approximately 60 percent decrease in typical hunting activity, we estimated the following upper and lower bound historic disturbance rates during the fall:

- Historic lower bound: 0.06 disturbance events per hour

- Historic upper bound:

$$(0.06\ disturbance\ per\ hour)/(40\ percent\ hunting\ volume) = (X\ disturbance\ per\ hour)/(100\ percent\ hunting\ volume)$$

$$X = (0.06/40) * 100 = 0.15\ disturbance\ events\ per\ hour$$

Using these rates, we can calculate an upper bound and lower bound average flight time per hour due to hunting disturbance in the 1980s. When disturbed by hunting, flocks of brant responded 39.2 percent of the time with a flight response and this flight response was triggered in an average 90 percent of brant within the flock (Ward et al. 1994). The average flight response due to hunting was 96 seconds, which may be an underestimate because flocks frequently left the study area when a flight response was triggered from hunting. Using these numbers, we can calculate the average additional time spent in the air per hour by a brant individual due to hunting disturbances:

- Historic lower bound:

$$(0.06\ disturbance\ events)/hour * (39.2\ flight\ event)/(100\ disturbance\ event) * 96\ seconds * (90\ flock\ individuals)/(100\ flock\ individuals)$$

$$= 2.03\ seconds\ of\ flight\ per\ hour$$

- Historic upper bound:

$$(0.15\ disturbance\ events)/hour * (39.2\ flight\ event)/(100\ disturbance\ event) * 96\ seconds * (90\ flock\ individuals)/(100\ flock\ individuals)$$

$$= 5.08\ seconds\ of\ flight\ per\ hour$$

In an average flock of birds, 82.4 percent of the flock responded to a hunting disturbance (alert, movement on the water, etc. and including flight response) for an average of 139.1 seconds. Using the same approach, we can also calculate the upper bound and lower bound average disturbance time experienced by an individual birds for all response types (not just flight response):

- Historic lower bound:

$$(0.06\ disturbance\ events)/hour * 139.1\ seconds * (82.4\ flock\ individuals)/(100\ flock\ individuals)$$

$$= 6.88\ seconds\ of\ disturbance\ per\ hour$$

- Historic upper bound = 17.19 seconds disturbance per hour

$$(0.15\ disturbance\ events)/hour * 139.1\ seconds * (82.4\ flock\ individuals)/(100\ flock\ individuals)$$

$$= 17.19\ seconds\ of\ disturbance\ per\ hour$$

Current Hunting Disturbance

Commercial hunting on Izembek National Wildlife Refuge has steadily increased, with commercially guided data from 2009 to 2021 indicating a threefold increase (Figure 13). The harvest rate of brant increased from 0.9 percent for the 2000 to 2002 hunting seasons to 3.3 percent for the 2013 to 2015 hunting seasons (Leach et al. 2017), again a threefold increase. Therefore, we consider a threefold increase in hunting from historic levels to be a reasonable proxy for calculating the current hunting levels in Izembek:

- Current lower bound:

$0.06\ disturbance\ events\ per\ hour * 3 = 0.18\ disturbance\ events\ per\ hour$

- Current upper bound =

$0.15\ distubance\ events\ per\ hour * 3 = 0.45\ disturbance\ events\ per\ hour$

Due to the increase in the hunting disturbance per hour, we would also expect a threefold increase in flight time in response:

- Current lower bound:

$2.03\ seconds\ of\ flight\ per\ hour * 3 = 6.09\ seconds\ of\ flight\ per\ hour$

- Current upper bound:

$5.08\ seconds\ of\ flight\ per\ hour * 3 = 15.24\ seconds\ of\ flight\ per\ hour$

And we would expect a threefold increase in the total disturbance time:

- Current lower bound:

$6.88\ seconds\ disturbance\ per\ hour * 3 = 20.64\ seconds\ disturbance\ per\ hour$

- Current upper bound:

$17.19\ seconds\ disturbance\ per\ hour * 3 = 51.57\ seconds\ disturbance\ per\ hour$

Future Hunting Disturbance with Road

We anticipate the proposed road would cause an increase in human activities in Izembek National Wildlife Refuge, including an increase in off-road hunting-related activities involving resident hunters participating in subsistence or sport hunting and non-resident sport hunters. Accessibility of Izembek Lagoon is currently a limiting factor for non-resident hunters. We calculated the projected increase in both sport hunting and subsistence harvest following construction of the road (see Appendix A). Our projected relative change is between a 2.3- and 3.2-fold increase in combined hunting activity. Using these calculations, we expect the following range of future disturbance levels due to hunting in Izembek Lagoon:

- Future lower lower bound (using a 2.3x increase):
$0.18\ disturbance\ events\ per\ hour * 2.3 = 0.41\ disturbance\ events\ per\ hour$

- Future upper lower bound (using a 2.3x increase):
$0.45\ disturbance\ events\ per\ hour * 2.3 = 1.04\ disturbance\ events\ per\ hour$

- Future lower upper bound (using a 3.2x increase):
$0.18\ disturbance\ events\ per\ hour * 3.2 = 0.58\ disturbance\ events\ per\ hour$

- Future upper upper bound (using a 3.2x increase):
$0.45\ disturbance\ events\ per\ hour * 3.2 = 1.44\ disturbance\ events\ per\ hour$

Due to the increase in the hunting disturbance per hour, we would also expect these future increases in flight time, using the 2.3- and 3.2- lower and upper bounds:

- Future lower lower bound:
$6.10\ seconds\ of\ flight\ per\ hour * 2.3\ =\ 14.0\ seconds\ of\ flight\ per\ hour$

  $(14.0\ seconds)/hour * (1\ minute)/(60\ seconds)$ = 0.2 minutes of flight per hour

- Future upper lower bound:
$15.24\ seconds\ of\ flight\ per\ hour * 2.3\ =\ 35.0\ seconds\ of\ flight\ per\ hour$

  $(35.0\ seconds)/hour * (1\ minute)/(60\ seconds)$ = 0.6 minutes of flight per hour

- Future lower upper bound:
$6.10\ seconds\ of\ flight\ per\ hour * 3.2\ =\ 19.5\ seconds\ of\ flight\ per\ hour$

  $(19.5\ seconds)/hour * (1\ minute)/(60\ seconds)$ = 0.3 minutes of flight per hour

- Future upper upper bound:
$15.24\ seconds\ of\ flight\ per\ hour * 3.2\ =\ 48.8\ seconds\ of\ flight\ per\ hour$

  $(48.8\ seconds)/hour * (1\ minute)/(60\ seconds)$ = 0.8 minutes of flight per hour

And similarly, we would expect these future increases in total disturbance time, using the 2.3- and 3.2- lower and upper bounds:

- Future lower lower bound:

$20.64 \; seconds \; disturbance \; per \; hour * 2.3 = 47.5 \; seconds \; per \; hour$

$(47.5 \; seconds)/hour * (1 \; minute)/(60 \; seconds) = 0.8 \; minutes \; per \; hour$

- Future upper lower bound:

$51.58 \; seconds \; disturbance \; per \; hour * 2.3 = 118.6 \; seconds \; per \; hour$

$(118.6 \; seconds)/hour * (1 \; minute)/(60 \; seconds) = 2.0 \; minutes \; per \; hour$

- Future lower upper bound:

$20.64 \; seconds \; disturbance \; per \; hour * 3.2 = 66.0 \; seconds \; per \; hour$

$(66.0 \; seconds)/hour * (1 \; minute)/(60 \; seconds) = 1.1 \; minutes \; per \; hour$

- Future upper upper bound:

$51.58 \; seconds \; disturbance \; per \; hour * 3.2 = 165.1 \; seconds \; per \; hour$

$(165.1 \; seconds)/hour * (1 \; minute)/(60 \; seconds) = 2.8 \; minutes \; per \; hour$

<u>Summary and Assumptions</u>
Using a study from the 1980s as our historic baseline (Ward et al. 1994), we calculated how hunting disturbance has increased through the current time period as well as estimates for how disturbance may increase in the future with the construction of a road through Izembek National Wildlife Refuge (Table B-1).

Table B-1. The number of Steller's eider disturbance events per hour and associated seconds of flight and total seconds of disturbance per hour experienced by an individual bird due to changes in fall hunting levels in Izembek National Wildlife Refuge.

Time Period	Disturbance events per hour		Seconds of flight per hour		Seconds of disturbance per hour	
	Lower Estimate	Upper Estimate	Lower Estimate	Upper estimate	Lower estimate	Upper estimate
Historic (1980s)	0.06	0.15	2.0	5.1	6.9	17.2
Current (2020s)	0.18	0.45	6.1	15.2	20.6	51.6
Plausible future (2.3x increase)	0.41	1.04	14.0	35.1	47.5	118.6
Plausible future (3.2x increase)	0.58	1.44	19.5	48.8	66.0	165.1

Assumptions and limitations:

The values represent calculations using the best available data for estimating changes in disturbance for Steller's eiders due to hunting. The reliability of these estimates is limited by several factors:

- We are using data from a 3-year study period in fall 1985 to 1987 (Ward et al. 1994) and we do not know if bird response to hunting has changed in the following decades.
- We do not know if and how hunting practices may have changed to yield a different response from birds since the study occurred.
- We are using Pacific brant as a proxy for Steller's eiders and eider response may differ.
- These data are derived from fall hunting periods and are likely not representative of year-round disturbance events, which we do not have data to calculate.
- We are assuming that bird response is proportional to the activity level, when it may not be.

Quantifying Increased Boat Vessel Rates and Associated Disturbance

Historic Vessel Disturbance
A disturbance study of Pacific black brant from 1985 to 1987 found boats caused an average of 0.02 +/- 0.00 disturbance events per hour within Izembek Lagoon (Ward et al. 1994). When disturbed by boats in the lagoon, an average of 94.4 +/- 2.0 percent of the brant flock had a flight response, with an average flight duration of 172.5 +/- 24.6 seconds. While boating, as well as hunting, did not contribute greatly to the overall interruption time of the study, these activities elicited a consistent and prolonged response from brant, with 77 percent of the flocks leaving the study area in response to boating.

Ward et al. (1994) measured brant disturbance from boating activity separately from disturbance from hunting, even though a portion boating activity was likely related to hunting and providing access. We have no way of knowing what percentage of boating activity was to facilitate hunting; however, we believe it is likely that the majority of boating activity was due to hunting during the fall harvest study period. To provide a conservative, historic upper bound, we assume that all boating activity derived from hunting. The study period of 1985 to 1987 occurred during a low period of hunting activity at Izembek Lagoon because hunting was closed for emperor geese and bag limits were lowered from 4 to 2 brant. It is estimated that these restrictions resulted in an approximately 60 percent decline in waterfowl hunting activity at Izembek Lagoon during the study period.

Using these data and accounting for 1985 to 1987 having an approximately 60 percent decrease in typical hunting activity, we estimated the following upper and lower bound historic disturbance rates due to boats during the fall:

- Historic lower bound: 0.02 disturbance events per hour (as reported in Ward et al. 1994)

- Historic upper bound:

$$(0.02\ disturbance\ events\ per\ hour)/(40\ percent\ hunting/boat\ volume) = (X\ disturbance\ events\ per\ hour)/(100\ percent\ hunting/boat\ volume)$$

$$X = (0.02/40) * 100 = 0.05\ disturbance\ events\ per\ hour$$

Using these rates, we can calculate an upper bound and lower bound average flight time per hour due to boating disturbance in the 1980s. When disturbed by boats, flocks of brant responded 75.0 percent of the time with a flight response and this flight response was triggered in an average 94.4 percent of brant within the flock (Ward et al. 1994). The average flight response due to boating lasted 172.5 seconds, which is likely an underestimate because flocks frequently left the study area when a flight response was triggered from boats. Using these numbers, we can calculate the average time spent in the air per hour by a brant individual due to boat disturbances:

- Historic lower bound:

$$(0.02\ disturbance\ events)/hour * (75\ flight\ event)/(100\ disturbance\ event) *\ 172\ seconds * (94.4\ flock\ individuals)/(100\ flock\ individuals)$$

$$= 2.4\ seconds\ of\ flight\ per\ hour$$

- Historic upper bound:

$$(0.05\ disturbance\ events)/hour * (75\ flight\ event)/(100\ disturbance\ event) *\ 172\ seconds * (94.4\ flock\ individuals)/(100\ flock\ individuals)$$

$$= 6.1\ seconds\ of\ flight\ per\ hour$$

We can also calculate an upper bound and lower bound average total disturbance of each individual per hour due to boat disturbance. When disturbed by boats, an average 93.1 percent of the flock was disturbed for an average of 223.5 seconds (Ward et al. 1994). Using these numbers, we can calculate an average disturbance time per hour for each brant individual due to boat disturbance:

- Historic lower bound:

$$(0.02\ disturbance\ events)/hour *\ 223.5\ seconds * (93.1\ flock\ individuals)/(100\ flock\ individuals)$$

$$= 4.2\ seconds\ of\ disturbance\ per\ hour$$

- Historic upper bound = 17.2 seconds disturbance per hour

$$(0.05\ disturbance\ events)/hour *\ 223.5\ seconds * (93.1\ flock\ individuals)/(100\ flock\ individuals)$$

$$= 10.4\ seconds\ of\ disturbance\ per\ hour$$

Current Vessel Disturbance

We do not have a direct way to calculate the potential changes in boat disturbance from all activities that may use boats in Izembek Lagoon. In the fall waterfowl harvest period, it is likely that the majority of boat activity is from hunting. We estimate that hunting has increased by threefold in the decades since the 1985 to 1987 study period. Hunters may gain hunting access to the lagoon on foot or by boat, therefore we estimate half of the hunts were occurring by boat. If there was a threefold increase in hunting and half occur by boat, we would expect a 1.5-fold increase in boat activity due to hunting:

- Current lower bound:
  $0.02\ disturbance\ events\ per\ hour * 1.5 = 0.03\ disturbance\ events\ per\ hour$

- Current upper bound =
  $0.05\ distubance\ events\ per\ hour * 1.5 = 0.075\ disturbance\ events\ per\ hour$

Due to the increase in the hunting disturbance per hour, we would also expect a threefold increase in flight time in response:

- Current lower bound:
  $2.4\ seconds\ of\ flight\ per\ hour * 1.5 =\ 3.7\ seconds\ of\ flight\ per\ hour$

- Current upper bound:
  $6.1\ seconds\ of\ flight\ per\ hour * 1.5 =\ 9.1\ seconds\ of\ flight\ per\ hour$

And we would expect a threefold increase in the total disturbance time:

- Current lower bound:
  $4.1\ seconds\ disturbance\ per\ hour * 1.5 =\ 6.2\ seconds\ disturbance\ per\ hour$

- Current upper bound:
  $10.4\ seconds\ disturbance\ per\ hour * 1.5 =\ 15.6\ seconds\ disturbance\ per\ hour$

Future Vessel Disturbance
We expect the proposed road would cause an increase in human activities in Izembek National Wildlife Refuge, including an increase in boat vessel activity. The proposed road would connect the community of King Cove to Cold Bay and allow boat-owners from both communities to trailer their vessels back and forth. Boat owners in King Cove (located on the south side of the peninsula) are currently unable to easily access Izembek Lagoon (located on the north side of the peninsula). By connecting the two communities by road, boat owners from King Cove will have a means to more easily access Izembek Lagoon by boat for the first time. We expect between a twofold and fourfold increase in boat vessel activity due to the road, as described in section 5.2.1.2.

- Current lower lower bound:
  $0.03\ disturbance\ events\ per\ hour * 2 = 0.06\ disturbance\ events\ per\ hour$

- Current upper lower bound =
  $0.075\ disturbance\ events\ per\ hour * 2 = 0.15\ disturbance\ events\ per\ hour$

- Current lower upper bound:
  $0.03\ disturbance\ events\ per\ hour * 4 = 0.12\ disturbance\ events\ per\ hour$

- Current upper upper bound =
  $0.075\ disturbance\ events\ per\ hour * 4 = 0.30\ disturbance\ events\ per\ hour$

Due to the increase in the hunting disturbance per hour, we would also expect between a twofold and fourfold increase in flight time in response:

- Current lower lower bound:
  $3.65\ seconds\ of\ flight\ per\ hour * 2 = 7.3\ seconds\ of\ flight\ per\ hour$

- Current upper lower bound:
  $9.13\ seconds\ of\ flight\ per\ hour$ * 2 = 18.3 *second of flight per hour*

- Current lower upper bound:
  $3.65\ seconds\ of\ flight\ per\ hour * 4 = 14.7\ seconds\ of\ flight\ per\ hour$

- Current upper upper bound:
  $9.13\ seconds\ of\ flight\ per\ hour$ * 4 = 36.6 *second of flight per hour*

And similarly, we would expect between a twofold and fourfold increase in the total disturbance time:

- Current lower lower bound:
  $6.2\ seconds\ disturbance\ per\ hour * 2 = 12.5\ seconds\ of\ disturbance\ per\ hour$

- Current upper lower bound:
  $15.6\ seconds\ disturbance\ per\ hour * 2 = 31.2\ seconds\ of\ disturbance\ per\ hour$

- Current lower upper bound:
  $6.2\ seconds\ disturbance\ per\ hour * 4 = 25.0\ seconds\ of\ disturbance\ per\ hour$

- Current upper upper bound:
  $15.6\ seconds\ disturbance\ per\ hour * 4 = 62.4\ seconds\ of\ disturbance\ per\ hour$

Summary and Assumptions

Using a study from the 1980s as our historic baseline (Ward et al. 1994), we calculated how vessel disturbance has increased through the current time period as well as estimates for how disturbance may increase in the future with the construction of a road through Izembek National Wildlife Refuge (Table B-2).

Table B-2. The number of Steller's eider disturbance events per hour and associated seconds of flight and total disturbance per hour experienced by an individual bird due to changes in fall boating levels in Izembek National Wildlife Refuge.

Time Period	Disturbance events per hour		Seconds of flight per hour		Seconds of disturbance per hour	
	Lower Estimate	Upper Estimate	Lower Estimate	Upper estimate	Lower estimate	Upper estimate
Historic (1980s)	0.02	0.05	2.4	6.1	4.2	10.4
Current (2020s)	0.03	0.075	3.7	9.1	6.2	15.6
Plausible future (2x increase)	0.06	0.15	7.3	18.3	14.7	36.6
Plausible future (4x increase)	0.12	0.30	14.6	36.5	25.0	62.4

Assumptions and limitations:

The numbers in Table B-2 represent calculations using the best available data for estimating changes in disturbance for Steller's eiders due to hunting. The reliability of these estimates is limited by several factors:

- We are using data from a 3-year study period in fall 1985 to 1987 (Ward et al. 1994) and we do know if bird response to boating has changed in the following decades.
- We do not know if and how boating practices may have changed to yield a different response from birds since the study occurred.
- We are using Pacific brant as a proxy for Steller's eiders and eider response may differ.
- These data are derived from the fall and are likely not representative of year-round disturbance events, which we do not have data to calculate.
- We are assuming that bird response is proportional to the activity level, when it may not be.
- We do not have data to measure changes in all types of boating activity in the lagoon since historical levels, so we are using hunting levels as a reasonable proxy. There may be additional changes in boat activity due to other human activities.

Quantifying the Combined Increase in Hunting and Vessel Disturbance

To calculate the total change in disturbance, we combine the data from the previous two analyses above, see Table B-3. At the maximum change in each of the two disturbance factors, hunting and vessel use, we calculate an increase of seconds of disturbance per hour of 2.7 minutes:

$$(227.5\ seconds - 67.2\ seconds) \div 60\ seconds\ per\ minute = 2.7\ minutes$$

Table B-3. The number of Steller's eider disturbance events per hour and associated seconds of flight and total seconds of disturbance per hour experienced by an individual bird due to the combined changes in fall hunting and boating levels in Izembek National Wildlife Refuge. These values combined the data from Tables B-1 and B-2.

Time Period	Disturbance events per hour		Seconds of flight per hour		Seconds of disturbance per hour	
	Lower Estimate	Upper Estimate	Lower Estimate	Upper estimate	Lower estimate	Upper estimate
Historic (1980s)	0.08	0.20	4.4	11.2	11.1	27.6
Current (2020s)	0.21	0.53	9.8	24.3	26.8	67.2
Plausible future (minimum)	0.47	1.19	21.3	53.4	62.2	155.2
Plausible future (maximum)	0.70	1.74	34.1	85.3	91.0	227.5