U.S. Fish and Wildlife Service

Draft Environmental Assessment

Reintroduction of Steller's Eiders to the Yukon-Kuskokwim Delta, Alaska

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1. Executive Summary

In this draft Environmental Assessment (EA), we[1] describe No Action and Preferred alternatives for potential efforts to use reintroduction to reestablish breeding Steller's eiders in western Alaska. We anticipate that reestablishment of this subpopulation will only occur through reintroduction. Reestablishment of this subpopulation is necessary to meet recovery criteria outlined in the Steller's Eider Recovery Plan for the Alaska-breeding population of Steller's eiders, which is classified as threatened under the Endangered Species Act (ESA). The draft EA includes a description of actions taken to date in evaluating the potential for reintroduction, concerns identified during the scoping process, and describes potential biological and social effects of reintroducing Steller's eiders to western Alaska.

If the Preferred Alternative is selected, reintroduction efforts would occur for several years, and we would use adaptive management techniques to incorporate new information, reduce uncertainties, and minimize risk. Program implementation would include captive propagation of Steller's eiders, habitat assessment and release site selection, release of captive eggs / birds into the wild, and monitoring to evaluate progress and inform future decisions. These phases are not sequential, but concurrent: releases will likely occur in multiple years, monitoring will take place annually to inform future decisions, and we may need to conduct new site assessments if changing release sites is necessary. Reintroduction activities may affect communities on the Yukon-Kuskokwim Delta of Alaska and near Izembek Lagoon, and we would continue to seek input from potentially-affected parties throughout the program.

2. Introduction, Purpose, Need, and Scoping

2.1. Introduction

In December 1990, the U.S. Fish and Wildlife Service (Service) was petitioned to list the Steller's eider (*Polysticta stelleri*) under the Endangered Species Act (ESA). Due to contraction of the species' breeding range in Alaska and the resulting increased vulnerability of the remaining Alaska-breeding population to extirpation, the Service listed the Alaska-breeding population as threatened in 1997 (USFWS 1997). Recovery efforts for the Alaska-breeding population of Steller's eiders are guided by the Steller's Eider Recovery Plan (Plan), signed in 2002. A recovery criterion identified in the Plan requires that a subpopulation of Steller's eiders in western Alaska persist by having a $\leq 10\%$ probability of extinction in 100 years and is stable or increasing. Under the National Environmental Policy Act of 1969 (NEPA), this draft Environmental Assessment (EA) evaluates the potential environmental and socioeconomic effects of reintroducing Steller's eiders to western Alaska.

In this section, we provide a brief description of Steller's eider life history, population status, and distribution, and discuss the purpose and need for reintroduction efforts. A discussion of ongoing efforts of the Service to consult with Alaska Native tribes and corporations and requests for comments during the scoping process follows.

[1] The pronouns "we" and "our" refer to U.S. Fish and Wildlife Service - Region 7.

2.1.1. Steller's Eider Life History

The Steller's eider is the smallest of four eider species, with both sexes weighing about 800 grams (1.8 pounds) (Fredrickson 2001). Steller's eiders in Alaska nest on tundra adjacent to small ponds or within drained lake basins, generally near the coast but also up to 90 kilometers (56 miles) inland (Frederickson 2001). Young hatch in late June (Frederickson 2001). Shortly after hatching, females lead ducklings to nearby wetlands to feed on aquatic insects and plants until they are capable of flight at about 40 days (Obritschkewitsch et al. 2001).

Three breeding populations of Steller's eiders are recognized: one in Alaska and two in Arctic Russia. The Alaska-breeding population nests primarily on the Arctic Coastal Plain, although a very small subpopulation remains on the Yukon-Kuskokwim Delta (YKD; Figure 2.1, Figure 4.1). The majority of Steller's eiders breed in Russia and are separated into two breeding and wintering distributions (Nygard et al. 1995). The Russian-Atlantic population nests west of the mouth of the Khatanga River and winters in the Barents and Baltic seas. The Russian-Pacific population nests east of the Khatanga River and winters in the southern Bering Sea and northern Pacific Ocean where it mixes with the Alaska-breeding population (Figure 2.1).

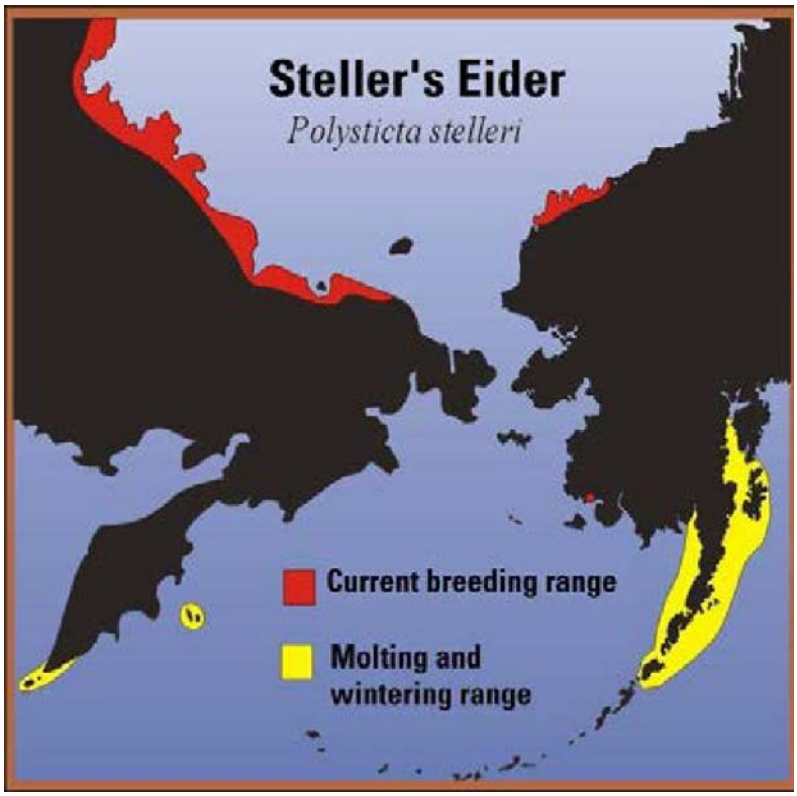

Figure 2.1. Distribution of the Russian-Pacific (to the Lena River Delta) and Alaska subpopulations of Steller's eiders.

After breeding, Steller's eiders move to marine waters and undergo a complete molt, including replacement of flight feathers. Steller's eiders from both the Alaska- and Russian-Pacific populations molt in several locations in southwest Alaska with the largest numbers occurring in three molting areas along the Alaska Peninsula: Izembek Lagoon, Nelson Lagoon, and Seal

Islands (Gill et al. 1981; Petersen 1981; Metzner 1993). Kuskokowim Shoals, an area offshore of the YKD, also provides molting habitat (Martin et al. 2015; USFWS 1997). Molting areas are characterized by extensive shallow areas with eelgrass (*Zostera marina*) beds and intertidal sand flats and mudflats where Steller's eiders forage on marine invertebrates such as molluscs and crustaceans (Petersen 1980, 1981; Metzner 1993). After molting, many Steller's eiders disperse to the Aleutian Islands, the south side of the Alaska Peninsula, Kodiak Island, and as far east as Cook Inlet, although thousands may remain in the lagoons used for molting unless freezing conditions force them to move to areas with less ice.

Steller's eiders generally winter in waters less than 10 meters (30 feet) deep, usually within 400 meters (400 yards) of shore except where shallows extend farther offshore in bays and lagoons or near reefs. Prior to spring migration, thousands to tens of thousands of Steller's eiders stage in estuaries along the north side of the Alaska Peninsula, including several areas used during molt and winter. From there, they migrate along the coast of the Bering Sea, lingering for days or weeks to feed and rest in productive areas along Bristol and Kuskokwim bays before continuing to nesting areas (Larned 2005, 2012).

2.1.2. Population Status and Distribution of the Alaska-breeding Population

The threatened Alaska-breeding population of Steller's eiders occurs as two subpopulations: the northern and western subpopulations. Historical records indicate the northern subpopulation nested on the Arctic Coastal Plain from Wainwright east, nearly to the Alaska-Canada border (Anderson 1913), but its range appears to have contracted and it has not been observed on the eastern Arctic Coastal Plain in recent decades. Historical data suggests the western subpopulation formerly nested on the YKD, possibly in significant numbers (Murie 1924; Conover 1926; Brandt 1943; Dufresne 1924; Murie 1959; USFWS 1997), and at least occasionally at other western Alaska sites (e.g., the Seward Peninsula, St. Lawrence Island, and possibly the eastern Aleutian Islands and Alaska Peninsula; Murie 1959). However, only eleven nests have been found on the YKD since 1997 (Flint and Herzog 1999; Service, unpublished data).

2.2. Purpose of the Action

The purpose of the proposed action is to reestablish a viable western Alaska subpopulation of breeding Steller's eiders by reintroducing the species to the YKD. A viable western Alaska subpopulation is one of the key recovery criteria for Alaska-breeding Steller's eiders, and must be met if the species is to be delisted. This draft EA considers impacts to the biological and social environments that may result from reintroduction efforts.

2.3. Need for the Action

The Service's purpose for reintroducing a subpopulation on the YKD is to assist in the recovery of the Alaska-breeding Steller's eider. In the Steller's Eider Recovery Plan the Service identified two criteria for delisting (USFWS 2002): the Alaska-breeding population has a $\leq$ 1% probability of extinction in the next 100 years; and both the northern and western subpopulations have $\leq$ 10% probability of extinction in 100 years and are stable or increasing. Thus, the western

subpopulation must survive or, if extirpated, be re-established for the Alaska-breeding population to be considered for delisting.

2.4. Consultation and Coordination with Tribes

The proposed action could affect Alaska Natives, their tribes, and Alaska Native Claims Settlement Act corporations. This NEPA analysis is only a small portion of on-going government-to-government consultation and coordination with potentially affected communities, tribes, and corporations. We began consultation prior to formally proposing reintroduction, and we would continue to seek input of potentially-affected Alaska Native tribes and corporations during all phases of the reintroduction program. Prior to initiation of the NEPA process, we began communicating with Tribal governments and corporations on the YKD's central coast, as these areas were considered the most likely to be potentially affected by reintroduction (Appendix 1). Before Scoping began, an invitation to participate in government-to-government consultation was extended to federally-recognized Alaska Native tribes and corporations within the Affected Environment (larger than the YKD). We also invited these groups to participate in a teleconference held on March 3, 2014. Later that month we described our proposed reintroduction efforts and answered questions by phone at two tribal meetings.

2.5. Scoping Process

The Service published a request for scoping comments that initiated the NEPA process on February 14, 2014. The Service sent the notice to individuals, agencies, conservation groups, landowners, local governments, Alaska Native corporations, tribal councils in or near proposed reintroduction sites, the Alaska congressional delegation, and others who expressed interest in the project (Appendix 1). On February 21, 2014 a Facebook page and Service website were established to increase information sharing with the public. Public service announcements were sent to radio stations in the Bethel region prior to public meetings, which were held in Anchorage, Bethel, Hooper Bay, and Newtok. The scoping period ended April 15, 2014.

2.6. Issues and Concerns

We received four written comments and tens of individuals provided oral comments during telephone conversations, scoping meetings, and tribal consultations. The following issues were identified and are addressed in this draft EA:

- Benefit of designating the western subpopulation as an "experimental and non-essential population" under the ESA;
- Hope for employment opportunities associated with the reintroduction;
- Request for involvement of local residents in the project;
- Loss of private property rights due to presence of Steller's eiders;
- Concern the project will increase human activity and reduce subsistence harvests;
- Concern important subsistence areas will be closed;
- Accidental shooting could lead to federal citations or closure of migratory bird harvest;
- Lack of monitoring could result in loss of valuable captive-reared birds;
- Failure of released birds to survive upon release;
- Concern that presence of lead shot on the breeding grounds may harm reintroduced birds;

- Research on the nesting grounds will disturb and displace wildlife;
- Changing climate will make recovery difficult;
- Released captive birds will introduce diseases to native wildlife;
- Conducting experiments could jeopardize the balance of the ecosystem; and,
- The presence of reintroduced Steller's eiders could increase regulatory requirements for resource development projects or other human activities.

Other issues raised were deemed not relevant because they were: 1) outside the scope of the proposed action; 2) already decided by law, regulation, or other higher level decision; 3) irrelevant to the decision to be made; or, 4) conjectural and not supported by scientific or factual evidence (40 CFR 1506.3).

3. Alternatives

We consider two alternatives in this draft EA: the No Action Alternative and the Preferred Alternative of reintroducing Steller's eiders to the YKD.

3.1. No Action Alternative

Under the No Action Alternative the Service would not reintroduce Steller's eiders to the YKD. Service employees and partners would not establish temporary facilities to support release and monitoring efforts. Actions such as field crews conducting site assessments, transport of field crews by aircraft or boat, nest-searching, releasing birds, or conducting predator management on the YKD would not occur. Additionally, other objectives associated with reintroduction (e.g., hiring of local youth and adults and outreach programs) would not occur. Under this alternative the western Alaska subpopulation is not likely to increase, leaving the extant threatened population more vulnerable to extirpation. Thus, the Service is unlikely to meet the established recovery criteria for this species (USFWS 2002).

3.2. Preferred Alternative

The purpose of the Preferred Alternative is to reestablish a viable western Alaska subpopulation through reintroduction, which would fulfill a recovery goal for Alaska-breeding Steller's eiders. For background, we discuss the history of the decision-making process to reintroduce Steller's eiders to the YKD and summarize our implementation plan.

3.2.1. History of the Decision-making Process

Structured Decision-making and Adaptive Management

After the Service listed the Alaska-breeding population of Steller's eiders as threatened, a team of species experts (the Spectacled and Steller's Eider Recovery Team; the Team, see Appendix 2) and Service staff applied structured decision-making methods to evaluate the biological, social, and economic feasibility of reintroduction (Table 3.1). Structured decision-making (SDM) is an organized approach to identifying and evaluating options and making choices in complex decision situations. This process enabled the Service to explicitly address uncertainty and respond transparently to legal mandates and public preferences or values; thus, SDM integrates science, policy, and social values explicitly. Should reintroduction efforts be

implemented, one goal will be to learn from early actions to improve subsequent management decisions. Thus, adaptive management techniques will be used throughout to incorporate new information, reduce uncertainties, and minimize risk. Adaptive management is a special case of SDM for decisions that are iterative or linked over time.

Table 3.1. Timeline of events in the structured decision-making process of the Spectacled and Steller's Eider Recovery Team (Team) leading up to the formal proposal of the Preferred Alternative.

Date	Event	Description
2005	Team meeting	New high priority recovery tasks: establish a captive flock and form a reintroduction subcommittee to draft feasibility analysis
Jan 2007	Team meeting	First draft of interim feasibility analysis presented to team by reintroduction subcommittee; feedback received
Dec 2007	Team meeting	Second draft of interim feasibility analysis presented to team by reintroduction subcommittee; feedback received
Jan 2008	Structured Decision Making Workshop at National Conservation Training Center	A group of Team members and structured decision-making (SDM) experts met to develop tools for the decision making process, and define reintroduction objectives and alternatives.
Feb 2009	Team meeting	The Team reviewed existing information and recommended to maintain and manage the existing reservoir captive population and future capacity for reintroduction. SDM Workshop report presented to Team; Team recommended continuing decision analysis and research to evaluate reintroduction as a tool.
Feb 2010	Habitat Workshop	Participants identified candidate areas for reintroduction, developed site selection criteria and identified research needs to support the feasibility analysis and decision making.
Sept 2011	FWS outreach planning meeting	FWS staff met to begin planning outreach objectives for the reintroduction planning process.
Dec 2011	Team meeting	The reintroduction subcommittee updated the Team on the planning process and discussed critical information needs.
Mar 2012	Organizational meeting	A group of Team members and other experts met to discuss model inputs and organize other available information prior to stakeholder meetings.
April 2012	FWS stakeholder meeting	A meeting with potentially affected FWS staff was held in Anchorage to inform them of the planning and decision making process and gather their input.
Sept 2012	Stakeholder meetings in	Meetings were held in Bethel and Anchorage to inform

	Bethel and Anchorage	potential stakeholders, including YKD community members, tribal and local governments, Native corporations, NGOs and other government agencies, of the decision making process and gather their input.
Dec 2012	Team meeting	The Service asked for Team input on the prognosis of success of Steller's eider reintroduction based on their expert evaluation of the available biological and ecological information.
Jan 2012	Internal Service meetings	In a series of meetings, the Team Leader and Coordinator discussed reintroduction with a group of upper-level managers in the Service (Assistant Regional Directors for Ecological Services, Migratory Bird Management, Refuges and LE) and with the Deputy and Regional Director.
Jan 2012	Service Regional Director decision	The Regional Director decided to further pursue the possibility of reintroducing Steller's eiders to the YKD and begin the regulatory, fundraising and implementation process.
Feb 2013	Stakeholder notification	Letters were sent to stakeholders notifying them of the Regional Director's decision.
Feb 2014	NEPA process initiated	Letters sent to potential stakeholders (See Appendix 1)

3.2.2. Implementation

Our approach for program implementation includes captive propagation of Steller's eiders, habitat assessment and release site selection, release of captive birds into the wild, and monitoring to evaluate progress and inform future decisions. These phases are not sequential, but concurrent: releases will likely occur in multiple years, monitoring will take place annually to inform future decisions, and we may need to conduct new site assessments if changing release sites is necessary. Our implementation plan also includes the objectives of minimizing disease risk, minimizing genetic and behavioral consequences of captive breeding, seeking input from and involving local communities, and complying with applicable laws, regulations, and Service policy. We expect protocols and timing of project components will change as we learn, perhaps even annually. Monitoring will evaluate success at meeting biological objectives, such as successful releases and eventual recruitment of breeding Steller's eiders into the area, and also social objectives, such as engaging local communities in conservation efforts and and minimizing effects to subsistence practices.

Captive Propagation

The Alaska SeaLife Center (SeaLife Center) in Seward, Alaska, currently maintains a flock of: 1) 22 Steller's eiders hatched from eggs collected from nests near Barrow; 2) 34 of their captive-bred offspring; 3) one Steller's eider brought in from Barrow as an injured juvenile; and 4) nine Steller's eiders captured as adults on the Alaska Peninsula. The SeaLife Center currently has the capacity to produce approximately 100+ eggs or 60 ducklings per year for release.

Habitat Assessment and Release Site Selection

An essential phase of the project is to assess potential sites for releases and support facilities on the YKD. Initial site assessments are underway. We are considering logistical, ecological, and social factors to identify potential rearing and release sites. Ecological considerations include wetland habitat characteristics and disease and contaminant exposure risks. Social considerations will help minimize negative impacts and maximize positive benefits to local communities.

Site-specific suitability assessments are being conducted by the SeaLife Center and Service staff. Areas currently under consideration include Kigigak Island and the lower Kashunuk River, but others may be considered as new information becomes available. Wetland habitat is being characterized using field measurements and remote sensing data following established protocols for habitat type assessments and monitoring of long-term change on the YKD (Jorgensen and Dissing 2010; Macander et al. 2012). Disease, parasite, and contaminant-exposure risk is being assessed by screening juvenile spectacled eiders and other suitable indicator species using serology, microbial swabs, and fecal screening for parasites, and tissue sampling for contaminant exposure.

Our site selection process also requires consideration of potential negative and positive effects to local communities. We have begun to communicate with local community members to identify potential release locations that would not interfere with subsistence activities. We would seek input to identify sites that would minimize negative effects and potentially benefit local communities by facilitating education and employment opportunities.

Release Methods

Although successful release methods have been developed for several waterfowl and other bird and species, we expect experimentation will be necessary to develop effective methods for Steller's eiders. At this time, the role of parental guidance in developing successful foraging, predator avoidance, and migratory behaviors is unknown. Further, it remains unknown when and how Steller's eiders imprint upon the area of natal origin, which presumably is involved in facilitating natal philopatry. Thus, we have identified a suite of possible release methods that vary in terms of: the duration and location that ducklings are held prior to release; the degree to which captive or wild hens are used to provide behavioral guidance; the facilities needed to support the method; and whether ducklings are transported to migration/molt areas after ducklings are reared and imprinted on the YKD during summer. We anticipate experimenting with multiple potential methods and refining subsequent release decisions based on monitoring results. Possible release methods include:

- Releasing small ducklings without prolonged captivity on the YKD ("hard releases");
- Rearing ducklings for several weeks in large enclosures on the YKD and releasing older ducklings prior to fledging ("soft releases");
- Rearing ducklings in enclosures on the YKD until fledging age, then transporting them to molting areas such as the Kuskokwim Shoals or Izembek Lagoon prior to release ("assisted migration");
- Bonding captive reared ducklings hens trapped in the wild at Kuskokwim Shoals or Izembek Lagoon, then releasing hens with adopted broods as family units ("foster hen");

- Augmenting naturally-occurring nests or broods with captive-reared eggs or ducklings ("nest or brood augmentation"); and,
- Augmenting wild nests or broods of surrogate species (e.g., common eiders or other duck species) with captive-reared Steller's eider eggs or ducklings ("surrogate").

Facilities

The type of facilities needed vary with release method used. Reintroduction efforts may require: 1) a breeding facility at the SeaLife Center; 2) a field camp and possible field release facilities at the release site; and/or 3) a holding facility in Bethel. We describe these in more detail below:

Breeding Facility (Alaska SeaLife Center). The SeaLife Center is an existing facility located in Seward, Alaska. Construction of new breeding areas and pools may be needed to increase capacity and production of releasable birds.

Field Camp at Release Site. All methods may require a temporary camp consisting of mobile structures (e.g., tents, weatherports, and/or fenced enclosures) at the release site to house Steller's eider ducklings and field crews. The size and amount of infrastructure would vary among methods. Regardless of release method, the facility must provide eiders with protection from predators, severe weather, disturbance, and allow for food supplementation and monitoring. We anticipate the camp and associated facilities will be removed annually to protect them from flooding and winter weather and because release sites may change.

Holding Facility (Bethel). If we choose to use wild-caught hens as foster hens, we anticipate constructing a permanent holding facility. A facility separate from the SeaLife Center is preferred to minimize the potential transmission of disease from wild eiders (foster hens) to the only existing captive flock of Steller's eiders and for logistical considerations described below. Our preferred location is Bethel, Alaska because: 1) Bethel is closer to potential release sites (compared to the SeaLife Center) which would reduce transport-related stress of captive birds; 2) a Bethel location would facilitate regional and local hire and community involvement; 3) housing may be available for Service and SeaLife Center staff at Service-owned facilities; 4) fresh water for pool habitats is available; and 5) the availability and reliability of supporting infrastructure such as electrical power, cargo shipping and receiving, and available labor likely exceeds that in smaller, more remote villages.

Monitoring

We would monitor during all phases to measure our progress and the need to change protocols. Development of a monitoring plan would likely involve several steps, including: 1) identification of monitoring targets; 2) selection of marking techniques and monitoring methods; 3) determining the frequency and scope of monitoring efforts; 4) implementing monitoring; and 5) evaluation of results to improve future decisions.

For reintroduction to be successful, released birds must move to appropriate molting, staging, and wintering areas, survive to adulthood, and then return to the YKD and successfully reproduce. The initial monitoring objective would be to evaluate if released Steller's eiders survive and persist in the wild. Subsequent efforts would focus on released birds returning to the YKD to breed. Five vital rates have been identified as key monitoring targets: 1) survival from

release until fledging; 2) survival from fledging until reaching molting or wintering areas; 3) first-year survival (i.e., survival from hatching until age of one year; 4) return of adult (2+ year-old) birds to the YKD; and 5) reproduction. We will also monitor success of other aspects of the program such as community involvement and effects to subsistence practices.

We will incorporate advice from subject-matter experts to apply the most cost-efficient and effective monitoring methods. Evaluating potential methods of monitoring is ongoing and is intended to keep pace with advancing technologies. Methods that may be used include aerial surveys and/or radio or satellite telemetry to locate released or breeding Steller's eiders and colored and metal leg bands, DNA genotyping ("fingerprinting"), or other technologies to distinguish among individuals. We have developed a list of selection criteria to further evaluate the marking/monitoring options, including detection range, location precision, cost, expected precision of estimates, retention rate, failure rate, and potential for carrier effects (mortality or morbidity of marked birds).

Minimizing Disease Risk

SeaLife Center staff have developed a management plan to maintain the health of captive and wild populations by preventing, treating, and controlling disease in the captive population. The current disease management plan for the captive population includes biosecurity practices to minimize exposure to pathogens, health monitoring and disease screening, and treatment and response plans to address potential disease concerns. Prior to release of eggs or birds to the YKD, pre-release health monitoring, monitoring of released birds, and disease response plans at all stages of the project would be developed and implemented.

The SeaLife Center also performed an extensive risk analysis that followed recommended guidelines for animal reintroduction using guidance provided by animal reintroduction and disease prevention experts. The risk analysis consisted of three main steps: 1) identifying, 2) ranking, and 3) evaluating the potential consequences of risk factors. First, a list of potential disease risks was created based on disease testing of the captive flock, field surveys, and knowledge of potential diseases of concern in the region where reintroduction would occur. Second, disease risks were ranked based on experimental evidence of pathogenicity (the ability of an organism to cause disease), known avian pathogenicity, and evidence of exposure in captive or wild populations. Expert opinion was used if published literature was inadequate to assess risk of specific agents. Third, the likelihood and consequences of transmission were evaluated for those disease agents identified in the first two steps.

The current risk analysis has not identified potential or significant disease transmission risks from captive to wild populations, thus the risk is considered low. However, disease risk assessment, management, and monitoring would continue during all phases of the reintroduction program should it go forward.

In summary, the current overall risk of disease transmission from captive birds to wild populations, based on extensive assessment, is low. Disease monitoring and prevention plans at the SeaLife Center are in place. Maintenance of disease risk at an acceptably-low level requires regular monitoring and adapting methods throughout the project.

Genetic Management of Captive Flock

Ideally, to prevent a reduction in genetic variation and ensure the presence of locally-adapted genes, the source population would originate from the release area, and/or genetic material from the YKD population would be available for comparative analyses of the target population's genetic diversity (Jamieson and Lacy 2012). However, this is not possible as very few Steller's eiders currently breed on the YKD. Therefore, the captive flock was derived from eggs collected on the Arctic Coastal Plain near Barrow (the only known breeding population remaining in Alaska). Future augmentation of the captive flock with males trapped on the wintering grounds may be considered to increase genetic diversity in the captive source population.

Molecular genetic techniques provide tools for monitoring levels of allelic variation in a population. The SeaLife Center, in partnership with U.S. Geological Survey Alaska Science Center, has used genotyping to compare genetic diversity of the captive population to the wild source population. Results indicate the current captive population is genetically comparable with the Alaska-breeding population on the Arctic Coastal Plain (Hollmén 2012). Only two genetic samples are available from YKD-nesting females, and we cannot draw conclusions regarding genetic structure from this small sample size. However, the genetic characteristics of the two individuals from the YKD were similar to those seen in eiders from Barrow (A. Riddle and T. Hollmén, unpublished data). Thus, we expect that the risk of reducing genetic variation in the wild population by introducing eiders raised at the SeaLife Center is minimal.

In summary, the current captive population originated from the Arctic Coastal Plain and contains comparable genetic diversity to the source population. We will continue to use tools such as pedigree analyses, genetic and physiological fitness monitoring to maintain genetic diversity of the captive flock. The risk of affecting genetic diversity of the wild population from releasing birds from the captive flock is low.

Predator management

Nest and/or duckling predation by mammalian and avian predators may hinder success efforts. The primary mammalian nest predators in the coastal zone of the YKD are foxes, although mink are present in some areas (B. McCaffery and J. Schmutz, *pers. comm.*). Avian predators include gulls and jaegers. We may implement temporary localized predator management efforts at release sites to improve nest success and survival rates in a limited area. These efforts may include passive predator exclusion such as fencing and/or mammalian trapping efforts.

3.2.3. Community Involvement

Government-to-Government Consultation

Reintroduction may affect areas of cultural importance to Alaska Native tribes and corporations. We have, and would continue to seek input from potentially-affected groups during all phases of this program and would comply with the Department of the Interior's Government-to-Government consultation policies (See Section 2.4). We would use written communication, in-person meetings, community meetings, and phone conversations to consult with potentially-affected parties throughout the project.

Outreach

Outreach would be a central part of a Steller's eider reintroduction effort. We would seek the participation of local community members from villages near reintroduction activities (particularly those on the central coast of the YKD), local and tribal governments, State and federal agencies, conservation organizations, and other non-government organizations. Our outreach objectives for the initial years include gaining support for the reintroduction program, developing effective partnerships, and engaging communities in conservation efforts. We also propose to develop communication tools and youth programs to promote reintroduction and provide additional benefits to local communities.

Frequent village visits may be the most effective way for Service staff and partners to discuss the rationale, scope, and possible outcomes (biological and socioeconomic) of reintroduction, listen and understand concerns, answer questions, and receive feedback. Visits would include community gatherings and one-on-one interactions. Reintroduction messages would be shared with Yukon Delta NWR Information Technicians from the local area so they can assist with village visits (to include translation as appropriate), conduct independent follow-up visits, or visit additional villages.

The establishment of a viable western Alaska subpopulation of Steller's eiders on the YKD may require developing infrastructure in local communities and a monitoring program to evaluate the effectiveness of the reintroduction program. Such a long-term commitment cannot be maintained without the active support of local residents, so their involvement would be critical. Thus, we would actively involve local residents throughout all phases of the program and make sure that concerns are understood and addressed. Planning and outreach efforts would actively encourage and solicit local residents to participate.

3.2.4. Compliance with Laws, Regulations, and Service Policy

We would ensure all components of the program maintain compliance with relevant statutes, regulations, and Service policies. For example, under section 7 of the ESA, we would formally consult on the effects of the Preferred Alternative on all listed species and designated critical habitat, and would comply with all terms and conditions of an incidental take statement. A Section 10(a)(1)(A) permit under the ESA would also be required and would contain conditions to minimize impacts to Steller’s eiders. Reintroduction efforts would also require compliance with provisions of the Animal Welfare Act of 1966 (7 USC 2131 and 7 CFR 2.22, 2.80, and 371.7), including a plan approved by an Institutional Animal Use and Care Committee. We would also protect cultural resources in accordance with Sections 106 and 110 of the National Historic Preservation Act of 1966, as amended (16 USC 470 and 36 CFR 800), the Antiquities Act of 1906 (16 USC 431-433), the Archaeological Resources Protection Act of 1979 (16 USC 470aa-470mm), and the Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001). These statutes require federal agencies to assure undertakings on lands under their jurisdiction are surveyed, evaluated, and mitigated from disturbances. Therefore, if we select the Preferred Alternative, the Service would comply with all applicable state and federal cultural resource statutes and policies.

3.3. Summary of the Preferred Alternative

The purpose of this NEPA document is to identify aspects of the biological and social environments that could be affected by reintroduction efforts. Because we are employing an adaptive management strategy, our description of the Preferred Alternative is intentionally broad in order to capture the range of possible approaches that may be applied during implementation. We anticipate that any reintroduction effort would face challenges as there is uncertainty regarding which methods would increase the prognosis for success. Learning and changing methods and approaches as a result of this learning are anticipated and are an inherent piece of adaptive management.

4. Affected Environment

The majority of effects would occur within the Yukon Delta NWR on the YKD's central coast where reintroduction activities would take place (e.g., camps, release sites, holding facilities, monitoring, and travel routes). Additionally, captive-bred Steller's eider releases may occur at nearshore marine areas of Kuskokwim Shoals (Figure 4.1) or Izembek Lagoon (on the Alaska Peninsula; Figure 4.2, where significant numbers of wild Steller's eiders molt (USFWS 2001a). Trapping of wild Steller's eider hens for use as foster hens may also occur at Kuskokwim Shoals or Izembek Lagoon. If needed, a holding facility may be constructed in Bethel, likely on Service property.

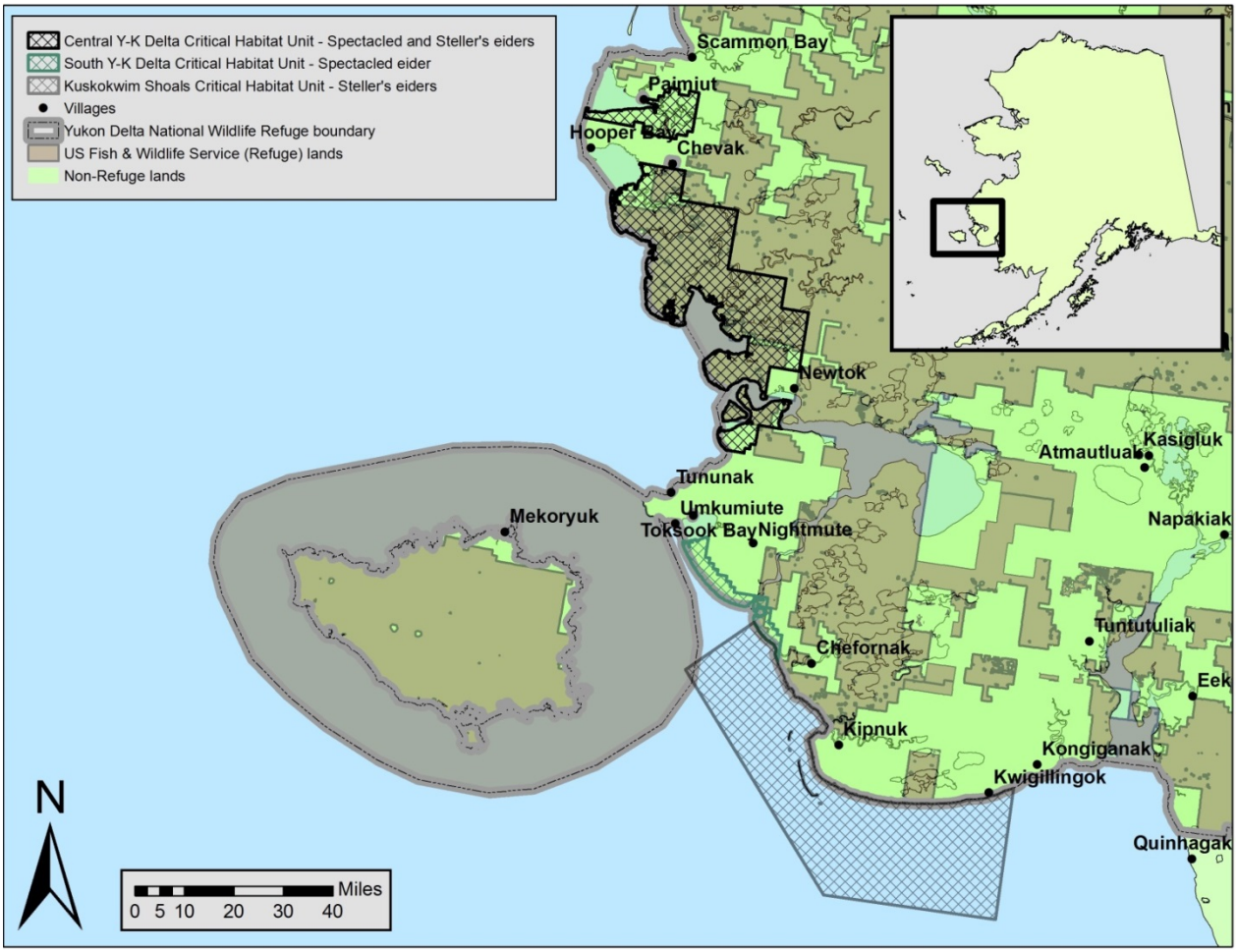

Figure 4.1. Yukon-Kuskokwim Delta and adjacent marine waters where Alaska-breeding Steller's eider reintroduction actions may occur. Map depicts villages, designated critical habitat units for Alaska-breeding Steller's eiders and spectacled eiders, and lands managed by the U.S. Fish and Wildlife Service (USFWS) and non-USFWS entities.

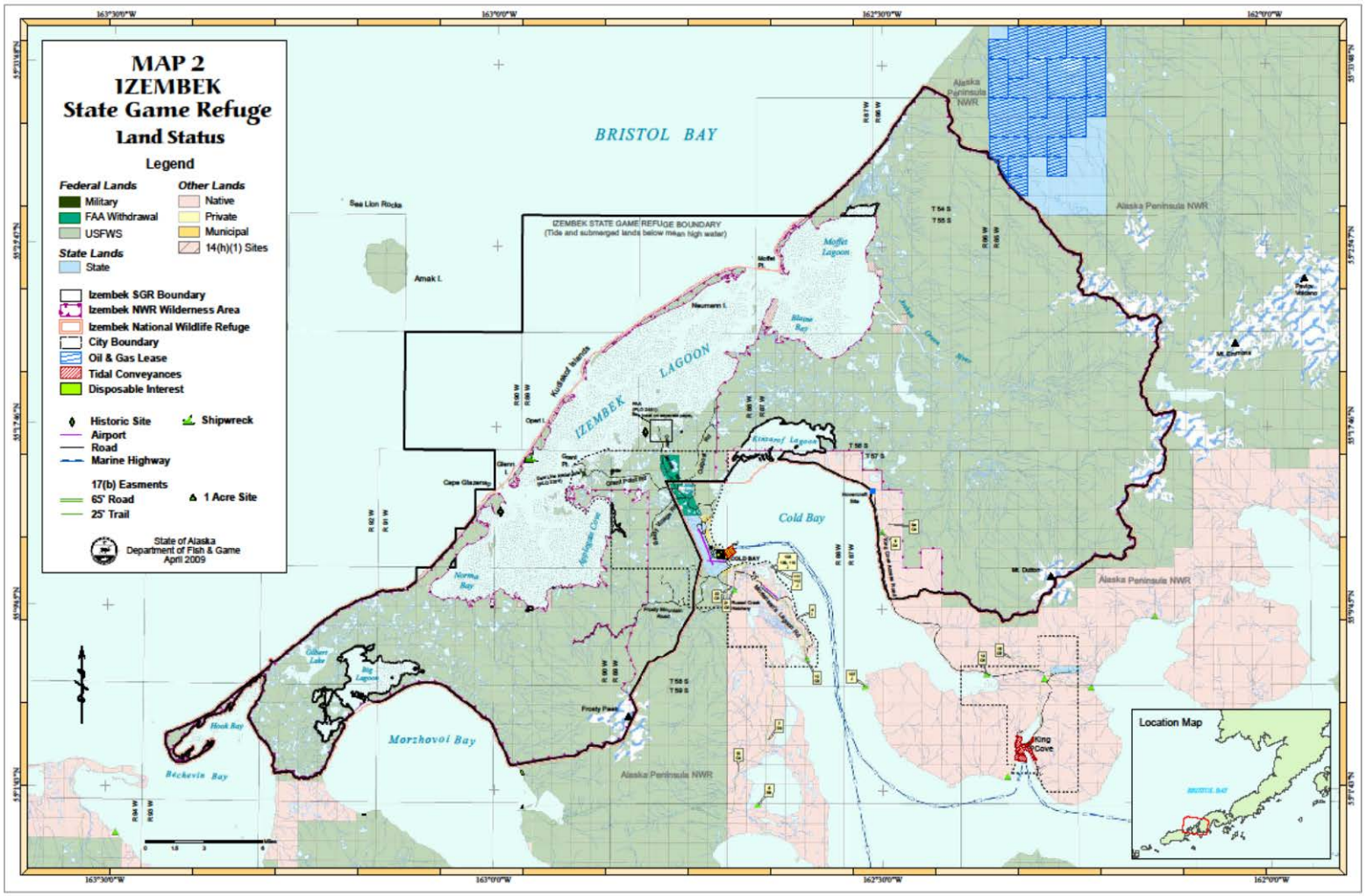

Figure 4.2. Land status map of Izembek Lagoon and surrounding area.

Outside of these areas, reintroduction actions may include aerial surveys to monitor released birds in nearshore areas of Bristol Bay, the Alaska Peninsula, lower Cook Inlet, and Kodiak Island. Aerial survey methods would be similar to ongoing surveys conducted by the Service to monitor Steller's eiders and other waterfowl species, and when possible, would be done in conjunction with ongoing surveys. Surveys will be conducted in a manner to minimize effects to other wildlife and humans, and will undergo section 7 consultation. Therefore, we do not anticipate more than a negligible effect on the biological or social environment due to aerial surveys, and they are not addressed further in this document.

A concern identified during Scoping was that the presence of reintroduced Steller's eiders could affect resource development or other human activities in areas where Steller's eiders molt and winter. However, for reintroduction to be successful, released Steller's eiders must adopt natural movement behavior of wild populations, including the use of migration routes and nesting, molting, and wintering areas currently or historically used by the wild population. We expect released eiders to use non-breeding habitats that are currently occupied by wild Steller's eiders. Thus, the presence of released birds and their offspring would not require regulatory actions beyond those that already occur due to the presence of wild Steller's eiders. We have not identified other effects to the biological or social environment at molting or wintering areas except those addressed below for Kuskokwim Shoals and Izembek Lagoon.

Therefore, for the above reasons, we determined that effects to the human and biophysical environments of the nearshore areas of Bristol Bay, Alaska Peninsula, lower Cook Inlet, and Kodiak Island are negligible and these areas will not be considered further in this document.

Similarly, the proposed reintroduction methods are meant to encourage released eiders to return to nest on the YKD's central coast. While Steller's eiders nest on Alaska's Arctic Coastal Plain (See Section 2.1.2), we have no basis to expect that Steller's eiders released on the YKD would recruit to the Arctic Coastal Plain subpopulation. Therefore, we anticipate no effect to the biological or social environment of the North Slope and it is not included in the Affected Environment (see Appendix 3 for definitions of terms such as "no effect").

Therefore, the Affected Environment is comprised of the following areas:

- Inland and nearshore areas of the central coast of the Yukon Delta NWR from the Askinuk Mountains to northern Nelson Island (Figure 4.1), where reintroduction actions (e.g., camps, release sites, holding facilities, monitoring, and travel routes) may occur and/or released Steller's eiders and their offspring may return to nest;
- Kuskokwim Shoals, where birds may be released or foster hens may be captured; and,
- Izembek Lagoon (Figure 4.2), where birds may be released or foster hens may be captured.

We have limited our analysis to the portions of the biological and social (human) environments that the Preferred Alternative is reasonably expected to affect. See Table 5.1 for a description of the resources that are not likely to be affected or, at most, will be affected negligibly.

4.1. The Kuskokowim Central Coast and Kuskokwim Shoals

4.1.1. General Description

The YKD is a vast low elevation area between the deltas of the Yukon and Kuskokwim Rivers in western Alaska. It is filled with freshwater and tidally-influenced wetlands and rivers (referred to as the intertidal zone). A more detailed description of the physical and vegetative characteristics can be found in Nowacki et al. (2000). The YKD is a globally-recognized waterfowl and migratory bird breeding area.

Kuskokwim Shoals is a shallow nearshore area that spans from the northern part of Kuskokwim Bay nearly to the village of Kwigillingok, and is used by thousands of Steller's eiders during fall molt and spring staging (USFWS 2001a).

4.1.2. Biological Environment

Many waterfowl, shorebird, and other waterbird species breed on the YKD and use tidal areas and shallow nearshore waters. Among other species eiders (*Somateria* spp.), dabbling ducks (*Anas* spp.), diving ducks (*Aythya* spp.), cackling Canada geese (*Branta hutchinsii*), Pacific brant (*B. bernicla*), white-fronted geese (*Anser albifrons*), emperor geese (*Chen canagica*), and tundra swans (*Cygnus columbianus*) nest in the coastal zone. Shorebirds include whimbrels (*Numenius phaeopus*), bristle-thighed curlews (*N. tahitiensis*), bar-tailed godwits (*Limosa lapponica*), and black turnstones (*Arenaria melanocephala*). Sandhill cranes (*Grus canadensis*) are common throughout the YKD's wetlands, including along the coast. The emergent vegetation of lakes provides nesting habitat for loons (*Gavia* spp.). Many of these species use adjacent marine waters to stage after breeding and prior to migrating to wintering areas. The threatened spectacled eider (*Somateria fischeri*) breeds and nests in the coastal intertidal zone of the YKD, and a portion of this area contains designated critical habitat for this species (USFWS 2001a, 2001b). Spectacled eiders also use the YKD's nearshore waters during migration.

The YKD also supports many species of fish, both resident species such as grayling and northern pike, and many that migrate, including whitefish and salmon species. The near shore marine environment harbors Pacific herring, halibut, and tomcod among others, and also supports a wide variety of marine mammals including several species of seal.

4.1.3. Social Environment

Currently and historically, Yup'ik Eskimos have lived and subsisted on the YKD and within its nearshore marine waters. People living on YKD still rely on subsistence resources for cultural identity and economic sustenance. The YKD is also a mosaic of land ownership and cultural and legal institutions that influence its use, including harvest of subsistence resources. In this section, we describe cultural and subsistence resources and land management practices in areas potentially affected by reintroduction. The focus of our discussion is on subsistence resources and activities.

Subsistence Activities

All Yukon Delta NWR waters and lands are open to fishing and hunting consistent with State and federal regulations, although subsistence fishing and hunting on the YKD and in nearshore waters far exceeds sport fishing and hunting (USFWS 2004). The mosaic of land ownership on

the YKD and the State and federal regulations can affect the traditional subsistence practices of YKD residents. Additionally, residents often must travel and devote time to harvesting resources when seasons and geography make them available (Argetsinger and West 2009; West and Ross 2012). Thus, YKD residents must have knowledge of the multifaceted land ownership, regulatory, and biological setting to maintain their traditional subsistence practices. The most commonly harvested resources within the intertidal zone and from within nearshore waters are fish, marine mammals, and waterfowl (USFWS 2004; Argetsinger and West 2009; West and Ross 2012). Land mammals and plants are also important subsistence resources (USFWS 1988; West and Ross 2012). We briefly describe the harvest of these resources below.

Harvested fish provide a primary food source for YKD residents. Subsistence harvest of salmon from YKD rivers begins in June (West and Ross 2012). Sheefish (*Stenodus nelma*) and whitefish are also harvested (West and Ross 2012) at this time. In winter, ice fishing for tomcod (*Microgadus tomcod*) and northern pike (*Esox lucius*) provides limited amounts of fresh meat (West and Ross 2012). Coastal communities can also harvest saltwater fish such as herring (*Clupea pallasii*) and starry flounder (*Platichthys stellatus*) (West and Ross 2012).

Marine mammals are an important traditional subsistence resource harvested by coastal and near-coastal communities on the YKD (Coffing et al. 1998, Ice Seal Committee 2012, West and Ross 2012). These communities frequently harvest beluga whales (*Delphinapterus leucas*), ice seals, and occasionally Pacific walruses (*Odobenus rosmarus divergens*) (USFWS 1988, West and Ross 2012). The harvest of belugas generally occurs in all months except for September and October (USFWS 1988). Seal harvest (e.g., bearded [*Erignathus barbatus*], ringed [*Phoca hispida*], northern fur [*Callorhinus ursinus*], and spotted [*P. largha*] seals) occurs year round but peaks in March, April, and September due to favorable ice conditions (USFWS 1988; Coffing et al. 1998; West and Ross 2012). Walruses are hunted offshore, primarily in conjunction with the spring seal hunts (USFWS 1988).

Waterfowl adults and eggs are an important subsistence resource for residents living on the YKD. Subsistence hunting of adult waterfowl occurs from their arrival in spring until departure in early winter. Regulations that govern waterfowl hunting in Alaska partition the year into subsistence hunting in spring and summer, and the fall (sport) hunt in fall and winter, although residents do not recognize the separation of sport and subsistence hunts because residents continue traditional activities similarly in both seasons. Therefore, we consider all hunting as subsistence in this document regardless of season or the underlying regulatory context. Subsistence egg collection occurs early in the nesting season.

The harvest of terrestrial mammals in the intertidal zone largely consists of smaller mammals such as muskrats, mink, and foxes and generally occurs in winter (USFWS 1988).

YKD communities also harvest berries including blueberries (*Vaccinium alaskensis*), crowberries (*Empetrum nigrum*), and cloudberries (*Rubus chamaemorus*); and greens including marsh marigold (*Caltha palustris*), wild celery (*Heracleum lanatum*), and cow parsnip (*Heracleum maximum*) (West and Ross 2012).

Resource Development
We are not aware of ongoing or pending resource development activities within the YKD's central coast zone, with the exception of commercial fishing off the coast and in the larger rivers. Commercial shipping near Kuskokwim Shoals may increase if Donlin Mine on the upper Kuskokwim River is developed.

4.2. Izembek Lagoon

4.2.1. General Description
Izembek Lagoon, Moffett Lagoon, and Norma Bay (hereafter, combined as Izembek Lagoon) are shallow, productive lagoons on the north side of the Alaska Peninsula located between the Bering Sea to the northwest and lowlands of the Aleutian Mountain Range to the southeast. The lagoon is about 48 kilometers (about 30 miles) long and varies in width from 5 to 10 kilometers (about 3 to 6 miles) and contains one of the world's largest eelgrass (*Zostera marina*) beds. A description of the species occurring within the lagoon and surrounding federal, State and private lands can be found in USFWS (2013).

4.2.2. Biological Environment
Izembek Lagoon and surrounding areas are recognized as globally important for several species of waterfowl (USFWS 2013). In 1986, Izembek Lagoon was the first wetland area in the United States to be recognized as a Wetland of International Importance by the RAMSAR Convention. In 2001, Izembek National Wildlife Refuge (Izembek NWR) was also designated as a Globally Important Bird Area by the American Bird Conservancy. A large number of Steller's eiders molt in Izembek Lagoon in fall, a portion of which is likely from the listed Alaska-breeding population; the lagoon is designated as critical habitat for this species (USFWS 2001a; USFWS 2013).

In addition to Steller's eiders, other bird species use the area, particularly in the fall. Izembek Lagoon is a key staging area for emperor geese and Pacific black brant, which graze on its extensive eelgrass beds. The area supports almost the entire population of Pacific black brant during spring and fall migration. Additionally, cackling geese use the area primarily during fall migration, foraging on eelgrass and upland berries. All three species are of conservation concern and can be sensitive to human disturbance. Other waterfowl, such as pintails, scoters, and tundra swans, and several shorebird, seabird, and raptor species, also use the area during the fall (USFWS 2013).

4.2.3. Social Environment
Izembek Lagoon is located within the boundaries of Izembek NWR, and the submerged lands and waters within the lagoon are managed by the State of Alaska as Izembek State Game Refuge. The nearest human settlement is the city of Cold Bay located 13 kilometers (8 miles) southeast of the lagoon. Public use activities include scientific research, tourism, beach combing, and subsistence activities, but a primary use in Izembek Lagoon is fall waterfowl hunting (September – November; USFWS 2013).

5. Environmental Consequences, including Cumulative Effects

The purpose of this section is to identify and describe potential environmental effects on the biological and social environments that could result from implementing the two proposed alternatives.

5.1. No Action Alternative

Because reestablishing a viable western Alaska subpopulation of breeding Steller's eiders on the YKD is a criterion for delisting, selecting the No-Action Alternative will likely prevent the Service from achieving recovery criteria and delisting this species.

5.1.1. Biological Environment

Selecting the No-Action Alternative would have no effect on the biological environment. Without reintroduction efforts, Steller's eiders will likely continue breeding only infrequently on the YKD and may become absent entirely from the area.

5.1.2. Social Environment

Selecting the No-Action Alternative would have no effect on cultural and historic resources or on human activities described in the Affected Environment. The Service would not provide additional outreach, education, or employment opportunities in communities on the YKD related to reintroduction.

5.1.3. Cumulative Effects

Selecting the no-action alternative is not anticipated to result in cumulative impacts. However, it would result in the current protections under the ESA and the Migratory Bird Treaty Act remaining in place because a population increase needed to reach recovery criteria would be unlikely without reintroduction efforts.

5.2. Preferred Alternative

During this analysis we sought to identify all potential effects, and then determine which should be further analyzed due the intensity, duration, or scale of the effect, or the level of concern expressed by stakeholders during the scoping process (See Appendix 3 for definitions). Table 5.1 lists the potential impacts eliminated from further analysis due to little or no effect and provides a justification for their elimination. We then describe the following potential effects that have a greater potential to affect the environment:

1) Effects to the extant wild Steller's eider population through changes in genetic diversity, disease, disturbance, and the potential for reintroduction to aid in recovery of the population;
2) Effects to other bird species within the Affected Environment through increased disease risk or disturbance during reintroduction activities; and,
3) Effects to the social environment, including how reintroduction activities and/or presence of reintroduced birds would affect subsistence activities, sport hunting, and resource development.

Table 5.1. Potential effects of the Preferred Alternative to the biological and social environment that were eliminated from further analysis because of minor importance.

Resource	Potential impact and justification for elimination
Physical Environment	We do not expect ground disturbance in association with reintroduction, with the possible exception of constructing a holding facility in Bethel. The facility, if constructed, is likely to be in an area that is already developed.
Terrestrial Mammals	Large mammals are not commonly present in coastal zone of YKD. Effects to small mammals such as voles during reintroduction actions would be minor, short-term, and site-specific. A high density of brown bears can be found along the outer edges of Izembek Lagoon in fall, including near the boat launch and tidal areas where duck traps may be set. Bears will be avoided and effects are likely to be negligible from these short-term activities.
Marine Mammals	It is possible that marine mammals, including northern sea otters, seals, killer whales, gray whales, Steller's sea lions, and walruses could be encountered when boating at Izembek Lagoon and Kuskokwim Shoals. However, reintroduction activities would have at most negligible effects to the above mammals because measures will be taken to avoid them, and activities will be of short duration.
Fish	Small watercraft may be used for transportation along major and minor waterways to camp sites and field sites, but this boating is unlikely to affect fish.
Listed Species	Reintroduction actions would be evaluated through section 7 consultation to ensure that any potential effects to listed species are minimized (see also Section 4.1.2 for discussion of spectacled eiders).
Captive reservoir population of Steller's eiders at Alaska SeaLife Center	We expect no negative effect to the captive flock. Eggs and ducklings produced from the reservoir flock are likely to be used for reintroduction (not adult members of the flock). The flock would be maintained at numbers necessary to preserve genetic reservoir, and methods would be reviewed by an animal care and use committee.
Cultural/Historic Resources	We expect no effect on known cultural or historic resources because we would avoid conducting reintroduction actions near these resources and would consult with the Regional Historic Preservation Officer to ensure compliance with all applicable laws. If cultural resources are found, we expect negligible impacts on newly-discovered cultural or historic resources because we can relocate our actions.
Private Property Rights/Land Use	We intend to carry out all reintroduction actions on Refuge land or in State waters that provide public access. We recognize the patchwork of land ownership requires consulting with Refuge

	staff and local experts to ensure we do not inadvertently trespass onto private land. We will pursue all required special use permits. Thus we expect no effect to private property rights.
Sport Hunting on the YKD	Sport hunting and fishing occurs rarely on the central coast of the YKD. Hunting and fishing on the YKD where reintroduction activities may occur consists primarily of subsistence activities rather than sport hunting; thus, reintroduction actions are unlikely to affect sport hunting. We address effects to subsistence activities later in this document.
Other uses of the YKD	The majority of Refuge-permitted activities involve avian research. At most a negligible effect is expected because we intend to communicate with researchers to minimize interference. Recreational users are rare in the coastal zone; if they are encountered we expect our actions would have no effect.
Local Economies	We expect this action to have a positive but minor effect on the local economy by providing education and employment opportunities as well as the purchase of supplies and services from the communities on the YKD and Cold Bay. If constructed, a holding facility in Bethel would create short-term construction jobs as well as some longer-term employment.
Sport and Subsistence Activities at Izembek Lagoon	Subsistence activities of Cold Bay and King Cove residents, including fishing at creeks/rivers that flow into Izembek Lagoon, and waterfowl hunting, may occur at the same time as reintroduction activities. Because it is difficult to distinguish between sport and subsistence hunting, and sport hunting is a significant activity in the fall at Izembek Lagoon, we consider waterfowl harvest at Izembek Lagoon in this document as sport hunting. Other subsistence activities are unlikely to overlap with the short-term, temporary reintroduction activities, but refuge personnel, communities, and Tribal governments will be consulted to ensure that is the case.
Other uses of Izembek Lagoon	Other uses of Izembek Lagoon include avian research, tourism, and beach combing (USFWS 2013). Some tourist and outreach activity occurs near Grant Point where watercraft would be launched for reintroduction activities. However, boating activities associated with reintroduction in Izembek Lagoon would occur so infrequently they are unlikely to overlap with other activities.

5.2.1. Biological Environment

In this section we describe the potential effects to the biological environment, including the extant wild population of Steller's eiders and other bird species that use the Affected Environment.

Vegetation
Short-term, high-intensity site-specific impacts to vegetation may occur during on-the-ground activities such as those occurring at camp and release sites. Vegetation would recover naturally upon project closedown, but depending on the number of years specific sites are occupied, recovery of these small areas could take years.

Wild Steller's Eider population
Disease and Genetic Risk. In 2009, the Team identified and recommended evaluation of critical risk factors that could negatively affect the wild Steller's eider population or other bird species, including the potential introduction of disease and the potential loss of genetic diversity in the captive source population. Both have been evaluated through formal risk analyses conducted by the Alaska SeaLife Center (Section 3.2.2). Results indicate that the current overall risk of disease transmission from captive birds, which are held in a facility with very high biosecurity standards, to wild populations is low. If Steller's eiders are reintroduced, the Service would regularly monitor and adapt protocols at all levels and phases of the program to minimize disease risk.

Similarly, the current captive population originated from the Arctic Coastal Plain and contains comparable genetic diversity to the source population; therefore, we expect that releasing progeny from the captive population will not result in a decrease in genetic diversity of the natural population. Tools such as pedigree analyses, genetic and physiological fitness monitoring would continue to be used to maintain genetic diversity of the captive flock, should the Preferred Alternative be selected (Section 3.2.2).

Disturbance. It is possible that certain reintroduction methods could disturb wild Steller's eiders. For example, if wild hens are captured, during releases of captive-reared birds to the molting areas, during nest/brood augmentation, and during monitoring.

To implement the foster hen release method, a small number of Steller's eider hens would be captured annually while flightless at molting areas of Kuskokwim Shoals or Izembek Lagoon and held in captivity over winter. Capture would involve methods similar to those used during Steller's eider banding drives for several years at Izembek and Nelson lagoons (see Dau et al. 2000 for more detailed description of methods). However, fewer birds would be captured to implement this method than were captured during banding drives. Capturing small numbers of female Steller's eiders annually is unlikely to have population-level effects on the Pacific population. Additionally, only a small proportion of individuals at Kuskokwim Shoals or Izembek Lagoon are thought to be from the listed Alaska-breeding population; thus, it is unlikely that a member of the listed population will be captured. Other bird species may be disturbed during these activities, but they will likely move to other areas of the lagoon, and displacement would be short-term. Thus, we do not expect that disturbance of Steller's eiders would have population-level effects.

Likewise, we expect that disturbance to Steller's eiders would be minimal during releases of captive-raised birds to molting grounds. We would attempt to spend as little time in the area as possible so released birds can acclimatize to the area, begin mixing with wild flocks, and acquire natural fear of humans and predators.

We may augment the nests of wild Steller's eiders on the YKD with eggs produced at the SeaLife Center. We do not expect to find many wild Steller's eiders because they nest on the YKD very infrequently. However, if wild Steller's eiders nests are found, females may be flushed from or temporarily prevented from returning to their nests. In rare instances, females may abandon their nests and eggs. Also, females may expend energy raising additional young. The Service currently conducts research on Steller's eiders in the Barrow area, and field crews on the YKD would use standard operating procedures (see Appendix 4: Example Minimization Measures from Barrow Eider Project) that include minimization measures successfully developed during the Barrow study. Additionally, field crews would adhere to conditions of all necessary permits. Therefore, we expect that impacts to individual wild Steller's eiders on the YKD would be of moderate intensity and duration.

As described in Section 3.2.2, we may conduct aerial monitoring on the YKD, the migratory route, and molting and wintering areas. These surveys would be of short duration and likely have only a negligible effect on wild Steller's eiders.

Potential contribution to Steller's eider recovery. The purpose of the Preferred Alternative is to re-establish a western Alaska subpopulation that is essential to the recovery of the listed Alaska-breeding population. However, we are uncertain how successful reintroduction may be at accomplishing this goal. In this section, we briefly describe the uncertainties related to reintroduction to provide context regarding the potential for a positive effect on the Alaska-breeding population.

Over the last several years, the Team helped the Service identify factors potentially affecting the success of reintroduction efforts. Key uncertainties include:

- Historical distribution and abundance of Steller's eiders on the YKD are unknown.
    - No population surveys were conducted prior to decline, and information is primarily limited to anecdotal observations and limited sampling efforts.
- Causes of decline are unknown.
    - Causes may have included changes in community ecology (concurrent goose population declines and subsequent prey switching by fox, changes in pond productivity), ingestion of spent lead shot, increased harvest, and changes in the marine environment.
    - Retrospective analyses to test these hypotheses are not possible.
    - Because original causes of decline are unknown, we cannot be certain that potential constraints to population re-establishment have been ameliorated.
- Potential future changes in the habitat's capability to support Steller's eiders are difficult to predict.
    - Climate change is likely to impact waterfowl habitat through increased storm surges, increased salinity in the intertidal zone, melting of permafrost, and vegetation change.
- The proportion of birds released on the YKD that will return upon reaching breeding age (natal philopatry) is unknown.

Two factors that may affect success warrant further discussion given the concerns raised by stakeholders during Scoping (see Section 2.5): predation risk and contamination from ingestion of spent lead shot.

Predation risk. Predation may influence productivity and survival of reintroduced eiders nesting on the YKD. Avian and mammalian predators could prey upon reintroduced Steller's eiders eggs, ducklings, or their nests. The primary mammalian nest predators in the coastal zone of the YKD are foxes, although mink are present in some areas (B. McCaffery *pers. comm*; J. Schmutz, *pers. comm*.; Fischer and Stehn 2014; Norment et al. 2015).

Predator management efforts may take place on the YKD near release sites to reduce predation risk to released birds. Some predator management efforts such as exclosures around nests to displace avian and mammalian predators would have only minor, extremely localized effects on vegetation and no effect on birds and mammals. Trapping efforts, if implemented, would have a minor effect on avian and mammalian species in a localized area near reintroduction sites. Some nesting birds may be disturbed while checking traps, but trappers would follow standard operating procedures that include minimization measures, and we expect these birds to return to their nests once the trapper has vacated the area. Predators such as foxes and mink would die. However, we expect effects of trapping on avian species would be short-term and localized, and if trapping were implemented it would have a localized effect by temporarily reducing predator numbers near reintroduction sites.

Contaminant Risk. For several decades, waterfowl and small game hunting resulted in the deposition of spent lead shot into wetlands on the YKD, especially near villages. The use of lead shot for hunting waterfowl has been illegal since 1991 in Alaska (50 CFR §20.102), and the Alaska Board of Game, at the request of regional advisory committees, passed regulations that prohibit the use of lead shot for all bird and small game hunting on the YKD. Opportunistic examination of spent shell casings, ammunition of hunters, and store shelves has revealed very few violations of this prohibition, indicating outreach, education, and enforcement efforts are having a positive effect. However, permafrost under shallow water bodies on the YKD contributes to the persistence and availability of lead pellets for years after deposition (Flint and Schamber 2010).

Steller's eiders on the YKD, particularly breeding hens and young birds that forage in shallow tundra ponds might ingest spent lead shot (Flint et al. 1997). The toxic effect of lead poisoning includes lethal and sublethal effects (Bellrose 1959; Eisler 1988). Observed geographic variation in spectacled eider survival on the YKD may be explained by variation in lead exposure (Grand et al. 1998, re-analysis by Anderson et al. 2000). Similar rates of exposure have been found in long-tailed ducks (*Clangula hyemalis*) on the YKD (Flint et al. 1997). The probability of lead exposure in spectacled eiders on the YKD is related to distance from villages and access routes to hunting areas, such as major rivers and sloughs (Petersen et al. 2012). Potential exposure, particularly at/near potential release sites, will be evaluated as part of final site selection to minimize the potential for exposure.

In summary, these uncertainties make assessing the likelihood of success of reintroduction difficult. However, the Team and Service believe that re-establishment of a viable subpopulation in western Alaska within a reasonable conservation horizon is unlikely without reintroduction. No other plausible alternatives have been identified.

Other Bird Species

Reintroduced Steller's eiders would have a negligible impact on other YKD wildlife; they are unlikely to displace other birds nesting on the YKD or compete with for other resources such as food. Implementation of the Preferred Alternative could affect other bird species through disturbance or through potential disease transmission, and some methods, such as using wild females of other waterfowl species as surrogate mothers for Steller's eider clutches, could have direct impacts to small numbers of those species.

Disturbance. Reintroduction actions may disturb some nesting birds of other species in a small area of the YKD. Incubating females may be flushed or temporarily prevented from returning to their nests. In most cases, females would return to their nests and continue incubation. In rare instances, females may abandon nests and eggs, or nests/eggs could be depredated while the female is absent. We would incorporate best practices commonly used in waterfowl nest studies to minimize nest disturbance and will adhere to conditions of all permits (see Appendix 4). Fieldwork would occur over a relatively small area of the YKD or nearshore waters. Because we expect behavioral responses would occur over a very small area and to be minor in scale and short in duration, we expect disturbance to cause only minor effects to a few individuals. While, in summary, we expect only minor, localized effects to birds, we also address the concern that disturbance may affect subsistence use of these species in Section 5.2.2 below.

Spectacled eiders, also listed as threatened under the ESA, may nest near reintroduction sites on the YKD. The Service would consult under section 7 and minimize disturbance by employing terms and conditions currently required of other researchers in the area.

Activities such as release of captive birds and capture of foster hens at Kuskokwim Shoals and Izembek Lagoon, as described above, may temporarily disturb other waterfowl and shorebirds. These birds are likely to be displaced for a short amount of time, but as with Steller's eiders, we do not expect disturbance associated with these capture efforts to cause population-level effects.

Disease. The Team considered disease risk to other birds as a critical factor that had to be adequately minimized prior to releasing captive-raised Steller's eiders. This is particularly important when releasing captive-reared birds to an area as important to waterfowl and shorebird populations as the YKD. As described above, the risk of disease has been evaluated through a formal risk analysis conducted by the Alaska SeaLife Center (Section 5.2.1). Results indicate that the current overall risk of disease transmission from captive birds to wild populations is low. If Steller's eiders are reintroduced, the Service would regularly monitor and adapt protocols at all levels and phases of the program to minimize disease risk. Therefore, we expect effects to wild birds from disease to be negligible and manageable.

Nest Success. One method being considered is to use hens of other waterfowl species nesting on the YKD as surrogate mothers for Steller's eiders. This method could involve replacing clutches of common eider, scaup, or other waterfowl with Steller's eider eggs. This method would reduce the reproductive success of the surrogate mother, as these eggs would not hatch. However, given the population sizes of potential surrogate species on the YKD (multiple thousands of individuals) the loss of a low number (likely 10s at most) of clutches if this method is used is expected to have negligible population-level impacts.

Summary of Biological Environment Impacts

In summary, we expect only minor impacts of the Preferred Alternative on the biological environment of the YKD, Kuskokwim Shoals, and Izembek Lagoon through short-term, minor disturbance, a negligible increase of disease transmission risk to other bird species, and possible reduction in reproductive success of a low number of females of other waterfowl species if a surrogate mother approach is implemented. Our intent is that reintroduction will have long-term, positive impacts to the Affected Environment and will not result in significant negative effects. If successful, the Preferred Alternative would establish a viable population of Steller's eiders on the YKD and increase the number of Steller's eiders using both Kuskokwim Shoals and Izembek Lagoon.

5.2.2. Social Environment

Reintroduction could impact the social environment by potentially affecting opportunities to: 1) conduct subsistence activities; 2) sport hunt; and/or 3) develop natural resources.

Subsistence Activities

Subsistence activities could be indirectly impacted by affecting subsistence resources, thereby making them unavailable for harvest, and/or they could be directly impacted by affecting the ability of subsistence users to conduct activities normally (for example, the presence of researchers could discourage hunters from using traditional areas). The greatest impact is likely to occur at sites on the YKD's central coast on Yukon Delta NWR land. Some impacts could also occur at Kuskokwim Shoals and/or Izembek Lagoon during capture and release activities, but reintroduction activities will be of such short duration and intensity at those locations that the effect on subsistence activities is likely to be negligible.

We addressed the potential indirect impacts (for example, potential disease transmission or disturbance on other birds) in Section 5.2.1 above. However, we recognize that subsistence users may have different perspectives and may disagree with our assessment that impacts to wildlife and other resources are likely to be minor, at most. Therefore, we propose to address these concerns in two ways: 1) continue to coordinate with local subsistence users to better understand any concerns; and 2) use that information to minimize impacts whenever possible. Our efforts to work with local subsistence users will be on-going throughout the project and will not be accomplished solely through this NEPA analysis.

Concerns about direct impacts can be divided into two categories. First, spatial and temporal overlap of reintroduction and subsistence use may discourage subsistence users from their normal activities. Second, some stakeholders are concerned that increasing the number of Steller's eiders would increase the likelihood of a local hunter accidentally shooting one, resulting in prosecution for harvesting a closed species.

Reintroduction activities could overlap with subsistence activities in the spring and summer during harvest of adult waterfowl and eggs, and during movement to and from fish camps along the YKD's central coast. However, reintroduction actions would occur on a very small scale relative to subsistence harvesting. We would carry out actions or camp at one or two sites annually and walk across the tundra on foot in a relatively small area. We would travel primarily by boat to conduct these activities, and use aircraft during set-up and take-down of camps and re-

supply of food or equipment. The Service would consult with local community members and Refuge staff to devise measures to avoid impacting areas traditionally used to harvest subsistence resources. Because of the small scale of the reintroduction activities and our commitment to consult with local users, we expect that reintroduction actions would have no more than a minor impact on subsistence activities on the YKD.

During scoping, some stakeholders expressed concern about the potential for subsistence hunters to accidentally shoot a reintroduced Steller's eider. Specifically, local residents, the Association of Village Council Presidents, the Alaska Migratory Bird Co-Management Council, and the Alaska Department of Fish and Game were concerned that an accidental shooting would result in citations, forfeiture of hunting equipment, and increased law enforcement actions in the area. While the level of stakeholder concern is significant, the actual risk is low. If reintroduction efforts are successful, Steller's eider abundance on the YKD and in nearshore waters would still be low relative to other waterfowl; thus, we expect the likelihood of hunters accidentally shooting Steller's eiders is negligible. The Service does not expect to increase law enforcement efforts in conjunction with reintroduction, promulgate new regulations, or close areas used for subsistence. However, if a Steller's eider is shot, law enforcement measures would take place in proportion with their need.

There is a negligible chance that a Steller's eider would be shot, but the concern is real and we take it seriously. Therefore, to minimize the risk as much as possible, we plan to conduct extensive outreach in nearby villages (in collaboration with village organizations and local hunters; Section 2.4) to increase awareness of hunting regulations and current reintroduction activities and improve species identification.

Public comments included a suggestion to designate the reintroduced population as a "non-essential experimental population" under Section 10(j) of the ESA (discussed below), and promulgating a special management rule under Section 4(d) to allow or legal subsistence harvest of reintroduced birds. However, subsistence harvest of Steller's eiders by Alaska Natives or any non-native permanent resident of an Alaska Native village is not prohibited under the ESA (see Section 10(e)). Steller's eiders are closed to harvest under the Migratory Bird Treaty Act (MBTA); thus, any regulatory change to legalize Steller's eiders for harvest would have to be accomplished through MBTA regulations, rather than through a special rule under the ESA.

In summary, our intent is to minimize the chances of negative impacts (e.g., disturbance of subsistence activities, or accidental shooting of Steller's eiders) from occurring by working with local communities to ensure our presence on the YKD is welcomed (e.g., communicating with local hunters, hiring local students, etc.). Because of the small-scale of reintroduction activities, the low likelihood that a reintroduced Steller's eider will be shot, and the Service's commitment to conduct outreach to minimize risk, we expect the impact to subsistence users to be minor. Please note that we do not intend to address these issues solely through the NEPA process represented here; communication and collaboration with subsistence users is necessary for success and would continue throughout the reintroduction project, should it go forward.

Resource Development
Public comments included concerns about increased regulation and effects to resource development due to reintroduction activities (and presence of released birds; See Section 2.6). We are not aware of proposed or current resource development activities on the YKD's central coast. Due to their short duration, we do not expect reintroduction activities at Kuskokwim Shoals or Izembek Lagoon to affect potential resource development.

The Service has designated several reintroduced populations of listed species as "non-essential experimental" under Section 10(j) of the ESA to reduce the requirements of section 7 and alleviate public concerns about the presence of a reintroduced listed species (e.g., as for the Aplomado falcon and whooping crane). However, this designation does not change the requirements of section 7 on Refuge lands. This designation also requires the reintroduced population to be wholly separate from the wild population. As the goal of reintroduction is for reintroduced birds to use the same molting and wintering grounds as wild Steller's eiders (and thus they will not be wholly separate), a 10(j) rule cannot be promulgated for Steller's eiders. However, we expect no additional need for section 7 consultation or other regulation to development activities due to reintroduction because these areas are already used by wild Steller's eiders (and the far more numerous threatened spectacled eider) so Federally-funded or permitted development activities already require section 7 consultation.

In summary, we expect no effect on resource development from the Preferred Alternative.

Sport Hunting
Sport hunting of waterfowl (primarily geese) at Izembek Lagoon occurs mostly September through November (USFWS 2013). Thus, hunting activities overlap with the potential capture of foster hens and release of captive-bred birds in the area. To avoid conflict with hunters, we will communicate with Izembek NWR and Alaska Department of Fish and Game staff, as well as hunting guides and lodges, about our proposed activities. Because our actions will be of short duration and intensity, we expect at most negligible impacts to sport hunting activities at Izembek Lagoon.

Summary of Social Environment Impacts
In summary, we expect the Preferred Alternative would have, at most, minor negative impacts on the social environment of the YKD through potential impacts to subsistence activities, and negligible impacts to the social environment of Kuskokwim Shoals and Izembek Lagoon through impacts to sport hunting and resource development. Possible positive impacts include helping recovery of Alaska-breeding Steller's eiders, hopefully contributing to eventual delisting of the species, and contributing to economic and educational opportunities in villages on the YKD.

5.2.3. Cumulative Effects
The Preferred Alternative would result in minimal cumulative effects. Over time, the Service would discontinue on-the-ground reintroduction fieldwork with the exception that if reintroduction is successful, the Service may maintain a presence on the YKD to promote conservation efforts and to monitor this population. While preventing impacts to subsistence activities will require extensive communication and outreach, we anticipate overall positive effects of restoring the Steller's eider to the YKD as we improve our working relationships with

local residents and provide economic opportunities through local hires and purchases of goods and services.

The YKD is likely to be affected by global climate change. Alaska's average annual statewide temperatures have increased by almost 4°F from 1949 to 2005, with significant spatial variability across the expanse of the State (Markon et al. 2012). Climate change contributes to melting glaciers, melting polar ice, rising sea levels, increased storm intensity, and coastal flooding. These factors could affect species distributions and abundances. For example, sea level rise could lead to saltwater intrusion into YKD freshwater wetlands, altering their suitability for current plant and animal associations. Climate change may be causing changes on the YKD and other portions of the Affected Environment, but uncertainty prevents us from predicting the extent of such changes. We are also uncertain how climate change would impact reintroduction efforts, but plan to use adaptive management strategies to respond to possible environmental changes caused by climate change.

6. Conclusion of the Draft Environmental Assessment

This Draft Environmental Assessment is intended to assist the Service in determining if reintroducing Steller's eiders to the YKD (the Preferred Alternative) would result in significant impacts to the environment. This analysis indicates that while some minor positive and negative impacts to the biological and social environment may occur, no significant impacts are expected if the Preferred Alternative is selected.

The purpose of reintroducing the species to the YKD is to assist in the recovery of the Alaska-breeding population of Steller's eiders by reestablishing a breeding population in western Alaska. Without reintroduction, the western Alaska subpopulation is not likely to increase, leaving the extant threatened population more vulnerable to extirpation. The Service, then, would be unlikely to meet the established recovery criteria (USFWS 2002) for this species. Therefore, the Service recommends implementing the Preferred Alternative.

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8. Appendix 1: Individuals and Entities Contacted During Scoping

The individuals, agencies, conservation groups, landowners, Alaska congressional delegation, local governments, and Alaska Native corporations, non-profit organizations and tribes listed below were sent an invitation to provide comments.

Agdaagux Tribe of King Cove

Akhiok-Kaguyak, Incorporated

Alaska Department of Environmental Conservation

Alaska Department of Fish & Game

Alaska SeaLife Center

Aleut Corporation

Aleutian Bering Sea Islands LCC

Aleutians East Borough

Aleutian Pribilof Islands Association, Incorporated

Arctic Slope Native Association

Arctic Slope Regional Corporation

Arviq Incorporated

Arviq, Inc.

Askinuk Corporation

Association of Village Council Presidents

Atqasuk Corporation

Atqasuk Village

Audubon Alaska

Becharof Corporation

Koniag Incorporated

Kugkaktlik Ltd.

Kuitsarak, Incorporated

Kuitsarak, Incorporated

Kuukpik Corporation

Kwik, Incorporated

Lake & Peninsula Borough

Leisnoi, Incorporated

Manokotak Village

Naknek Native Village

National Fish and Wildlife Foundation

National Marine Fisheries Service

National Park Service

Native Village of Akhiok

Native Village of Akutan

Native Village of Barrow Inupiat Traditional Government

Native Village of Belkofski

Native Village of Chignik Lagoon

Native Village of Ekuk

Belkofski Corporation

Bethel Native Corporation

Bristol Bay Borough

Bristol Bay Native Association, Incorporated

Bristol Bay Native Corporation

Bureau of Land Management

Bureau of Ocean and Energy Management

Calista Corporation, Lands & Natural Resources Dept.

Center for Biological Diversity

Chaluka Corporation

Chefarnrmute Inc.

Chevak Company Corporation

Chevak Native Village

Chignik Bay Tribal Council

Chignik Lagoon Native Corporation

Chinuruk Incorporated

Choggiung Limited

City of Akhiok

City of Akutan

City of Atqasuk

City of Barrow

City of Chefornak

City of Chevak

City of Chignik

Native Village of False Pass

Native Village of Goodnews Bay

Native Village of Hooper Bay

Native Village of Kipnuk

Native Village of Kongiganak

Native Village of Kwigillingok

Native Village of Mekoryuk

Native Village of Nelson Lagoon

Native Village of Nightmute

Native Village of Nikolski

Native Village of Nuiqsut

Native Village of Paimiut

Native Village of Pilot Point

Native Village of Port Heiden

Native Village of Quinhagak

Native Village of Scammon Bay

Native Village of Tununak

Native Village of Unga

Natives of Kodiak, Incorporated

Nelson Lagoon Corporation

Newtok Traditional Council

Newtok Village Corporation

Nima Corporation

Ninilchik Natives Association,

	Incorporated
City of Clark's Point	Ninilchik Village
City of Cold Bay	North Slope Borough
City of Dillingham	North Slope Borough Dept. of Wildlife Management
City of Egegik	Nunakauiak Yupik Corporation
City of False Pass	Nunakauyarmiut Tribe
City of Goodnews Bay	Olgoonik Corporation
City of Homer	Orutsararmiut Native Council
City of Hooper Bay	Ounalashka Corporation
City of King Cove	Paimiut Corporation
City of Kodiak	Paug-Vik Incorporated, Limited
City of Manokotak	Pauloff Harbor Tribal Council
City of Mekoryuk	Pilot Point Native Corporation
City of Nightmute	Platinum Traditional Village
City of Nuiqsut	Qagan Tayagungin Tribal Council
City of Pilot Point	Qanirtuuq Inc.
City of Platinum	Qawalangin Tribe of Unalaska
City of Port Heiden	Qemirtalek Coast Corporation
City of Quinhagak	Saguyak Incorporated
City of Sand Point	SeaLion Corporation
City of Scammon Bay	Senator Lisa Murkowski
City of Togiak	Senator Mark Begich
City of Toksook Bay	Shumagin Corporation
City of Unalaska	Sierra Club

City of Wainwright

Congressman Don Young

Cook Inlet Region Incorporated

Cook Inlet Tribal Council, Incorporated

Curyung Tribal Council

Defenders of Wildlife

Ducks Unlimited Alaska

Eastern Aleutian Tribes, Incorporated

Egegik Village

Environmental Protection Agency

Far West, Incorporated

Friends of Alaska National Wildlife Refuges

Inupiat Community of the Arctic Slope

Isanotski Corporation

Kaguyak Village

Kenai Peninsula Borough

Kodiak Island Borough

Sun'aq Tribe of Kodiak

Tangirnaq Native Village

The Akutan Corporation

The King Cove Corporation

Togiak Natives Limited

Traditional Village of Togiak

Tununrmiut Rinit Corporation

Ukpeagvik Inupiat Corporation

US Army Corps of Engineers

US Geological Survey

Village of Chefornak

Village of Clarks Point

Village of Wainwright

Western Alaska LCC

Wildlife Conservation Society

Yukon-Kuskokwim Delta Subsistence Regional Advisory Council

9. Appendix 2: Current and Past Eider Recovery Team Members

Current Members

Name	**Affiliation**
Shannon Atkinson	School of Fisheries and Ocean Sciences, University of Alaska Fairbanks, Fisheries Division
Chris Dau	Service, Migratory Bird Management
Julian Fischer	Service, Migratory Bird Management
(James) Barry Grand	US Geological Survey, Alabama Cooperative Fisheries and Wildlife Research Unit and Auburn University
Tuula Hollmén	Alaska SeaLife Center and University of Alaska Fairbanks
Ellen Lance	Service, Anchorage Fish and Wildlife Field Office, Endangered Species Branch
Jim Lovvorn	Department of Zoology, Southern Illinois University
Brian McCaffery	Service, Yukon Delta National Wildlife Refuge
Deb Nigro	US Bureau of Land Management
Margaret Petersen	US Geological Survey, Alaska Science Center
Jason Schamber	Alaska Department of Fish and Game, Waterfowl Program
Todd Sformo	North Slope Borough
Ted Swem	Service, Fairbanks Fish and Wildlife Field Office

Former Members

Dan Rosenberg	Alaska Department of Fish and Game
Tom Rothe	Alaska Department of Fish and Game
Greg Balogh	Service, Anchorage Field Office
Russ Oates	Service, Migratory Bird Management
Robert Suydam	North Slope Borough
Declan Troy	Private Consultant
Angela Matz	Service, Fairbanks Fish and Wildlife Field Office
Barb Taylor	National Marine Fisheries Service
Cal Lensink	Service
Bob Day	ABR, Inc.
Bruce Campbell	Alaska Department of Fish and Game

10. Appendix 3: Definitions

Possible effects of each alternative on biophysical resources and the human environment were described in terms of their intensity, duration, scale, and the nature of potential impacts. In this assessment, these terms are defined as follows:

Intensity of the Impact resulting from the specified action

- No effect – Impacts that would not affect resources or human environment.
- Negligible – Impacts that would have no measurable effect on the biological or human environment.
- Minor – Impacts that can be reasonably expected to have detectable though limited effect on the biological or human environment.
- Moderate – Impacts that can be reasonably expected to have detectable and apparent effect on the biological or human environment.

Duration of the Impact on biophysical resources or the human environment

- Short-term – Effects that only occur during implementation of an action.
- Medium-term – Effects that occur during implementation of the action and that are expected to persist for some time into the future though not throughout the life of this Plan (not longer than 5 years).
- Long-term – Effects that occur during implementation of the action that are expected to persist throughout the life of this Plan and, most likely, longer (longer than 5 years).

Scale of the Impact in a specified area

- Site-specific – Positive or negative impacts occurring at a specific site that are relatively small in size (e.g., a nest site).
- Local – Positive or negative impacts occurring throughout a specific area that are large in size (e.g., in a lagoon, island or breeding area).

Nature of the Impact resulting from the action

- Positive – Impacts that maintain or enhance the quality and/or quantity of resources or human environment.
- Negative – Impacts that degrade the quality and/or quantity of resources or human environment.

Cumulative Effects

A "cumulative impact" is an impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). At the end of each alternative, we discuss anticipated cumulative impacts of the alternative on the biophysical and human environments.

11. Appendix 4: Example Minimization Measures from Barrow Eider Project

During nest monitoring:
Nests not monitored by camera (including those monitored using data loggers) will be visited approximately once every 7 to 10 days during incubation. The incubation period lasts ~24 days post-laying of the penultimate egg for many waterfowl species. Nests will be relocated with GPS coordinates and maps. When visiting a nest, we aim to confirm the presence of the female on the nest without flushing her. For many species we can confirm presence with binoculars from ~20 – 40 m away. If the hen is absent from the nest or flushed when approached, we visit the nest briefly to count, age, and cover the eggs. If eggs have not been previously measured (see description of methods under nest searching, above), we will quickly measure the length and width of eggs. Latex gloves will be worn when touching the nest or eggs. Nest revisits generally take only a few minutes. We avoid placing backpacks within 20m of the nest and using more than 1 person to visit the nest to limit exposure to human odors and matting vegetation that may attract predators. Information on nest contents and status will be recorded on each visit. The data will then be entered into the Eider Ecology Database in program Access.

During hen capture on nests:
Following capture, hens will be carried ~40m from the nest bowl for processing, to minimize damage to cover near the nest bowl which might influence predation risk. While the hen is banded and samples are taken, one crew member will measure eggs (see description under nest searching, above) if this has not already been done.

Methods of alleviating stress during handling and sampling waterfowl:
Our best method to alleviate any adverse effects of handling and sampling of birds (i.e., stress and pain) is to have experienced staff holding and sampling birds, and minimize handling time. Experienced bird handlers will hold the bird with firm enough pressure to eliminate movement by the bird and potential injury, but not so firm as to inhibit normal respiration. A bird that is help by a confident bird handler, will struggle less, can be sampled quicker and easier, and will be held shorter, thus enduring less stress. The capture must have enough staff to be able to process the bird quickly and efficiently, but no so many people as to disturb the area near the nest and potentially attract predators. Our ideal capture crew is 3 people. As we watch birds for signs of stress, if stress levels appear to elevate above normal, our best method to reduce stress is to keep the bird cool and eyes covered. In this situation we may add water to the webbing of the feet, and blow on the feet. This immediately creates evaporative cooling, and quickly lowers the bird's body temperature. Covering the head with a light towel or tucking the birds head under a wing are two methods that also work well to alleviate stress, as it becomes dark, visual stimuli are reduced, and birds tend to relax. If we see a bird show signs of possible capture myopathy, we immediately cease our sampling and carefully monitor the bird. The feet are cooled, the holder's grip on the bird is relaxed to improve respiration, and the ability of the bird to keep its head elevated is monitored closely. Typically a bird will quickly begin to show more normal vital signs, and once this occurs, we will release the bird. If in the rare event the bird can't regain normal vital signs after trying several methods to relax and cool the bird, we would transport the bird to the veterinarian in Barrow for medical treatment.