INTRA-SERVICE BIOLOGICAL OPINION

For

Managing Migratory Bird Subsistence Hunting in Alaska: Hunting Regulations for the 2011 Spring/Summer Harvest

Consultation with the
U.S. Fish and Wildlife Service – Migratory Birds
Anchorage, Alaska

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1. INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) in accordance with Section 7(a)(2) of the Endangered Species Act of 1973, as amended (Act), on effects of the proposed 2011 Regulations for Migratory Birds Subsistence Harvest in Alaska (Regulations) on the listed spectacled eiders (*Somateria fischeri*) and Alaska-breeding Steller's eiders (*Polysticta stelleri*), and the candidate species yellow-billed loons (*Gavia adamsii*) and Kittlitz's murrelets (*Brachyramphus brevirostris*). The Action is not likely to adversely affect the threatened polar bear (*Ursus maritimus*), Northern sea otter (*Enhydra lutris kenyoni*), or polar bear critical habitat, or the candidate species Pacific walrus (*Odobenus rosmarus divergens*), so polar bears, polar bear critical habitat, and walruses are not discussed in this biological opinion.

The proposed Regulations were developed by the Alaska Migratory Bird Co-management Council (AMBCC) involving the Alaska Department of Fish and Game, the Alaska Native representatives, and the Service and published by the Service on October 26, 2010 in the Federal Register (Vol. 75, No. 206). The objective of the Regulations is to enable the continuation of customary and traditional uses of migratory birds in Alaska with a spring and summer harvest, while ensuring conservation of migratory birds. The Regulations prescribe dates when harvesting of birds may occur, species that can be taken, and methods and means excluded from use. The rulemaking proposes region-specific harvest regulations that go into effect on April 2, 2011 and expire August 31, 2011. Annual rulemaking is necessary because the migratory bird harvest season is closed unless opened, and the regulations governing subsistence harvest of migratory birds in Alaska are subject to public review and annual approval.

Because regulations for a spring/summer subsistence harvest expire immediately after the hunt, new regulations must be promulgated each year by the Alaska Migratory Bird Co-Management Council. Thus potential impacts of a spring/summer subsistence harvest on listed and candidate species and critical habitat are evaluated each year by an ESA section 7 consultation.

On March 19, 2010 the Service's Region 7 Office of Migratory Bird Management (MBM) provided the Fairbanks Fish and Wildlife Field Office (FFWFO) with a biological assessment that indicated the spring/summer subsistence harvest may affect spectacled and Steller's eiders, so a formal consultation was initiated regarding the Regulations. On February 02, 2011 the Service's FFWFO requested any new information or data that could be used for the 2011 biological opinion for the subsistence hunt. Because no new data or information are available, The FFWFO did not request a new biological assessment for the 2011 hunt. Specifically, this BO evaluated whether issuance of Regulations allowing a spring/summer subsistence hunt are likely to jeopardize the continued existence of ESA listed and candidate species, or destroy or adversely modify designated critical habitat.

This BO is based on information provided in: 1) the Intra-agency Biological Assessment for 2010 proposed Alaska migratory bird subsistence hunt (BA; USFWS 2010a), 2) the U.S. Fish and Wildlife Service Environmental Assessment: Hunting Regulations for the 2011 Spring/Summer Harvest (EA), 3) current and historical survey data for Steller's and spectacled eiders and yellow-billed loons, 4) published literature, unpublished reports, and 5) other sources of information.

This BO concludes the consultation regarding the effects of the proposed 2011 Regulations for the migratory bird subsistence harvest in Alaska on listed and candidate species. An administrative record of this consultation is on file at FFWFO, 101 12th Ave., Room 110, Fairbanks, AK, 99701. If you have comments or concerns regarding this BO, please contact Ted Swem, Endangered Species Branch Chief, FFWFO at (907) 456-0441.

2. DESCRIPTION OF THE PROPOSED ACTION

2.1 Background

Section 7(a)(2) of the Act requires that Federal agencies shall insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any threatened or endangered species, or result in the destruction or adverse modification of critical habitat. When the actions of a Federal agency may adversely affect a protected species, that agency (i.e., the action agency) is required to consult with either the National Marine Fisheries Service (NMFS) or the Service, depending upon the protected species that may be affected.

For the action described in this document, the action agency is the Region 7 Migratory Bird Management Office of the U.S. Fish and Wildlife Service, and consultation is being conducted with the Endangered Species Branch of the Fairbanks Fish and Wildlife Field Office. This section of the BO describes the Action Area and activities that may occur as a result of promulgating subsistence hunting regulations.

2.2 Proposed Action

The Service proposes to open a 2011 spring/summer harvest of migratory birds in Alaska from April 2, 2011 until August 31, 2011. To the extent possible, the harvest would be consistent with the customary and traditional subsistence harvest of migratory birds by Alaskan indigenous inhabitants, while providing for their long-term sustained use. Most species of Alaska's migratory birds will be open to the spring/summer subsistence harvest, and are listed in the Federal Register Proposed Rule. Species not listed open will remain closed, as well as some region-specific restrictions for certain open species for which there are local or specific concerns. Waterfowl that would remain closed to hunting and egg-gathering throughout Alaska are Steller's eiders, spectacled eiders, emperor geese, and yellow-billed loons[1], and tundra swans and Aleutian cackling goose in certain areas. Cackling geese are closed throughout Alaska for egg gathering only, and black brant are closed for egg gathering on the Yukon-Kuskokwim Delta and the North Slope.

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[1] Yellow-billed Loons: Annually, up to 20 yellow-billed loons caught inadvertently in subsistence fishing nets in the North Slope Region may be kept for subsistence use. Individuals must report each yellow-billed loon inadvertently caught while subsistence gill net fishing to the North Slope Borough Department of Wildlife Management by the end of the season.

To ensure the subsistence harvest does not jeopardize the continued existence of Steller's eiders and to minimize impacts to spectacled eiders, the Service developed a combination of regulations and Conservation Measures for implementation in 2011.

The regulations and conservation measures address threats and management needs for the listed species. Below are portions of the Final Rule that are particularly protective of the listed eiders.

Regulations:

- Steller's eiders and spectacled eiders are closed to hunting and egg gathering.
- Possession or use of lead shot or other toxic shot while hunting is prohibited.
- A 30-day harvest closure for migratory birds during their peak nesting period.

While the Service believes some provisions in the regulations should remain, the request to eliminate the shooting hours provision from the 2011 regulations is under consideration. Although we believe that shooting hours minimize the risk of inadvertent shooting of closed species when light levels are low and misidentification is more likely, we believe we can work with our North Slope partners to provide the same protections to listed eiders in other ways. To this end, the 2011 proposed regulations do not include the shooting hours provision along the coastal areas encompassing Point Hope, Point Lay, Wainwright, and Barrow.

Two additional legal requirements published in the Final Rule aid in compliance with the Regulations and the verification of harvest:

- No person shall at any time, by any means, or any manner, possess or have in custody any migratory bird or part thereof, taken in violation of these regulations.
- Upon request from a Service law enforcement officer, hunters taking, attempting to take, or transporting migratory birds taken during the subsistence harvest season must present them to the officer for species identification.

The Final Rule also specifically describes the Service's authority to prescribe emergency regulations, if necessary, to protect Steller's eiders:

- §92.32 *Emergency regulations to protect Steller's eiders*. Upon finding that continuation of these subsistence regulations would pose an imminent threat to the conservation of threatened Steller's eiders, the U.S. Fish and Wildlife Service Alaska Regional Director, in consultation with the Co-management Council, will immediately under § 92.21 take action as is necessary to prevent further take. Regulation changes implemented could range from a temporary closure of duck hunting in a small geographic area to large-scale regional or State-wide long-term closures of all subsistence migratory bird hunting. Such closures or temporary suspensions will remain in effect until the Regional Director, in consultation with the Co-management Council, determines that the potential for additional Steller's eiders to be taken no longer exists.

Thus, several spectacled and Steller's eider management needs are addressed by the Final Rule. It clarifies for subsistence users that Service law enforcement personnel have authority to verify species of birds possessed by hunters; it clarifies that it is illegal to possess any bird closed to harvest; and it describes how the Service's existing authority of prescribing emergency regulations would be implemented, if necessary, to protect Steller's eiders.

In addition to the regulations, conservation measures will be implemented to:

1. Verify compliance of migratory bird hunting regulations and the harvest of species;
2. Enhance a culture of conservation through continuing education of hunters; and
3. Continue to gather data on listed eiders allowing more informed management decisions.

The Service believes the immediate need of verifying compliance of migratory bird hunting regulations and harvest of species will be accomplished through the continued presence of the Service's Office of Law Enforcement (OLE). This immediate monitoring provides data allowing for additional management actions to be implemented if they are appropriate to protect these species. While this provides immediate, short term protection, we recognize that stewardship for listed eiders and voluntary compliance of the migratory bird hunting regulations is the desired long-term goal. The Service commits to continuing the outreach, education, and communication program developed and continually modified by the Service and its partners. In addition, the Service will continue biological monitoring to gather data critical to managers tasked with making informed management decisions.

Details of the conservation measures are provided below.

Service Enforcement of Migratory Bird Regulations and Harvest Verification

OLE will have a presence on the North Slope during the migratory bird hunts, commensurate with the threat to the Steller's eiders and other species of concern. This presence will include Barrow and possibly outlying villages. The Service believes this will help increase community understanding and acceptance of the shooting mortality problem, deter violations, and obtain compliance with the regulations.

While present in Barrow and other villages, OLE will document mortality of Steller's eiders and other species of concern, including shooting mortality, to ensure that appropriate and timely corrective actions are taken to prevent further mortality.

OLE will participate in outreach activities related to enforcement of regulations as requested.

Education, Communication, and Outreach

The Service commits to continuing the education, communication, and outreach program. Successful conservation of listed eiders in Alaska will require partnerships with local residents, subsistence hunters, land owners, and many others. The Service will continue to build effective working relationships that are beneficial to all parties and result in listed eider conservation. An example of our commitment to working with partners to promote eider conservation is to assist the partners by providing staff time and funding to produce outreach materials. The Service will continue to meet with the North Slope Borough, Ukpeagvik Inupiat Corporation, Inupiat Community of the Arctic Slope, Native Village of Barrow, and local community members to refine the education and outreach plan, including implementation of education programs for the 2011 hunt. Examples of programs include the Migratory Bird Fair, science camps, outreach to hunters on the roads and at Pigniq (duck camp), radio shows, flyers, meetings, and others. Additionally, the Service in collaboration with North Slope partners will routinely monitor and verify that listed eiders are not being shot and will evaluate the effectiveness of our education, communication, and outreach efforts. If mortality is detected, the Service will reassess current outreach and education strategies, determine where changes are needed, and heighten targeted outreach and targeted law enforcement efforts commensurate with the risk. If determined that success is not likely the Service Regional Director may institute emergency regulations in consultation with AMBCC until impacts can be revaluated and minimized.

Biological Monitoring

Steller's and spectacled eider aerial and ground-based breeding surveys are used to locate pre-breeding and breeding concentrations of listed eiders. Amongst other things these data identify high use areas, habitat preferences, and population size and trends which help inform management decisions. In 2011, the Service will continue to perform the following annual surveys:

- Arctic Coastal Plain aerial survey for Steller's and spectacled eiders (June; MBM)
- Barrow-area aerial survey for Steller's and spectacled eiders (June; ABR)
- Barrow ground survey for Steller's eiders (June; FFWFO)
- Barrow ground survey for Steller's eiders nests and broods (June-August; FFWFO)

2.3 Action Area

The Action Area is that area in which the direct and indirect effects of the proposed action may occur. The Action Area for this consultation is all lands of included areas within the 11 regions established by the AMBCC for the subsistence hunt, excluding national monuments, parks, and preserves managed by the National Park Service and not specifically designated as open to subsistence (Figure 2.1) (AMBCC 2009). Eligible participants for the proposed subsistence hunt are permanent residents, regardless of race, located within the established regions. Overall, this Action is available to 13 percent of the state's total population of 686,293 (Census 2009, USFWS 2009a)

The Action Area contains foraging, resting, breeding, migrating, molting, and wintering habitat for spectacled and Steller's eiders (listed as threatened under the Act), and yellow-billed loons and Kittlitz's murrelets (candidates for listing under the Act).

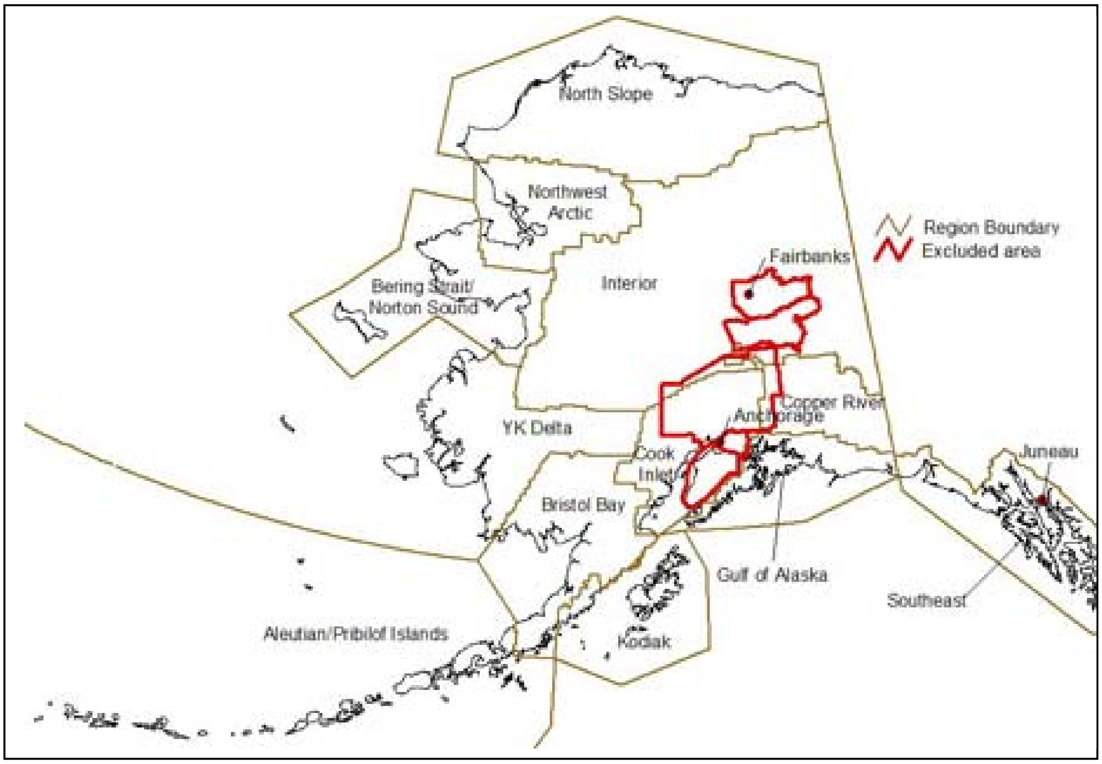


Figure 2.1. All lands of included areas within the 11 regions established by the AMBCC are proposed for the subsistence hunt, excluding national monuments, parks, and preserves managed by the National Park Service and not specifically designated as open to subsistence (AMBCC 2009).

3. STATUS OF SPECIES

This section presents biological and ecological information relevant to formation of the BO. Appropriate information on the species' life history, habitat and distribution, and other factors necessary for their survival is included for analysis in later sections.

3.1 Steller's Eider

Physical Appearance

The Steller's eider is the smallest of the four eider species. From early winter until mid-summer males are in breeding plumage - black back, white shoulders and sides, chestnut breast, white head with black eye patches and a greenish tuft (Figure 3.1). During late summer and fall, males molt to dark brown with a white-bordered blue wing speculum; this plumage is replaced during the autumn molt when males re-acquire breeding plumage, which lasts through the next summer. Females are dark mottled brown with a blue wing speculum year round. Juveniles are dark mottled brown until the fall of their second year, when they acquire breeding plumage (Fredrickson 2001).

Figure 3.1 - Male and female Steller's eider in breeding plumage.

Status and Distribution

The Steller's eider is a sea duck with a circumpolar distribution. Steller's eiders are divided into Atlantic and Pacific populations; the Pacific population is further divided into the Russia-breeding population along the Russian eastern arctic coastal plain, and the Alaska-breeding population. On June 11, 1997, the Alaska-breeding population of Steller's eiders was listed as threatened based on a substantial decrease in this population's breeding range and the increased vulnerability of the remaining Alaska-breeding population to extirpation (USFWS 1997). Although population size estimates for the Alaska-breeding population were imprecise, it was clear Steller's eiders had essentially disappeared as a breeding species from the Yukon-Kuskokwim Delta (Y-K Delta), where they had historically occurred in significant numbers, and that their Arctic Coastal Plain (North Slope) breeding range was much reduced. On the North Slope they historically occurred east to the Canada border (Brooks 1915), but have not been observed on the eastern North Slope in recent decades (USFWS 2002). The Alaska-breeding population of Steller's eiders now nests primarily on the North Slope, particularly near Barrow and at very low densities from Wainwright to at least as far east as Prudhoe Bay (Figure 3.2). A few pairs may still nest on the Y-K Delta; only 10 Steller's eider nests have been recorded on the Y-K Delta since 1970 (Hollmen et al. 2007).

Life History – North Slope (Breeding)

Steller's eiders arrive in pairs on Alaska's North Slope in early June, but nests are only found intermittently near Barrow since 1991. Nests of Steller's eiders have been found near Barrow in 12 (60%) of the last 20 years. (USFWS, unpublished data). Individuals foregoing breeding is common in long-lived eider species and is typically related to inadequate body condition (Coulson 1984), but reasons for Steller's eiders non-breeding may be more complex. In the Barrow area, Steller's eider nesting is correlated with lemming numbers and other environmental cues; nest success could be enhanced in years of lemming abundance because nest predators are less likely to prey-switch to eider eggs and young, or because avian predators such as pomarine jaegers (*Stercorarius pomarinus*) and snowy owls (*Bubo scandiaca*) that nest nearby (and consume abundant lemmings) may protect eider nests from mammalian predators such as arctic fox (Quakenbush and Suydam 1999, and summarized by Rojek 2006).

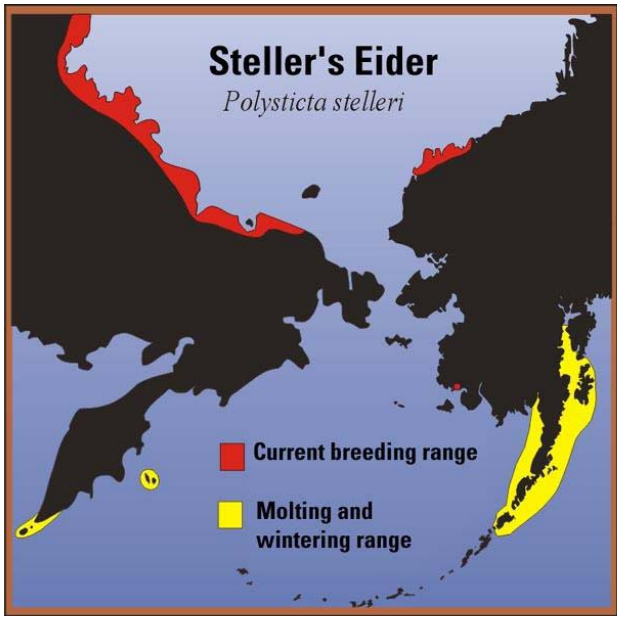


Figure 3.2 - Steller's eider distribution in the Bering, Beaufort and Chukchi seas

When they do nest, Alaska-breeding Steller's eiders use coastal tundra adjacent to small ponds or within drained lake basins, occasionally as far as 90 km inland. Nests are initiated in the first half of June (Quakenbush et al. 1995), and hatching occurs from July 7 to August 3 (Quakenbush et al. 1998). Nests located in the vicinity of Barrow were in wet tundra, in drained lake basins or low-center or low indistinct flat-centered polygon areas (Quakenbush et al. 1998). Average clutch sizes at Barrow varied from 5.3-6.3, with clutches of up to 8 reported (Quakenbush et al. 1998). Nest survival (the probability a nest will hatch at least one egg) averaged 0.23 in nesting years (1991-2004) prior to fox control, whereas nest survival during nesting years after fox control began (2005–2010) was 0.48 (USFWS, unpublished data).

As with spectacled eiders, nest and egg loss was attributed to predation by jaegers, common raven (*Corvus corax*), arctic fox, and possibly glaucous gulls (*Larus hyperboreus*) (Quakenbush et al. 1995, Obritschkewitsch et al. 2001).

Within a day or two after hatch, hens move their broods to adjacent ponds with emergent vegetation, particularly *Carex* spp. and *Arctophila fulva* (Quakenbush et al. 1998, Rojek 2006, 2007) Here they feed on insect larvae and other wetland invertebrates. Broods may move up to several kilometers from the nest prior to fledging (Quakenbush et al. 1998, Rojek 2006). Fledging occurs from 32-37 days post hatch (Obritschkewitsch et al. 2001, Rojek 2006).

Information on breeding site fidelity of Steller's eiders is limited. However, some information is available from the breeding ecology study at Barrow. Since the mid 1990s, five birds that were originally captured as confirmed nesters near Barrow were recaptured in subsequent years nesting near Barrow. The time between capture events ranged from 1 to 12 years and the distance between nests ranged from 0.1 to 6.3 km.

Life History – Non-breeding

Localized post-breeding movements.–Departure from the breeding grounds near Barrow differs between sexes and between breeding and non-breeding years. However, prior to their migration in both breeding and non-breeding years, some Steller's eiders stage in Elson Lagoon, North Salt Lagoon, Imikpuk Lake, and the Chukchi Sea in the vicinity of Pigniq (Duck Camp; Figure 3.3). Male Steller's eiders typically leave the breeding grounds after females begin incubating, around the end of June or early July (Quakenbush et al. 1995, and Obritschkewitsch et al. 2001). Groups of Steller's eiders have been observed just off the Chukchi beach from the gravel pits, which are south of Barrow, north to Nuvuk (the northern most point of the Barrow spit). In breeding years these flocks were comprised of mostly drakes and persisted until about the second week of July (J. Bacon, North Slope Borough Department of Wildlife Management [NSBDWM], pers. comm.; figure 3.4).

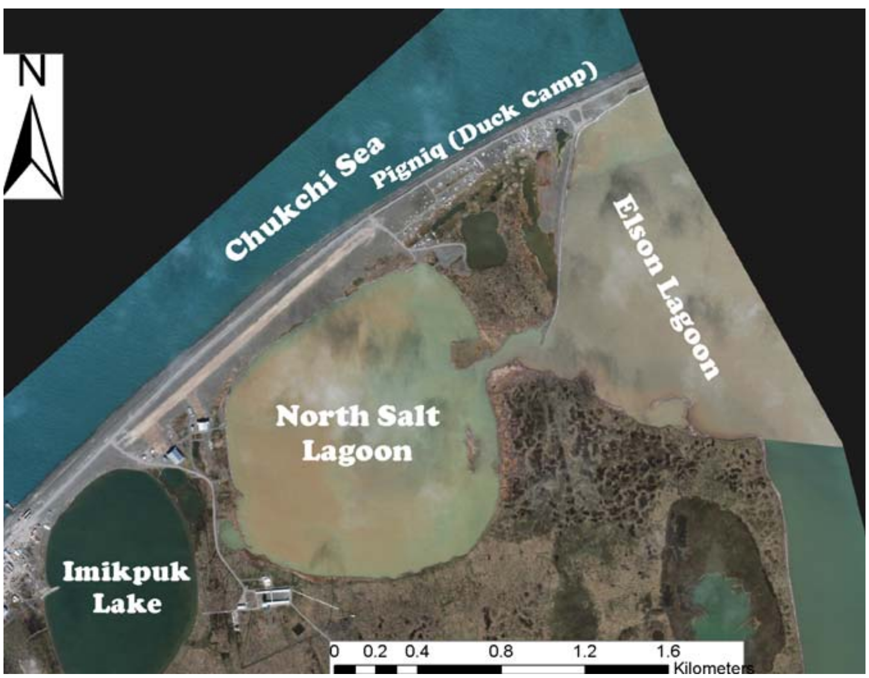


Figure 3.3 Location of Steller's eider post-breeding staging areas in relation to Pigniq (Duck Camp) hunting area north of Barrow, Alaska.

Figure 3.4 24 Steller's (20 males and 4 females) eiders in the Chukchi Sea a few meters offshore from the cabins at Pigniq (Duck Camp). Photo by J. Bacon, NSBDWM.

Females that successfully hatch nests and fledged young depart the breeding grounds in late August to mid-September and stage in water bodies near Pigniq prior to their southward migration along the Chukchi coast. From mid-July through September single hens, hens with broods, and small groups of two to three birds have been observed in North Saltwater Lagoon, Elson Lagoon and near shore on the Chukchi Sea. The majority of observations have been of individuals swimming in North Salt Lagoon, but occasionally individuals and small groups flying between North Salt Lagoon, Elson Lagoon and the Chukchi Sea have been observed. Hens with broods have been observed mostly near the channel that connects North Salt Lagoon and Elson Lagoon (J. Bacon, NSBDWM, pers. comm.). In 2008, 10-30 Steller's eider adult females and juveniles were observed daily between late August and mid-September staging in Elson Lagoon, North Salt Lagoon, Imikpuk Lake, and the Chukchi Sea (USFWS, unpublished data). Females whose nests fail may also remain near Barrow later in summer; a single failed-nesting female equipped with a transmitter in 2000 remained near the breeding site until the end of July and stayed in the Beaufort Sea off Barrow until late August (Martin et al. *in prep*).
In non-breeding years, groups of Steller's eiders are observed just off the Chukchi beach from the gravel pits north to Nuvuk, however they became absent earlier compared to breeding years and the sex ratios were more even (J. Bacon, NSBDWM, pers. comm.). Telemetry data showed at least 5 of 14 birds used Elson Lagoon and males and females dispersed across the area between Wainwright and Admiralty Inlet in late June and early July, with most birds entering marine waters by the first week of July (Martin et al. *in prep*.).

Migration Patterns Related to Breeding Origin.
There is limited information available on the migratory movements of Steller's eiders, particularly connecting breeding populations with migratory routes or specific molting or wintering areas. The best information available is from two satellite telemetry studies of Steller's eiders. One study marked Steller's eiders wintering on Kodiak Island, Alaska and

followed birds through the subsequent spring (n = 24) and fall (n = 16) migrations from 2004 – 2006 (D. Rosenberg, Alaska Department of Fish and Game [ADFG]). Most of the birds marked on Kodiak returned to eastern arctic Russia during the nesting period, and none of these birds (all presumed to be from the Russian breeding population) were relocated on land or the near shore waters North of the mouth of the Yukon River in Alaska (ADFG, unpublished data). The second (but earlier) study marked birds (n = 14) near Barrow, Alaska (within the range of the listed Alaska-breeding population) in 2000 and 2001(Martin et al. in prep). Birds from this study were relocated subsequently along arctic coast of Alaska Southwest of Barrow to areas near Pt. Hope, on the Seward Peninsula, and in Southern Norton Sound (Martin et al. in prep). The birds marked near Barrow were also relocated further South in Alaska and in eastern arctic Russia in similar locations to birds marked in Kodiak. Based on the data from two satellite telemetry studies of Steller's eiders in Alaska, it remains unclear where the the Russia and Alaska breeding populations merge and diverge during molt and spring migrations, respectively.

Molt and Winter Distribution.– During post-breeding migration, Steller's eiders move toward molting areas in the near shore waters of Southwest Alaska where they undergo a complete flightless molt for about 3 weeks. The combined (Russian and Alaskan-breeding) Pacific population molts in numerous locations in Southwest Alaska, with exceptional concentrations in four areas along the north side of the Alaska Peninsula: Izembek Lagoon, Nelson Lagoon, Port Heiden, and Seal Islands (Gill et al. 1981, Petersen 1981, Metzner 1993). Additionally, smaller numbers are known or thought to molt in a number of other locations along the western Alaska coast, around islands in the Bering Sea, along the coast of Bristol Bay, and in smaller lagoons along the Alaska Peninsula (Swarth 1934; Dick and Dick 1971; Petersen and Sigman 1977; Wilk et al. 1986; Dau 1987; Petersen et al. 1991).

After molt, many of the Pacific-wintering Steller's eiders disperse to additional areas in the eastern Aleutian Islands, the south side of the Alaskan Peninsula, Kodiak Island, and as far east as Cook Inlet, although thousands may remain in lagoons used for molting unless or until freezing conditions force them to move (USFWS 2002). During the winter, this species congregates in select near shore waters throughout the Alaska Peninsula and the Aleutian Islands, around Nunivak Island, the Pribilof Islands, the Kodiak Archipelago, and lower Cook Inlet (Larned 2000b, Bent 1987, Agler et al. 1994, Larned and Zwiefelhofer 1995). Wintering Steller's eiders usually (although not always; Martin et al. in prep.) occur in waters less than 10 m deep, which are normally within 400 m of shore or at offshore shallows.

Northward Spring Migration.– During spring migration, thousands of Steller's eiders stage in estuaries along the north side of the Alaska Peninsula, including some molting lagoons, and at the Kuskokwim Shoals near the mouth of the Kuskokwim River in late May (Larned 2007, Martin et al. *in prep*.). Like other eiders, Steller's eider may use spring leads for feeding and resting, but there is little information on habitat use during spring migration. Spring migration usually includes movements along the coast, although birds may take shortcuts across water bodies such as Bristol Bay (W. Larned, USFWS, pers. comm. 2000). Interestingly, despite many daytime aerial surveys, Steller's eiders have never been observed during migratory flights (W. Larned, USFWS, pers. comm. 2000). Larned (1998) concluded that Steller's eiders show strong site fidelity to "favored" habitats during migration, where they congregate in large numbers to feed before continuing their northward migration.

Several areas receive consistent use by Steller's eiders during spring migration, including Bechevin Bay, Morzhovoi Bay, Izembek Lagoon, Nelson Lagoon/Port Moller Complex, Cape Seniavin, Seal Islands, Port Heiden, Cinder River State Critical Habitat Area, Ugashik Bay, Egegik Bay, Kulukak Bay, Togiak Bay, Nanwak Bay, Kuskokwim Bay, Goodnews Bay, and the south side of Nunivak Island (Larned et al. 1993, Larned 1998, Larned 2000a, Larned 2000b).

Steller's Eider Abundance and Trends – Pacific Population

The majority of the world population of Steller's eiders migrates along the Bristol Bay coast of the Alaska Peninsula in the spring, where they linger en route to feed at the mouths of lagoons and other productive habitats. Annual spring aerial surveys have been conducted since 1992 to monitor the population status and habitat use of Steller's eiders (*Polysticta stelleri)* staging for spring migration in southwestern Alaska. Annual Steller's eider estimates ranged from 137,904 (1992) to 54,888 (2010), mean 73,904. The long-term trend indicates an exponential decline of 2.7 percent per year (R^2=0.43; Larned and Bollinger, 2010). Larned and Bollinger (2010) suggest that a slight negative trend bias may have resulted from a higher frequency of optimally-timed counts in early years due to free selection from among survey replicates, compared to the single annual counts in subsequent years. A variable low-bias may also be present in most annual estimates due to inaccuracies in timing, observer effects and other uncontrolled variables (Larned and Bollinger 2010).

Steller's Eider Abundance and Trends – Listed Alaska-Breeding

The listed Alaska-breeding population is only a small proportion of the Pacific-wintering population of Steller's eiders, approximately 0.8%. This estimate is derived by taking the most recent North Slope breeding bird estimate of 576 birds (described below, Stehn and Platte, 2009), adding 1 for the YKD population, and then dividing by the population estimate of Pacific-wintering Steller's eiders from 2010 (73,904; Larned and Bollinger 2010). Thus, 577 ÷ 73,904 = 0.8% or rounded to 1%.

Stehn and Platte (2009) conducted a review of the distribution, abundance, and trends of the listed population of Steller's eiders on the arctic coastal plain (ACP). Using data from three aerial surveys, (the ACP, the North Slope eider survey [NSE], and the Barrow Triangle survey [ABR]), they assessed population status and trends of the Steller's eider population nesting on the ACP of Alaska. Data reported from these three surveys provide different estimates of average population size and trend. The 1989-2006 ACP survey (Mallek et al. 2007) estimated a total average population size of 866 birds with a declining population growth rate of 0.778 (Stehn and Platte 2009); the NSE survey (1992-2008; Larned et al. 2009) averaged 162 birds with increasing growth rate of 1.059. The ABR survey, which surveys only the Barrow triangle, which is a subset of the larger ACP and NSE survey areas (1999-2007; Obrishkewitsch et al. 2008) averaged 100 birds with a growth rate of 0.934. Average population size and trend can be biased by changes in observer, detection rates and survey timing. Survey timing was considered especially important for species with male departure early in incubation, or other marked shifts in habitat use, movements, or flocking behavior (ground breeding surveys near Barrow indicate the best time for aerial surveys of breeding Steller's eiders is about 12-20 June, after arrival of most breeding individuals but before most males depart. Using a subset of data least confounded by changes in survey timing and observer, the appropriately-timed NSE survey observations from 1993-2008 averaged 173 indicated total Steller's eiders (88-258, 90% confidence interval) with an estimated growth rate of 1.011 (0.857 – 1.193, 90% CI). The authors assumed a detection probability of 30% (based upon reasonable estimates with similar species and habitats), yielding a total average population of Steller's eiders breeding in the ACP of about 576 (292-859, 90% CI; Stehn and Platte 2009).

Standardized ground surveys for eiders near Barrow have been conducted since 1999, and have found an average density near Barrow of 0.63 birds/ km^2 (Rojek 2008). The Barrow vicinity supports the largest known concentration of nesting Steller's eiders in Alaska. The highest number of Steller's eiders observed during systematic surveys at Barrow occurred in 1999 with 135 males counted during ground surveys (36 nests found); in 2008, 114 male Steller's eiders were counted during ground surveys (28 nests found). Counts of males are the most reliable indicator of Steller's eider presences because females are cryptic and are often undercounted. Approximately 90% of all Steller's eiders nests found near Barrow since 1991 were within one mile of the Barrow road network (1991-2007 locations are summarized in Rojek 2008; 2008 locations are USFWS, unpublished data).

Recovery Criteria

The Steller's Eider Recovery Plan (USFWS 2002) presents research and management priorities, that are re-evaluated and adjusted every year, with the objective of recovery and delisting so that protection under the Act is no longer required. When the Alaska-breeding population was listed as threatened, factors causing the decline were unknown, but possible causes identified were increased predation, over hunting, ingestion of spent lead shot in wetlands, and habitat loss from development. Since listing, other potential threats have been identified, including exposure to other contaminants, scientific research, and climate change but causes of decline and obstacles to recovery remain poorly understood.

Criteria used to determine when species are recovered are often based on historical abundance and distribution, or on the number needed to ensure the risk of extinction is tolerably low (with extinction risk estimated by population modeling). For Steller's eiders, information on historical abundance is lacking, and demographic parameters needed for accurate population modeling are poorly understood. Therefore, the Recovery Plan for Steller's eiders establishes interim recovery criteria based on extinction risk, with the assumption that numeric population goals will be developed as demographic parameters become better understood. Under the Recovery Plan, the Alaska-breeding population would be considered for reclassification to endangered if the population has ≥ 20% probability of extinction in the next 100 years for 3 consecutive years, or the population has ≥ 20% probability of extinction in the next 100 years and is decreasing in abundance. The Alaska-breeding population would be considered for delisting from threatened status if it has ≤ 1% probability of extinction in the next 100 years, and each of the northern and western subpopulations are stable or increasing and have ≤ 10% probability of extinction in 100 years.

Steller's Eider Critical Habitat

In 2001, the Service designated 2,830 mi^2 (7,330 km^2) of critical habitat for the Alaska-breeding population of Steller's eiders at breeding areas on the Y- K Delta, a molting and staging area in the Kuskokwim Shoals, and molting areas in marine waters at Seal Islands, Nelson Lagoon, and Izembek Lagoon (66 FR 8849, February 2, 2001). No critical habitat for Steller's eiders has been designated on the ACP. In accordance with section 3(5)(A)(i) of the Act and regulations in

50 C.F.R. 424.12, critical habitat for a species contains those physical or biological features that are essential for the conservation of the species and which may require special management considerations and protection. Under the Act these features are considered “primary constituent elements” of critical habitat, and include, but are not limited to: space for individual and population growth, and for normal behavior; food, water air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and habitats that are protected from disturbance or are representative of the historical geographic and ecological distribution of a species.

3.2 Spectacled Eider

Physical Appearance

Spectacled eiders are large sea ducks. Males in breeding plumage have a white back, black breast, and pale green head with large white “spectacles” around the eyes. In late summer and autumn males molt into a mottled brown plumage that lasts until late fall, when they re-acquire breeding plumage. Females are mottled brown year round, with pale tan spectacles. Juveniles attain breeding plumage in their second (female) or third (male) year; until then they are mottled brown (Petersen et al. 2000). Both males and females have long sloped bills, giving them a characteristic profile (Fig 3.5).

Figure 3.5 - Male and female spectacled eiders in breeding plumage.

Distribution and Status

Spectacled eiders inhabit the North Pacific. There are three primary breeding populations; those on Alaska's North Slope, the Y-K Delta, and northern Russia. Historically, spectacled eiders nested in Alaska discontinuously from the Nushagak Peninsula north to Barrow, and east nearly to Canada's Yukon Territory (Phillips 1922-1926, Bent 1925, Bailey 1948, Dau and Kistchinski 1977, Derksen et al. 1981, Garner and Reynolds 1986, Johnson and Herter 1989). The entire species was listed throughout its range as threatened on May 10, 1993 (USFWS 1993) because of documented population declines. The Y-K Delta population had declined 96% between the 1970s and early 1990s (Stehn et al. 1993, Ely et al. 1994), and anecdotal information indicated that populations in the other two primary breeding areas had also declined (USFWS 1996). The global population of spectacled eiders is estimated at 363,000 birds (Petersen et al. 1999), or 418,420 birds (USFWS & USGS Spectacled Eider Experts Meeting 2006).

Distribution of spectacled eiders. Molting areas (green) are used July through October. Wintering areas (yellow) are used October through April. The full extent of molting and wintering areas is not yet known, and may extend beyond the boundaries shown.

Figure 3.6 - Distribution of spectacled eiders.

Spectacled eiders molt in several discrete areas (Figure 3.6), with birds from the different populations and genders apparently favoring different molting areas (Petersen et al. 1999). After molting, spectacled eiders migrate to openings in pack ice of the central Bering Sea south/southwest of St. Lawrence Island (Petersen et al. 1999; Figure 3.6), where they remain until March or April (Lovvorn et al. 2003).

Life History – North Slope Population (Breeding)

Research and spring aerial surveys have provided data on spectacled eider populations on Alaska's ACP (the North Slope breeding population) since 1992. On the North Slope, spectacled eiders breed north of a line connecting the mouth of the Utukok River to a point on the Shaviovik River about 24 km (~15 miles) inland from its mouth. Breeding density varies across the North Slope (Figure 3.7). Breeding pair numbers peak in mid-June and the number of males declines 4-5 days later (Smith et al. 1994, Anderson and Cooper 1994, Anderson et al. 1995, Bart and Earnst 2005).

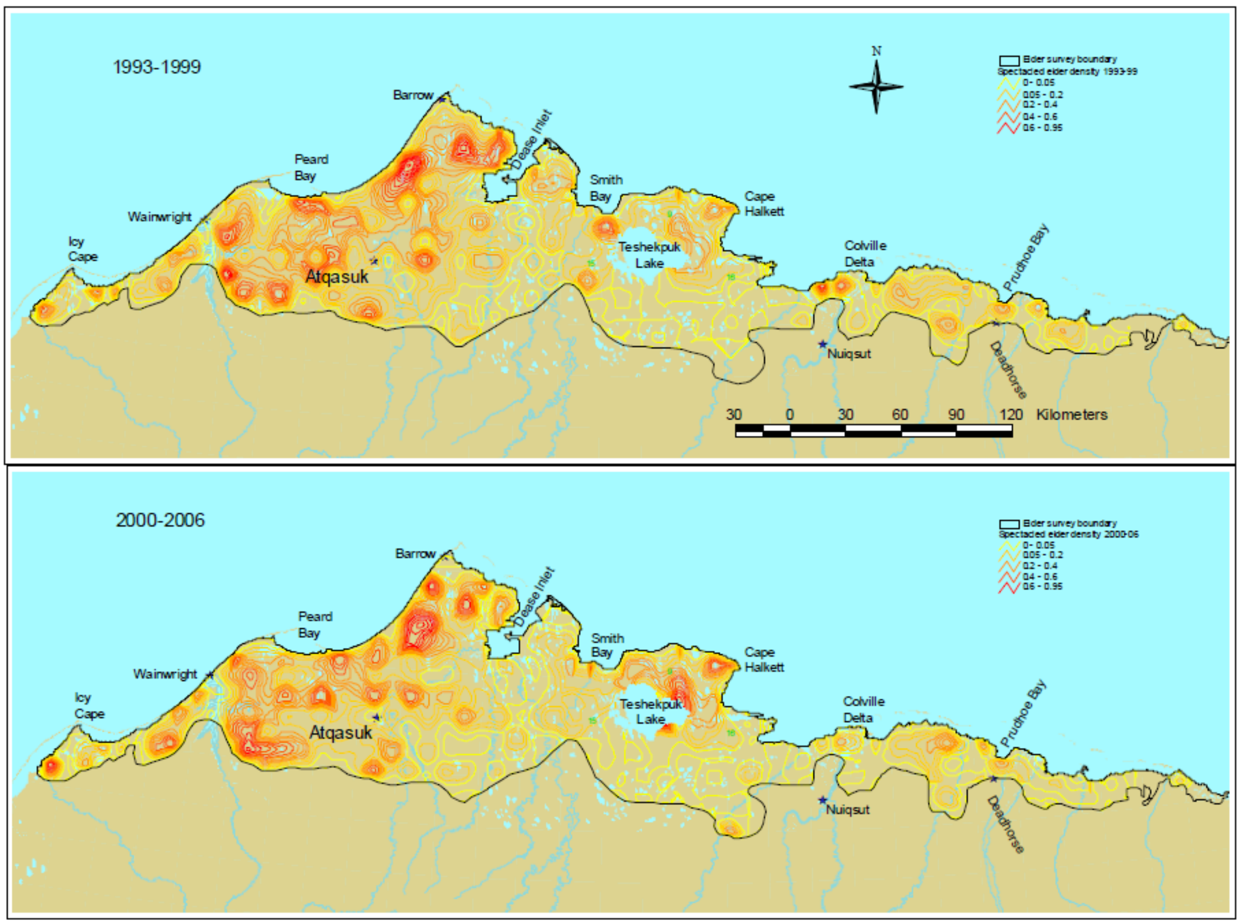


Figure 3.7 – Mean spectacled eider breeding density across Alaska's Arctic Coastal Plain 1993-1999 above and 2000 – 2006 below (from Larned et al. 2006).

North Slope spectacled eider clutch size averages 3.2-3.8, with clutches of up to eight eggs reported (Quakenbush et al. 1995). Incubation lasts 20-25 days (Kondratev and Zadorina 1992, Harwood and Moran 1993, Moran and Harwood 1994, Moran 1995), and hatching occurs from mid- to late July (Warnock and Troy 1992). On the nesting grounds, spectacled eiders feed on mollusks, insect larvae (craneflies and caddisflies), midges, small freshwater crustaceans, and plants and seeds (Kondratev and Zadorina 1992) in shallow freshwater or brackish ponds, or on flooded tundra. Young fledge approximately 50 days after hatch, and then females with broods move from freshwater to marine habitats.

Nest success is highly variable and greatly influenced by predators, including gulls (*Larus* spp.), jaegers (*Stercorarius* spp.), and red (*Vulpes vulpes*) and arctic (*Alopex lagopus*) foxes. In arctic Russia, apparent nest success was calculated as <2% in 1994 and 27% in 1995; predation was believed to be the cause of high failure rates, with foxes, gulls and jaegers the suspected predators (Pearce et al. 1998). Apparent nest success in 1991 and 1993-1995 in the Kuparuk and Prudhoe Bay oil fields on the ACP varied from 25-40% (Warnock and Troy 1992, Anderson et al. 1998)

Life History – Y-K Delta Population (Breeding)
Spectacled eiders historically nested throughout the coastal zone of the Y-K Delta. They currently breed primarily within about 15 km (~9 miles) of the coast from Kigigak Island north to Kokechik Bay (USFWS 1996; Figure 3.8), although a number of sightings have been made on the Y-K Delta both north and south of this area during the breeding season (R. Platte, USFWS, pers. comm. 1997). Breeding density varies in the primary nesting area, the central coast zone, of the Y-K Delta (Platte and Stehn 2009; Figure 3.8).

Spectacled eider clutch size at Kigigak Island on the Y-K Delta has averaged 4.9 eggs from 1992-2007, with clutches of up to eight eggs reported (Lake 2007). At Hock Slough on the Y-K Delta, clutch size averaged 5.2 from 1991-1995, with clutches up to seven eggs (Grand and Flint 1997). Nest initiation occurs from mid-May to mid-June (Lake 2007), incubation lasts approximately 24 days (Dau 1974), and hatching occurs from mid-June to mid-July (Warnock and Troy 1992). On the nesting grounds, spectacled eiders feed on mollusks, insect larvae (craneflies and caddisflies), midges, small freshwater crustaceans, and plants and seeds (Kondratev and Zadorina 1992) in shallow freshwater or brackish ponds, or on flooded tundra. Young fledge approximately 50 days after hatch, and then females with broods move directly from freshwater to marine habitats. Nest success is variable and greatly influenced by predators, including gulls (*Larus* spp.), jaegers (*Stercorarius* spp.), and red (*Vulpes vulpes*) and arctic (*Alopex lagopus*) foxes. On Kigigak Island in the Y-K Delta, nest survival probability ranged from 0.06 – 0.92 from 1992-2007 (Lake 2007). Nest success tended to be higher in years with low fox numbers or activity (i.e., no denning) and when foxes were eliminated from the island prior to the nesting season or years.

Life History – Demographics
Age at first breeding has not been determined but probably occurs most often in the third year for females and the third or fourth year for males, coinciding with the acquisition of plumage (USFWS 1999). Wild and captive spectacled eiders are documented to breed as early as 2 years of age. Spectacled eiders lay an average of five eggs (Strobel 2004), and their incubation period

averages 24 days (Dau 1974). Egg hatchability on the North Slope and in arctic Russia is very high for nesting spectacled eiders. Spectacled eider eggs that are addled or that do not hatch are very rare in the Prudhoe Bay area (Declan Troy, TERA, pers. comm. 1997), and Esler et al. (1995) found very few addled eggs on the Indigirka River Delta in Arctic Russia. Additionally, from 1969 to 1973 at an inland site on the Yukon Delta National Wildlife Refuge, only 0.8% of spectacled eider eggs were addled or infertile (Dau 1974). In contrast, 24% of all nests monitored in a coastal region of the Y-K Delta during the early to mid-1990s contained inviable eggs (Grand and Flint 1997). Approximately 10% of eggs in successful nests did not hatch due to either embryonic mortality or infertility, and the relatively high occurrence of inviable eggs is believed to be related to exposure to contaminants (Grand and Flint 1997).

Recruitment rate (the percentage of young eiders that hatch, fledge, and survive to sexual-maturity) of spectacled eiders is poorly known (USFWS 1999) as there is limited data on juvenile survival. The nesting success of spectacled eiders is variable, ranging from 20% to 95 % depending on the year and location (Bowman et al. 2002). Adult female survival can average 93%, and duckling survival can average 34 % (Flint and Grand 1997). In a coastal region of the Y-K Delta, duckling survival to 30 days averaged 34%, with 74% of this mortality occurring in the first 10 days. Survival of adult females during the first 30 days post hatch was 93+3% (Flint and Grand 1997).

Life History – (Non-breeding)

General

As with many other sea ducks, spectacled eiders spend the 8-10 month-long non-breeding season at sea, but until recently much about the species' life in the marine environment was unknown. Satellite telemetry and aerial surveys led to the discovery of spectacled eider migrating, molting, and wintering areas. These studies are summarized in Petersen et al. (1995), Larned et al. (1995), and Petersen at al. (1999).

Post-breeding – North Slope

Males generally depart breeding areas when the females begin incubation in late June (Anderson and Cooper 1994, Bart and Earnst 2005). Use of the Beaufort Sea by departing males is variable. Some appear to move directly to the Chukchi Sea over land, while the majority moved rapidly (average travel of 1.75 days), over near shore waters from breeding grounds to the Chukchi Sea (TERA 2002). Of 14 males implanted with satellite transmitters, only four spent an extended period of time (11–30 days), in the Beaufort Sea (TERA 2002). Preferred areas for males appeared to be near large river Deltas such as the Colville River where open water is more prevalent in early summer when much of the Beaufort Sea is still frozen.

Females generally depart the breeding grounds later, when much more of the Beaufort Sea is ice-free, allowing for more extensive use of the area. Females spent an average of two weeks in the Beaufort Sea (range 6-30 days) with the western Beaufort Sea the most heavily used (TERA 2002). Females also appeared to migrate through the Beaufort Sea an average of 10 km further offshore than the males (Peterson et al. 1999). The greater use of the Beaufort Sea and offshore areas by females was attributed to the greater availability of open water when females depart the area (Peterson et al. 1999, TERA 2002).

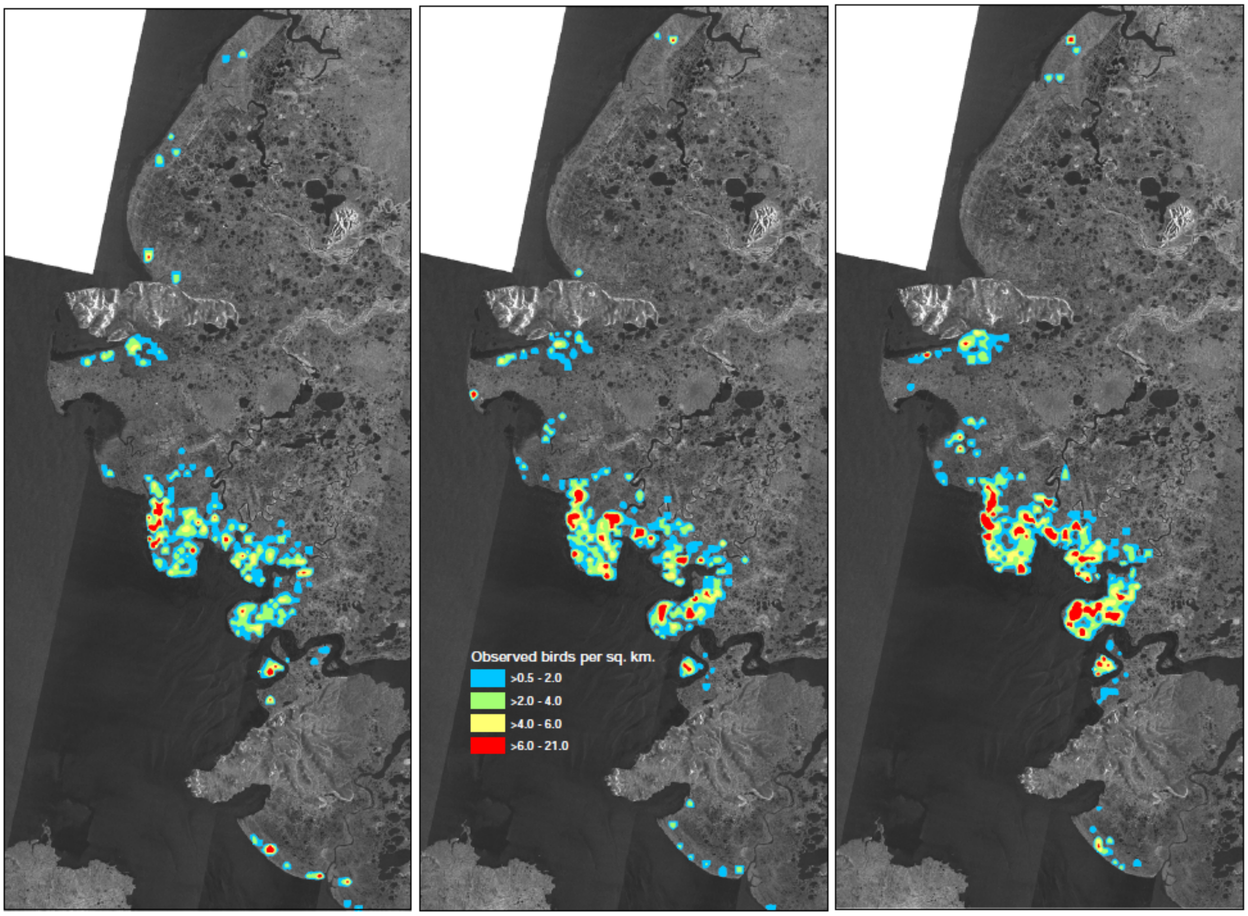


Figure 3.8 – Estimated relative density distribution of spectacled eiders on the central coast zone of the Yukon Delta, Alaska based on 3 time periods: 1998-2001 (left), 2002-2005 (middle), and 2006-2009 (right; from Platte and Stehn 2009).

Post-breeding – Y-K Delta
Males departing from the Y-K Delta breeding grounds leave 3-weeks sooner than males from Russia and the North Slope (Petersen et al. 1999).

Molt
Spectacled eiders use specific molting areas from July to late October. Larned et al. (1995) and Peterson et al. (1999) discussed spectacled eiders' apparently strong preference for specific molting locations, and concluded that all spectacled eiders molt in four discrete areas (Table 3.1). Females generally used molting areas nearest their breeding grounds. All transmittered females from the Y-K Delta molted in nearby Norton Sound (n = 18), while females from the North Slope (n = 15) molted in Ledyard Bay (10), along the Russian coast (4), and near St. Lawrence Island (1). Males did not show strong molting site fidelity; males from all three breeding areas molted in Ledyard Bay, Mechigmenskiy Bay, and the Indigirka/Kolyma River Delta. Males reached molting areas first, beginning in late June, and remained through mid-October. Non-breeding females, and those that nested but failed, arrived at molting areas in late July, while

successfully-breeding females and young of the year reached molting areas in late August or September and remained through October.
Avian molt is energetically demanding, especially for species such as spectacled eiders that complete molt in a few weeks. Molting birds must have ample food resources, and the rich benthic community of Ledyard Bay (Feder et al. 1989, 1994a, 1994b) likely provides these for spectacled eiders. Large concentrations of spectacled eiders molt in Ledyard Bay to use this food resource; aerial surveys on 4 days in different years counted 200 to 33,192 molting spectacled eiders in Ledyard Bay (Petersen et al. 1999; Larned et al. 1995).

Wintering
After molting, spectacled eiders migrate offshore in the Chukchi and Bering Seas to a single wintering area in openings in pack ice of the central Bering Sea south/southwest of St. Lawrence Island (Figure 3.6). In this relatively shallow area, hundreds of thousands of spectacled eiders (Petersen et al. 1999) rest and feed, diving up to 70 m to eat bivalves, mollusks, and crustaceans (Cottam 1939, Petersen et al. 1998, Petersen and Douglas 2004). Twelve spectacled eiders collected in the Bering Sea wintering area in March 2001 contained primarily the bivalve *Nuculana radiata* (Lovvorn et al. 2003). Sampling over several decades suggests that the benthic community in the overwintering area has shifted from larger to smaller species of clams (Lovvorn et al. 2000, Richman and Lovvorn 2003).

Table 3.1 Important staging and molting areas for each sex of each breeding population of spectacled eiders.

Population and Sex	Known Major Staging/Molting Areas
Arctic Russia Males	Northwest of Medvezhni (Bear) Island group
	Mechigmenskiy Bay
	Ledyard Bay
Arctic Russia Females	unknown
North Slope Males	Ledyard Bay
	Northwest of Medvezhni (Bear) Island group
	Mechigmenskiy Bay
North Slope Females	Ledyard Bay
	Mechigmenskiy Bay
	West of St. Lawrence Island
Y-K Delta Males	Mechigmenskiy Bay Northeastern Norton Sound
Y-K Delta Females	Northeastern Norton Sound

Late winter/spring
Recent information about spectacled and other eiders indicates that they probably make extensive use of the eastern Chukchi spring lead system between departure from the wintering area in March and April and arrival on the North Slope in mid-May or early June. Limited spring aerial observations in the eastern Chukchi have documented dozens to several hundred common (*Somateria mollissima)* and spectacled eiders in spring leads and several miles offshore in relatively small openings in rotting sea ice (W. Larned, USFWS; J. Lovvorn, University of Wyoming, pers. comm.). Woodby and Divoky (1982) documented large numbers of king (*Somateria spectabilis*) and common eiders using the eastern Chukchi lead system, advancing in pulses during days of favorable following winds, and concluded that an open lead is probably requisite for the spring eider passage in this region. Information obtained in 2002-2006 about 57 satellite marked king eiders found that 100% of the birds migrating from the Bering Sea to breeding grounds in North America occupied the spring lead system in the eastern Chukchi (Figure 3.9) for approximately 3-4 weeks (S. Oppel, University of Alaska Fairbanks, unpublished data).

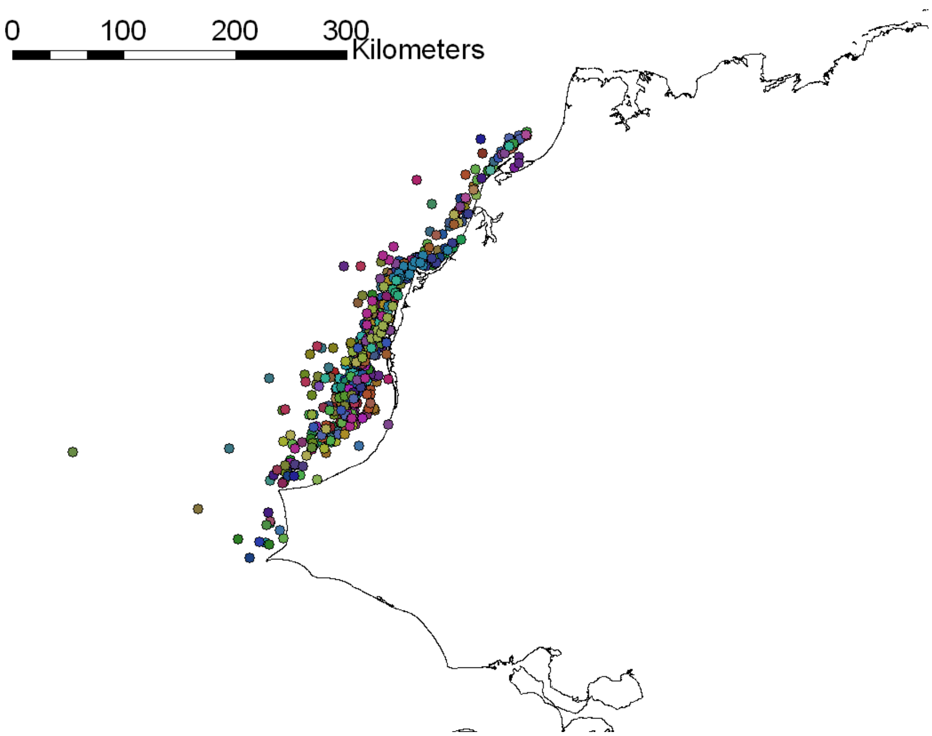


Figure 3.9. Spring migration locations of satellite-marked North Slope king eiders, 2002-2006 (Data from Steffen Oppel, University of Alaska-Fairbanks).

Adequate foraging opportunities and nutrition during spring migration are critical to spectacled eider productivity. Like most sea ducks, female spectacled eiders do not feed substantially on the breeding grounds, but produce and incubate their eggs while living primarilyoff body reserves (Korschgen 1977, Drent and Daan 1980, Parker and Holm 1990). Clutch size, a measure of reproductive potential, was positively correlated with body condition and reserves obtained prior to arrival at breeding areas (Coulson 1984, Raveling 1979, Parker and Holm 1990). Body reserves must be maintained from winter or acquired during the 4-8 weeks (Lovvorn et al. 2003) of spring staging, and Petersen and Flint (2002) suggest common eider productivity on the western Beaufort Sea coast is influenced by conditions encountered in May to early June during their spring migration through the Chukchi Sea (including Ledyard Bay). Common eider female body mass increased 20% during the 4-6 weeks prior to egg laying (Gorman and Milne 1971, Milne 1976, Korschgen 1977, Parker and Holm 1990). For spectacled eiders, average female body weight in late March in the Bering Sea was 1,550 ± 35 g (n = 12), and slightly (but not significantly) more upon arrival at breeding sites (1,623 ± 46 g, n = 11; Lovvorn et al. 2003), indicating that spectacled eiders must maintain or enhance their physiological condition during spring staging.

Abundance and Trends
The most recent rangewide estimate of the total number of spectacled eiders was 363,000 (333,526-392,532 95% CI), obtained by aerial surveys of the known wintering area in the Bering Sea in late winter 1996-1997 (Petersen et al. 1999). Winter/Spring aerial surveys were repeated in 2009 and 2010. Preliminary results from 2009 indicate an estimate of 301,812 spectacled eiders, but this value will be updated when surveys from both years are analyzed (Larned et al. 2009, p. 2).

In 1992, the Y-K Delta spectacled eider population was reportedly at about 4% of historic levels (Stehn et al. 1993). Evidence of the dramatic decline in spectacled eider nesting on the Y-K Delta was corroborated by Ely et al. (1994). They documented a 79% decline in eider nesting between 1969 and 1992 for areas near the Kashunuk River. Aerial and ground survey data indicated that spectacled eiders were undergoing a decline of 9-14% per year from 1985-1992 (Stehn et al. 1993). Further, from the early 1970s to the early 1990s, the number of pairs on the Y-K Delta declined from 48,000 to 2,000, apparently stabilizing at that low level (Stehn et al. 1993). Before 1972, an estimated 47,700 to 70,000 pairs of spectacled eiders nested on the Y-K Delta in average to good years (Dau and Kistchinski 1977).

Fischer et al. (2010) used ground-based and aerial surveys to estimate the number of nests and eggs of spectacled eiders on the coastal zone of the Y-K Delta from 1985–2010. The estimated total number of nests is a direct measure of effective breeding population size and an index to the number of potential nesters (Fischer et al. 2010). In 2010 they estimated 6,750 (SE 866) spectacled eiders nests on the Y-K Delta. The 2009 indicated total bird index, based solely on aerial surveys for the entire coastal zone, was 6,537 birds (SE 527; Platte and Stehn 2009). The aerial index is lower than the nest estimate because the indicated total number of birds has not been corrected for detection probability. The average aerial index for 2005–2009 was 5,244 birds (4,872–5,616, 90% C.I.), and the estimated population averaged for the last 5 years was 11,411 spectacled eiders (9,657–13,165, 90% C.I.; corrected for detection probability of 46%).

The average population growth rate of the estimated number of nests on the Y-K Delta from 2000–2010 increased at 1.098 (1.057-1.138, 90%CI; Fischer et al. 2010). The population growth rate from 2000 to 2009 for the Y-K Delta indicated total bird index from aerial surveys of spectacled eiders was 1.081 (1.050–1.113, 90% CI; Platte and Stehn 2009). A more thorough analysis accounting for observer experience and survey timing yielded a 1993-2006 adjusted growth rate of 1.042 (1.030–1.053; 90% C.I.; Stehn et al. 2006).

No population estimates for the North Slope breeding population are available before 1993. At Prudhoe Bay, within the North Slope breeding area, Warnock and Troy (1992) documented an 80% decline in spectacled eider abundance from 1981 until 1991. For the North Slope breeding population, ground-plot surveys have not been conducted. The 2009 population index based on aerial surveys was 5,018 birds (SE 854; unadjusted for detection probability). The North Slope spectacled eider population from 1993-2009 was slightly decreasing, with an average (n = 17 years) population growth rate of 0.985 (0.971–0.999, 90% CI; Larned et al. 2010). The North Slope breeding population estimate for 2007-2009 (adjusted for detection probability = 46%) was 12,506 (9,365–15,646, 90% C.I.)

Spectacled Eider Recovery Criteria

The Spectacled Eider Recovery Plan (USFWS 1996) presents research and management priorities with the objective of recovery and delisting so that protection under the Act is no longer required. Although the cause or causes of the spectacled eider population decline is not known, factors that affect adult survival are likely to be the most influential on population growth rate. These include lead poisoning from ingested spent shotgun pellets, which may have contributed to the rapid decline observed in the Y-K Delta (Franson et al 1995, Grand et al. 1998), and other factors such as habitat loss, increased nest predation, over harvest, and disturbance and collisions caused by human infrastructure (factors discussed in Section 4 – *Environmental Baseline*). Under the Recovery Plan, the species will be considered recovered when each of the three recognized populations (Y-K Delta, North Slope of Alaska, and Arctic Russia): 1) is stable or increasing over 10 or more years and the minimum estimated population size is at least 6,000 breeding pairs, or 2) number at least 10,000 breeding pairs over 3 or more years, or 3) number at least 25,000 breeding pairs in one year. Spectacled eiders do not currently meet these recovery criteria.

Spectacled Eider Critical Habitat

Critical habitat for molting spectacled eiders was designated in Norton Sound and Ledyard Bay molting areas, nesting areas on the Y-K Delta, and the wintering area southwest of St. Lawrence Island (critical habitat was not designated on the ACP; 66 CFR 9146 [February 6, 2001]) .

3.3 Yellow-billed Loon

Physical Appearance

The yellow-billed loon (*Gavia adamsii*) is the largest, rarest, and most northerly distributed of the five loon species in the family Gaviidae. Although the yellow-billed loon is similar in appearance to the common loon (*Gavia immer*), the yellow-billed loon is most easily distinguished by their larger yellow or ivory-colored bill. During the non-breeding season, yellow-billed loons lose their distinctive black and white plumage and molt into gray-brown plumage, with paler undersides and head, and a blue-gray bill. Similarity of plumage among loon species in non-breeding and juvenal plumages, makes distinguishing among species difficult. Yellow-billed loons are specialized for aquatic foraging with a streamlined shape and legs near the rear of the body, and are unable to take flight from land.

Status and Distribution
On March 25, 2009, the yellow-billed loon was designated a candidate for protection under the Act because of its small population size range-wide and concerns about levels of subsistence harvest and other potential impacts to the species (Federal Register 74(56):12932-12968). This finding resulted in a determination that listing under the Act is "warranted but precluded" by higher priority listing actions, with the desire that improved information on subsistence harvest and other potential threats will gathered and used to inform subsequent decisions regarding the species' possible listing.

Yellow-billed loons are intrinsically vulnerable due to a combination of small population size, low reproductive rate, and very specific breeding habitat requirements. There is no reliable scientific information on lifespan and survivorship, but as large-bodied birds with low clutch size, yellow-billed loons are probably "K-selected;" that is, they are long-lived and dependent upon high annual adult survival to maintain populations.

Yellow-billed loons nest from June to September near freshwater lakes in tundra on Alaska's North Slope, northwestern Alaska, and St. Lawrence Island; in Canada east of the Mackenzie Delta and west of Hudson Bay; and in Russia on a relatively narrow strip of coastal tundra from the Chukotka Peninsula in the east and on the western Taymyr Peninsula in the west, with a break in distribution between these two areas (Earnst 2004, North 1993, Red Data Book of the Russian Federation 2001, Ryabitsev 2001, Il'ichev and Flint 1982, Pearce et al. 1998) (Figure 3.10).

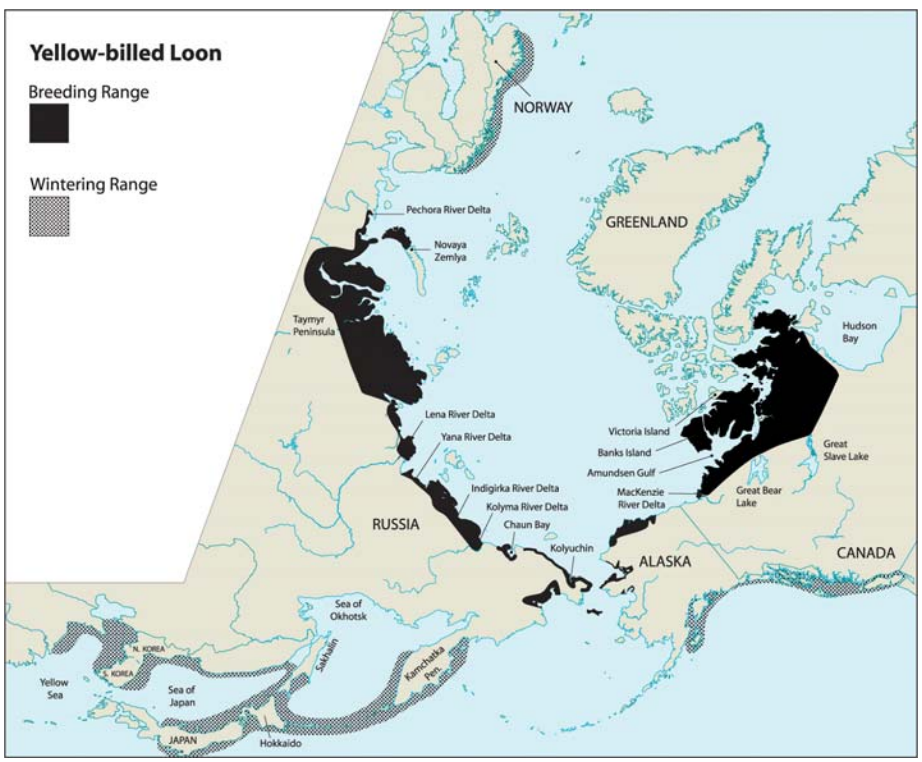
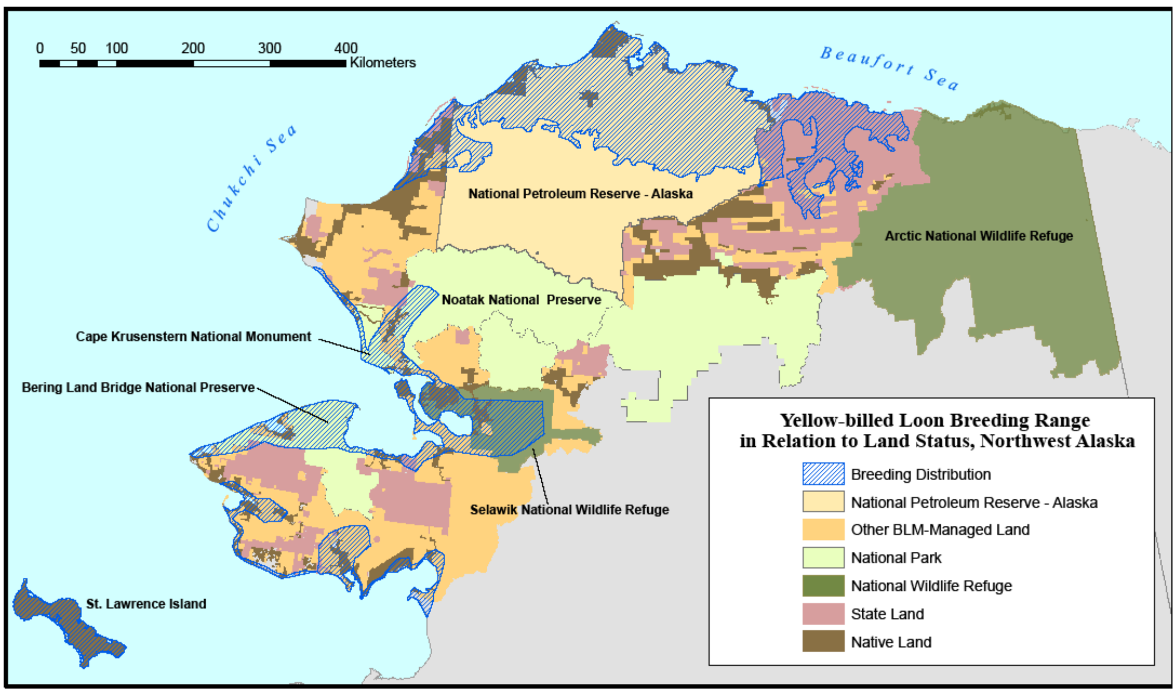


Figure 3.10 - Range of the yellow-billed loon.

The yellow-billed loon is a migratory species. During the non-nesting season (October through May), the species winters in principally coastal marine waters at mid to high latitudes, including southern Alaska and British Columbia to Puget Sound; the Pacific coast of Asia from the Sea of Okhotsk south to the Yellow Sea; the Barents Sea and the coast of the Kola Peninsula; coastal waters of Norway; and possibly Great Britain (Earnst 2004, North 1993, Ryabitsev 2001, Schmutz *pers. comm.* 2008, Strann and Østnes 2007, Burn and Mather 1974, Gibson and Byrd 2007) (Figure 3.10). A small proportion of yellow-billed loons may winter in interior lakes or reservoirs in North America (North 1994). Non-breeding birds remain in marine waters throughout the year, either in wintering areas or offshore from breeding grounds.

Life History - Breeding

Yellow-billed loons nest exclusively on margins of lakes and islands in coastal and inland low-lying tundra from latitude 62° to 74° North. Yellow-billed loons are sparsely distributed during the breeding season, and are somewhat clumped at a large scale, perhaps because of non-uniform habitat quality. Within Alaska, there are two breeding areas – the North Slope region north of the Brooks Range and the region surrounding Kotzebue Sound in northwest Alaska, primarily the northern Seward Peninsula (Earnst 2004, North 1993) (Figure 3.11).



Yellow-billed Loon breeding distribution follows Earnst (2004); land status from Alaska Department of Natural Resources, General Land Status Database

Figure 3.11 -Yellow-billed loon breeding distribution in Alaska.

Nest sites are usually located on islands, hummocks, or peninsulas, along low shorelines, within 1 m of water. Nests are constructed of mud or peat, and are often lined with vegetation. It is thought that loons occupy the same breeding territory throughout their reproductive lives. One or two large eggs are laid in mid- to late June (North 1994). Egg replacement after nest predation occurs rarely as the short arctic summer probably precludes the production or success of replacement clutches (Earnst 2004). Hatching occurs after 27 to 28 days of incubation by both sexes. Although the age at which young are capable of flight is unknown, it is probably similar to common loons (8-9, possibly up to 11, weeks). Young leave the nest soon after hatching, and the family may move between natal and brood-rearing lakes. Both males and females participate in feeding and caring for young (North 1994).

Information on reproductive success is limited but significant inter-annual variation has been described. Mayfield survival rates to 6 weeks of ages for yellow-billed loons on the Colville River Delta between 1995-2000 ranged from 4% to 60% (Earnst 2004), with low success attributed to late ice melt or extreme flooding. Apparent nest success on the Colville River Delta recorded by aerial surveys ranged from 19% - 64% between 1993 and 2007 (ABR, Inc. 2007, ABR, Inc., unpublished data).

During the breeding season, foraging habitats include lakes, rivers, and the nearshore marine environment. Successfully breeding adults feed their young almost entirely from the brood-rearing lake (North 1994).

Life History – Migration and Wintering

Yellow-billed loon migration routes are thought to be primarily marine. J. Schmutz (in litt, 2008). *comm.*) found that adult yellow-billed loons marked with satellite transmitters on Alaska breeding grounds generally remained between 1 and 20 miles from land during migration and winter. Yellow-billed loons migrate singly or in pairs, but gather in polynyas (areas of open water at predictable, recurrent locations in sea-ice covered regions), ice leads (more ephemeral breaks in sea ice, often along coastlines), and early-melting areas off large river deltas near breeding grounds in spring along the Beaufort Sea coast of Alaska and Canada (Barry et al.1981, Barry and Barry 1982, Woodby and Divoky 1982, Johnson and Herter1989, Barr 1997, Alexander et al. 1997, Mallory and Fontaine 2004).

Yellow-billed loons breeding in Alaska are also being studied to determine their migration routes. Twenty-six yellow-billed loons captured on the ACP between 2002 and 2009 were outfitted with satellite transmitters (J. Schmutz; pers. comm. 2010). All of them migrated south to Asia, predominantly along the Russian coastline from the Chukotka Peninsula (either through the Bering Strait or across the mountains from the north side of the Chukotka Peninsula to the Gulf of Anadyr), and along the Kamchatka coast. They wintered in the Yellow Sea and Sea of Japan off the coasts of China, North Korea, Russia, and Japan (near Hokkaido). All 10 yellow-billed loons captured on the Seward Peninsula, Alaska and fitted with transmitters in 2007 and 2008 also used the Bering Strait region after leaving their breeding grounds. Five of these loons migrated to Asian breeding grounds as described above for ACP breeding birds; the other 5 wintered throughout the Aleutian Islands from Shemya Island in the west to the Semidi Islands off the coast of the Alaska Peninsula (Schmutz in litt,. 2008). Most of these yellow-billed loons departed breeding areas in late September, arrived in wintering locations in mid-November, started spring migration in April, and arrived on breeding grounds in the first half of June; these dates are consistent with breeding ground arrival dates reported by North (1994). Non-breeders or failed nesters may start their fall migration in July.

The migration routes of yellow-billed loons breeding in Russia have not been studied. Because of the proximity of the Chukotka Peninsula to the North Slope in Alaska, and the fact that North Slope breeding yellow-billed loons use the Chukotka Peninsula during migration (J. Schmutz in litt., 2008), it is likely that some or all yellow-billed loons from eastern Russia migrate through the Chukchi Sea and Bering Straits to Asian wintering areas.

Abundance and Trends

The global population size of yellow-billed loons is unknown, but probably in the range of 16,000-32,000, with of 3,000-4,000 thought to breed in Alaska (Federal Register 74(56):12932-12968). Maximum estimates based on the amount of available habitat (plus limited survey data for Canada) are 20,000 birds in Canada and 8,000 in Russia. Most of the breeding range of the yellow-billed loon has not been adequately surveyed, and only in Alaska have surveys been conducted specifically for breeding yellow-billed loons.

Until 2007, yellow-billed loon population indices on the North Slope were determined by two independent fixed-wing aerial transect surveys for waterfowl conducted each year by the Service's Migratory Bird Management program (MBM). The North Slope Eider survey was flown in early June (1992-2008) and the Arctic Coastal Plain survey in late June (1986-2006). Survey timing and coverage differed between the two surveys, and consequently the resulting yellow-billed loon population index differed. In 2007, MBM merged the two surveys into a single Arctic Coastal Plain survey flown in early June. Based on several studies and survey methods, an estimated 2,500-3,500 yellow-billed loons breed on the North Slope (USFWS unpublished data based on examining results in Earnst et al. 2005, Stehn et al. 2005, Mallek et al. 2007, Larned et al. 2009).

Population indices in western Alaska are determined from fixed-wing aerial lake-circling surveys flown on the Seward Peninsula and Cape Krusenstern (June 2005 and 2007) and transect surveys of Selawik National Wildlife Refuge (June 1996 and 1997) (Platte 1999, Bollinger et al. 2008). Approximately 500 loons are estimated to breed in the Kotzebue Sound region in western Alaska.

Although there is no a recent survey estimate of yellow-billed loon nesting population on St. Lawrence Island (USFWS 2009b) and no published record since the late 50s (Fay and Cade 1959), the number nesting there is thought to be approximately 50 birds (Fair 2002).

Several analytical approaches have been used to estimate population trends for yellow-billed loons breeding on the North Slope. Aerial survey data adjusted for the possible confounding variation due to survey timing, phenology, and observer experience, indicated an average trend from 1986-2003 of 0.991 (0.964–1.018, 95% CI; Earnst et al. 2005). The Service recently examined a subset of the NSE data through 2008 that analyzed the pilot-observer data and estimated the average growth rate as 0.986 (0.967–1.006, 95% CI). Finally, including the most recent aerial indices for the NSE survey not adjusted by covariates, the 1992-2009 growth rate was 1.021 (1.005–1.037, 90% CI, Larned et al. 2010). These multiple analytical approaches provide varying estimates of trends ranging from slightly increasing to slightly decreasing, and those estimates with the most precision (95% CIs) include a lambda of 1.0. Thus, the population of yellow-billed loons breeding on the North Slope may be stable, slightly increasing, or slightly decreasing.

Surveys in western Alaska have not been conducted for a long enough period (only in 2005 and 2007) to detect trends. Similarly, limited surveys have been conducted only in small parts of the Russian and Canadian breeding ranges, so population sizes for these ranges are gross approximations and no information on trends is available. Therefore, we are not able to estimate trends at the species level.

3.4 Kittlitz's Murrelet

Physical Appearance

Kittlitz's murrelets are small diving seabirds in the family Alcidae (including puffins, guillemots, and murres) which inhabit Alaskan coastal waters. Breeding plumage is mottled golden-brown and winter non-breeding plumage is more distinct, with a white underbelly and face and dark back and chest band.

Status and Distribution

On May 4, 2004, the Kittlitz's murrelet was designated a candidate for protection under the ESA because its numbers have declined sharply and it may warrant listing as threatened or endangered (Federal Register 69(86):24875-24904). This finding resulted in a determination that listing under the Act is "warranted but precluded" by higher priority listing actions.

All of the North American and a large proportion of the known world population of Kittlitz's murrelets breed, molt, and winter in Alaska (Day et al. 1999). An estimated 10% of the world population breeds in the Russian Far East from the Okhotsk Sea to the Chukchi Sea (Day et al. 1999), but in the late 1990s large numbers of Kittlitz's murrelets were reported from the Kamchatka Peninsula (Vyatkin 1999). During the breeding season, Kittlitz's murrelets are often found in association with marine tidewater glaciers and glacial-influenced water and in protected fiords (Kuletz and Piatt 1992, Day and Nigro 1998, Day et al. 2000). Kittlitz's murrelets are also found around Kodiak Island, the Aleutian Islands, Bristol Bay, Seward Peninsula, Cape Lisburne, and Chukotka and Kamchatka peninsulas in Russia; areas not currently influenced by glaciers (Figure 3.12). Kittlitz's murrelets possibly nest as far north as Cape Sabine and Cape Beaufort, (inland of Ledyard Bay), although suitable habitat may not be available in that location (D.G. Roseneau, pers. comm., reported by Day et al. 1999). Suitable nesting habitat disappears north of Cape Beaufort, so the species rarely occurs and probably does not breed north of there (from Wainwright to Barrow; Huey 1931, Bailey et al. 1933, Bailey 1948, Pitelka 1974).

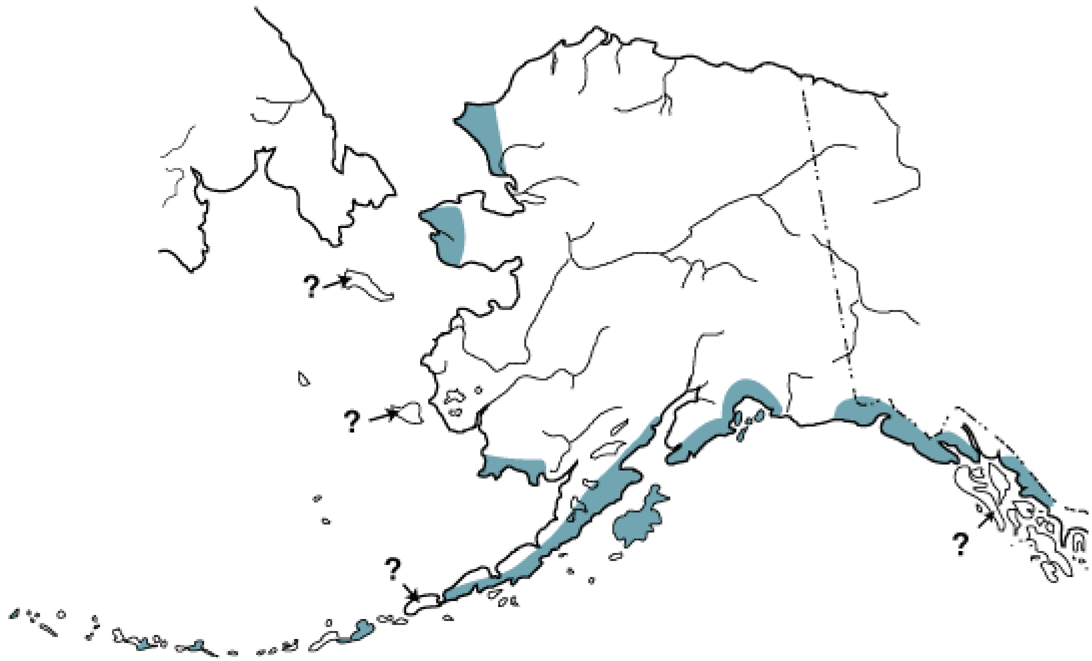


Figure 3.12 - Breeding distribution of Kittlitz's murrelet in North America (Day et al. 1999)

Life History
Kittlitz's murrelets appear to use a predator avoidance strategy for nesting; their nests are widely dispersed in areas with sparse or no vegetation (Kaler et al. 2008). They nest solitarily on the ground, in very remote areas (Day 1995; Day et al. 1999). Nesting habitat in Alaska is believed to be unvegetated scree-fields, coastal cliffs, barren ground, rock ledges, and talus above timberline in coastal mountains, generally in the vicinity of glaciers, cirques near glaciers, or recently glaciated areas, primarily from the Alaska Peninsula to Glacier Bay (Day et al. 1983; Day 1995; Day et al. 1999; Piatt et al. 1999). Local climate, geomorphology and elevation may be important parameters determining nest site suitability (Kaler 2006). Kittlitz's murrelets lay one large egg in a stone nest bowl, and the same site may be used for nesting year after year (Piatt et al. 1999). The timing of egg-laying appears to be asynchronous (Kissling, US Fish and Wildlife Service, Juneau, Alaska, unpublished data, 2007). Egg laying initiates approximately 18 May through 29 June (Agness 2006; Kissling et al. 2007a; Kaler et al. 2009) (June in northern Alaska; Day et al 1999), and there is evidence that Kittlitz's murrelets attempt to renest (Kaler et al. 2008). Duration of incubation is 30 days (Kissling, US Fish and Wildlife Service, Juneau, Alaska, unpublished data, 2007; Kaler et al. in press). The chick is fed for 24 to 30 days post-hatch (Day et al. 1999; Naslund et al. 1994; Kaler et al. 2009). Young fledge in August in the northern part of their range, including the Chukchi Sea coast (Day et al. 1999). Both males and females incubate eggs and brood the young. There is no information on annual or lifetime reproductive success but some evidence suggests this species may forego breeding in some years (Day et al. 1999).

Kittlitz's murrelets occur at sea in substantial numbers along the ice edge in late summer and fall, particularly in the central Chukchi Sea, although there is much interannual variation in abundance (fall population in Chukchi Sea estimated as 1,000-5,000 birds by G.J. Divoky, University of Alaska-Fairbanks, unpubl. data). The species is not recorded in the Beaufort Sea (Divoky 1984, Johnson and Herter 1989). Both the timing and migration routes to and from the breeding grounds are unknown, but the shift between summer and winter distribution appears to be rapid and asynchronous (Day et al. 1999). It is likely that Kittlitz's murrelets follow the retreating ice edge, feeding on the biomass associate with ice plankton blooms.

During the breeding season, Kittlitz's murrelets feed on schooling fishes such as Pacific capelin, Pacific sand lance, Pacific herring (*Clupea pallasi*), and walleye pollock (Piatt et al. 1994; Day and Nigro 2000; Agness 2006; Kissling et al. 2007a). Although they are considered a piscivorous species, Kittlitz's murrelets also feed on invertebrates (Sanger 1987; Hobson et al. 1994). Because the energy density of available forage fishes is seasonally influenced (Montevecchi and Piatt 1987; Litzow et al. 2004), Kittlitz's murrelets may switch prey at various times of the year (Ostrand et al. 2004). In Prince William Sound and Glacier Bay, they tend to forage as single birds or in small groups (Day and Nigro 2000; Agness 2006), and rarely forage in mixed-species feeding flocks (Day and Nigro 2000). Winter foods are unknown, although the stomach of one museum specimen contained macro-zooplankton (Day et al. 1999).

The winter range of the Kittlitz's murrelet is not well known, but is probably pelagic (open ocean) (Day et al. 1999). There are records of occasional winter sightings in Southeast and western Alaska, and locally common sightings in a few locations in Southcoastal Alaska (Kendall and Agler 1998; Day et al. 1999). Kittlitz's murrelets are also reported during winter in the mid-shelf regions of the northern Gulf of Alaska (Day and Prichard 2001). Winter range of the species outside the Americas is largely unknown, but observations have been reported from the Kamchatka Peninsula and the Kuril Islands in the Russian Far East (Flint et al. 1984).

Abundance and Trends

The Kittlitz's murrelet is thought to be one of the rarest seabirds in North America. Based on compilation of information from various locations and from various years from 1999 to 2008, the Service's current Alaska population estimate of the Kittlitz's murrelet is 19,578 birds (range = 8,190-36,193; USFWS 2009c). Additionally, there may be as many as 5,000 birds along the north-eastern coast of Kamchatka (Vyatkin 1999) and perhaps 100 birds on the southeastern tip of the Chukotka Peninsula (Konyukhov et al. 1998); however, data from Russia are scarce. Given these data together, the worldwide population of Kittlitz's murrelets is estimated to be 24,678 individuals (USFWS 2009c).

A long-term data set from Prince William Sound in South central Alaska indicates that Kittlitz's murrelets may have declined at a rate of up to 18% per year from 1989 to 2000, for a total of 84% over the 11 survey years in this region (Kuletz et al. 2003). Other documented declines of Kittlitz's murrelets in Southcentral Alaska include an estimated 74% decline along the coast of the Kenai Fjords (1986-2002; van Pelt and Piatt 2003) and 43% decline between two decadal periods (1988-1999 and 2004-2007) in Kachemak Bay, Lower Cook Inlet (Kuletz et al. 2008). In Southeast Alaska, documented declines include an estimated 80% decline in Glacier Bay (between 1991 and 1999-2000; Robards et al. 2003, Drew and Piatt 2008), 90% decline in

Malaspina Forelands (Kissling et al. 2007b), and possibly 59% over a 3-year period in Icy Bay (2002-2005; Kissling, USFWS, unpublished data, 2006). Data from two surveys around Adak Island in the Aleutians suggest an annual decline of 7.4% for marbled and Kittlitz's murrelets combined (Piatt et al. 2007). There are no data available to assess declining population trends in the Russian population.

4. ENVIRONMENTAL BASELINE

The environmental baseline, as described in section 7 regulations (50 CFR §402.02) includes the past and present impacts of all Federal, State, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed Federal projects in the Action Area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The environmental baseline provides the context within which the effects of the Action will be analyzed and evaluated.

4.1 Spectacled and Steller's Eiders

Status in the Action Area

The North Slope and Y-K Delta breeding populations of spectacled eiders (approximately 12,506 and 11,411 breeding birds, respectively), and Steller's eiders (approximately 576 breeding birds) occupy terrestrial and marine portions of the Action Area for significant portions of their life history. Spectacled and Steller's eiders from both the Y-K Delta and North Slope breeding populations spend the majority of their annual cycle within the terrestrial and marine environments of the Action Area. During the proposed action (hunt dates 2 April – 31 August), Steller's and spectacled eiders can be moving from wintering to breeding areas, on breeding area, migrating from breeding to molting areas, and on molting areas. Spectacled eiders occur in the following AMBCC regions during the proposed action: North Slope, Northwest Arctic, Bering Strait/Norton Sound, and YK Delta. Steller's eiders have a wider distribution during the proposed action and can occur in the same AMBCC regions as spectacled eiders in addition to the following regions: Aleutian/Pribilof Islands, Bristol Bay, Kodiak, and Cook Inlet.

Both species have undergone significant, unexplained declines in their Alaska-breeding populations. Factors that may have contributed to the current status of spectacled and Steller's eiders are discussed below and include, but are not limited to, toxic contamination of habitat, increased predator populations, harvest, and impacts of development, science impacts, and climate change. Factors that affect adult survival may be the most influential on population growth rates. Recovery efforts for both species are underway in portions of the Action Area.

Data from annual aerial surveys adjusted by a surrogate visual correction factor estimates the North Slope-breeding population of spectacled eiders is approximately 12,506 individuals most of which nest in the Action Area. Of spectacled eiders observed on the North Slope during aerial surveys, the highest densities of spectacled eiders are consistently found in the Barrow Triangle, the area near Peard Bay, southeast of Wainwright, and northeast of Teshekpuk Lake (Figure 3.7).

As discussed in *Section 3 – Status of the Species*, it is difficult to determine the number of Steller's eiders that breed on the North Slope. However, annual aerial eider surveys show Steller's eiders are not evenly distributed across the ACP, with highest densities occurring in the Barrow Triangle, which comprises lands near Barrow, north of 70°50' N and west of Dease Inlet. This area accounts for only 4.8% of the survey area, but contained 40% of all Steller's eider observations in the aerial surveys. This is likely an underestimate of the proportion of Steller's eiders in this area because: 1) the scale of the concentration is too small to be adequately represented in the sampling regime; and 2) a portion of the concentration area is excluded because the area near the Barrow airport cannot be surveyed due to aviation safety concerns. Both species have undergone significant, unexplained declines in their Alaska-breeding populations. Factors that may have contributed to the current status of spectacled and Steller's eiders are discussed below and include, but are not limited to, toxic contamination of habitat, increased predator populations, harvest, and impacts of development, science impacts, and climate change. Factors that affect adult survival may be most influential on population growth rates. Recovery efforts for both species are underway in portions of the Action Area.

Increased Predator Populations

There is some evidence that predator and scavenger populations may be increasing on the North Slope near sites of human habitation, such as villages and industrial infrastructure (Eberhardt et al. 1983, Day 1998, Powell and Bakensto 2009). Researchers have proposed that reduced fox trapping, anthropogenic food sources in villages and oil fields, and nesting/denning sites on human-built structures have resulted in increased fox, gull, and raven numbers (R. Suydam and D. Troy pers. comm., Day 1998). These anthropogenic influences on predator populations and predation rates may have affected eider populations, but this has not been substantiated. However, increasing predator populations are a concern, and Steller's eider studies at Barrow attributed poor breeding success to high predation rates (Obritschkewitsch et al. 2001), and in years where arctic fox removal was conducted at Barrow prior to and during Steller's eider nesting, nest success appears to have increased significantly (Rojek 2008).

Habitat Loss through Development and Disturbance - With the exception of contamination by lead shot, destruction or modification of North Slope nesting habitat of listed eiders has been limited to date, and is not thought to have played a major role in population declines of spectacled or Steller's eiders. Until recently eider breeding habitat on the ACP was largely unaltered by humans, but limited portions of each species' breeding habitat have been impacted by fill of wetlands, the presence of infrastructure that presents collision risk, and other types of human activity that may disturb birds or increase populations of nest predators. These impacts have resulted from the gradual expansion of villages, coupled with cold war era military developments such as the Distant Early Warning (DEW) Line sites at Cape Lonely and Cape Simpson (*circa* 1957), and more recently, the initiation and expansion of oil development since construction of the Prudhoe Bay field and Trans Alaska Pipeline System (TAPS) in the 1970s.

The population of communities such as Barrow has been increasing, and the U.S. Bureau of Land Management (BLM) (2007) predicts growth to continue at approximately 2% per annum until at least the middle of this century. Assuming community infrastructure and footprint grow at roughly the same pace as population, BLM (2007) estimates that community footprint could cover 3,600 acres by the 2040s. Major community development projects such as the new hospital, landfill, and water treatment plant at Barrow, airport improvements and development of science support facilities in the area, have all undergone formal section 7 consultations

There are currently few permanent structures associated with the oil and gas industry in National Petroleum Reserve-Alaska (NPR-A), a vast area that contains virtually all currently occupied nesting habitat for the listed population of Steller's eiders, and almost 90% of the North Slope breeding habitat of spectacled eiders (USFWS 2008). However, development has steadily moved westward towards NPR-A since the initial discovery and development of oil on the North Slope. Given industry's interest in NPR-A as expressed by lease sales, seismic surveys, drilling of exploratory wells, and the construction of the Alpine field, industrial development is likely to continue in NE and NW NPR-A. Development in NPR-A may also facilitate development in more remote, currently undeveloped areas such as the Chukchi Sea or areas of the Beaufort Sea, and vice versa. Formal section 7 consultations were conducted for MMS's Lease Sale 193 in the Chukchi Sea, and Lease Sales 185, 196, and 202 in the Beaufort Sea. Consultation on these areas will continue if development proceeds past the exploration phase under the incremental step consultation authority granted to Outer Continental Shelf (OCS) activities (50 CFR § 402.14(k)).

Incidental Take

Recent activities across the North Slope that required formal section 7 consultation, and the estimated incidental take of listed eiders, is presented in Table 4.1. These actions were considered in the final jeopardy analysis of this biological opinion. It should be noted that incidental take is estimated prior to the implementation of reasonable and prudent measures and associated terms and conditions which serve to reduce the levels of incidental take. Further, in some cases included in this table, estimated take is likely to occur over the life of the project (often 30–50 years) rather than annually or during single years reducing the severity of the impact to the population. There are also important differences in the type of incidental take. The majority of the incidental take estimated is a loss of eggs/ducklings, which is of much lower significance for survival and recovery of the species than the death of an adult bird. For example, spectacled eider nest success recorded on the Y-K Delta ranged from 18-73% (Grand and Flint 1997), and average clutch size was 5 eggs (Petersen et al. 1999). From the nests that survived to hatch, spectacled eider duckling survival to 30-days ranged from 25-47% on the Y-K Delta (Flint et al. 2000). Over-winter survival of one-year old spectacled eiders was estimated at 25% (P. Flint pers. comm.), with annual adult survival of 2-year old birds (that may enter the breeding population) of 80% (Grand et al. 1998). Using these data (in a very simplistic scenario) we estimate for every 100 spectacled eider nests on the Y-K Delta, less than 2 - 17 adult females would be expected to survive and enter (recruit) into the breeding population. Similarly, we expect that only a small proportion of spectacled and Steller's eider eggs or ducklings on the North Slope would eventually survive to recruit into the breeding population.

Table 4.1 illustrates the number and diversity of actions that required consultation in Alaska. We believe these estimates have overestimated, possibly significantly, actual take. Actual take is likely reduced by the implementation of terms and conditions in each biological opinion, is spread over the life-span of a project (often 50 years), and is dominated by the *potential* loss of eggs/ducklings which, as described above, is of less significance than adult mortality for survival and recovery of these K-selected species. Also, it remains unknown to what degree spectacled and Steller's eiders potentially affected by disturbance can reproduce in disturbed areas or move to other less disturbed areas to reproduce. If either or both occur, these factors also serve to reduce actual impacts from the maximal potential impacts.

Table 4.1 - Activities in Alaska that required formal section 7 consultation and the amount of incidental take provided.

Project Name	Impact Type	Estimated Incidental Take
False Pass Harbor (2001)	Contaminants	4 adult Steller's eiders
NPDES-GP (2001)	Collisions	1 adult Steller's eider
Chignik Lagoon Tank Farm (2001)	Contaminants	14 adult Steller's eiders
Chignik Dock (2002)	Contaminants	4 adult Steller's eiders
Chignik Bay Tank Farm (2002)	Contaminants	5 adult Steller's eiders
Sandpoint Harbor (2002)	Contaminants Collisions Habitat loss	13 adult Steller's eiders
Beaufort Sea Planning Area Lease Sale 186, 195, & 202 (2002)	Collisions	5 adult spectacled eiders 1 adult Steller's eider
Fairweather Seismic (2003)	Disturbance	66 adult Steller's eiders
Nelson Lagoon Tank Farm (2003)	Contaminants Collisions	21 adult Steller's eiders
Akutan Mooring Basin (2003)	Contaminants Collisions	10 adult Steller's eiders
Alpine Development Project (2004)	Habitat loss Collisions	4 spectacled eider eggs/ducklings 3 adult spectacled eiders
Barrow Airport Expansion (2006)	Habitat loss	14 spectacled eider eggs/ducklings 29 Steller's eider eggs/ducklings
Barrow Hospital (2004 & 2007)	Habitat loss	2 spectacled eider eggs/ducklings 17 Steller's eider eggs/ducklings
Barrow Landfill (2003)	Habitat loss	1 spectacled eider nest/ year 1 Steller's eider nest/year
Barrow Artificial Egg Incubation	Removal of eggs for captive breeding program	Maximum of 24 Steller's eider eggs
Barrow Tundra Manipulation Experiment (2005)	Habitat loss Collisions	2 spectacled eider eggs/ducklings 1 Steller's eider eggs/ducklings 2 adult spectacled eiders 2 adult Steller's eiders
Barrow Global Climate Change Research Facility, Phase I & II (2005 & 2007)	Habitat loss Collisions	6 spectacled eider eggs/ducklings 25 Steller's eider eggs/ducklings 1 adult spectacled eider 1 adult Steller's eider
Barrow Wastewater Treatment Facility (2005)	Habitat loss	3 Steller's eider eggs/ducklings 3 spectacled eider eggs/ducklings
Savoonga Wind Turbine (2005)	Collisions	1 adult spectacled eider
Chukchi Sea Lease Sale 193 (2007)	Collisions	3 adult spectacled eiders 1 adult Steller's eider
ABR Avian Research/USFWS Intra-Service Consultation	Disturbance	5 spectacled eider eggs/ducklings
Pioneer's Ooogurük Project	Habitat loss Collisions	3 spectacled eider eggs/ducklings 3 adult spectacled eiders
BP's 69Kv Powerline	Collisions	10 adult spectacled eiders over 50 years
BP's Liberty Project	Habitat loss Collisions	2 spectacled eider eggs/ducklings 1 adult spectacled eider

Intra-service on Subsistence Hunting Regulations 2007	No estimate of incidental take provided	
Intra-service on Subsistence Hunting Regulations 2008	No estimate of incidental take provided	
Intra-service on Subsistence Hunting Regulations 2009	No estimate of incidental take provided	
BP Alaska's Northstar Project	Collisions	≤ 2 adult spectacled eiders/year ≤ 1 adult Steller's eider/year
KMG Nikaitchuq Project	Habitat loss Collisions	2 spectacled eiders/year 7 adult spectacled eiders over 30 years
Akutan Transportation (2007)	Disturbance	20 adult Steller's eiders
Unalaska Harbor (2007)	Contaminants Collisions Habitat loss	3 adult Steller's eiders
Intra-Service Consultation 2007 on MBM Avian Influenza Sampling	Disturbance	6 spectacled eider eggs/ducklings
Goodnews Bay Processor (2008)	Disturbance	28 adult Steller's eiders
BLM 2007 Programmatic on Summer Activities in NPR-A	Disturbance	21 spectacled eider eggs/ducklings
BLM 2008 Programmatic on Summer Activities in NPR-A	Disturbance	56 spectacled eider eggs/ducklings
BLM 2009 Programmatic on Summer Activities in NPR-A	Disturbance	49 spectacled eider eggs/ducklings
BLM Northern Planning Areas of NPR-A (2008)	Disturbance Collision	87 spectacled eider eggs/ducklings/year 12 Steller's eider eggs/ducklings/year < 7 adult spectacled eiders < 1 adult Steller's eider
MBM/USFWS Intra-Service Consultation 2008	Disturbance	21 spectacled eider eggs/ducklings
NOAA National Weather Service Office in Barrow	Habitat loss Disturbance Collision	< 4 spectacled eider eggs/ducklings < 10 Steller's eider eggs/ducklings 1 adult Steller's eider
Intra-Service on Section 10 permit for Dr. Peterson's 2009 PTT project	Loss of Production Capture/surgery	130 spectacled eider eggs/ducklings 4 adult spectacled eiders
MMS Beaufort and Chukchi Sea Program Area Lease Sales (2009)	Collision	12 adult spectacled eiders <1 adult Steller's eider
Intra-Service, Migratory Bird 2010 Subsistence Hunting Regulations	No estimate of incidental take provided	
Intra-Service, Section 10 permit for Dr. Peterson's telemetry research on spectacled eider use of the the Chukchi and Beaufort Seas (2010)	Loss of Production Capture/handling/ surgery	130 spectacled eider eggs/ducklings 7 adult/juvenile spectacled eiders (lethal take) 108 adult/juvenile spectacled eiders (non-lethal take)
BLM programmatic for activities between June 5 and Oct 31, 2010	Disturbance	32 Spectacled eider eggs
Intra-Service, Migratory Bird Management goose banding on the North Slope of Alaska (2010)	Disturbance	4 spectacled eider eggs/ducklings
Intra-Service, Section 10 permit for USFWS eider survey work at Barrow (2010)	Disturbance Capture/handling	3 Steller's eider or spectacled eider clutches 90 pairs + 60 hens, Steller's eider 60 pairs + 60 hens, spectacled eider 1 Steller's eider or spectacled eider adult

		(lethal take) 7 ducklings Steller's eider or spectacled eider (lethal take) 30 Steller's eider or spectacled eider hens (nonlethal take) 40 Steller's eider or spectacled eider ducklings (nonlethal take)
Intra-Service, Section 10 permit for ABR Inc.'s eider survey work on the North Slope and at Cook Inlet (2010)	Disturbance	35 spectacled eider eggs/ducklings

Research

Scientific, field-based research is also increasing on the ACP as interest in climate change and its effects on high latitude areas continues. While many of these activities have no impacts on listed eiders as they occur in seasons when eiders are absent from the area, or use remote sensing tools, on-the-ground activities and tundra aircraft landings likely disturb a small number of listed eiders each year. Many of these activities are considered in intra-Service consultations, or under a programmatic consultation with BLM for summer activities in NPR-A.

The FWS has issued permits under Section 10 of the ESA to authorize take of endangered or threatened species for purposes of propagation, enhancement, or survival. Annual reporting requirements associated with §10 permits for both spectacled and Steller's eiders indicate 11 spectacled eider adults and 5 eggs have reportedly died as an indirect result of research activities since 1993 (due to the numerous amended actions and permits, and because of the variation and inconsistencies in reporting, accomplishing a precise tally of incidental take proved difficult). From 1997 to present, the Service estimates approximately 1 Steller's eiders from the listed Alaska-breeding population has died incidental to research activities (based on a total of 37 Steller's eiders reportedly taken from the non-listed Pacific-wintering population, incidental to research activities, and the estimate that approximately 1% of the Pacific-wintering population are Alaska-breeding Steller's eiders). Since listing, there likely have been no listed Steller's eider adults intentionally taken (from a probabilistic standpoint), though there have been 16 permitted and 16 actual, direct and intentional takings of non-listed Steller's eider adults. Additionally, permits have been issued to salvage and opportunistically collect up to 68 Steller's eider eggs from the Alaska-breeding population for a captive breeding program at the Alaska Sea Life Center (ASLC). To date, 31 eggs have been taken. The eiders taken in these research programs have provided biological information and the eggs have been used to establish a captive breeding population of the species to ultimately improve our understanding of their reproduction in the wild and help future efforts to recover the species.

Climate Change

High latitude regions, such as Alaska's North Slope, are thought to be especially sensitive to the effects of climate change (Quinlan et al. 2005, Schindler and Smol 2006, and Smol et al. 2005). While climate change will likely affect individual organisms and communities, it is difficult to predict with any specificity how these effects will manifest. Biological, climatological, and hydrologic components of the ecosystem are interlinked and operate on multiple spatial, temporal, and organizational scales with feedback between the components (Hinzman et al. 2005).

There are a wide variety of changes occurring in the arctic worldwide, including Alaska's North Slope. Arctic landscapes are dominated by lakes and ponds (Quinlan et al. 2005), such as those used by listed eiders for feeding and brood rearing. In many areas these arctic water bodies are draining and drying out during summer as the underlying permafrost thaws (Smith et al. 2005, Oechel et al. 1995). Further, many are losing water through increased evaporation and evapotranspiration resulting from longer ice-free periods, warmer temperatures, and longer growing seasons (Schindler and Smol 2006, Smol and Douglas 2007). Productivity of lakes and ponds appears to be increasing as a result of nutrient inputs from thawing soil and an increase in degree days (Quinlan et al. 2005, Smol et al. 2005, Hinzman et al. 2005, and Chapin et al. 1995). Changes in water chemistry and temperature are also resulting in changes in the algal and invertebrate communities that form the basis of the food web in these areas (Smol et al. 2005, Quinlan et al. 2005).

With the reduction in summer sea ice, the frequency and magnitude of coastal storm surges has increased. These often result in breaching of lakes and low-lying coastal wetland areas, killing salt-intolerant plants and altering soil and water chemistry, and hence, the fauna and flora of the area (USGS 2006). Historically, sea ice has served to protect shorelines from erosion; however, this protection has decreased as sea ice decreases in extent and duration. Coupled with softer, partially thawed permafrost, the lack of sea ice has significantly increased coastal erosion rates (USGS 2006), potentially reducing available coastal tundra habitat.

Changes in precipitation patterns, air and soil temperature, and water chemistry are also affecting tundra vegetation communities (Hinzman et al. 2005, Prowse et al. 2006, Chapin et al. 1995), and boreal species are expanding their ranges into tundra areas (Callaghan et al. 2004). Changes in the distribution of predators, parasites, and disease- causing agents resulting from climate change may have significant effects on listed species and other arctic fauna and flora. Climate change may also result in mismatched timing of migration and development of food in arctic ponds (Callaghan et al. 2004), and changes in the population cycles of small mammals such as lemmings to which many other species, including nesting Steller's eiders (Quakenbush and Suydam 1999), are linked (Callaghan et al. 2004).

While the impacts of climate change on listed species in the Action Area are unclear, species with small populations are more vulnerable to environmental change (Crick 2004). Some species may increase in abundance or range with climate change, while others will suffer from reduced population size or range. The ultimate effects of climate change which will impact both the terrestrial and marine habitats of listed eiders are undetermined at present. While it is certain that listed eiders will be impacted by the effects of climate change on their terrestrial and marine habitats, it is presently impossible to predict the direction or magnitude of these individual impacts or their combined sum.

Summary of Environmental Baseline
Because this is a state-wide consultation with a very large Action Area (the ACP alone is about the size of Minnesota), the environmental baseline is necessarily also quite large and complex. The listed eiders are migrating to and breeding principally on the Y-K Delta and ACP during the Action, so that will focus the evaluation. As discussed above, because the Service has consulted upon these regulations since their inception in 2003, it now has several years of harvest survey information documentation of the effects of the action on listed species. The Service has also included information in the environmental baseline about the MOU between the subsistence community representatives and the Service describing the collaboration that will occur during the harvest to reduce/eliminate shooting mortality and injury of Steller's eiders. Thus, the environmental baseline, which describes the present human and natural context, provides the starting point for the Service's effects analysis.

4.2 Yellow-billed Loons
In designating the yellow-billed loon as a candidate species, the Service considered the best available data about factors that could affect their populations. Factors that may be affecting yellow-billed loons in the Action Area are thought to include harvest (assessed in this document in the Effects of the Action section), oil and gas development, inadvertent fishing by-catch, climate change, and conservation efforts. These are discussed below.

Oil and Gas Development
Oil and gas development has occurred on the North Slope, primarily on state lands between the Arctic National Wildlife Refuge and NPR-A. Over 90% of yellow-billed loons nesting on the North Slope nest within NPR-A (USFWS 2009d). At this time only seismic and exploratory operations have been conducted in NPR-A; and although more development is likely to occur in the future, the majority of yellow billed loon nesting habitat in NPR-A is not presently affected by development. In addition, disturbance and habitat degradation that may result from oil and gas development in NPR-A would largely be mitigated by BLM's stipulations and required operating procedures (USBLM 2004; USBLM 2008). The remaining North Slope nesting population, particularly concentrations of yellow-billed loons in the Colville River Delta and those in lower concentrations in the Kuparuk and Prudhoe Bay oil fields, may be affected by current oil and gas activities on land managed by the State of Alaska.

The potential negative effects of industrial development in yellow-billed loon nesting areas includes disturbance caused by aircraft, vehicular traffic, heavy-equipment use, maintenance activities, and pedestrian traffic. Disturbance to nesting birds from oil infrastructure has been widely discussed but poorly documented (National Research Council 2003, USBLM 2008). Loons as a genus are susceptible to disturbance, although they sometimes habituate to predictable disturbance (Vogel 1995, Barr 1997, Evers 2004, Earnst 2004, Mills and Andres 2004, North 1994). Human disturbance could cause yellow-billed loons to abandon reproductive efforts or leave eggs or chicks unattended and exposed to predators or bad weather (Earnst 2004).

Both non-nesting and breeding yellow-billed loons on Alaska's North Slope use marine areas of the Beaufort and Chukchi seas to forage. Additionally, in spring yellow-billed loons gather in polynyas, ices leads, and open shorelines near river deltas offshore of breeding areas prior to dispersing to nesting grounds. Thus yellow-billed loons are at risk from spills of crude and refined oils that may result from oil and gas development in the area.

Water withdrawal from freshwater lakes to construct ice roads and pads, or supply exploration camps may adversely affect nesting habitat. However, regulations by the State of Alaska and BLM will likely prevent any significant adverse effects to yellow-billed loons from water withdrawal activities (USFWS 2009d).

As the majority of yellow billed loon breeding areas in western Alaska are managed as wildlife refuges or national parks, they are not subject to the same broad-scale extractive industry or infrastructure as the North Slope. While future development could occur there, oil and gas development is not a threat at present.

Subsistence Fishing By-catch

Across the Alaska breeding range of the yellow-billed loon, rural residents fish using gill nets near villages and fish camps, in marine inlets and lagoons, lakes, and rivers (Craig 1987, Bacon 2008 pers.comm.). During the breeding season, yellow-billed loons often forage for fish in the same areas targeted for fishing (Earnst 2004), which leads to the potential for loons being inadvertently caught in nets. Yellow-billed loons may also be susceptible during spring and fall migrations when foraging in near-shore marine habitats.

While it is illegal to kill yellow-billed loons under the MBTA, fishermen on the North Slope are allowed to possess up to 20 total yellow-billed loons inadvertently caught in nets annually (USFWS 2009a). Little information is available regarding the number of loons caught in subsistence nets for most of the state, with the exception of the North Slope, which is discussed in more detail, below.

The North Slope Borough Department of Wildlife (NSB) has asked fishermen to immediately report inadvertent entanglements of yellow-billed loons and has required such reporting by the end of each season (USFWS 2009a). Participation by fishermen is incomplete, and likely varies annually. NSB reports indicate that two to 14 yellow-billed loons were reported as killed in subsistence nets annually from 2005-2007 in Barrow (Acker and Suydam 2006, Acker and Suydam 2007, Hepa and Bacon 2008, Hepa and Bacon 2010). Small numbers of loons, including yellow-billed loons, were also reported as found alive and released. These numbers are likely a minimum estimate of yellow-billed loon subsistence by-catch in the Barrow area because not all fishermen were contacted (Hepa and Bacon 2008). Additionally, anecdotal evidence suggests that yellow-billed loons killed in fishing nets have been reported as part of the subsistence harvest rather than as inadvertent catch in fishing nets (USFWS 2010b). Due to apparent confusion between hunting and fishing by-catch as sources of yellow-billed loon mortality on the North Slope, both sources are discussed further in the upcoming section reporting harvest survey estimates.

In summary, data is limited on the number of yellow-billed loons taken inadvertently during subsistence fishing in Alaska. We do not have enough information to extrapolate subsistence by-catch accounts to areas lacking data or to evaluate likely population-level affects. While it is possible that take of yellow-billed loons during subsistence fishing, combined with other threats, may impact recovery of the species, conservation recommendations by the Service will strive to improve estimates of this source of mortality.

Climate Change
There are multiple hypothetical mechanisms associated with climate change that could potentially affect loons and their breeding and non-breeding habitats. Currently, however, we lack predictive models on how climate change will affect yellow-billed loon terrestrial, freshwater, and marine habitats, and there is little certainty regarding the timing, magnitude, and net effect of impact. However, despite uncertainty over how climate change will affect yellow-billed loons in the long term, we have no reason to believe that climate change will provide a significant stressor to yellow-billed loon populations within the next year, which is the interval over which the effects of this action are being evaluated.

Conservation Efforts
In 2006, the Service, National Park Service, Alaska Department of Natural Resources, Alaska Department of Fish and Game, Bureau of Land Management, and the North Slope Borough entered into a "Conservation Agreement for the Yellow-billed Loon (*Gavia adamsii)*." The agreement specifies the goal of protecting the yellow-billed loon and its habitat in Alaska and identifies several strategies for achieving this goal. These strategies include: (1) implement specific actions to protect yellow-billed loons and their breeding habitats in Alaska from potential impacts of land uses and management activities, including oil and gas development; (2) inventory and monitor yellow-billed loon breeding populations in Alaska; (3) reduce the impact of subsistence activities (including fishing and hunting) on yellow-billed loons in Alaska; and (4) conduct biological research on yellow-billed loons, including response to management actions.

The Conservation Agreement partners have continued collaborating to collect and refine information about the yellow-billed loon to help guide future management. For example, BLM has proactively worked with loon experts and the Service to identify appropriate protections for the species and its habitat. Those protections were incorporated into their Records of Decision for NPR-A management plans.

Past Service outreach efforts have included staff trips to Gambell and Savoonga on St. Lawrence Island in 2003 and 2009 (Zeller 2003, Ahmasuk 2010) to gain information on loon subsistence harvest. Based on these visits and information from other villages, the Service has developed conservation measures to reduce take of yellow-billed loons and improve harvest surveys, which are included in this document.

4.3 Kittlitz's Murrelet
Kittlitz's murrelets are closely associated with marine tidewater glaciers, and their decline may be related to the retreat of glaciers and decreased foraging habitat. At this time, the ultimate cause for the population decline of Kittlitz's murrelet is unknown, but major threats appear to be habitat-based, caused by one or a combination of mechanisms, including: change to forage fish quality and availability due to rapid atmospheric and/or decadal oceanic climate change, and by contamination of the marine environment. Additive to this underlying stress to the population may be adult mortality from incidental bycatch in commercial fisheries, disturbance by tour

boats, and predation (USFWS 2009c). The primary distribution and breeding range of Kittlitz's murrelets occurs in southeast Alaska.

5. EFFECTS OF THE ACTION ON LISTED SPECIES AND CRITICAL HABITAT

The following section discusses the possible effects of the action on listed and candidate species. This discussion includes, where appropriate, quantitative information from harvest survey reports, and qualitative information from Traditional Ecological Knowledge (TEK), anecdotal observations, results of recent or ongoing research on the species, the Intra-agency Conference for Proposed 2010 Alaska Migratory Bird Spring/Summer Subsistence Hunt (USFWS 2010b), and best professional judgment regarding the species' availability and vulnerability to harvest.

Harvest survey reports used in this evaluation are derived primarily from three sources:

1) Older, "historical" survey from 1965-2006, summarized by Huntington (2009a, 2009b), primarily focusing on the region from the Y-K Delta north to the Beaufort Sea coast, but also including some reports from Bristol Bay (Appendices 1 and 2);
2) Alaska Migratory Bird Co-Management Council Subsistence Harvest Survey. In 2004, a new Alaska-wide subsistence harvest survey, including spring, summer, and fall seasons (and separated into spring/summer and fall/winter intervals), was initiated subsequent to the 2003 implementation of migratory bird subsistence harvest regulations (hereafter referred to as the AMBCC survey; Appendices 3 and 4). These surveys also include, as a separate category, eggs collected from nests. Under the new regulations, areas of Alaska eligible for migratory bird subsistence harvest are divided into regions that are surveyed periodically. (Note: these data were not included in Huntington's (2009a, 2009b) summary in years of overlap); and
3) A draft report summarizing subsistence harvest surveys sponsored by the North Slope Borough for 1994-2003 (Bacon et al. 2009; Appendix 5).

In using harvest survey reports to evaluate harvest, it is important to consider that their reliability is affected by a number of unquantifiable biases. Identified biases include sampling flaws or measurement error such as targeting unrepresentative households or villages, inaccurate recall by survey respondents, reluctance to report illegally-taken species, mischaracterization of fishing by-catch as hunting harvest, lack of detection of unrecovered killed or crippled birds, and errors in data collection (Huntington 2009, Omelak et al. 2009, Naves 2009, USFWS 2010b). Additionally, for rare species, survey coverage may not be adequate to detect harvest since it occurs at low levels, particularly in large villages. Each of these biases has likely affected the accuracy of survey data, but the direction and magnitude of each, and how they cumulatively affect the estimates, remains unknown. Additionally, coverage has varied among years, and methods and sampling designs have evolved over time, compromising comparison among years or over other intervals (Georgette 2009 and Wentworth 2004, as cited in Huntington 2009). Further, the available harvest survey data contain considerable evidence of misidentification among species. Although we find numerous examples where other species appear to have been incorrectly reported as listed or candidate species ("false positives"), it follows that systemic confusion over identification among closely-related or similar species will also have resulted in "false negatives" where listed or candidate species have been incorrectly reported as other species. How these negative and positive biases balance out cannot be determined from the available information. The evidence of biases including misidentification and their possible influence on the reliability of harvest estimates is discussed below, on a species-specific basis.

This Biological Opinion exclusively pertains to the Alaska Migratory Bird Spring/Summer Subsistence Hunt (subsistence hunt). It is important to note that in assessing the effects of the subsistence hunt, we also included the effects of subsistence harvest in the fall season. Waterfowl hunting in Alaska is defined by the Service as two separate hunting periods, governed by different regulations in April – August and in September – February. Several methodological reasons make it difficult to divide the available harvest survey data separately into these two distinct categories. First, survey methods have changed over time; in early surveys, eider harvest was not separated by time period. Second, harvest surveys are generally (but not always) conducted after the end of the fall hunt, when hunters are asked to recall the number of birds shot before August 31, and the number shot afterward. As most hunters probably do not see the August 31 date as particularly noteworthy, and significant time has passed between the early spring hunt and the day the survey takes place, it is reasonable to assume that assigning harvest accurately to two different time periods would be difficult. Additionally, for yellow-billed loons we considered the effects of inadvertent by-catch in subsistence fishing nets.

The fall hunt will be considered in a separate Biological Opinion developed by the Service's Washington Office. However, because of the difficulty with splitting the subsistence harvest data into two different time periods, we will consider the total annual harvest in this effects analysis. This is a more conservative approach that will allow us to ensure we are considering the total effect of the subsistence harvest. Further, we reason that precise allocation of impacts to the correct subsistence-related increment is essential only in the event that our final conclusion were to jeopardize the continued existence of ESA listed and candidate species. If our final conclusion, after summing all identified increments of impact, is non-jeopardy, it follows that each subset of this total i.e., both the spring/summer subsistence and fall hunts is also non-jeopardy.

5.1 Steller's eiders

Vulnerability of Steller's Eiders to Harvest

The vulnerability of Steller's eiders to subsistence harvest varies according to location, year, and time of year. Steller's eiders are thought to migrate northward from the Bering Sea to the North Slope as leads of open water develop in the Bering and Chukchi sea pack ice. North Slope hunters anecdotally report that during migration, Steller's eiders may fly in single or mixed-species flocks, and are difficult to distinguish from other eiders that are legally hunted during this time. The early subsistence harvest (April and May) of migratory birds typically commences from the coast or shorefast ice, and in some cases, in conjunction with the subsistence harvest for whales. Therefore, hunters along the western coast of Alaska may encounter Steller's eiders during spring migration, and they may be harvested during hunting focusing primarily on other species.

Steller's eiders arrive on the North Slope, including Barrow, in early June. A large portion of Alaska-breeding Steller's eiders remain near Barrow, and can be observed from the road system for several weeks in non-breeding years, and several months in breeding years (Figure 5.1). Because ducks and geese are regularly hunted from this road system (USFWS, unpubl. observations), Steller's eiders are at risk from shooting during the breeding season near Barrow.

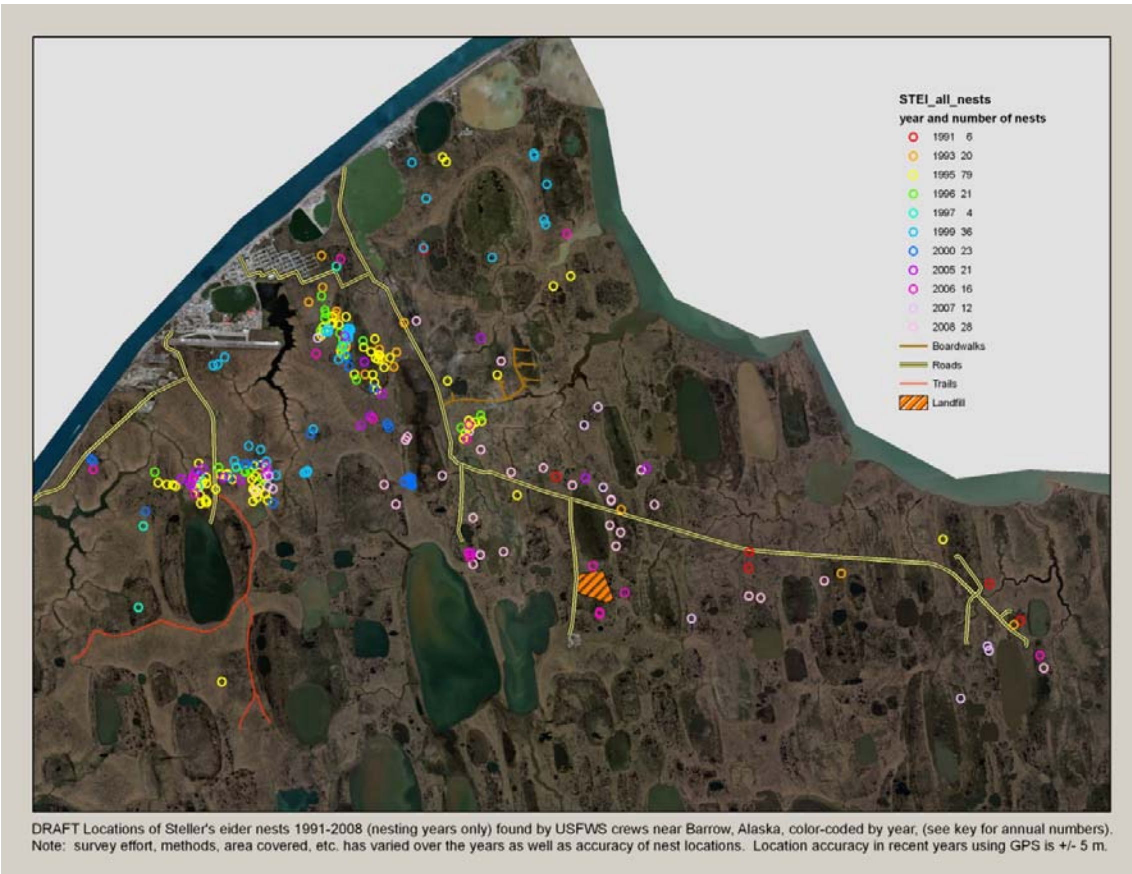


Figure 5.1. Steller's eider nests found during studies near Barrow, 1991-2008 (Quakenbush *et al.* 1998, Rojek 2008).

In non-breeding years both male and female Steller's eiders return to the ocean by mid-summer, where they may be vulnerable to subsistence hunting from boats. In mid-August through September, successfully breeding females and their ducklings are vulnerable as they stage and forage in waterbodies near Barrow Duck Camp before commencing their southward migration (USFWS, unpubl. data).

There is limited information available on the movements of non-breeding and post-breeding Steller's eiders, particularly on the North Slope. However, birds radio-tracked near Barrow moved along the Chukchi Sea coast from Barrow to Pt. Hope, near the Seward Peninsula, and in southern Norton Sound (USFWS, unpubl. data); therefore, it is reasonable to assume that Alaska-breeding Steller's eiders may be vulnerable along the coast where hunting occurs during fall migration.

Because the majority of Steller's eiders are thought to molt and winter in nearshore waters in southwest Alaska, sometimes near known hunting areas, they may be at risk to harvest. However, in southwest Alaska, Alaska-breeding Steller's eiders are mixed with the larger Russia-breeding population which also molts and winters in southwest Alaska, so presumably only a very small proportion of Steller's eiders taken in this region are from the Alaska-breeding population.

Therefore, the Service believes Alaska-breeding Steller's eiders may be shot during the subsistence hunt: 1) during northward, spring migration; 2) while on their breeding grounds on the North Slope, especially near Barrow; 3) during post-breeding movements and migration; and 4) to a much lesser extent, throughout their traditional molting and wintering range. Steller's eiders appear to be at particular risk near Barrow during the spring, summer, and fall because of their concentrated use of the Barrow area, use of habitats near the road system at Barrow, and repeated flights near Barrow Duck Camp.

Harvest survey data
Huntington (2009a) summarized harvest survey data from several sources, but spatial and temporal coverage is incomplete and varies annually. Methods also varied; for example, in some years eiders were not identified to species, but grouped as "eiders." Harvest was reported in some villages in the North Slope, Northwest Arctic, Bering Strait-Norton Sound, Bristol Bay, and Y-K Delta regions. Many villages in most years reported zero take of Steller's eiders. When take was reported, estimates ranged from to 2 to 160 Steller's eiders harvested in each village annually. The most comprehensive survey included five villages on the North Slope in 1992, which estimated Steller's eider harvest of 321 in that year (Fuller and George 1997, and summarized by Huntington 2009a), although the authors suggested that some of these birds were misidentified and may have been king or common eiders. We also question the reliability of this estimate, as harvest of over 300 from a small population would be reflected in a severe decline that would be observable from Service monitoring efforts. Additionally, such a large harvest of a species that occurs in small numbers on the North Slope would be difficult to accomplish. In the Northwest Arctic region, the only indicated listed eider harvest from various years between 1972 and 2007 indicated 115 Steller's eiders shot in the village of Kotzebue in 1997. Other regional annual harvest summarized in Huntington (2009a) ranges from 0 to 60 for Bering Strait – Norton Sound, 0 to 90 for the Y-K Delta, and 4 to 90 in the Bristol Bay region.

Bacon (2009) is another source of harvest information for villages on the North Slope from 1994-2003. Harvest is identified to species level in some years and villages, but grouped as "eider species" and not separated into species in other instances. Of particular note is an estimate of 43 Steller's eiders harvested in Wainwright in 2003 (based on reported harvest of 38 Steller's eiders). Aerial survey data and TEK of village residents indicate that Steller's eiders are very rare near Wainwright during the breeding season. Thus it is reasonable to assume that if Steller's eiders are harvested at Wainwright, they are most likely taken during spring or fall migration, as Steller's eiders migrate along coastlines (and thus past coastal villages) in spring as leads open and in fall *en route* to molting areas. Because this estimate is only from a single year, we do not assume that it is representative of normal or average harvest rates, and it may in fact be either anomalous or erroneous (possibly because of misidentification), but we cannot determine its credibility with the available information.

Harvest of Steller's eiders was reported by AMBCC in four regions: North Slope, Bristol Bay, Y-K Delta, Bering Strait/Norton Sound (Appendices 3 and 4). AMBCC estimates of harvest in the North Slope region, where the Alaska population breeds, range from 0 to 36 birds during the spring/summer subsistence hunt. The North Slope was not sampled during the fall hunt period of 2004-2008, although Steller's and spectacled eiders are still available for harvest on the North Slope during this time, as breeding females and fledged young depart the breeding grounds in mid-August to mid-September (USFWS, unpubl. data and observations). Therefore, these AMBCC estimates of 0 to 36 do not include potential fall harvest and thus are biased low.

AMBCC reports annual harvest estimates of Steller's eiders ranging from 0 to 78 in Bristol Bay, 0 to 76 in the Y-K Delta, and 30 to 121 in the Bering Strait/Norton Sound region. We believe that listed, Alaska-breeding Steller's eiders comprise a very small proportion of those Steller's eiders occurring in the Bristol Bay and the Y-K Delta regions, so risk to the listed population of harvest in these regions is proportionately very low. (The proportion of listed Steller's eiders within the total Steller's eider population in these regions likely roughly approximates the proportion in southwest Alaska wintering areas, which is generally thought to be < 1%; see *Status of the Species* above). In contrast, harvest of Steller's eiders in the Bering Strait/Norton Sound region may include a larger proportion of Alaska-breeding Steller's eiders, depending on where within this region the harvest actually takes place. Available satellite telemetry data provide no evidence that Russia-breeding Steller's eiders regularly move along the Seward Peninsula or through Norton Sound *en route* to or from Russia. Thus, harvest along the Seward Peninsula or in Norton Sound may include members of the listed population, possibly even a high proportion, depending on the frequency at which Russia-breeding individuals do actually pass through these sub-regions. We do not currently have Bering Strait harvest data at the sub-regional scale for all years, but at least 121 of the 199 (61%) of three-year total estimated Steller's eider harvest came from the Nome sub-region, and therefore from the Seward Peninsula.

From all sources, Steller's eider harvest survey data exhibit high inter-annual variation, which could reflect high sampling error or actual high inter-annual variation in harvest rates The fact that Steller's eiders only breed intermittently, and have decidedly different patterns of occurrence on the North Slope in breeding and non-breeding years, provides a biological basis for inter-annual variation, but it is unknown how much this contributes to variation in harvest estimates. Regardless, high inter-annual variation in harvest estimates makes it difficult to reliably estimate average annual harvest rates or predict harvest in advance for a specific year.

Reported Steller's eider harvest estimates also indicate chronic and numerically significant misidentification error which undermines the credibility of the harvest estimates. Older harvest surveys summarized by Huntington (2009a) include an estimate of Steller's eider harvest for the North Slope of 321, which are likely incredible for the reasons stated above. More recent and locally-designed estimates by the North Slope Borough (Bacon, 2009) include an estimate of 43 Steller's eiders for Wainwright in a single year, which although possible, is probably not representative of average harvest levels from this village. Finally, the AMBCC reports estimate Steller's eider egg harvest of 40 to 120 eggs in three years in the Bering Straits/Norton Sound region (egg harvest is discussed further in *Loss of Eggs/Chicks*), although it is unlikely that Steller's eiders nest in this region, and highly unlikely that they nest there in numbers required to support this level of egg harvest. The last recorded nest in the region was on St. Lawrence Island over 50 years ago (Fay and Cade 1959), and the last recorded nest from the Seward Peninsula was in the 19th century (Portenko 1989). Because confusion among eider species apparently accounts for many reports of Steller's eider harvest, it must also be assumed that some harvested Steller's eiders may be misidentified and reported as other species.

It appears that Steller's eider harvest estimates are plagued by significant unquantifiable biases, and none of the three general sources of information appear to be immune or provide a means of estimating harvest that is decidedly more reliable. Even though the harvest survey data have many notable shortcomings, it is the best information available, and it did influence our analysis when estimating the amount of harvest. To imply an appropriate level of confidence in the data, we considered the range of values given from harvest surveys in a general sense by considering the estimates as orders of magnitude instead of precise numbers (for example, "tens" rather than "23"). We conclude that while these data do not allow for a precise estimate of harvest with a reasonable degree of reliability, it is probably reasonable to assume, based on the range of estimates reported in areas where Alaska-breeding Steller's eiders are vulnerable to harvest, that roughly tens of Alaska-breeding Steller's eiders may be harvested during subsistence hunting in spring, summer, and fall in many years, with actual harvest rates in individual years likely varying with breeding conditions on the North Slope.

Other Available Information Regarding Harvest

Discussion with hunters on the North Slope and direct observations confirm that some Steller's eiders are taken during the subsistence hunt. North Slope hunters indicate that Steller's eiders often fly in mixed flocks with king and common eiders, are hard to identify, and on occasion, are inadvertently shot. Specifically, hunters report that Steller's eiders staging in waterbodies near Duck Camp may join migrating king and common eider flocks and are subject to shooting. Direct observations by the Service's law enforcement officers and biologists in Barrow have documented shot Steller's eiders along the roads and in hunters' possession. Between 1993 and 2010, 29 shot Steller's eiders were detected at Barrow; 21 of these were shot in 2008 (16 at Duck Camp, 5 along roadsides). The year 2008 was considered a highly successful breeding year for Steller's eiders (USFWS, unpubl. data). These observations suggest that Steller's eiders are highly vulnerable to shooting mortality in breeding years, and during these years, subsistence harvest may result in roughly tens of Steller's eiders shot in the Barrow area alone, which is consistent with our conjecture based on harvest survey data.

In summary, our ability to enumerate Steller's eider harvest from harvest survey reports is limited by the unquantifiable bias associated with the harvest estimates. However, these data, coupled with information on Steller's eider availability, direct observations, and TEK from local residents, suggest that roughly tens of Steller's eiders may have been harvested annually during subsistence hunting, but the harvest rate likely varied annually with the breeding status of Steller's eiders on the North Slope. Although we cannot quantify harvest, we are certain that Steller's eider mortality has occurred in past years, and we cannot precisely predict future mortality risk; therefore, a conservation program to eliminate or reduce the risk of mortality began in 2009 and will be implemented in 2011, as described below.

Conservation Measures to Reduce Risk of Harvest
In response to indications that Steller's eiders have been shot in recent years, particularly 2008, the Service has developed and implemented a species-specific conservation program intended to reduce the risk. This program currently focuses on the North Slope, especially Barrow, where the species' propensity to nest, combined with observations described in *Other Available Information Regarding Harvest*, indicate risk is likely the greatest. This program consists of 3 major components:

1) Regulations for the subsistence hunt which include the expressed intent to check hunters to verify compliance with prohibitions against closed species (which include spectacled and Steller's eiders) and the expressed capability for the Service's Alaska Regional Director to prescribe emergency regulations necessary in the event that substantial harvest of Steller's eiders is indicated, ranging from temporary closure of duck hunting in a small geographic area to large-scale regional or State-wide long-term closures of all subsistence migratory bird hunting;

2) The presence of Service law enforcement agents during the subsistence harvest on the North Slope, commensurate with the need, aimed at: a) enforcing regulations; b) engaging in outreach and education efforts with hunters; and c) verifying compliance with prohibitions against taking Steller's eiders, to ensure a timely and appropriate response in the event that mortality of Steller's eiders takes place; and

3) A long-term outreach and education effort developed and implemented collaboratively with hunters and residents of the North Slope, to seek support for Steller's eider conservation efforts.

The regulations, implemented in accordance with the Conservation Measures, are considered the principal way in which threatened eider shooting mortality will be substantially reduced or eliminated. The authority to prescribe emergency regulations provides an additional level of assurance that, if an unexpected amount of Steller's eider shooting mortality occurs, it will be curtailed to avoid approaching jeopardy to the existence of the species.

Summary
In summary, we conclude that we cannot reliably characterize previous Steller's eider harvest levels in Alaska. Our ability to assess impacts is further compromised by difficulty in appropriately allocating harvest in some portions of Alaska to listed and unlisted populations. It is possible that no Steller's eiders are harvested in non-breeding years because of their short tenure in breeding areas and resulting lack of availability to hunters. However, we expect that in a breeding year, some Steller's eiders could be taken (possibly in the order of tens), particularly on the North Slope where the majority of the listed taxon breeds, but the conservation measures above reduce eliminate that risk.

Additionally, the Service in collaboration with North Slope partners, will routinely monitor and verify that listed eiders are not being shot and will evaluate the effectiveness of our education, communication, and outreach efforts. If mortality is detected, the Service will reassess current outreach and education strategies, determine where changes are needed, and heighten targeted outreach and targeted law enforcement efforts commensurate with the risk. If it cannot be reasonably assumed that the factors leading to shooting of Steller's eiders have been identified and adequately ameliorated, the Service Regional Director may institute emergency regulations in consultation with AMBCC until impacts can be revaluated and minimized.

5.2 Spectacled Eiders

Vulnerability of Spectacled Eiders to Harvest

Similar to Steller's eiders, spectacled eiders are at risk to shooting during the subsistence harvest during their spring and fall migrations along the western coast and North Slope of Alaska. Because they often fly in mixed-species flocks, and are similar size to common and king eiders, spectacled eiders can be difficult to distinguish from other eiders that can be legally hunted; thus they are subject to misidentification and inadvertent harvest during migration. They may also be taken by hunters that are unaware of that fact that spectacled eiders cannot be legally hunted, and by hunters not inclined to comply with species-specific closures.

Spectacled eiders breed on the Y-K Delta and the North Slope of Alaska, where nests are broadly dispersed (Figs. 3.6 and 3.7). Breeding spectacled eiders are not found in unusually large concentrations near villages or areas of high human activity, and their dispersed nesting distribution probably prevents a large proportion of the nesting population from being subject to possible harvest.

Although data are lacking, molting spectacled eiders may be at risk from shooting. Spectacled eiders molting in Ledyard Bay and Norton Sound may be shot during the course of other legal subsistence activities (e.g., marine mammal hunting by boat) in July and August. However, during winter, most spectacled eiders occur in ice leads and polynyas south of St. Lawrence Island, where they are likely inaccessible to subsistence hunters.

Based on limited information, we expect that spectacled eiders are at greatest risk from shooting during the subsistence harvest on their spring and fall migrations, and to a lesser degree on their breeding and molting areas.

Harvest Survey Data

Huntington (2009a) summarizes harvest survey data from several sources from various years between 1972 and 2007, but spatial coverage is incomplete and varies annually. The only year that has significant survey coverage on the North Slope (five villages) is 1992, with reported harvest of 995 spectacled eiders. Fuller and George (1997) suggested that some of these birds were misidentified and may have been king or common eiders. In the Northwest Arctic region spectacled eider harvest was not identified specifically in the data; however, total reported eider harvest in this region ranged from 0 to 196 annually, and may have included common, king, spectacled and/or Steller's eiders. In the Bering Strait – Norton Sound region, annual reported harvest ranged from 0 – 517 spectacled eiders. The Y-K Delta region has the most complete historical data set of harvest, since Alaska Department of Fish and Game conducted annual subsistence surveys in the region from 1985 to 2005 (except 1988 and 2003), with reported annual harvest of spectacled eiders ranging from 20 (2005) to 305 (1986). Reported annual harvest of spectacled eiders in the Bristol Bay region ranges from 0 to 156. Not all regions and sub-regions, or all years, are represented in this data; in addition, methodology varied. Therefore, it is impossible to predict precise 2011 harvest levels from these data.

Bacon et al. (2006) is another source of harvest data for villages on the North Slope from 1994-2003. Of particular interest are the harvest estimates of 253 spectacled eiders from Wainwright in May and June, 2003. As with Steller's eiders, these data support the supposition that spectacled eiders are susceptible to harvest on migration, but this single report cannot be assumed to be representative of normal harvest levels.

Harvest of spectacled eiders was reported by AMBCC in four regions: North Slope, Bristol Bay, Y-K Delta, and Bering Strait – Norton Sound. Estimates of annual harvest in the North Slope and Y-K Delta regions, where spectacled eiders nest, range from 9 to 99 and 13 to 55, respectively. Harvest estimates ranged from 11 to 231 in the Bristol Bay region and 6 to 863 in the Bering Strait – Norton Sound region.

As with Steller's eiders, spectacled eider harvest data may be plagued by misidentification among eider species. If Steller's eiders, which are significantly smaller in size and have behaviors that distinguish them from other species, are misidentified as other eiders, it follows that spectacled eiders would be even more likely to be misidentified, because they are closer in size to common and king eiders and also fly in mixed flocks.

While the variability and accuracy of harvest estimates may be affected by misidentification, reports of spectacled eider harvest in the four regions are consistent with spectacled eider distribution and thus do not indicate any misidentification bias based on likelihood of occurrence in a particular area. It is plausible that spectacled eiders are harvested in their two primary nesting areas in Alaska, the North Slope and Y-K Delta. As they winter and migrate through the Bering Strait – Norton Sound region, it is also reasonable to assume that spectacled eiders may be harvested there. Little is known about the presence of spectacled eiders in the Bristol Bay region; in fact, this area is not within the documented range of the species in published reports (Peterson et al., 2000). However, due to Bristol Bay's proximity to the Y-K Delta breeding grounds, it is possible that non-breeding, failed-breeding, or post-breeding individuals may temporarily occupy Bristol Bay, providing possible legitimacy to these reports of harvested birds (B. McCaffery, pers. comm.).

Other Available Information Regarding Harvest

Discussion with North Slope hunters and observations of Service employees confirm that some spectacled eiders are taken during the subsistence hunt. North Slope hunters report that spectacled eiders often fly in mixed flocks with king and common eiders and are inadvertently shot on occasion. Service biologists and enforcement agents in Barrow have documented shot spectacled eiders along the roads, in hunters' possession, and hanging from racks.

Summary

While the accuracy of harvest estimates may be affected by misidentification, reports of spectacled eider harvest in the four regions are generally consistent with known or feasible spectacled eider distribution and thus do not indicate obvious errors based on likelihood of occurrence. Several factors could bias estimates high, but it is possible that some also bias estimates low. As identified above with Steller's eiders, these biases cannot be quantified or cumulatively assessed, which seriously constrains the precision with which we can estimate harvest; however, these data, combined with information on spectacled eider availability, direct observations, and TEK from local residents, suggest that roughly tens to hundreds of spectacled eiders are likely harvested each year, but more precise estimates are not possible with the available information.

Loss of Eggs/Chicks –Steller's and Spectacled Eiders
Proposed subsistence harvest subsistence seasons coincide with sensitive periods such as egg laying, incubation, and brood rearing, for both listed eider species.

Egg harvesters target goose nests, and especially those of colonially nesting species of geese. While it is true that eiders sometimes nest near and among colonially nesting geese, we do not believe the nests of tundra-nesting eiders, such as Steller's and spectacled eiders, are typically targeted by egg collectors because they tend to nest at lower density and their nests are very cryptic. Yet, listed eiders and their nest contents could be collected or disturbed by serendipitous discovery.

Egg collection is probably reduced to some extent by subsistence harvest closures designed to protect nest and broods during the middle of the nesting season. On the North Slope, the proposed regulations include a 30-day closure June 15 – July 15; on the YKD, the dates of the 30-day closure vary annually with current year nesting phenology and are not yet established for 2011 (AMBCC 2010b). The closure is likely most effective near Barrow, where increased outreach and LE efforts have been successful at announcing and enforcing the closure, particularly since 2008. The closure does not encompass the entirety of the listed eider nesting season, and it is possible that some illegal egg collection of other species occurs during the closure, so some harvest of listed eider eggs may occur.

Limited egg-gathering data presented by Trost and Drut (2001 and 2002) suggest that collection of Steller's or spectacled eider eggs is low, with an average of seven spectacled eider eggs and one Steller's eider egg taken annually between 1992 and 2001. The 2001 Pacific Flyway Data Book (Trost and Drut 2001) reported annual average egg harvest for the years 1995, 1997 and 1999 ranges between 4 and 84 for spectacled eiders and up to 1 for Steller's eiders in the Bristol Bay region. Because the Bristol Bay region is well outside the breeding range of Steller's and spectacled eiders, the reported harvest from that region calls the reliability of these data into question.

More recently, AMBCC subsistence harvest surveys have reported take of Steller's eider eggs in two regions during 2004-2008 (Naves 2009a). One sub-region (the lower Kuskokwim) reported harvest of 12 Steller's eider eggs in 2007, with no other egg harvest reports in the Y-K Delta region. Steller's eider egg harvest was reported in the Bering Strait-Norton Sound region in the three years it was surveyed by AMBCC, with harvest estimates ranging from 40 to 120 annually. The same two regions reported take of spectacled eider eggs: the only report of spectacled eider egg harvest on the Y-K Delta was from the mid coast sub-region in 2008, with an estimate of 109 eggs harvested; and the Bering Strait/Norton Sound region reported spectacled eider egg harvest in 2 of 3 years surveyed, with estimates of 23 in 2004 and 48 in 2005. No listed eider eggs were reported taken in the North Slope region.

Similar to the harvest survey data, egg collection data reported in harvest surveys are subject to potential bias, and several examples of misidentification are apparent based on species distribution information, so caution must be used in interpreting results. For example, Fay and Cade (1959) reported nesting Steller's eiders on St. Lawrence Island as recently as the 1950s, but no data currently suggests that a breeding population of Steller's eiders or spectacled eiders in the Bering Strait/Norton Sound region exists. Likewise, the number of Steller's eiders nesting on the Y-K Delta is extremely small and probably non-existent in some years (Flint, P.L. and M.P. Herzog. 1999.). Therefore data suggesting Steller's and spectacled eider egg collection in the Bering Strait/ Norton Sound region are probably erroneous, and Steller's eider egg collection reports from the Y-K Delta are either anomalous or erroneous.

Spectacled eiders nest in significant numbers on the Y-K Delta (see *Status of the Species*), therefore take of eggs in this region is possible. However, numbers are probably small because spectacled eider nests are normally sparsely distributed as compared to targeted species such as geese, and the closure of harvest during the middle of the nesting period probably discourages egg collection.

Therefore, given that: 1) subsistence hunting and egg collection are closed during the egg-laying and incubation stages of Steller's and spectacled eiders on their primary nesting areas of the North Slope and YKD; 2) egg collectors tend to target other species; and, 3) although biased by some unknown amount, harvest surveys suggest that low numbers of listed eider eggs are collected; we estimate that the proposed subsistence regulations will result in low tens of spectacled eider eggs, and no Steller's eider eggs, collected annually throughout Alaska.

Lead Contamination- Steller's and spectacled eiders

Spring subsistence hunting may result in the deposition of lead shot into freshwater environments, especially near villages on the Y-K Delta and the North Slope. Ingestion of lead shot by listed eiders could occur during the breeding season, particularly for breeding hens and young birds that forage in shallow tundra ponds. Steller's eiders may be more vulnerable to lead poisoning during egg laying and incubation as they continue to forage throughout nesting, whereas spectacled eider females largely fast during incubation. Ducklings could be exposed to lead pellets in ponds after they hatch and begin foraging in tundra ponds.

The toxic effect of lead poisoning varies among individuals, but includes lethal and sublethal effects (Hoffman 1990). Ingestion of spent lead shot reduced annual survival of spectacled eiders on the Y-K Delta in Alaska (Franson et al. 1995, Flint et al. 1997, Flint and Grand 1997, Grand et al. 1998, Flint and Herzog 1999). Similar rates of exposure have been found in long-tailed ducks (*Clangula hyemalis*). Steller's eiders breeding near Barrow on the North Slope showed high levels and rates of exposure (Trust et al. 1997, A. Matz, unpubl. data), and 11 percent of long-tailed ducks captured northeast of Teshukpuk Lake on the North Slope in 1980 had lead shot in their gizzards (Taylor 1986). Lead shot was identified as the source of high and harmful lead levels through blood samples, radiographs, necropsy, and lead isotope analysis (Matz et al., in prep.).

The use of lead shot for hunting waterfowl has been illegal since 1991 in Alaska, and the Service intensified efforts in 1998 to enforce prohibitions against the possession and use of lead shot for migratory bird hunting. Later, the State of Alaska, at the request of regional advisory boards, passed more restrictive regulations that prohibit the use of lead shot for upland game bird hunting on the North Slope and all bird and small game hunting on the Y-K Delta.

There are indications that compliance with these regulations is improving as a result of outreach, education, and enforcement. In recent years, indices of lead shot use such as examination of spent shell casings, checking for illegal shot in stores, and checks of hunters have shown improvement. However, this has varied regionally; compliance was considered "excellent" in portions of the Y-K Delta (G. Peltola, pers. comm.) in 2009 although lead shot was still available in stores and hunters were found in possession of lead shot on the North Slope (USFWS, unpubl. observations). Further, permafrost under shallow water bodies contributes to the persistence and availability of lead pellets years after their deposition (Flint and Schamber 2010).

The rate of deposition of lead shot in eider breeding habitat is expected to remain constant under the time frame of the proposed action, which is the 2011 spring waterfowl hunt, but take is difficult to quantify. While outreach and LE efforts may have reduced the use of lead shot over time, any spent lead shot in breeding wetlands will remain available to Steller's and spectacled eiders for years. However, we believe that the contribution caused only by the 2011 hunt to this long-term problem will be minimal.

Additionally, to better address the long-term lead problem and assess compliance with the regulation, the Service plans to develop a study to systematically collect empirical data on the use and availability of lead shot. We believe these data will serve to quantify ongoing use of toxic lead shot and better inform associated management decisions in the upcoming years.

Increased human disturbance

The activities associated with the spring hunt will likely result in an increase of hunter presence in areas used by Steller's and spectacled eiders for breeding, feeding, and roosting on the North Slope and the Y-K Delta. Hunters shooting waterfowl and/or collecting eggs may incidentally disturb listed eiders during egg laying, incubation, and brood rearing. The amount of increased disturbance will be dependent on hunter density, accessibility of nesting areas, and factors that influence the level of subsistence hunting required for rural Alaskans to meet their nutritional needs.

While little quantitative data is available on the effects of disturbance to nesting eiders, it is possible that disturbance of sufficient frequency and severity could result in decreased nest or brood survival. If females are regularly flushed from their nests during incubation, successful hatching may be precluded. After hatching, if brood rearing is frequently interrupted by human disturbance, fitness of the chicks may decrease and their vulnerability to predation may increase. However, the magnitude of disturbance necessary to affect nesting behaviors to an extent that declines in recruitment are observable is unknown.

Steller's eiders are particularly at risk to disturbance based on their proclivity to nesting near the road system outside of the largest population center on the North Slope. However, as explained in *Lead contamination – Steller's and spectacled eiders*, mid-season closures are included in the subsistence harvest regulations to minimize effects to nesting birds. Some hunters may illegally hunt during the closure; however, beginning in 2009 significant outreach and enforcement were successful at announcing the closure period and discouraging hunting during the closure near Barrow.

Nesting spectacled eiders are distributed across the North Slope as well as the Y-K Delta. As spectacled eider nests are sparsely distributed across both nesting areas, it is unlikely that disturbance from hunters affects a large proportion of nesting spectacled eiders.

Given: 1) the uncertainty in how disturbance affects recruitment; 2) the mid-season closure and the indication of success of outreach and enforcement in encouraging compliance in Barrow, where the highest densities of Steller's eiders nest; and 3) the sparse distribution of spectacled eider nests across both breeding areas, we expect that the adverse effects to Steller's and spectacled eiders from disturbance as a result of the Action is possible but will likely be minimal.

Listed Eider Critical Habitat
Steller's eider critical habitat includes breeding areas on the Y-K Delta, molting and staging area in the Kuskokwim Shoals, and molting areas on the Alaska Peninsula. Critical habitat for molting spectacled eiders was designated in Norton Sound and Ledyard Bay molting areas, nesting areas on the Y-K Delta, and the wintering area southwest of St. Lawrence Island. Lead shot deposition during subsistence hunting may affect the conservation value of these critical habitat units, particularly on the Y-K Delta breeding area where more hunting probably occurs than in other units. As stated above in *Lead Contamination,* the rate of lead deposition is difficult to quantify, and any spent lead shot in breeding wetlands will remain available to Steller's and spectacled eiders for years. However, we believe that the contribution caused only by the 2011 hunt to this long-term problem will be minimal, and therefore the Action is unlikely to adversely modify critical habitat for listed eiders.

5.3 Yellow-billed Loon

The action may affect yellow-billed loons through hunting mortality, egg collection, lead contamination, and/or disturbance. Effects are described below.

Harvest Surveys
Huntington (2009b) summarized available historical harvest data from 1965-2006 (Appendix 2). These surveys documented harvest of yellow-billed loons in the Bering Strait, Norton Sound, Y-K Delta, and Bristol Bay regions. In 19 years with information from more than one region included, reported harvest ranged from tens to hundreds annually (14-650), with significant numbers reported in most years from the Y-K Delta, where 4 to370 were reported annually. Of those reported from the Y-K Delta, ~ 45% were from communities along the coast, where yellow-billed loons might be available for harvest during spring and/or fall migration, and ~55% were from inland communities where yellow-billed loons are extremely rare and therefore are unlikely or unlikely to be harvested (B. McCaffery, pers. comm.). High numbers were also

reported in some years from the Bering Strait/Norton Sound region (range 25-322) and Bristol Bay (range 5-269). In 19 years with reports from multiple regions included, totals were <100 in 8 years, 100-200 in 5 years, and >200 in 5 years, but it is important to keep in mind that coverage was highly variable among years Huntington (2009). These data reported by Huntington (2009) cannot be allocated to separate increments for the subsistence and fall hunts.

More recent AMBCC surveys (Appendices 3 and 4) show yellow-billed loons and/or their eggs reported to be harvested in the Bering Strait/Norton Sound, Bristol Bay, North Slope, and Y-K Delta regions in 2004-2008 (Naves 2009). Across five years with harvest reports, point estimates for average annual egg harvest ranged from 0 to 60, with 92 (82%) of the reported total from the Y-K Delta region, where the species is not thought to nest, and 20 (18%) from the Bering Strait/Norton Sound region, where the species does nest. Harvest for 2004–2008 was reported from 4 regions (with variable coverage among years); a total of 1663 yellow-billed loons (average 333/year) were estimated to be taken, with slightly less than half (780; 47%) during the subsistence hunt and slightly more than half (883; 53%) during the fall hunt (Naves 2009). Of the 185 estimated from the North Slope in 2007-2008, 32% were reported as drowned in fishing nets, although subsistence experts from the region suggest that all or nearly all of these likely represent fishing by-catch rather than hunting, and therefore would not be considered an effect of the action under consultation (USFWS 2010b). Few (<5/year on average) were reported from the Y-K Delta (Naves 2009) in contrast to earlier survey reports summarized by Huntington (2009b). By far the greatest reported harvest was from Bering Strait sub-region, where annual harvest estimates ranged from 44 to 1077 in 3 years with estimates (Naves 2009). Concurrent with high estimated yellow-billed loon harvest from the Bering Strait sub-region (which consists of 2 villages on St. Lawrence Island and 1 village on Little Diomede Island) were high common loon harvest estimates, which ranged from 404 to 2,514, and comprised the majority (60%) of estimated loon harvest from these years. Common loons are considered rare near St. Lawrence Island (Lehman 2009), suggesting significant misidentification error in the loon harvest survey reports from this sub-region.

Estimates for harvest for the North Slope (Bacon et al., 2009) for the years 1994-2003 provide little indication of harvest of yellow-billed loons from most communities in most years, although reports from Barrow in 2 years resulted in village-wide estimates of 12 and 18. It is unclear if these reports more likely reflect fishing by-catch rather than birds hunted, but recent indications from AMBCC harvest data indicate this possibility (USFWS 2010b).

There are two indications that these harvest estimates are highly biased. The first, and most important, is indication of significant misidentification error. In historical surveys, a significant number of yellow-billed loons (> 100 per year) were reported from the Y-K Delta (Huntington 2009), including over half from inland areas where the species is rare and harvest is therefore unlikely (B McCaffery, pers. comm.). From more contemporary surveys, 82% of the estimated egg harvest comes from the Y-K Delta (Naves 2009), where the species is not known to nest. The greatest estimates of yellow-billed loon harvest in AMBCC surveys come from the Bering Strait sub-region, where incredible numbers of common loons are also reported to be harvested. In this sub-region, over half the reported loon harvest has consisted of common loons (Naves 2009), despite the fact that the species is considered rare there (Fay and Cade 1959, Kessel 1989, Lehman 2005, Lehman 2009). This suggests confusion in identification among hunters reporting loon harvest for this sub-region. With all regions, years, and surveys considered, the majority of reported take of yellow-billed loons can be considered to be highly suspect. However, because confusion among loon species apparently accounts for many reports of yellow-billed loon harvest, it must also be assumed that some yellow-billed loons are incorrectly identified and reported as other species. This pertains to, but is not limited to, the reports of common loon harvest in the Bering Strait. It is unknown how these possible forms of positive and negative bias balance out in a net effect on harvest estimates.

A second indication of substantial bias within harvest estimates is the high degree of inter-annual variation. From the various sources mentioned above, regional estimates among years varied from 4 to 370 (Y-K Delta; 19 years; Huntington 2009), 5 to269 (Bristol Bay; 7 years; Huntington 2009), and 44 to1,077 (Bering Strait; 3 years; Naves 2009), with egg harvest varying from 0 to60 (5 years; Naves 2009). In a study investigating yellow-billed loon migration routes, Joel Schmutz (pers. comm.) observed that some yellow-billed loons fitted with transmitters in 2002, 2003, and 2007 on Alaskan breeding grounds moved to marine waters near St. Lawrence Island before migrating south, but others, including all eight birds fitted with transmitters in 2008, moved from Alaskan breeding grounds to Kolyuchin Bay on the north side of the Chukotka Peninsula, and crossed overland to the southwest over the peninsula and into Anadyr Bay, thereby avoiding the St. Lawrence Island area. Thus, migratory behavior may vary from year to year based on some unknown environmental factor, and loon harvest could vary with changes in the number of loons moving past hunting areas in different years. However, small sample size may limit inference from these studies, and it seems unlikely that differences in migratory behavior can alone account for the reported differences in harvest levels, and therefore at least some of the high inter-annual variation could reflect measurement error in reported harvest.

Considering these indications of substantial error within harvest estimates, we conclude that it is impossible to balance these positive and negative biases against each other in a quantifiable manner to adjust estimates, and therefore these data do not allow for an estimate of harvest with reasonable reliability and precision.

Other Available Information Regarding Harvest

There are several other sources of information that can help assess risk of yellow-billed loons from subsistence harvest. Yellow-billed loons are present in areas where subsistence hunting of birds and egg gathering take place in Alaska, with those individuals that breed in Alaska available for possible harvest during the breeding season from late May – late August, and many or all of the yellow-billed loons that nest in Alaska, Canada and Russia are potentially subject to harvest while migrating through the Chukchi and Bering seas during spring and fall migration (J.Schmutz, USGS, unpubl. data). Some hunters from St. Lawrence Island confirm that they target loons for harvest (USFWS 2010b), and hunters from Savoonga and Gambell report that yellow-billed loons congregate near St. Lawrence Island in late September and early October, when they gorge and fatten on abundant small fish, which makes them approachable from boats and desirable as a subsistence food (K. Kingeekuk, B. Boolowon, pers. comm.). Thus, yellow-billed loons are available for harvest, and hunters state that some are intentionally taken.

Traditional Ecological Knowledge and anecdotal information provides support for the belief that yellow-billed loons are not an important subsistence resource, and therefore harvest estimates described above may, at least in some cases, be biased high. Discussions with hunters from St. Lawrence Island indicate that most hunters do not target loons in spring or summer (Ahmasuk 2009, Zeller 2010), which would serve to limit the number taken. At Gambell, one of two villages on St. Lawrence Island, only a small proportion of the hunters (10 % of households) reportedly hunt loons in fall, and those that do may harvest “only a few” yellow-billed loons (Ahmasuk 2009). Although yellow-billed loons are considered an “uncommon to fairly common migrant” at Gambell (Lehman 2009), and may aggregate along western and southern shores of the island (Ahmasuk 2009), radio-telemetry data of 13 yellow-billed loons that passed by St. Lawrence Island showed that most remained well offshore (only 49, or 19%, of 254 radio-relocations were within 10 km of shore) (J. Schmutz ,USGS, unpubl. data). This indicates that hunters may have to range far from their villages, and far from shore, to have access to significant numbers of yellow-billed loons. Also, a limited sample of subsistence-harvested loons on St. Lawrence Island in 2006 (31) and 2009 (1) examined by biologists contained only 2 (6%) yellow-billed loons (USFWS 2010b), although contemporary harvest survey reports are comprised of 23% yellow-billed loons (Naves 2009). (Unfortunately, harvest survey data from the island are not available for 2006 to allow direct comparison.) Finally, observations of loons migrating past Gambell in late August to early October made by highly-skilled birders indicate that passage rates of Pacific loons exceed those of yellow-billed loons, roughly by a factor of 3 or 4 to 1, during the interval in which hunters report targeting loons for harvest (Lehman 2009). If hunters target birds in proportion to their abundance, and both species are equally vulnerable to being taken, harvest survey data should reflect this ratio in a relative sense. Depending on how those individuals incorrectly identified as common loons are allocated among loon species that actually do occur there, AMBCC harvest reports (Naves 2009) may be out of line with these expected ratios. While these observations do not provide a basis for quantitative estimation of harvest, cumulatively they suggest that recent harvest estimates (Naves 2009) are likely biased high.

In summary, harvest survey reports and available TEK and anecdotal observations indicate that yellow-billed loons are available for subsistence harvest during the breeding season as well as spring and fall migration, and some are certainly taken. Methods to quantify harvest are subject to a number of unquantifiable biases, and harvest estimates show evidence of systemic misidentification among loon species, which compromises the veracity of all loon harvest reports, including both positive and negative reports. Additionally, there is high inter-annual variation that likely is at least in part symptomatic of high measurement error. Several factors likely bias estimates high, but it is possible that some also bias estimates low. These cannot be quantified or cumulatively assessed, which seriously constrains precise estimation of future harvest. All things considered, we conclude that tens to hundreds of yellow-billed loons are likely taken each year in Alaska, but that more precise estimates are impossible with the available information.

The majority of whatever harvest does occur likely consists of migrants, as little credible evidence exists for subsistence hunting during summer in areas where the species nests. The available information suggests that most or possibly all of the reported yellow-billed loon harvest from the North Slope may result from inadvertent drowning in fishing nets rather than hunting. Similarly, the majority of reported egg harvest likely results from misidentification. Absent any historical or contemporary indication that YBLO eggs are important subsistence resources, we believe it is reasonable to conclude that at most low tens, and most likely less than ten, YLBO eggs are harvested each year in Alaska.

Lead Contamination
Based on currently available information, lead exposure on the breeding grounds does not appear to be a problem for yellow-billed loons, at least in NPR-A. Twelve of 13 blood samples collected in 2007 in NPR-A from incubating adult yellow-billed loons had lead levels below the detection limit of 0.05 ppm wet weight (ww); the 13th had 0.115 ppm ww, which is still well below the threshold for background exposure (which is 0.2 ppm ww) (Pain 1996). Based on this information, we conclude that lead shot deposition associated with the Action will affect at most a limited number of yellow-billed loons.

Disturbance
Subsistence hunting is expected to lead to some unknown amount of hunter presence in the three yellow-billed loon nesting areas in Alaska, which could result in disturbance to individual yellow-billed loons and their eggs or young.

Loons as a genus are susceptible to disturbance, although they sometimes habituate to predictable disturbance (Vogel 1995, Barr 1997, Evers 2004, Earnst 2004, Mills and Andres 2004, North 1994). Human disturbance can cause yellow-billed loons to abandon reproductive efforts or leave eggs or chicks unattended and exposed to predators or bad weather (Earnst 2004). Observations by Earnst (2004) indicated that adults left nests when an approaching human is as much as 1.6 km (1 mi) away, or as close as a few meters. These behaviors varied by individual and circumstance, and have not been subject to formal study (Earnst 2004); more importantly, the impacts to nest success, fitness, and the potential for habituation have not been studied.

While little quantitative data on the effects of disturbance to nesting yellow-billed loons exists, it is possible that disturbance of sufficient frequency, duration or severity could result in reduced nest success or brood survival at individual nests. Yellow-billed loon nests are widely dispersed throughout their breeding areas, and not concentrated near village areas where hunting or egg collecting pressure is high; thus a small proportion of the overall number of Alaska breeding loons would be affected by disturbance. Given the low number of nesting loons likely to be subject to possible disturbance from hunters, it is reasonable to conclude that disturbance from the Action will affect at most a small number of yellow-billed loon nests.

5.4 Kittlitz's Murrelet
Kittlitz's murrelet distribution and behavior probably preclude much harvest of adults and eggs. Although they may forage in marine habitats in groups, Kittlitz's murrelets do not commonly congregate in groups near villages or hunting areas, or migrate in large flocks (D. Irons, USFWS, pers. comm.), thus large numbers are not available to harvest. Little information on nest site characteristics suggest that Kittlitz's murrelets nest at extremely low densities on scree slopes. Given characteristically inapproachable nesting habitat, very small egg size, and solitary nesting, subsistence egg harvest from Kittlitz's murrelet nests would be unproductive and thus very unlikely.

Additionally, Kittlitz's murrelets were not on the list of species requested by eligible participants for an open season and no records of Kittlitz's murrelet harvest during subsistence hunting have been reported (FWS 2009 – MMS BO, AMBCC 2009). No records of harvest of marbled murrelet (*Brachyramphus marmoratus*), which are far more numerous in Alaska and similar in appearance, have been found. Subsistence harvest was not listed as a threat for Kittlitz's murrelet in the listing document (USFWS 2005), current candidate notice of review (USFWS 2009e), or spotlight species action plan (USFWS 2009f).

In summary, based on the behavior and distribution of Kittlitz's murrelets and lack of evidence that individuals or eggs are targeted in the subsistence hunt, we do not expect adverse effects to occur from the promulgation of the subsistence hunting regulations.

6. CUMULATIVE EFFECTS

Community Growth

Community growth is anticipated to continue across the North Slope. The footprints of North Slope villages will likely increase, along with associated infrastructure such as roads, powerlines, communication towers, landfills, and gravel pits and these activities may adversely affect listed species. The scale of impacts will depend not only on the amount of growth, but the location as it relates to eider habitat. For example, community development projects at Barrow may potentially impact Steller's eiders to a much higher degree than developments at Point Lay.

Because over 97% of the Action Area is wetlands or open water (USGS National Land Cover Database), and listed eiders breed near and use wetland areas, a section 404 permit from the COE would likely be necessary for all large scale community development projects that may impact eiders. The issuance of these permits would also trigger consultation under the ESA.

Projected Growth in Hunter Numbers

United States 2000 Census data indicate the estimated village size in the Wade-Hampton and Bethel census areas, where subsistence hunters on the Y-K Delta might encounter Steller's or spectacled eiders. Census data is also provided for the North Slope, which encompasses the ACP breeding area for these two species. At current rates of population growth the increases in the numbers of households and projected population numbers can be approximated (Table 6.1).

Predicting future levels of take of either eider species as a result of population growth is problematic. However, the Service anticipates that the potential number of subsistence hunters will grow in Alaska, indicating a continuing and growing need for careful management of the subsistence hunt and a need for long-term education, outreach, and law enforcement activities to protect listed species during the hunt.

Table 6.1. Projected human population and household increases in rural Alaska areas where Steller's and Spectacled Eiders are found during spring and summer

Census Area	Bethel Population	Bethel Households	Wade-Hampton Population	Wade-Hampton Households	North Slope Population	North Slope Households
2000	16006	4226	7028	2063	7385	2109
2010	18538	4847	8264	2364	8788	2543
2020	21056	5559	9718	2709	10457	2958
2030	24151	6376	11428	3104	12443	3567

Oil and Gas Development
Oil and gas development, whether in Federal or State waters or in the terrestrial environment on State, private, Native-owned, or Federal lands, would require Federal permits (such as section 404 of the Clean Water Act authorization from the U.S. Army Corps of Engineers (COE), and National Pollution Discharge Elimination System permits from the Environmental Protection Agency) and, therefore, are not considered cumulative effects.

Gas Line
The BLM now considers the development and export of North Slope natural gas from the Action Area via pipeline to be reasonably foreseeable. While much of this line is likely to be on State lands, a project of this magnitude would require Federal permits and section 7 consultation. It is therefore, not a cumulative effect under the ESA.

Increased Scientific Research
Scientific research across the North Slope is increasing as concern about effects of climate change in the arctic grows. There are a number of long-term study plots near Barrow and NPR-A providing baseline data, further increasing interest in the area. While much research is conducted by universities and private institutions, all activities in NPR-A require land use authorization by BLM and therefore, require section 7 consultation. The Service has also consulted on the major long-term research area near Barrow, and researchers are currently conducting activities in ways that minimize impacts to listed eiders.

Summary of Cumulative Effects
In summary, we anticipate community growth, a gradual increase in subsistence hunter numbers (with community growth), terrestrial and offshore oil and gas development, scientific activities, and other activities will continue in the Action Area in coming decades. Most notably activities with potential to affect significant numbers of individuals of listed species (such as oil and gas development, community growth, and large-scale science projects) are expected to require consultation under the ESA, whereas those that may not require consultation (such as non-federal research) will likely have minor impacts to only a few individuals.

7. CONCLUSIONS

7.1 Steller's Eider:

After reviewing the current status of the Steller's eider, the environmental baseline for the Action Area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Action, as proposed, is not likely to jeopardize the continued existence of the Steller's eider or adversely modify Steller's eider critical habitat. This conclusion is based on the following factors.

Our best estimates of population abundance and trend for the Alaska-breeding population of Steller's eiders are imprecise, probably due to the species' rarity and the annual variability of abundance on the North Slope related to the number of breeding birds in any given year. The most recent population estimate of Steller's eiders breeding on the North Slope is 576 (292-859, 90% CI) with an estimated growth rate of 1.011 (0.857 – 1.193, 90% CI). The low precision associated with the trend estimate limits interpretation, and we cannot determine if the population of Alaska-breeding Steller's eiders is stable, increasing, or decreasing. It is important to note that because the population is relatively small, it is presumably more vulnerable to stochastic events and anthropogenic effects that may decrease population vital rates.

Information on take of Steller's eiders resulting from the Action is also unclear. As outlined in the *Effects of the Action* section, in general, estimates from harvest surveys are subject to a number of unquantifiable biases. Harvest reports also contain obvious misidentifications (or language translation errors) that cast question upon the reliability of harvest estimates. We conclude that roughly tens of Alaska-breeding Steller's eiders have been harvested in most years, but this likely varies considerably among years. More precise estimates are not possible with the available information. We expect that Steller's eiders face the highest mortality risk near Barrow, where the majority of the Alaska-breeding population nests near the largest human population center on the North Slope.

In addition to shooting, potential adverse effects of the action include egg harvest, disturbance caused during hunting and/or egg gathering, and lead contamination. We expect that no Steller's eider eggs are harvested in most years, and a small number of nests may be disturbed during harvest of adults or eggs of other species on the breeding grounds. Based on the available information, we believe that the effects of egg harvest and disturbance caused by hunting and egg gathering will affect at most a few individuals or nests, and therefore will likely have negligible population-level effects. In contrast, ingestion of spent lead pellets is likely affecting a number of nesting females near the village of Barrow, possibly causing minor population level effects. Fortunately, our indices of use of lead shot suggest that outreach and enforcement actions have recently reduced the sale and use of lead shot, and thus we expect exposure rates and potential impacts to continue to gradually decrease over time.

Additionally, to better address the long-term lead problem and assess compliance with the regulation, the Service plans to develop a study to systematically collect empirical data on the use and availability of lead shot. We believe these data will serve to quantify ongoing use of toxic lead shot and better inform associated management decisions in the upcoming years.

Importantly, though, this consultation is evaluating just the effects of lead shot deposited in 2011, and we believe that the contribution caused by the 2011 hunt to this long-term problem will be minimal.

The small population size of Alaska-breeding population of Steller's eiders, the lack of information from which to adequately assess the risk of effect of the action on the population, and the apparent vulnerability of Steller's eiders to harvest mortality in Barrow is of concern to the Service.

While we believe that it is *unlikely* that the subsistence hunt will appreciably reduce the likelihood of survival and recovery of the Alaska-breeding population of Steller's eiders, given the uncertainty surrounding harvest rates and population status, we cannot be certain that jeopardy will not result if the hunt is left unmitigated. Therefore, to meet our obligation that we *ensure* that the proposed action will not appreciably reduce the likelihood of survival and recovery of the Alaska-breeding population of Steller's eiders, the Service has: 1) promulgated regulations specifically intended to reduce risk of harvest of Steller's eiders on the North Slope; 2) committed to maintain the presence of law enforcement agents on the North Slope during the course of the hunt, commensurate with the risk to eiders, to enforce existing regulations, ensure compliance with regulations prohibiting harvest of Steller's eiders, and conduct outreach; and 3) committed to ongoing, long-term collaborative outreach and education effort with hunters and North Slope residents. In combination, we believe that these efforts will reduce the effects of subsistence harvest throughout Alaska, including harvest in spring, summer, and fall, to the point that we have ensured that the 2011 hunt will not appreciably reduce the likelihood of survival and recovery of the Alaska-breeding population of Steller's eiders.

This conclusion is based on the following: The potential effects of the proposed action on the species' reproduction will be limited, as we believe that no Steller's eider eggs are harvested in most years, and that only a small number of individual nests are disturbed during the course of hunting and egg gathering. The subsistence hunt has the potential to affect numbers of Alaska-breeding Steller's eiders through harvest at a level best estimated to be in the tens; however, we believe that the conservation measures described above will reduce harvest to the point that survival and recovery are not compromised. We do not expect the proposed action to affect the distribution of the Alaska-breeding population, as the greatest harvest levels in previous years have been proximal to the village of Barrow. Even when unmitigated by the conservation measures described above, Steller's eiders have continued to nest in this area.

It should be noted that this consultation considers exclusively the effect of the Action during 2011; consultation will be re-initiated in 2012 with the proposal of subsistence harvest regulations, when information from 2011 will be incorporated into the Service's consultation.

It is also important to note that in reaching our conclusion, we have considered, and not attempted to separate or exclude, the effects of the fall hunt (which is a separate Service action requiring a separate consultation later this year), from the effects of the subsistence hunt (which is the action evaluated in this Biological Opinion). We have done this due to the difficulty in disentangling these sources of impact in available harvest estimates, and to ensure that all identified increments of impact were considered in reaching our jeopardy/non-jeopardy conclusion, as explained in the *Effects of the Action*. While this may result in confusion over which Service action the specific impacts should be linked to, we believe that it ensures all possible impacts are considered. Further, by including impacts of the fall hunt in our jeopardy/non-jeopardy conclusion for this action, we believe that our non-jeopardy conclusion also applies to the fall hunt *unless new information indicating that we have underestimated impacts in this consultation is identified in the interim*.

7.2 Spectacled eider:
After reviewing the current status of the spectacled eider, the environmental baseline for the Action Area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Action, as proposed, is not likely to jeopardize the continued existence of the spectacled eider or adversely modify spectacled eider critical habitat. This conclusion is based on the following factors.

Spectacled eiders are listed at the species level; therefore, we consider the effect of the action on the range-wide population. The most recent range-wide estimate of spectacled eiders is 363,000 (333,526 - 392,532, 95% CI, Peterson et al. 1999). While there is some uncertainty in the range-wide estimate, the lower bound on the confidence interval is still well above 300,000 individuals. Additionally, due to the difficulty in conducting species-wide population surveys, this estimate likely represents a minimum population size (Petersen et al. 1999). Because the population is relatively large, it is likely robust to stochastic events and anthropogenic effects that may decrease population vital rates in any given year.

Range-wide trend estimates for spectacled eiders are not available, but population trends from the two nesting populations in Alaska suggest that within Alaska, breeding populations are roughly stable to increasing. Based on aerial survey data, the most current trend analysis (1988-2009) estimates a growth rate of 1.071 (1.058-1.084, 90% CI) for the Y-K Delta (Stehn and Platte 2009), meaning that the population is growing at a rate of about 7% per year. This is a high population growth rate for sea ducks, which are typically long-lived species with relatively low reproductive rates (Esler et al. 2002, Goudie et al.1994), and indicates that this population is recovering, through some combination of high reproduction, survival or immigration, from the depressed population on the Y-K Delta in the 1990s.

The North Slope spectacled eider population appears to be slightly decreasing, with an estimated growth rate of 0.985 (0.971-0.999, 90% CI), indicating a rate of decrease of 1.5% per year (0-3%, 90% CI). Given that range-wide trends for spectacled eiders are not available, we base our inference exclusively on data from Alaska-breeding population surveys. The North Slope population may be slightly declining and Y-K Delta is increasing, so in the absence of other data, we surmise that, overall, spectacled eider populations are relatively stable in the Action Area.

As outlined in the *Effects of the Action* section, we conclude that tens to hundreds of spectacled eiders are likely taken each year, but that more precise estimates are not possible with the available information. Additionally, estimates are highly variable among years. Using a conservative approach by assuming the current population abundance is approximately equal to the lower confidence limit of the abundance estimates, roughly 0.1% of the listed population (90/330,000 = 0.03%, 400/330,000 = 0.1%) may be harvested annually. Furthermore, if only the

Alaska breeding population is considered (conservatively using the lower confidence limits of each estimated population: 9,600 on the Y-K Delta and 9,300 on the North Slope), the estimates equate to approximately 2% of the Alaska-breeding population (90/18,900 = 0.5%, 400/18,900 = 2.1%) harvested annually. The loss of this proportion of the listed population from the direct effect of harvest (a subset of the total effect of the Action) appears to be sustainable.

In addition to the direct effect of shooting, potential adverse effects of the action include the direct effect of egg harvest and the indirect effects of disturbance and lead contamination. We expect that spectacled eider eggs are harvested annually in the low tens, and a small number of nests may be disturbed during harvest of adults or eggs on the breeding grounds. Lead contamination may affect the survival and reproduction of spectacled eiders to an unknown extent for more than 25 years after lead shot deposition (Flint and Schamber 2010), and is of particular concern as lead contamination may have been a major factor in the species' decline on the Y-K Delta (listing document). This consultation is evaluating just the effects of lead shot deposited in 2011, and we believe that the contribution caused only by the 2011 hunt to this long-term problem will be minimal. We expect that egg collection, disturbance and lead contamination resulting from this action will occur, but in absence of reliable emperical data, cannot quantify their effect on the population.

In summary, biases and imprecision plague the available harvest data, but using conservative estimates we expect that a minimal proportion of the listed population is shot, or collected as eggs, annually during subsistence activities. Additionally, while it is impossible to quantify the indirect effects of disturbance and lead contamination, their effects are expected to be low. Therefore, considering the sum of direct and indirect effects, it is reasonable to expect that a small proportion of the listed population is likely to be taken annually as a result of the Action. After considering the status of the species, the environmental baseline, and the effects of the action, we do not reasonably expect the action to appreciably reduce the likelihood of survival and recovery of spectacled eiders by reducing the reproduction, numbers, or distribution of the species. Furthermore, this consultation considers the effect of the Action during one year; consultation will be re-initiated in 2011 with the proposal of subsistence harvest regulations, when new information can be incorporated into the Service's jeopardy analysis.

This conclusion is based on the following: The potential effects of the proposed action on the species' reproduction will be limited, as we believe that low tens of spectacled eider eggs are harvested in most years, and that only a small number of individual nests are disturbed during the course of hunting and egg gathering. Given the number of eggs and nests each year range-wide, this comprises a negligible proportion. The subsistence hunt has the potential to affect numbers of spectacled eiders through harvest of tens to hundreds annually. This comprises roughly 0.1% of the listed population, so we believe this will have a negligible effect on total numbers. We do not expect the proposed action to affect the distribution of the spectacled eider, as total impacts are insufficient to affect the number of individuals breeding in any portion of the species' range.

It is important to note that in reaching our conclusion, we have considered, and not attempted to separate or exclude, the effects of the fall hunt (which is a separate Service action requiring a separate consultation later this year) from the effects of the subsistence hunt (which is the action evaluated in this Biological Opinion). We have done this due to the difficulty in disentangling these sources of impact in available harvest estimates, and to ensure that all identified increments of impact were considered in reaching our jeopardy/non-jeopardy conclusion, as explained in the *Effects of the Action*. While this may result in confusion over which specific Service action particular impacts should be linked to, we believe this approach ensures all possible impacts are considered. Further, by including impacts of the fall hunt in our jeopardy/non-jeopardy conclusion for this action, we believe that our non-jeopardy conclusion also applies to the fall hunt *unless new information indicating that we have underestimated impacts in this consultation is identified in the interim*.

7.3 Yellow-billed loon

After reviewing the current status of the yellow-billed loon, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of yellow-billed loons. Because the species has not been proposed for listing under the Act, no critical habitat has been proposed or designated, and, therefore, none will be affected.

As described in the *Effects of the Action* section, we conclude that tens to hundreds of yellow-billed loons are likely taken each year in Alaska, but that more precise estimates are not possible with the available information. The available information suggests that few eggs or adults are taken during the breeding season, so the majority of harvest likely occurs during spring and fall migrations, as yellow-billed loons move along the coast of Alaska or through the Chukchi and Bering seas. In addition to Alaska-breeding populations, significant numbers of yellow-billed loons that nest in Russia and Canada likely migrate through the Bering and Chukchi seas. As a result, what harvest actually is occurring is extracted from a migrant population that likely includes much of the species' total range-wide numbers of 16,000–32,000 (USFWS 2009d). Thus, despite uncertainty surrounding harvest levels, breeding-population composition of the migrant population, and total population size, it is most likely that a small proportion of the migrant population is harvested each year.

As described in the *Status of the Species* section, we currently have no means to assess population trends in Russia- or Canada-breeding populations, but systematic, standardized aerial surveys in Alaska provide a means of assessing trends in Alaska. Various analytical approaches yield slightly different estimates of population trend that range from slightly decreasing to slightly increasing, with no indication of rapid population trend in either direction.

Due to changes in harvest survey and sampling methods over time, we cannot assess trends in harvest levels over time. However, we possess no information suggesting that the number of subsistence hunters or the amount of effort expended in hunting loons has increased over time, and therefore we have no reason to expect that loon harvest would have increased significantly in recent years. Therefore, current population trends, such as they are, likely reflect population-level response to the ongoing effects of harvest over time. We find no reason to conclude that harvest in 2011, which is the action we are evaluating, will cause significant population-level effects.

Further, to proactively address possible ongoing harvest of yellow-billed loons, and to address lingering uncertainty in harvest estimates, we have developed conservation measures to be collaboratively implemented by multiple Service programs and representatives from subsistence communities on St. Lawrence Island and on the North Slope. We believe that these recommendations will serve to reduce potential future harvest and improve the information upon which we base management decisions in the upcoming years.

In summary, based on our best estimates of current harvest levels and likely population-level response, and our belief that conservation recommendations to be implemented this year will further reduce risk, we conclude that the proposed action will not jeopardize the continued existence of yellow-billed loons.

This conclusion is based on the following: The potential effects of the proposed action on the species' reproduction will be limited, as we believe that few yellow-billed loon eggs are harvested in most years, and that only a small number of individual nests are disturbed during the course of hunting and egg gathering. The subsistence hunt has the potential to affect numbers of yellow-billed loons through harvest in the tens to hundreds; however, this is thought to comprise only a small proportion of the population from which it is extracted. We do not expect the proposed action to affect the distribution of the yellow-billed loon, as harvest is likely extracted from Russia-, Canada-, and Alaska-breeding populations, diffusing any potential effect across the species' range.

It is important to note that in reaching our conclusion, we have considered, and not attempted to separate or exclude, the effects of the fall hunt (which is a separate Service action requiring a separate conference later this year), and bycatch of yellow-billed loons in subsistence fishing nets (which we do not expect to be included in a separate conference at this time), from the effects of the subsistence hunt (which is the action evaluated in this conference). We have done this due to the difficulty in disentangling these sources of impact in available harvest estimates, and to ensure that all identified increments of impact were considered in reaching our jeopardy/non-jeopardy conclusion, as explained in the *Effects of the Action*. While this may result in confusion over which Service action the specific impacts should be linked to, we believe that it ensures all possible impacts are considered. Further, by including impacts of the fall hunt in our jeopardy/non-jeopardy conclusion for this action, we believe that our non-jeopardy conclusion also applies to the fall hunt *unless new information indicating that we have underestimated impacts in this conference is identified in the interim*.

7.4 Kittlitz's murrelet

After reviewing the current status of the Kittlitz's murrelet, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of Kittlitz's murrelet. Because the species has not been proposed for listing under the Act, no critical habitat has been proposed or designated, and, therefore, none will be affected. As described in the *Effects of the Action*, adverse effects are unlikely to occur from the promulgation of the subsistence hunting regulations; therefore we do not reasonably expect the action to appreciably reduce the likelihood of survival and recovery of Kittlitz's murrelets by reducing the reproduction, numbers, or distribution of the species.

8. INCIDENTAL TAKE STATEMENT

Section 9 of the Act and regulations pursuant to section 4(d) of the Act prohibits the take of endangered and threatened species, except as provided in section 6(g)(2) and 10 of the Act. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

However, under section 10(e) of the Act, the provisions of the Act shall not apply with respect to the taking of any such species, or the importation of such species taken pursuant to this section, by any Indian, Aleut, or Eskimo who is an Alaska Native who resides in Alaska, or any non-Native permanent resident of an Alaska Native village if such taking is primarily for subsistence purposes, unless the Secretary determines that the taking of an endangered or threatened species materially and negatively affects the species. Because the proposed action here is to authorize the spring and summer hunting of migratory birds for subsistence purposes, and all those authorized to participate in this activity are either Alaska Natives or non-Native permanent residents of an Alaska Native village, all potential incidental take that is anticipated from the proposed action qualifies under section 10(e), and therefore, is not prohibited under the Act.

Although the taking of listed species for subsistence purposes here is not prohibited under the Endangered Species Act, the taking of spectacled and Steller's eiders remains prohibited under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712). Therefore, the Service will refer the incidental or intentional take of any listed migratory bird species for prosecution under the Migratory Bird Treaty Act.

Amount or extent of take

As described in the *Effects of the Action* section, the activities described and assessed in this BO may adversely affect spectacled and Steller's eiders through accidental or illegal shooting. In general as previously described, estimates from harvest surveys are subject to a number of unquantifiable biases making it difficult to reliably estimate take.

Steller's eider

Based on the harvest data that are available, other sources of information, and what we believe are reasonable assumptions, we anticipate that up to 4 Alaska-breeding Steller's eiders could be taken by hunters during the 2011 spring and summer hunting season. We believe the conservation measures included in the project description and incorporated into the description of the proposed action will reduce the risk of take of Steller's eiders. This estimate of 4 Steller's eiders was established based on what we think is reasonable from all available information, our assessment of risk, consideration of the likely benefits of recently implemented conservation measures, and is one that provides an appropriate and conservative threshold for reinitiation of consultation to ensure that Jeopardy is avoided.

Additionally, the Service in collaboration with North Slope partners will routinely monitor and verify that listed eiders are not being shot and will evaluate the effectiveness of our education, communication, and outreach efforts. If mortality is detected, the Service will reassess current outreach and education strategies, determine where changes are needed, and heighten targeted outreach and targeted law enforcement efforts commensurate with the risk. If it cannot be reasonably assumed that the factors leading to shooting of Steller's eiders have been identified and adequately ameliorated, the Service Regional Director may institute emergency regulations in consultation with AMBCC until impacts can be revaluated and minimized.

Spectacled eider
Based on the harvest data that are available, other sources of information, what we believe are reasonable assumptions, and the potential benefits of conservation, outreach and educational efforts regarding prohibited species, we anticipate that up to 400 spectacled eiders could be taken by hunters during the spring and summer hunting season. As described above, this estimate equates to approximately 2% of the Alaska-breeding population (400/18,900 = 2.1%) harvested annually. The Service believes that the loss of this proportion of the listed population from the direct effect of harvest will not appreciably reduce the likelihood of survival and recovery.

9. CONSERVATION RECOMMENDATIONS FOR YELLOW-BILLED LOONS

St. Lawrence Island
To proactively address possible ongoing harvest of yellow-billed loons, and to address lingering uncertainty in harvest estimates, we have developed conservation recommendations to be collaboratively implemented by multiple Service programs and representatives from subsistence communities on St. Lawrence Island. We believe that these efforts will serve to educate the local community, reduce potential future harvest, and improve the information upon which we base management decisions in the upcoming years.

The conservation recommendations will:

1. Build effective working relationships with the communities on St. Lawrence Island;
2. Enhance a culture of conservation through continuing education of hunters; and
3. Improve knowledge of harvest information and relative abundance for loons allowing more informed management decisions.

Details of the conservation recommendations are provided below.

Education, Communication, and Outreach
The Service will continue the education, communication, and outreach program. Successful conservation of Yellow-billed loons in Alaska will require partnerships with local residents, subsistence hunters, land owners, and many others. The Service will continue to build

relationships that are beneficial to all parties and enhance a culture of conservation. Specifically, the Service will:

- Continue dialogue and build partnerships with residents on St. Lawrence Island;
- Attend appropriate meetings that provide a forum for migratory bird conservation discussions;
- Continue delivery of conservation messages about loons and other migratory birds;
- Continue to work with Kawerak on education and outreach ideas such as the loon identification guides, posters, and products that help with language barriers such as posters that communicate American Ornithologist Union common names used for loons; and
- Acquire study skins of loon species in alternate, basic, and juvenile plumages to demonstrate and facilitate discussions of species differences.

Loon Harvest Verification
The Service, working with partners, will initiate a program that will focus on verification of harvested species to address continuing uncertainty in harvest composition on St. Lawrence Island. Specifically, the Service will:

- Continue dialogue and work with partners to develop agreeable and practical methods for verifying species identification of harvested loons; and
- Request feather samples and/or photographs of loons harvested as examined at the avian influenza sample stations and opportunistically elsewhere.

North Slope
To proactively address possible ongoing harvest of yellow-billed loons, and to address lingering uncertainty in harvest estimates, the North Slope Region representative in collaboration with the Co-management Council and the Service will design and implement a scientifically defensible survey to estimate entanglement of yellow-billed loons by North Slope subsistence fishers starting in 2011. Additional information is needed relative to species and number entangled in subsistence nets, distribution of harvest across the North Slope Region, age of birds entangled (adult vs. young-of-year), and time of harvest. These data will allow the Service to better assess the potential effects of harvest on this species. Currently, individual reporting to the North Slope Borough Department of Wildlife is required by the end of each season. In 2009, two yellow-billed loons were reported entangled and found dead in fishing nets, while two others were released from fishing nets by the North Slope Borough staff.

10. REINITIATION NOTICE

This concludes formal consultation on the proposed action. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if:

1) If the amount or extent of incidental take is exceeded;
2) If new information reveals effects of the action agency that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion;
3) If the agency action is subsequently modified in a manner that causes an effect to listed or critical habitat not considered in this opinion;
4) If a new species is listed or critical habitat designated that may be affected by the action.

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