2002026

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Anchorage Fish and Wildlife Field Office
605 West 4th Avenue, Room G-61
Anchorage, Alaska 99501-2249

In reply, refer to:
AFWFO2002026

June 7, 2007

Mr. Guy McConnell
Environmental Resources Section
U.S. Army Engineer District, Alaska
P.O. Box 898
Anchorage, Alaska 99506-0898

Re: Final Biological Opinion on the Effects of the Construction of a Harbor at Little South America – South, Unalaska, Alaska, on the Threatened Steller's Eider (*Polysticta stelleri*) Revised June 6, 2007 (*endangered species consultation number 2002026)*

Dear Mr. McConnell

The enclosed document transmits the U.S. Fish and Wildlife Service's (Service) June 6, 2007 Final Biological Opinion based on our review of the proposed construction of a harbor at the Little South America-South site in Unalaska, as modified, and its effects on the Steller's eider (*Polysticta stelleri*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). On March 30, 2007, we received notification that harbor location had been moved approximately 15 meters further off shore to reduce the volume of dredged material and to avoid blasting activities in the nearshore environment. While we determined that the proposed modifications to the project fall within the scope of analysis of the existing biological opinion, we have updated population estimates for the Steller's eider and listed the southwestern distinct population segment of the northern sea otter (*Enhydra lutris kenyonii*) as threatened. Consequently, we revised the life history and analysis of effects for both of these species. Our reanalysis did not result in any changes to our take estimate or terms and conditions. This letter provides only a summary of the findings included in the Biological Opinion, where a complete discussion of the effects analysis can be found. Also considered in this Biological Opinion are the potential effects of the proposed action on the short-tailed albatross (*Phoebastria albatrus*).

This Biological Opinion is based on information provided in the Biological Assessments for the proposed project (U.S. Army Corps. of Engineers (COE) 2003), Alaska Department of Environmental Conservation and U.S. Coast Guard spill data, Service and COE Steller's eider surveys at Dutch Harbor/Unalaska, the LSA Harbor Discussion Paper and appendices obtained

from the City of Unalaska's web site, the final Fish and Wildlife Coordination Act Report for the proposed project (Schroeder 2004), and discussions with the COE and the City of Unalaska. In addition, other sources of information were also used in formulating this Biological Opinion. The complete administrative record for this consultation is on file at the Anchorage Fish and Wildlife Field Office.

This Biological Opinion is the result of many hours of hard work and cooperation among City of Unalaska representatives, and Corps of Engineers and Service staff, all striving to balance conservation needs of listed species with community development goals. I commend all involved for their commitment and diligence in this effort. Formal consultation on this project was initiated on August 14, 2003. A draft biological opinion was provided to the COE and the City of Unalaska for review on October 22, 2003. Many conversations with the COE and the City of Unalaska have resulted in refinements to our analysis as well as revisions to our Terms and Conditions. Consequently, I believe we can be proud of this final product as a cooperative effort.

The proposed construction of a small boat harbor at LSA, as modified, is not anticipated to lead to an increase in the number of vessels participating in the longline fisheries. Additionally, based on our understanding of sea otter distribution, abundance, and use of the area, we believe the redistribution of vessels is unlikely to result in more than an insignificant increase in exposure to petroleum compounds. Consequently, we concur with your determination that the project is not likely to adversely affect the short-tailed albatross or the sea otter. However, we did find that the proposed project is likely to adversely affect the Steller's eider.

The Endangered Species Act charges the Service with the difficult task of quantifying the individual and population-level effects of Federal actions on listed species. Where data gaps prevent a thorough analysis, we are compelled to use the best available scientific and commercial information and make reasonable assumptions about the potential effects of an action. A paucity of local and species-specific information in the Dutch Harbor/Unalaska area required us to use our best professional judgment in analyzing the effects of constructing a harbor at the LSA South site. Significant data gaps include: we know little about the migration of contaminants in the marine environment and the areal extent of the ecological influences of harbors, both with and without fueling facilities; very little is known about the pathways of exposure of Steller's eiders to contaminants, and even less is known about the physiological effects of that exposure; and finally, there is no data on what these physiological effects mean in terms of survival of the listed entity. Faced with these data gaps, we synthesized available information from the literature and expert opinion to facilitate formulation of the assumptions on which our analysis is based.

In qualitative terms, the potential effects of the action are apparent to us. In its August 2003 Biological Assessment on the Steller's eider, the COE acknowledges that contamination levels in sediments at the project site may increase as a result of vessel moorage at the LSA location, and that increased contamination may affect nearby food resources. In section 4.2.5, the COE writes: "Construction of a harbor at the LSA South site could increase the risk of petroleum spills in an area currently not exposed to spillage." In section 4.3.1, the COE goes on to say: "The principal indirect effect of harbor construction at the LSA site on Steller's eiders would be potential contamination of benthic food resources near the proposed harbor site." The areal extent of these

affects is not delineated. A body of evidence exists documenting the direct and indirect effects of oil pollution on waterfowl, sea ducks, and seabirds from a variety of sources, including contaminated prey. Given that contamination of marine waters by vessel fuels and lubricants is likely to increase in the LSA South site and surrounding areas, and considering that these contaminants are known to have detrimental physiological affects on waterfowl, sea ducks and seabirds, it is incumbent upon us to acknowledge the probability that the proposed project will result in a non-zero take. Quantifying the anticipated effects of the proposed action is a much more difficult task.

After reviewing all the available information on the location, timing of construction, and facility operation, along with the anticipated effects of the proposed action and the best available information on the status, distribution, and life history of the Steller's eider, it is the Service's Biological Opinion that the action, as proposed, is not likely to jeopardize the continued existence of the species.

We estimate that the acute and chronic exposure to petroleum compounds and collisions with harbor-related facilities and vessels as a result of the construction of a new harbor at the LSA South site would be unlikely to result in a take that exceeds 6 individuals of the Alaska breeding population. This Biological Opinion includes Reasonable and Prudent Measures and Terms and Conditions that the Service believes will minimize the impacts of incidental take of Steller's eiders resulting from the proposed project. We expect that adequate spill response, natural spill dispersal and evaporation of spilled products, and proper shielding and orientation of harbor-related and vessel lighting would preclude take beyond the level anticipated by our analysis. In order to be exempt from the prohibitions of section 9 of the ESA, the ACOE must require the applicant to comply with the terms and conditions, which implement the reasonable and prudent measures.

We appreciate the continuing dialogue we have established with the COE and City of Unalaska as environmental reviews of the proposed boat harbor have progressed. If you have any questions about the Biological Opinion you can contact me at (907) 271-2787, ann_rappoport@fws.gov, or our Endangered Species Biologist for this consultation, Charla Sterne, at (907) 271-2781, charla_sterne@fws..gov. We look forward to working with you and the City as the Terms and Conditions and Conservation Recommendations included herein are implemented.

Sincerely,

Ann G. Rappoport
Field Supervisor

Enclosure
cc: Chris Hladick , City of Unalaska

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6 June 2007

FINAL BIOLOGICAL OPINION

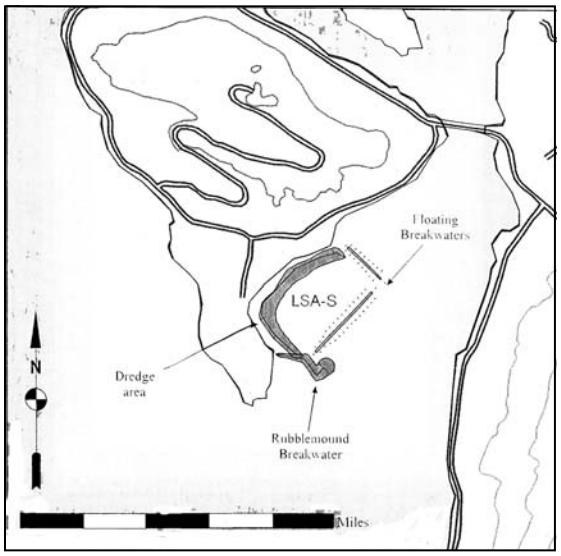
on Effects of the Construction of a Harbor at Little South America-South, Unalaska, Alaska, on the Threatened Steller's Eider (*Polysticta stelleri*)

DESCRIPTION OF PROPOSED ACTION

The local sponsor's preferred site and action as described in the "Biological Assessment of Steller's Eider *Polysticta stelleri* (Pallas) for Harbor Construction at Unalaska, Alaska" (USACOE 2003) involves construction of a 75-vessel harbor on the east side of the southern tip of Amaknak Island, also known as "Little South America - South" (LSA). The proposed harbor would accommodate a fleet of vessels ranging up to 82 to 130 feet (25 to 40 meters) in length. Makeup of vessels anticipated to be using the LSA harbor is as follows: 44 vessels 130 feet (40 m) in length; 11 vessels 98 feet (30 m) in length; and 20 vessels 82 feet (25 m) in length (Guy McConnel, pers. comm. November 4, 2003). Because this site would have the greatest impacts to Steller's eiders of several sites evaluated, we used it as the basis for this Biological Opinion. The following description of the proposed action is paraphrased from the August 2003 biological assessment provided by the USACOE.

Construction of the approximately 24-acre harbor would involve the placement of combined rubble mound and either floating breakwaters or wave barriers (Figure 1). Any entrance channel depth would remain unchanged from existing depths, which range from –50 feet MLLW to –72 feet MLLW. A portion of the mooring basin would be dredged to a depth of –18 feet MLLW. Approximately 47,600 yd^3 of rock inside the harbor basin may require blasting, which would occur within a confined area (berm or air curtain). Dredged material, mostly sand, gravel, and rock, would be disposed of in a deep-water area in the mooring basin. Maintenance dredging would be expected to be minimal since the depths, steep shoreline slopes and currents in this area would preclude accumulation of large amounts of sediments in the harbor. No fueling services will be provided at the new harbor site.

Figure 1. Little South America - South harbor design, Unalaska.



Circulation in the harbor would be driven by wind-driven surface water currents that contribute to mixing in the water column. Wave action and tides transmitted through the floating breakwater will also affect circulation.

For purposes of this analysis, we are assuming no net increase in the number of vessels using the Dutch Harbor/Unalaska area as per our conversation with the USACOE and the City of Unalsaka on November 6, 2003 (Guy McConnell, USACOE, and Chris Hladick, City of Unalaska, pers. comm.). We understand that no vessels will be moored to the floating breakwaters. However, if such moorings were to occur, either inside or outside the breakwaters, it would represent an increase in the number of vessels using the area, an increase in contamination sources, as well as an additional area of contamination (for vessels moored on the outside of the floating breakwaters) to what was analyzed in this Biological Opinion. Moorage of vessels beyond what is described in the project description would require reinitiation of consultation, or development of an HCP in order to retain protections afforded under section 10 of the Act.

STATUS OF THE SPECIES - STELLER'S EIDER

Species Description

The Steller's eider was listed as a threatened species on June 11, 1997 (62 FR 31748). Critical habitat was designated for the Steller's eider on February 6, 2001 (65 FR 13262). The Steller's eider is the smallest of the eiders. The average weight of adult male and female Steller's eiders is 1.94 pounds (Bellrose 1980). Adult male Steller's eiders in breeding plumage have a black back, white shoulders, and a chestnut brown breast and belly. The males have a white head with black eye patches; they also have a black chin

patch and a small greenish patch on the back of the head. Females and juveniles are mottled dark brown.

Life History

Longevity

Steller's eiders are long lived, with individuals known to have lived at least as long as 21 years and 4 months in the wild (Chris Dau, pers. comm. 2000).

Energetics

Goudie and Ankney (1986) suggest that small bodied sea ducks such as harlequin (*Histrionicus histrionicus*) and long-tailed ducks (*Clangula hyemalis*) that winter at northern latitudes do so near the limits of their energetic threshold. These species have little flexibility in regards to caloric consumption or on reliance of caloric reserves. Under this life history strategy, the species are vulnerable to perturbations within their winter habitat. Because the Steller's eider is relatively small-bodied, being intermediate in size to the harlequin and long-tailed ducks (Bellrose 1980), and because it overlaps with harlequins and long-tailed ducks in its choice of foraging areas and prey items, the species may, like the harlequin and long-tailed ducks, exist near its energetic limits. We note that unlike other larger eiders, Steller's eiders must continue to feed upon reaching their nesting areas to build up enough energy reserves to breed (D. Solovieva, pers. comm. 2000). In addition, female Steller's eiders must continue to feed during incubation. In contrast, spectacled eiders, a larger bodied sea duck, apparently do not exist so close to their energetic threshold; they arrive on the nesting grounds fit enough to fast through egg laying and incubation.

Age to Maturity

Sexual maturity is believed to be deferred to the second year (Bellrose 1980).

Reproductive Strategy

Johnsgard (1994) indicated that pair formation for most sea ducks occurs in fall and spring. Metzner (1993) hypothesized that Steller's eiders at Izembek Lagoon and Cold Bay pair in the spring because they were apparently too preoccupied with feeding during the fall and winter to form pair bonds. The length of time that Steller's eiders remain paired is unknown. However, long-term pair bonds have been documented in other ducks (Bengtson 1972, Savard 1985, as in Cooke et al. 2000).

Pairs of Steller's eiders arrive at Point Barrow as early as June 5 (Bent 1987). While nesting, Steller's eiders often occupy shallow coastal wetlands in association with tundra (Bent 1987, Quakenbush et al. 1995, Solovieva 1997), although we have records of aerial observations of Steller's eider pairs well inland on the Arctic Coastal Plain. This species establishes nests near shallow ponds or lakes, usually close to water. Clutch size has

been reported to range from 2 to 10 eggs (Bent 1987, Bellrose 1980, Quakenbush et al. 1995). The average clutch size of successful nests near Barrow is reported as 5.5. Solovieva (1997), found that clutch size for Steller's eiders on the Lena Delta varied between 5 and 8 eggs with an average of 6.1 (n = 32). Nesting success near Barrow (percent of nests with at least one egg hatching) is variable, ranging from 0 to 87.5% (Obritschkewitsch et al. 2001, 8.8%; Quakenbush et al. 2001, 29%; Rojek 2007, 87.5%). Nest success reported by Rojek (2007) is the highest recorded since 1991, when a similarly high success rate was documented, and may have been enhanced by fox control.

Near Barrow, Steller's eiders occur regularly, although abundance and breeding effort vary widely from year to year. Between 1991 and 2002, Steller's eiders nested in eight years (1991, 1993, 1995, 1996, 1997, 1999, 2005 and 2006) (Nora Rojek 2007, Quakenbush et al. 2001). Periodic nonbreeding of Steller's eiders may be related to the response of predators to fluctuations in brown lemming (*Lemmus trimucronatus*) abundance (Quakenbush et al. 2001). Five of the six nesting years in that study coincided with lemming populations high enough to support nesting snowy owls and pomarine jaegers, the one exception being 1997. None of the four nests found in 1997, a low lemming year, were successful. Behavior of Steller's eiders is less predictable in non-nesting years when birds may disappear from terrestrial (non-marine) sites in early June (1998), or may remain grouped in terrestrial habitats for several weeks (1994) (Quakenbush et al. 2001). The degree to which these reproductive parameters are representative of what occurs elsewhere in Alaska (outside of the Barrow Area) is not known.

Hatching Success

Near Barrow, 83.3% (5 of 6) of Steller's eiders nests with eggs hatched in 1991, 20.0% (4 of 20) hatched in 1993 (Quakenbush et al. 1995), and 15% (3 of 20) hatched in 2000 (Philip Martin, Service, pers. comm., 2000).

Fledging Rate

Of the 15% of nests that produce at least one chick, 7% (1 in 14) had chicks survive to an age at which fledging appeared likely (Phillip Martin, USFWS, pers. comm. 2003). Consequently, only about 1 in 100 Steller's eider nests from the Barrow area have produced fledging-aged young in recent years.

Recruitment

Steller's eider recruitment rate (the percentage of fledged birds that reach sexual maturity) is unknown, but has is believed to be low due to low breeding success and fledging rates.

Seasonal Distribution Patterns

Banded and Satellite-Tagged Alaskan Breeding Birds

Little is known of the distribution of Alaska breeding Steller's eiders outside of the breeding season. Band recoveries indicate that birds that breed near Barrow molt in Izembek Lagoon. The vast majority of birds that molt in Izembek and Nelson Lagoons breed in Siberia, however. A satellite telemetry study was initiated in 2000 to investigate the molting and wintering locations of the Alaskan population of Steller's eiders. Telemetry research was expanded in 2004 to include Steller's eiders traveling from Kodiak Island to the coast of Siberia.

Satellite transmitters were placed on four Steller's eiders captured in Barrow in 2000. Two Steller's eiders (one male and one female) spent the molting season on the Kuskokwim Shoals, while a third (a male) molted near the Seal Islands (Philip Martin, USFWS, pers. comm.). Both birds that molted at Kuskokwim Shoals moved on to the Hook Bay portion of Bechevin Bay in November. The male remained in Hook Bay at least until late December when his transmitter stopped working. The female remained at Hook Bay until early February, at which time she returned to Izembek Lagoon and remained there into spring. The bird that molted near the Seal Islands moved west to Nelson Lagoon in October. After spending approximately 3 weeks at Nelson Lagoon, this bird moved west to Sanak Island at the end of November. The bird remained at Sanak Island for 3 months. During this time his use area was small, only a few square kilometers. By March 4, he had moved back to Izembek Lagoon in the vicinity of his November locations (Philip Martin, USFWS, pers. comm.).

In 2004, twenty Steller's eiders (10 males and 10 females) were captured on Kodiak Island and fitted with radio transmitters (Rosenberg 2004). In 2005, 16 more were captured, held in captivity and released back to their capture locations on March 16 (Rosenberg 2005). Both years, telemetered birds departed Kodiak Island beginning in mid March through April. By mid June, radioed eiders began showing up on the coast of Siberia from the Kolyma to Lena Rivers and beyond, where breeding was subsequently initiated.

Breeding Distribution

Three breeding populations of Steller's eiders are recognized, two in Arctic Russia and one in Alaska. The Russian Atlantic population breeds in western Russia and winters in the north Atlantic Ocean while the Russian Pacific population nests in eastern Russia and winters in the southern Bering Sea, including southwest Alaska. The exact historical breeding range of the Alaska-breeding population of Steller's eiders is not clear. The historical breeding range may have extended discontinuously from the eastern Aleutian Islands to the western and northern Alaska coasts, possibly as far east as the Canadian border. In more recent times, breeding occurred in two general areas, the Arctic Coastal Plain, and western Alaska, primarily on the Y-K Delta. Currently, Steller's eiders breed on the western Arctic Coastal Plain in northern Alaska, from approximately Point Lay east to Prudhoe Bay, and in extremely low numbers on the Y-K Delta.

On the Arctic Coastal Plain, anecdotal historical records indicate that the species occurred from Wainwright east, nearly to the Alaska-Canada border (Anderson 1913;

Brooks 1915). There are very few nesting records from the eastern Arctic Coastal Plain, however, so it is unknown if the species commonly nested there or not. Currently, the species predominantly breeds on the western Arctic Coastal Plain, in the northern half of the National Petroleum Reserve - Alaska (NPR-A). The majority of sightings in the last decade have occurred east of the mouth of the Utukok River, west of the Colville River, and within 90 km (56 mi) of the coast. Within this extensive area, Steller's eiders generally breed at very low densities.

The Steller's eider was considered a locally "common" breeder in the intertidal, central Y-K Delta by naturalists early in the 1900s (Murie 1924; Conover 1926; Gillham 1941; Brandt 1943), but the bird was reported to breed in only a few locations. By the 1960s or 70s, the species had become extremely rare on the Y-K Delta, and only six nests have been found in the 1990s (Flint and Herzog 1999). Given the paucity of early-recorded observations, only subjective estimates can be made of the Steller's eider's historical abundance or distribution on the Y-K Delta.

A few Steller's eiders were reportedly found nesting in other locations in western Alaska, including the Aleutian Islands in the 1870s and 80s (Gabrielson and Lincoln 1959), Alaska Peninsula in the 1880s or 90s (Murie and Scheffer 1959), Seward Peninsula in the 1870s (Portenko 1989), and on Saint Lawrence Island as recently as the 1950s (Fay and Cade 1959). It is unknown how regularly these areas were used or whether the species ever nested in intervening areas.

Post-Breeding Distribution and Fall Migration

Following breeding, males and some females with failed nests depart their Russian nesting area and return to marine waters (Solovieva 1997). We know little of Steller's eiders use of marine waters adjacent to Alaska's Arctic Coastal Plain and along the west and southwest coast of Alaska during late summer and fall migration. Historical observations made by Murdoch (1885 as in Bent 1987) indicate that birds that have bred near Point Barrow begin to return to the coast from the first to the middle of July. In addition, he indicated that they disappear from the Barrow area from the first to the middle of August. Steller's eiders arrived at St. Michael around 21 September (Bent 1987). Late date of departure was as follows: Point Barrow, September 17; St. Michael, October 5; and Ugashik, November 28 (Bent 1987).

Over 15,000 Steller's eiders were observed on September 27, 1996, in Kuskokwim Bay (Larned and Tiplady 1996). Most (nearly 14,000) were located along the mainland side of barrier islands while about 1,100 were detected further offshore. Despite this species' apparent preference for near shore habitats, several groups were detected over 10 kilometers (km) from shore and two groups were over 30 km from shore.

In late summer and fall, large numbers of Steller's eiders molt in a few lagoons located on the north side of the Alaska Peninsula (i.e., Izembek and Nelson Lagoon/Port Moller Complex, Seal Islands) (Petersen 1980 & 1981). Recent observations of over 15,000 Steller's eiders in Kuskokwim Bay, and the observation of two out of three satellite-tagged birds from Barrow molting there suggests that Kuskokwim Bay may also be a

notable molting area for this species and for the listed entity (Larned and Tiplady 1996; Martin 2001). Following the molt, large numbers of Steller's eiders are known to over winter in near shore marine waters of the Alaska Peninsula, Aleutian Islands, Kodiak Archipelago, and the Kenai Peninsula (e.g., within Kachemak Bay).

Molt Distribution

After breeding, Steller's eiders move to marine waters where they undergo a flightless molt for about 3 weeks. The majority of Steller's eiders are thought to molt in four areas along the Alaska Peninsula: Izembek Lagoon (Metzner 1993; Dau 1987; Laubhan and Metzner 1999), Nelson Lagoon, Herendeen Bay, and Port Moller (Gill et al. 1981; Petersen 1981; Dau 1999). 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).

Winter Distribution

Following the molt many, but not all, Steller's eiders disperse from major molting areas to other portions of the Alaska Peninsula and Aleutian Islands. Winter ice formation often temporarily forces birds out of shallow protected areas such as Izembek and Nelson Lagoons. 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 in Kachemak Bay (Larned 2000a, Bent 1987, Agler et al. 1994, Larned and Zwiefelhofer 1995).

Larned (2000b) did not see Steller's eiders along most of the surveyed Alaska Peninsula coastline during winter 2002. Most of the birds were concentrated within relatively small portions of the coastal waters. Much of the population that is detected during spring migration was not detected on this survey. We conclude that either the survey failed to detect many birds in the survey area, or many Steller's eiders are wintering further west in the Aleutian Islands and/or along the south side of the Alaska Peninsula. We suspect the latter.

Spring Migration

In the spring, Steller's eiders form large flocks along the north side of the Alaska Peninsula and move east and north (Larned et al. 1993, Larned 1998, Larned 2000b, Larned 2004, Larned 2005). Spring migration usually includes movement along the coast, although birds may take shortcuts across water bodies such as Bristol Bay (William Larned, Service, pers. com. 2000). Interestingly, despite many daytime aerial surveys, Steller's eiders have never been observed during migratory flights (William Larned pers. com. 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.

The number of Steller's eiders observed in each site during migration surveys should be considered a minimum estimate of the number of eiders that actually use these sites

during migration. These data represent eider use during a snapshot in time, when in reality, a stream of eiders likely flows into and out of these sites throughout the migration season. The spring migration survey was not intended to document the intensity of use of any particular site by Steller's eiders, but was designed to monitor the entire population of Steller's eiders and other sea ducks during the spring migration.

Because the spring Steller's eider aerial survey was not intended to quantify use of any particular area by Steller's eiders during spring migration, care must be taken in interpreting the results with this purpose in mind. For example, Steller's eider use of habitat near Ugashik and Egegik Bays was documented in 1992, 1993, 1997, and 1998 (Larned et al. 1993, Larned 1998). However, in 2000, no Steller's eiders were observed there (Larned 2000b). In fact, no Steller's eiders were observed from the Cinder River Sanctuary to Cape Constantine; an expanse of approximately 110 miles of coastline which encompasses these bays and which has had several thousand Steller's eiders documented in previous years (Larned et al. 1993, Larned 1998). However, 15,000 Steller's eiders were observed south of this area and were distributed between Port Heiden and Port Moller (Larned 2000b). Three days later, about 43,000 Steller's eiders were observed south of Port Moller (Larned 2000b). The birds were, in essence, stacking up behind Port Moller, or were otherwise phenologically late in their migration relative to the previous few years. Regardless, survey results from that year suggested low use of habitats north of Port Moller, even though the birds that were counted south of Port Moller presumably used those more northerly habitats following the conclusion of the spring aerial survey.

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, and Larned 2000b).

Summer Distribution in Southern Alaska

A small number of Steller's eiders are known to remain along the Alaska Peninsula and Kachemak Bay during the summer; approximately 100 have been observed in Kachemak Bay while a few may spend the summer at Izembek Lagoon (Chris Dau, Service, pers. comm. 2000).

Site Fidelity

Molting Site Fidelity

Steller's eiders appear to show site fidelity at different spatial scales during different times of the year. There is good evidence of fidelity to molting sites in this species. About 95 % of recaptured molting Steller's eiders are recaptured at the same site at which they were banded (Flint et al. 2000). Flocks of Steller's eiders make repeated use of certain areas between years (Larned 1998), although it is unknown to what extent individuals display repeated use of these areas.

Breeding Site Fidelity

Female philopatry to breeding grounds in waterfowl species is high. Female waterfowl tend to return to the area where they hatched for their first nesting effort, and subsequently tend to return to the same area to breed in the following years (Anderson et al. 1992). Despite having had only a few opportunities to observe Steller's eiders breeding on the Y-K Delta, we have observed philopatry displayed by a female Steller's eider there; one individual chose nest sites in two consecutive years that were about 124 m apart (Paul Flint, U. S. Geological Service, Biological Resource Division, pers. comm. 1999). Banding data from the Barrow area suggests some level of site fidelity for Steller's eiders breeding there as well (Quakenbush et al. 1995; Martin 2001). Natal philopatry has not been observed in Steller's eiders nesting in Russia (D. Solovieva, Zoological Institute, Russian Academy of Science, pers. comm. 2000).

Further evidence of breeding site fidelity is found in other sea ducks. Female spectacled eiders did not move between general nesting areas (coastal versus interior) between years (Scribner et al. 2000). In addition, mitochondrial DNA analysis indicates that female spectacled eiders tend to return to their natal breeding area once they are recruited to the breeding population (Scribner et al. 2000). Natal, breeding, and winter philopatry in other sea ducks has also been documented (Dow and Fredga 1983, Savard and Eadie 1989, Robertsen 1997, Robertson et al. 1999).

Wintering Site Fidelity

Preliminary evidence suggests that Steller's eiders also show fidelity for over wintering sites. Satellite transmitters were placed on four Steller's eiders captured in Barrow, Alaska in the summer of 2000. The transmitters ceased functioning for two of these birds prior to the over wintering season. Of the remaining two eiders with transmitters, one over wintered in the Sanak Islands and the other over wintered in the Hook Bay portion of Bechevin Bay. Although these two birds over wintered in different locations, both eiders remained in their respective locations from November 2000 through February 2001. Their use area was small, only a few square kilometers (Martin 2001).

Preliminary data from radio transmitters placed on 23 Steller's eiders captured in Captain's Bay and around Amaknak Island (near Dutch Harbor) in spring 2001 also reveal that eiders show site fidelity to general wintering areas (USGS April 2001 trip report). Steller's eiders remained in the general vicinity from which they were initially captured from mid-February to mid-March 2001 when the radio transmitters stopped working (Paul Flint, USGS, pers. comm.). The birds marked in Captain's Bay were never detected outside of the area that the flock was observed using. Birds marked around Amaknak Island remained in that general area, but appeared to use a larger home range. Although further investigation is needed, preliminary studies suggest that Steller's eiders show high site fidelity at over wintering sites, at least within one winter season. Whether Steller's eiders show fidelity to over wintering sites between years remains unknown.

Site fidelity has been observed in wintering harlequin ducks; they showed strong site fidelity for short stretches (5 km) of coastline (Cooke et al. 2000). Robertson et al.

(1999) concluded that strong site tenacity suggests that local knowledge of an area is valuable and may help ensure high survival of individuals remaining in a familiar site. They suggest that site fidelity would be expected of long-lived species that are sensitive to adult mortality and depend, at least in part, upon habitat stability for survival.

Population Structure

While Steller's eiders exhibit strong fidelity to their molting grounds (Flint et al. 2000), nest site fidelity is not similarly displayed (Dearing 2003). Using DNA fingerprinting techniques to individually identify female Steller's eiders nesting in the Barrow area between 1991 and 1999, Dearing (2003) was unable to detect subsequent re-nesting of "marked" individuals within the area sampled. However, Dearing (2003) found genetic similarities among nests sampled year after year, and concluded the relatedness was due to offspring, siblings or otherwise closely-related individuals nesting in the Barrow area. Moreover, Dearing (2003) concluded that different groups of Steller's eiders arrive to nest in Barrow from year to year, and that Steller's eiders nesting in the Barrow area are not likely to comprise a single population, but may represent a nesting location on the periphery of the main breeding grounds in Siberia. This hypothesis was refuted by Pearce and Talbot (2004), however. They state:

"It is very unusual for these two measures of population differentiation to produce such disparate values in recently-diverged populations or those that are connected by even low levels of ongoing gene flow." And, "… both allele and frequencies are different only in 1993 and not in every year as suggested by Deering. Furthermore, low and negative values… represent a lack of genetic differentiation between those years, which does not fit with Deering's conclusion that 'different groups of Steller's arrive to nest at Barrow from year to year'."

Results of a population genetics study by Pearce and Talbot (2004), using microsatellite and mtDNA, found no evidence for population structuring among Pacific breeding Steller's eiders. Similar nuclear allele and mtDNA haplotype frequencies were observed among all sampling areas within the Pacific population. The inclusion of male mtDNA haplotypes from breeding areas resulted in the most significant decrease in population differentiation, suggesting a greater level of dispersal by males than females. Lack of population structuring between breeding, wintering and molting areas suggests gene flow, but it could also reflect common ancestry and insufficient time since divergence for genetic differences to be detected with the markers used (J. Pearce, Alaska Science Center, pers. comm.).

No significant inbreeding was detected among Steller's eiders from four breeding populations: Western arctic, Indigirka River, Lena River, and Alaska (Pearce et al. 2003). Steller's eiders collected on wintering grounds in Norway are assumed to represent breeding birds from the Western arctic breeding population. This assumption is supported by satellite telemetry data (M. Petersen, Alaska Science Center, unpublished data). Significant genetic differentiation between the Western arctic and Alaskan breeding populations was detected using nuclear loci ($2_{ST} = 0.01$, $P < 0.001$) and mtDNA

(M_{ST} = 0.131, P < 0.05), suggesting that the populations at the extreme ends of the breeding range are likely reproductively isolated or, alternatively, that gene flow does not occur at a level that homogenizes gene frequencies between these distant populations (Pearce et al. 2003).

Food Habits

Steller's eiders employ a variety of foraging strategies that include diving to a maximum depth of at least 9 meters (30 feet), bill dipping, body tipping, and gleaning from the surface of water, plants, and mud. During the fall and winter, Steller's eiders forage on a variety of invertebrates that are found in near-shore marine waters (Metzner 1993, Petersen 1981, Bustnes et al. 2000). Esophageal contents from 152 Steller's eiders collected at Izembek Lagoon, Kinzarof Lagoon, and Cold Bay, Alaska, indicate Steller's eiders forage on a wide variety of invertebrates (Metzner 1993). According to Metzner (1993), marine invertebrates accounted for the majority of the Steller's eider diet (92%, aggregate dry weight). In addition, occurrence of shell-free prey (e.g., Crustacea, Polychaeta) predominated, compared to that of food items with shells (Metzner 1993). Metzner (1993) concluded that Steller's eiders were opportunistic generalists, foraging primarily on fauna associated with eelgrass beds in Izembek Lagoon and Kinzarof Lagoon, and infauna, epibenthos, and highly mobile fauna. During molt, Steller's eiders were found to have consumed blue mussel (*Mytilus edulis*), other bivalves (e.g., *Macoma balthca*), and amphipods (a small crustacean). They were also found to have consumed more blue mussels while growing wing-feathers (Petersen 1981).

In northern Norway, 31 species were identified as Steller's eider winter food items: 13 species of gastropods (68.4% of total number of items); 4 species of bivalves (18.5%); 12 species of crustaceans (13%); and 2 species of echinoderms (0.1%) (Bustnes et al. 2000). Juveniles sampled in this study fed more on crustaceans (x = 61% aggregate wet weight) than did adults (x = 26% aggregate wet weight). Examination of female Steller's eiders found dead near Barrow had consumed mostly Chironomid larvae, which are the predominant macrobenthic invertebrate in arctic tundra ponds (Quakenbush et al. 1995).

Predators

Predators of Steller's eiders include snowy owls (*Nyctea scandiaca*), short-eared owls (*Asio flammeus*), peregrine falcons (*Falco peregrinus*), gyrfalcon (*Falco rusticolus*), pomarine jaegers (*Stercorarius pomarinus*), rough-legged hawks (*Buteo lagopus*), common raven (*Corvus corax*), glaucous gulls (*Larus hyperboreus*), arctic fox (*Alopex lagopus*), and red fox (*Vulpes vulpes*). Quackenbush et al. (1995) reported five adult male and three adult female Steller's eiders taken by avian predators in 4 years near Barrow. Predators included peregrine falcons, gyrfalcons, and snowy owls. In addition, pomarine jaegers preyed on Steller's eider eggs. On the Y-K Delta, Steller's eider nests have been destroyed by gulls (Paul Flint, USGS, pers. comm., 1999). In fall and winter, bald eagles (*Haliaeetus leucocephalus*) are important predators of Steller's eiders (McKinney 1965).

Population Dynamics

Population Size

Population sizes are only imprecisely known. The Russian Atlantic population is estimated at 30,000 to 50,000 individuals, and the Russian Pacific population likely numbers 50,000 to 100,000. The threatened Alaska-breeding population is thought to include dozens to low hundreds on the Arctic Coastal Plain, and possibly tens on the Yukon-Kuskokwim Delta.

Yukon-Kuskokwim Delta

Estimating the size of the Steller's eider breeding population in Alaska has proved difficult. Due to the low counts and high variation in counts between years during systematic surveys, an accurate/precise statistical estimate is unavailable. Aerial surveys that included the Y-K Delta but did not include the Arctic Coastal Plain indicate that the population sizes of eiders (*Polysticta stelleri* and *Somateria* spp.) had declined by 90% since 1957 (Hodges et al. 1996). For the 1950s and early 1960s, the upper limit of the population, excluding the North Slope, had been estimated to be approximately 3,500 pairs (Kertell 1991). Kertell noted, however, that the population might have been smaller due to the potential restriction of nesting Steller's eiders to specific habitats. Kertell (1991) concluded that the Steller's eider had been extirpated from the Y-K Delta prior to 1990.

Since publication of Kertell (1991), a few pairs of Steller's eiders have nested on the Y-K Delta (Table 1) (Paul Flint, USGS, pers. comm. 1999). In no single year have biologists found more than three nests there, despite extensive ground-based nest search efforts throughout nearly all of the Steller's eider critical habitat area.

Table 1. Recent sightings of Steller's eiders on the Y-K Delta (Paul Flint pers. comm.)

Year	General Location	Number of Pairs	Nest Detected	Number of Eggs	Fate of Nest
1994	Kashunuk River near Hock Slough	1	1	7	Destroyed by Gulls
1996	Tutakoke River	1	1	6	Unknown
1997	Tutakoke River	2	0	NA	NA
1997	Kashunuk River	1	1	6	Hatched

1998	Tutakoke River; Kashunuk River	2;1	2; 1	Unk.; 7	Destroyed; Hatched
1997	Kashunuk River	1	1	6	Hatched
2000	Kigigak Island	2	2	Unk	Unk
2004	Kigigak Island (south central	1	1	7	Hatched
2005	Kigigak Island (south central and west coastal)	2 probable	1	6; unk	Abandoned; 2 ducklings observed

Because extensive ground investigations occur over at least 1.4% of Steller's eider critical habitat on the Y-K Delta each year (Tim Bowman, Service, Anchorage, 2003, pers. comm), with additional searching occurring by crews walking to and from study sites, and because these searches have not revealed more than two Steller's eider nest in any given year, we believe the estimate of hundreds of Steller's eiders on the Y-K Delta is optimistic.

Arctic Coastal Plain/North Slope

Aerial surveys optimized to detect eiders have been conducted on the North Slope since 1992 (Larned et al. 2006), and indicate Steller's eiders occur at very low densities across the ACP, with a higher density in the vicinity of Barrow. Standardized ground surveys for eiders near Barrow have been conducted since 1999, and have found an average density near Barrow of 0.66 birds/ km^2 (Rojek 2006). The Barrow vicinity supports the largest known concentration of nesting Steller's eiders in North America.

Because Alaska-breeding Steller's eiders occur at very low densities, there is not sufficient information to estimate population size or detect population trends. The mean 1992-2006 aerial-survey generated population index (An index rather than a population abundance estimate is used because no aerial survey-ground survey correction factor has been created for Steller's eiders on the North Slope.) was 116 (n=15, standard deviation [sd] = 204), but the indices in these years ranged from 20 (calculated in a year when no birds were seen) to 785 (Larned et al. 2006). The most recent index (2002-2006) was 112 (n=5, sd=98). However, aerial surveys likely undercount Steller's eiders for several reasons. An unknown number are simply missed when observers count from aircraft; this proportion varies by species and is unknown for Steller's eiders. Additionally, because observations at Barrow indicate that many Steller's eiders vacate nesting habitat early in non-nesting years, it is possible that aerial surveys fail to detect some individuals that were present early in the season, at least in some years. Further, the concentration area at Barrow, which contains a significant proportion of Steller's eiders detected on the entire ACP in most years, may be under-sampled 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 flown due to aviation safety concerns. Due to these biases, we cannot precisely estimate

Steller's eider abundance on the North Slope, but the best available information leads the Service to estimate that roughly several hundred Steller's eiders occupy the North Slope in most years. For purposes of this consultation, such as estimating incidental take, we assume that there are 500 North Slope-breeding Steller's eiders.

Population Variability

Variability in the abundance of the Alaska breeding population of Steller's eiders is not well understood. The sampling errors around population estimates are large enough to obscure relatively large annual population fluctuations. However, ground-based efforts in the Barrow area suggest that local breeding populations there fluctuate dramatically (Quakenbush et al. 1995).

Population Stability

Long life spans, multiple reproductive periods, high reproductive rates, and even-age distributions all have stabilizing affects on populations. The Steller's eider is a relatively long-lived species with low and variable nest success, low duckling survival, and poor overall productivity (Quakenbush et al. 2001, Phillip Martin, pers. comm. 17 April 2003). Although periodic non-breeding is consistent with the reproductive strategy for a long-lived species (Begon and Mortimer 1986), such species do not typically display the high variability measured for North Slope Steller's eiders populations.

The high degree of variability in aerial survey data make detecting anything but the most dramatic trends in the breeding population difficult. Population modeling based on parameters derived from birds breeding in the Barrow area indicates annual declines of 15 to 25% in the Alaska breeding population (Paul Flint, pers. comm. 21 April 2003). However, additional data are needed to develop a predictive model of the North Slope Steller's eider population, as Barrow-area observations may not apply across the species range in northern Alaska, and birds that forego breeding in the Barrow area may attempt to breed elsewhere in some years.

Long term spring survey data suggests a 3.8% annual decline in migrating Steller's eiders ($R^2 = 0.44$; Larned 2005). If a marine-based threat is causing a decline in the Pacific population of Steller's eiders, then it is reasonable to conclude that the Alaska breeding population may also be affected by such a threat.

Status and Distribution

Reasons for Listing

The Alaska breeding population of Steller's eiders was listed as a threatened species on June 11, 1997 (Service 1997). It was listed due to (1) its recognition as a distinct vertebrate population segment, (2) a substantial decrease in the species' nesting range in Alaska, (3) a reduction in the number of Steller's eiders nesting in Alaska, and (4) the vulnerability of the remaining breeding population to extirpation (Service 1997).

Habitat Loss

The direct and indirect effects of future gas/oil development within the National Petroleum Reserve-Alaska, and future village expansion (e.g., at Barrow), were cited as potential threats to the Steller's eider (Service 1997). Within the marine distribution of Steller's eiders, perceived threats include marine transport, commercial fishing, and environmental pollutants (Service 1997).

Hunting

Although not cited as a cause in the decline of Steller's eiders, the take of this species by subsistence hunters was cited as a threat to the population of Steller's eiders near Barrow in the final rule (Service 1997). Between 1995 and 1999, an average of 67% of Mid-Coast Alaska Native village households surveyed harvested migratory birds, their eggs, or both during the spring. A hunt participation rate of 69% was reported for all three coastal harvest survey areas during the same time period (Wentworth and Wong 2001). Voluntary subsistence harvest surveys have documented take of as few as 1 to as many as 104 Steller's eiders by subsistence hunters in 8 of the 18 regions surveyed (Yukon-Kuskokwim Delta, Bering Strait Mainland, Diomede, St. Lawrence Island, Togiak NWR, Nushagak-Dillingham-Iliamna, Alaska Peninsula/Becharof NWR, North Slope). While subsistence harvest surveys similar to those conducted on the Y-K Delta has met with resistance on the Arctic Coastal Plain in previous years, surveys were successfully completed there during 2004 and 2005, the results of which are included in this analysis.

Predation

Increased predation by arctic foxes (*Alopex lagopus*) upon eider nests resulting from the early to mid-1980's crash of goose populations is cited as a possible contributing factor to the decline of the Steller's eider on the Y-K Delta (Service 1997). In addition, a decline in fox trapping concurrent with the decline in fur prices may result in at least temporary fox population increases. The potential for increased predation near villages resulting from the associated gull and raven populations was also cited as a potential threat to this species (Service 1997). Research has shown that expanding predatory gull populations take a heavy toll on waterfowl eggs and young (Bowman et al. 1997), although spectacled eider ducklings were not detected as gull prey in this study.

Lead Poisoning

The presence of lead shot in the nesting environment on the Y-K Delta was cited as a continuing potential threat to the Steller's eider. The Service enforces a nationwide ban on lead shot for waterfowl hunting on the Arctic Coastal Plain (Service 1997) and throughout Alaska. The Service still permits use of lead shot for hunting of non-waterfowl species on National Wildlife Refuges in Alaska.

Ecosystem Change

Direct and indirect changes in the marine ecosystem caused by increasing populations of Pacific walrus (*Odobenus rosmarus*), gray whale (*Eschrichtius robustus*), and sea otter (*Enhydras lutris*), were cited as potential causes of the decline of Steller's eiders. Subsequent declines in sea otter populations (65 FR 67343) and continuing declines in

Steller's eider populations suggest that otters were not responsible for a decline in eider numbers. In addition, changes in the commercial fishing industry were also cited as perhaps causing a change in the marine ecosystem with possible effects upon eiders (Service 1997). However, we are unaware of any link between changes in the marine environment and contraction of the eider's breeding range in Alaska (Service 1997).

Range-wide Trend

Populations of Steller's eiders molting and wintering along the Alaska Peninsula have declined since the 1960s (Kertell 1991), and appear to be in continued decline (Flint et al. 2000, Larned 2005). Annual spring aerial surveys provide an index of the Pacific Steller's eider population. These long-term survey data suggest a 3.8% annual decline in migrating Steller's eiders (R^2 = 0..44; Larned 2005). It is our opinion that this survey provides the best estimate for trend; moreover, we do not have any information indicating that this negative trend does not apply to the Alaska breeding population of Steller's eiders. In addition, comparison of banding data from 1975 -1981 to 1991-1997 indicates a reduction in Steller's eider survival over time (Flint et al, 2000).

The Steller's Eider Recovery Plan (2002) establishes criteria for reclassifying the species from threatened to endangered as follows:

> "The Alaska-breeding population will be considered for reclassification from Threatened to Endangered when:
>
> > 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."

A population viability model is being developed that will be used to estimate the population size corresponding to specific probabilities of extinction. Lacking this more complex stochastic model, we developed a simple deterministic model based on observed annual declines and estimated breeding population size to project population longevity. Based on a 3.8% annual decline (from Larned's spring surveys) and a starting population of 500, the Alaska breeding population of Steller's eider is expected to reach functional extinction (125 birds) in 36 years.

<u>IUCN status</u>

Based on the IUCN 2001 Categories and Criteria (version 3.1), the North American breeding population of Steller's eiders belong in the category of Endangered (EN). In the nomenclature used by IUCN, the following is the justification for this categorization: EN A1b+A2+B1b(v)c(iv)+C1.

EN

A. Reduction in population size based on any of the following:
   1. An estimated population size reduction of ≥ 70% over the last three generations (for Steller's eiders, three generations equals about 25.5 years).

b. an index of abundance appropriate to the taxon.
Evidence: Larned (2003) reported a 61% decline over 10 years in the wintering population of Steller's eiders. Extrapolating this 10 year / 61% decline back in time would imply that the population declined by at least 70% in the past 25.5 years. We believe recent survey data suggests that this criterion for classification as endangered is satisfied.

A. Reduction in population size based on any of the following:
2. An observed, estimated, inferred or suspected population size reduction of $\geq$ 50% over the last three generations.
Evidence: Based on population models (Service, unpublished data 2003), and using a beginning population of 1106 Steller's eiders (mean of past 10 years breeding surveys) and a population decline of 6.1% annually (Larned 2002), we expect an 86% decline in the next 25 years. We believe recent survey data suggests that this criterion for classification as endangered is satisfied. If current population trends hold, Steller's eiders will have exceeded the 50% loss criterion in 10 years.

B. Geographic range in the form of either extent of occurrence or area of occupancy.
1. Extent of occurrence estimated to be less than 5000 km^2 and at least two of a – c:
b. Continuing decline, observed, inferred or projected in any of the following:
v. number of mature individuals
c. Extreme fluctuations in any of the following:
iv. number of mature individuals
Evidence: Because of the large geographic extent over which this species breeds, it is unlikely that the North American breeding population of Steller's eiders will satisfy this classification criterion unless their breeding range becomes or is determined to be restricted to the "Barrow Triangle". Ritchie and King (2002) reported that the area of the Barrow Triangle is approximately 2757 km^2. We believe that available evidence suggests that the majority of Alaska breeding Steller's eiders do nest within the Barrow Triangle. However, we also acknowledge occasional nesting records outside this area.

C. Population size estimated to number fewer than 2500 mature individuals and either:
1. An estimated continuing decline of at least 20% within five years of 2 generations (17 years).
Evidence: The current population estimate for Alaska breeding Steller's eiders (1106) is an average of counts from the last 10 years of surveys of the Arctic Coastal Plain during the nesting season. In the past 10 years there has been a 55% decline in wintering Steller's eiders (Larned 2002). We believe recent survey data suggests that this criterion for classification as endangered is satisfied.

New Threats

Chronic Petroleum Spills

The chronic release of petroleum products near large concentrations of Steller's eiders is not a new threat as much as it is a newly realized threat. The gregarious behavior of Steller's eiders during a spill event may result in acute and/or chronic toxicity in large numbers of birds. Larned (2000b), expressed concern for the survival and reproductive success of large number of Steller's eiders observed in harbors.

A life-history strategy of long life and low annual reproductive effort would be expected to evolve under conditions of predictable and stable non-breeding environments (Sterns 1992). The life history strategy of the Steller's eider seems to fit this model. That is, the Steller's eider is long-lived, has low annual recruitment, and winters in apparently productive and reasonably stable near-shore marine environments. Because the Steller's eider is relatively small bodied and winters at northern latitudes, it may do so near the limits of its energetic threshold. Harlequin ducks and long-tailed ducks exist near their energetic limit in such climates (Goudie and Ankney 1986), and the Steller's eider is intermediate in size to these two species. Therefore, environmental perturbations that reduce prey availability or increase the species energetic needs may result in harm. Fuels and oils are toxic to Steller's eiders' prey (e.g., amphipods and snails) (Newey and Seed 1995 as in Glegg et al. 1999, Finley et al. 1999), and to the species itself (Holmes et al. 1978, Holmes et al. 1979, McEwan and Whitehead 1980, Leighton et al. 1983, Holmes 1984, Leighton 1993, Rocke et al. 1984, Yamato et al. 1996, Glegg et al. 1999, Trust et al. 2000, Esler et al. 2002). Therefore, we believe that spilled petroleum is likely to adversely affect Steller's eiders.

Seafood Processor Organic Waste

Discharge from seafood processors may affect the water column, sea floor, or shore directly or indirectly through burial and smothering, putrification and decay, deoxygenation, nutrient loading and alteration of habitats, aquatic communities and food webs. Although wave action in shallow, near shore habitat may keep particles suspended and prevent waste deposition, contaminants, parasites, viruses, and other pathogens may be present and/or concentrated in these wastes and may bioaccumulate in prey items consumed by eiders.

Increased Risk of Lead Poisoning

Because this species continues feeding near the nesting site before and during incubation (D. Solovieva pers. comm. 2000), it may be subjected to an increased risk of exposure to lead shot over other waterfowl species that largely forego feeding at this time. Spectacled eiders do not seem to engage in feeding activities as much as Steller's eiders once breeding has commenced, however, spectacled eiders have been observed to have higher rates of exposure to lead than any species sampled on the Y-K Delta (Flint et al. 1997). The proportion of spectacled eiders on the Y-K Delta's lower Kashunuk River drainage that contained lead shot in their gizzards was high (11.6%, N = 112) compared to other waterfowl in the lower 48 states from 1938-1954 (8.7%, N = 5,088) and from 1977-1979 (8.0%, N = 12,880). Blood analyses of spectacled eiders indicated elevated

levels of lead in 13% of pre-nesting females, 25.3% of females during hatch, and 35.8% of females during brood rearing. Nine of 43 spectacled eider broods (20.9%) contained one or more ducklings exposed to lead by 30 days after hatch (Flint et al. 1997). Thus, if spectacled eiders have experienced population level effects on the Y-K Delta due to lead poisoning, then Steller's eiders may have experienced similar, or even greater lead-induced effects.

Collisions with Manmade Structures

Steller's and spectacled eiders have been documented colliding with boats, wires, communication towers, and other structures. The incidence of bird strikes appears to rise when objects are illuminated with constant diffuse light, and the tendency for birds to be drawn to diffuse light appears to increase during rainy or foggy weather. Fog or low cloud cover makes the attraction problem worse, because the moisture droplets associated with overcast conditions increase the area illuminated by refraction (Rojek 2001).

The incidence of species-specific bird strikes relates to life histories. Eiders are nocturnal and are known to fly below an altitude of 10 meters (Johnson and Richardson 1982, Day et al. 2003), making them susceptible to collisions with structures, particularly during periods of low visibility.

Most of the recent literature documents the attraction of birds to the artificial lights of communication towers and other tall lighted structures, and documents that extinguishing lights stops or prevents birds' responses (Cochran and Graber 1958, Aldrich et al. 1966, Herbert 1970, Avery et al. 1976, Avise and Crawford 1981, Crawford 1981a, Crawford 1981b, Verheijen 1981, Larkin and Frase 1988, Fedun 1995, Bower 2000. Bird attraction to artificial lights is so strong the scientific community utilizes artificial lights as a technique for capturing birds for research purposes. This technique, used on several species of waterfowl (Cummings and Hewitt 1964, Bishop and Barratt 1969) and common eiders (Snow et al. 1990), disorients birds, allowing easy capture. Shielding lights, a technique commonly recommended by regulatory agencies and utilized by industry, reduces attraction about 39%, but does not eliminate the problem (Rojek 2001).

The attraction of seabirds to lights of commercial fishing vessels has been noted by observers involved with longline fisheries (Cherel et al.1996, Ryan and Watkins 1999, Weimerskirch et al. 2000). Furthermore, large seabird wrecks have been noted in the literature. Dick and Donaldson (1978) documented over 6,000 crested auklets (*Aethia cristatella*) landing aboard a crab-fishing vessel near Kodiak Island, Alaska on 18 January 1977. The boat had bright fishing lights on and the crew feared they might capsize due to the weight of the birds on deck. After the crew finally realized that the outside lights attracted the birds and turned them off, the number landing on board decreased. Several hundred birds were still on the boat the following day. These types of events, otherwise known as "bird storms" are a well-documented occurrence within the commercial crab fishery fleet, a result of their use of bright lights during inclement nighttime weather. During snowing and "icing" conditions, large numbers of bird strikes have been observed (Stephen Tuttle, Service, Division of Law Enforcement, Anchorage,

Alaska). Known incidents of eiders colliding with structures and vessels are summarized in Table 2.

Table 2. Summary of known collisions of eiders with structures and vessels.

SEASON/ YEAR	TYPE	NUMBER OF BIRDS DEAD OR INJURED	LOCATION	COMMENTS
December 1980	Collision with vessel M/V Northern Endeavor	At least 150 Steller's eiders	False Pass (Bering Sea side)	Crab lights illuminated, stormy night
February, 1991	Collision with vessel P/V Wolstad (State Protection Patrol Vessel	Two Steller's eiders	Unknown	Crab lights illuminated
February, 1997	Collision with vessel Elizabeth F	Two Steller's eiders	Unknown	One bird struck vessel on Feb. 14 and the second struck the vessel on Feb. 15.
April, 2003	Collision with power line	One Steller's eider	Bristol Bay Coast, near the intersection of the road to lake Camp and the road to Rapids Camp	Rainy with low ceiling. Biologist in the area believe this happens much more than is seen or reported.
SEASON/ YEAR	TYPE	NUMBER OF BIRDS KNOWN DEAD OR INJURED	LOCATION	COMMENTS
September/October, 2001	Collision with oil rigs	19 Sea Ducks (king and common eiders and long-tailed ducks) and 16 eiders (species unknown)	North Slope	At Endicott spur drilling island, foxes had already been on the eiders (approximately 24 hours post-collision)
Pre 1974 and 1983	Collision with Grant Point DEW site tower	90 and 38 (respectively) Steller's eiders	Izembek Lagoon, Alaska Peninsula	Strikes occurred during low viability events and storms, primarily in winter. More individual strike of Steller's eiders anecdotally reported from this site.
Unknown	Collision with vessel	Many Steller's eiders	Nelson Lagoon, Alaska Peninsula	Villager reported to AFWFO personnel that he recalls sweeping Steller's eiders off the deck of his fishing boat.

Unknown	Collision with power line	150 Steller's eiders	Pilot Point, Alaska Peninsula	Pilot Point resident, responsible for erecting power line, recalls that shortly after he put it up about 150 Steller's eiders flew into it and died. The power line runs approximately 600 feet along the shoreline.
October, 2002	Collision with vessel F/V Sea Storm	6 sea birds, 2 positively identified as spectacled eiders	Eastern Bering Sea: 62 59.741N 172 30.366W	Stormy weather conditions, blowing snow and whiteout conditions. Wind was 25030 knots. AFWFO personnel skinned one of the recovered carcasses and noted massive internal injuries throughout neck and torso. Leg and wing broken.

A complete search of fishery observer logbooks for additional data on collisions has not yet been completed. The actual number of birds injured and killed through collisions with manmade structures is likely higher; many injured and killed birds are believed to go undetected, unreported, or become scavenged before humans detect them.

Stochastic Events

The small population size of the Steller's eiders on the Y-K Delta and the Arctic Coastal Plain may put them at risk of the deleterious effects of demographic and environmental stochasticity. Demographic stochasticity refers to random events that effect the survival and reproduction of individuals (Goodman 1987) (e.g., shifts in sex ratios, striking wires, being shot, oil/fuel spills). Environmental stochasticity is due to random, or at least unpredictable, changes in factors such as weather, food supply, and populations of predators (Shaffer 1987). As discussed by Gilpen (1987), small populations will have difficulty surviving the combined effects of demographic and environmental stochasticity. The risk of local extirpation is probably highest for Steller's eiders nesting on the Y-K Delta due to the low number of birds that breed there.

The world population of Steller's eiders is probably not at high risk of extinction due to environmental stochasticity alone, but local groups of wintering birds may be vulnerable to starvation due to stochastic events (e.g., unusually heavy ice cover in their feeding habitats).

Allee Effect

"Allee effect" refers to the destabilizing tendency associated with inverse density-dependence as it relates to population size and birth rate. One form of this occurs when the ability to find a mate is diminished (Begon and Mortimer 1986). For example, if the

sex ratio of a population significantly shifts from a normal condition for a species, the ability of adults to produce young may diminish. For the Steller's eider, the higher mortality rate of males (Flint et al. 2000) may result in a lower number of pairs returning to nest (i.e., adult females unable to find a mate are effectively removed from the breeding population).

The annual survival rate for Steller's eiders molting and wintering in Alaska is estimated to be 0.899 ± 0.032 for females and 0.765 ± 0.044 for males (Flint et al. 2000). At this estimated annual survival rate, about 39 % of the females of a cohort will reach 10 years of age, while only about 7% of the males will survive for 10 years.

The observed difference in annual survival between sexes may be manifested in a skewed sex ratio. Female Steller's eiders notably out-numbered male eiders on winter surveys of three areas during January, February, and March (LGL 2000; Lanctot and King 2000). In waters off Unalaska and False Pass, female Steller's eiders comprised 63 and 69 %, respectively, of Steller's eiders observed (N = 2,053 and 114 respectively) (John Burns, U.S. Corp of Engineers, pers. comm.; Lanctot and King 2000). At Akutan Harbor, the combined female to male sex ratio for all surveys was approximately 3 to 1 (n = 590) (Lanctot and King 2000). Band recoveries reported by Dau et al. (2000) also suggest a shift in Steller's eider sex ratios through time (Table 3), however, in photographs taken of over 13,000 Steller's eiders at Izembek Lagoon in January 2002, 61% were classified as males (Chris Dau, Service, pers. comm.). Furthermore, females represented only 38% and 21% of Steller's eiders captured at Nelson Lagoon over a 3-year period (Flint et al. 2000). This suggests that spatial segregation among sexes, during winter, may lead to assumptions of skewed sex ratio depending on areas surveyed.

Table 3. Shifting sex ratio of Steller's eiders at sample area No. 1 in Izembek Lagoon. Data used are from Dau et al. (2000).

Years	Female	Male	Sample Size	Percent Male
1961-1966	271	566	837	68%
1968	60	85	145	59%
1974-1981	3576	2197	5773	38%
1991-1997	5971	708	6679	11%

Observations of a skewed sex ratio in Steller's eiders are inconsistent across the range of the species (Table 4). However, if Dau's time series data from Izembek Lagoon are correct, then the skew towards females are in stark contrast to that which is typical for many other Anatinae, where an excess of males is the norm (Johnsgard 1994). If an excess of females does exists throughout the species range (as opposed to just at some locations) then the biased sex ratio may have implications regarding reproductive potential. Although our limited observations and Dau et al.'s (2000) banding data suggest that a biased sex ratio exists for this species, we do not know if this biased sex ratio exists range wide, nor do we know what may be causing it.

Table 4. Observed sex ratios of Steller's eiders in their fall and winter range.

Location	n	Female	Male	Year
Unalaska	2,053	63	37	2000
False Pass	114	69	31	2000
Akutan	590	67	33	2000
Izembek	52 flocks	39	61	2002
Nelson Lagoon	11,961	38	62	1995 – 1997
Nelson Lagoon	14,940	21	79	1995 - 1997

STATUS OF THE SPECIES – SHORT-TAILED ALBATROSS

The species once ranged throughout most of the north Pacific Ocean and Bering Sea, with known nesting colonies on numerous western North Pacific islands in Japan and Taiwan (Hasegawa 1979, King 1981). Other undocumented nesting colonies may have existed. For example, recent observations, together with records from the 1930s, suggest that the short-tailed albatross may once have nested on Midway Atoll, United States. However, no confirmed historical breeding accounts are available for this area. Prehistoric evidence indicates the species once bred in Bermuda as well.

Pre-exploitation worldwide population estimates of short-tailed albatrosses are not known; the total number of birds harvested may provide the best estimate, since the harvest drove the species nearly to extinction. Between approximately 1885 and 1903, an estimated 5 million short-tailed albatrosses were harvested from the breeding colony on Torishima (Yamashina in Austin 1949), and harvest continued until the early 1930s, except for a few years following the 1903 volcanic eruption. By 1949, there were no short-tailed albatrosses breeding at any of the historically known breeding sites, including Torishima, and the species was thought to be extinct (Austin 1949).

The Service's short-tailed albatross "at-sea sightings" database contains many observations of short-tailed albatrosses within 10 km (6 miles (mi)) of shore, and 40 (of a total 993) observations of birds within 5 km (3 mi) of the shore (U.S. Fish and Wildlife Service (2002c), although these could represent multiple sightings of fewer individuals. However, these records derive from boats that were near shore to begin with; the lack of more pelagic observations may say more about the distribution of boats than of albatrosses. Coastal marine habitats often coincide with areas of high biological productivity, such as along the west coast of North America, the Bering Sea, and offshore from the Aleutians (Hasegawa and DeGange 1982). Coastal regions of upwelling and high productivity and expansive, deep water beyond the continental shelf characterize the North Pacific marine environment.

Available data suggest that the short-tailed albatross uses coastal shelf break areas of the Aleutian Islands, Bering Sea, and northern Gulf of Alaska on a regular basis for foraging. However, it is not known how important these areas are to the species, what percentage

of the population visits these areas, what amount of time the species spends in these coastal areas. Satellite telemetry data indicates disproportionately high use of continental shelf break areas by short-tailed albatross in Alaska.

The diet of short-tailed albatrosses includes squid, fish, eggs of flying fish, shrimp, and other crustaceans (Hattori in Austin 1949, H. Hasegawa pers. comm. 1997). There is currently no information on variation in diet by season, habitat, or environmental condition.

STATUS OF THE SPECIES – SEA OTTER

Species Description

The southwestern DPS of the Northern sea otter was listed as threatened on August 9, 2005 (70 FR 46366). Critical habitat has not yet been designated. The sea otter is a mammal in the family Mustelidae and it is the only species in the genus *Enhydra.* It is the smallest marine mammal in the world, except for the South American marine otter (*Lontra* (= *Lutra*) *felina*) (Reidman and Estes 1990). Adult males average 130 centimeters (cm) (4.3feet (ft)) in length and 30 kilograms (kg) (66 pounds (lb)) in weight; adult females average 120 cm (3.9 ft) in length and 20 kg (44 lb) in weight (Kenyon 1969). The northern sea otter in Russian waters (*E. l. lutris*) is the largest of the three subspecies, characterized as having a wide skull with short nasal bones (Wilson *et al.* 1991). The southern sea otter (*E. l. nereis*) is smaller and has a narrower skull with a long rostrum and small teeth. The northern sea otter in Alaska (*E. l. kenyoni*) is intermediate in size and has a longer mandible than either of the other two subspecies. Sea otters lack the blubber layer found in most marine mammals and depend entirely upon their fur for insulation (Riedman and Estes 1990). Their pelage consists of a sparse outer layer of guard hairs and an underfur that is the densest mammalian fur in the world, averaging more than 100,000 hairs per square centimeter (645,000 hairs per square inch) (Kenyon 1969). As compared to pinnipeds (seals and sea lions) that have a distinct molting season, sea otters molt gradually throughout the year (Kenyon 1969).

Life History

Longevity

The maximum life span of a wild sea otter is believed to be 23 years (Nowak 1999).

Energetics

Sea otters have a relatively high rate of metabolism as compared to land mammals of similar size (Costa 1978; Costa and Kooyman 1982, 1984). To maintain the level of heat

production required to sustain them, sea otters eat large amounts of food, estimated at 23–33 percent of their body weight per day (Riedman and Estes 1990).

Age to Maturity

Male sea otters appear to reach sexual maturity at 5–6 years of age (Schneider 1978, Garshelis 1983). The average age of sexual maturity for female sea otters is 3–4 years, but some appear to reach sexual maturity as early as 2 years of age.

Reproductive Strategy

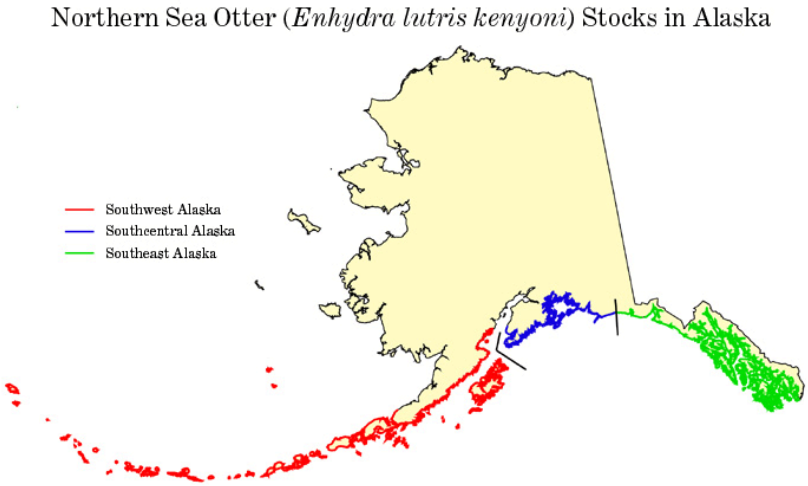
The presence of pups and fetuses at different stages of development throughout the year suggests that reproduction occurs at all times of the year. Most areas that have been studied show evidence of one or more seasonal peaks in pupping (Rotterman and Simon-Jackson 1988). Similar to other mustelids, sea otters can have delayed implantation of the blastocyst (developing embryo) (Sinha *et al.* 1966). As a result, pregnancy can have two phases: from fertilization to implantation, and from implantation to birth (Rotterman and Simon-Jackson 1988). The average time between copulation and birth is 6–7 months. Female sea otters typically will not mate while accompanied by a pup (Lensink 1962; Kenyon 1969; Schneider 1978; Garshelis *et al.* 1984). The interval between pups is typically 1 year.

Distribution

E. l. kenyoni, also known as the northern sea otter, has a range that extends from the Aleutian Islands in southwestern Alaska to the coast of the State of Washington; The southernmost extent of the range of *E. l. kenyoni* is in Washington state and British Columbia, and is the result of translocations of sea otters from Alaska between 1969 and 1972 (Jameson et al. 1982).

Three stocks of sea otters are recognized in Alaska: southwestern, southcentral and southeastern stocks (Figure 2). The southwest Alaska population ranges from Attu Island at the western end of Near Islands in the Aleutians, east to Kamishak Bay on the western side of lower Cook Inlet, and includes waters adjacent to the Aleutian Islands, the Alaska Peninsula, the Kodiak archipelago, and the Barren Islands (USFWS 2005).

Figure 2. Northern sea otter stocks in Alaska.



Movement Patterns

Movement patterns of sea otters have been influenced by the processes of natural population recolonization and the translocation of sea otters into former habitat. While sea otters have been known to make long distance movements up to 350 km (217 mi) over a relatively short period of time when translocated to new or vacant habitat (Ralls *et al.* 1992), the home ranges of sea otters in established populations are relatively small.

Once a population has become established and has reached equilibrium density within the habitat, movement of individual sea otters appears to be largely dictated by environmental and social factors, including gender, breeding status, age, climatic variables (*e.g.* weather, tidal state, season), and human disturbance. Home range and movement patterns of sea otters vary depending on the gender and breeding status of the otter. In the Aleutian Islands, breeding males remain for all or part of the year within the bounds of their breeding territory, which constitutes a length of coastline anywhere from 100 m (328 ft) to approximately 1 km (0.62 mi). Sexually mature females have home ranges of approximately 8–16 km (5–10 mi), which may include one or more male territories. Male sea otters that do not hold territories may move greater distances between resting and foraging areas than territorial males (Lensink 1962, Kenyon 1969, Riedman and Estes 1990, Estes and Tinker 1996). Juvenile males (1–2 years of age) are known to disperse later and for greater distances, up to 120 km (75 mi), from their natal (birth) area than 1-year-old females, for which the greatest distance traveled was 38 km (23.6 mi) (Garshelis and Garshelis 1984, Monnett and Rotterman 1988, Riedman and Estes 1990).

Sea otter movements are also influenced by local climatic conditions such as storm events, prevailing winds, and in some areas, tidal states. Sea otters tend to move to protected or sheltered waters (bays, inlets, or lees) during storm events or high winds. In calm weather conditions, sea otters may be encountered further from shore (Lensink

1962, Kenyon 1969). In the Commander Islands, Russia, weather, season, time of day, and human disturbance have been cited as factors that induce sea otter movement (Barabash-Nikiforov 1947, Barabash-Nikiforov *et al.* 1968).

Habitat

Sea otters generally occur in shallow water areas near the shoreline. They use waters less than 100 meters (m) (328 ft) in depth, and the majority of all foraging dives take place in waters less than 30m (98 ft) in depth (Bodkin *et al.* 2004). As water depth is generally correlated with distance to shore, sea otters typically inhabit waters within 1–2 km (0.62–1.24 mi) of shore (Riedman and Estes 1990).

Much of the marine habitat of the sea otter in southwest Alaska is characterized by a rocky substrate. In these areas, sea otters typically are concentrated between the shoreline and the outer limit of the kelp canopy (Riedman and Estes 1990), but can also occur further seaward. Sea otters also inhabit marine environments that have soft sediment substrates, such as Bristol Bay and the Kodiak archipelago. As communities of benthic invertebrates differ between rocky and soft sediment substrate areas, so do sea otter diets.

Food Habits

Sea otters are carnivores that primarily eat a wide variety of benthic (living in or on the sea floor) invertebrates, including sea urchins, clams, mussels, crabs, and octopus. In some parts of Alaska, sea otters also eat epibenthic (living upon the sea floor) fishes (Estes *et al.* 1982; Estes 1990).

Sea otters are considered a keystone species, strongly influencing the species composition and diversity of the nearshore marine environment they inhabit (Estes *et al.* 1978). For example, studies of subtidal communities in Alaska have demonstrated that, when sea otters are abundant, epibenthic herbivores such as sea urchins will be present at low densities whereas kelp, which is consumed by sea urchins, will flourish. Conversely, when sea otters are absent, grazing by abundant sea urchin populations creates areas of low kelp abundance, known as urchin barrens (Estes and Harrold 1988).

Population Dynamics

Population Size

<u>Aleutian Islands</u>
The first systematic, large-scale population surveys of sea otters in the Aleutian Islands were conducted from 1957 to 1965 by Kenyon (1969). The total unadjusted count for the entire Aleutian archipelago during the 1965 survey was 9,700 sea otters (Table 5). In 1965, sea otters were believed to have reached equilibrium densities throughout roughly one-third of the Aleutian archipelago, ranging from Adak Island in the east to Buldir Island in the west (Estes 1990). Islands in the other two-thirds of the archipelago had few

sea otters, and researchers expected additional population growth in the Aleutians to occur through range expansion.

From the mid-1960's to the mid- 1980's, otters expanded their range, and presumably their numbers as well, until they had recolonized all the major island groups in the Aleutians. Although the maximum size reached by the sea otter population is unknown, a habitat-based computer model estimates that the population in the late-1980s may have numbered approximately 74,000 individuals in the Aleutians (Burn et al. 2003). But in a 1992 aerial survey of the entire Aleutian archipelago, only 8,048 otters were counted (Evans et al. 1997); approximately 19% fewer than the total reported for the 1965 survey. Sea otter surveys conducted during the mid-1990s also indicated substantial declines at several islands in the western and central Aleutians (Estes et al. 1998).

In April 2000, 2,442 sea otters were counted; a 70% decline from the count 8 years previous (Doroff et al. 2003). Along the more than 5,000 km (3,107 miles) of shoreline surveyed, sea otter density was at a uniformly low level, which clearly indicated that sea otter abundance had declined throughout the archipelago. Doroff et al. (2003) calculated that the decline proceeded at an average rate of 17.5% per year in the Aleutians. In the summer of 2003, surveys indicated that the sea otter population declined by 63% at an estimated annual rate of 29% per year (Estes et al. 2005).

Alaska Peninsula

Three remnant colonies (at False Pass, Sandman Reefs, and Shumagin Islands) were believed to have existed near the western end of the Alaska Peninsula after commercial fur harvests ended in 1911 (Kenyon 1969). During surveys in the late 1950s and early 1960s, substantial numbers of sea otters were observed between Unimak Island and Amak Island (2,892 in 1965) on the north side of the Peninsula, and around Sanak Island and the Sandman reefs (1,186 in 1962), and the Shumagin Islands on the south side (1,352 in 1962) (Kenyon 1969). Schneider (1976) calculated an unadjusted population estimate of 11,681 sea otters on the north side of the Alaska Peninsula in 1976, which he believed to have been within the carrying capacity for that area. In 1986, an estimated 6,474–9,215 sea otters occurred in this area (Burn and Doroff 2005). In May 2000, an estimated 4,728 sea otters were counted on the north side of the Alaska Peninsula; a 27–49% decline from 1986 (Burn and Doroff 2005).

Estimates of sea otters occupying offshore areas on the south side of the Alaska Peninsula in 1986 (Brueggeman et al. 1988) are 13,900–17,500 (Burn and Doroff 2005). A replication of this 1986 survey route during April of 2001, suggested a 93% decline in abundance (Burn and Doroff 2005).

Several island groups along the south side of the Alaska Peninsula; Pavlof and Shumagin Islands, as well as Sanak, Caton, and Deer Islands were surveyed in 1962 (Kenyon 1969; 1,900 otters), in 1986, (Brueggeman et al. 1988; 2,122 otters) in 1989 (DeGange et al. 1995; 1,589 otters). There were approximately 16–28% fewer sea otters in 1995 than were reported in the earlier counts. This decrease was the first indication of a sea otter population decline in the area of the Alaska Peninsula. Sea otter counts were again

conducted in these island groups in 2001, and only 405 individuals were counted (Burn and Doroff 2005); an 81% decline from the 1986 count (Brueggeman et al. 1988).

In 1989, DeGange et al. (1995) counted 2,632 sea otters along the southern shoreline of the Alaska Peninsula from False Pass to Castle Cape. In a repeated survey of this route in 2001, 2,651 sea otters were counted (Burn and Doroff 2005), nearly the same as the 1989 count.

Table 5. Summary of Northern sea otter population surveys in southwest Alaska (USFWS 2005)

Survey area	Year	Count or Estimate	Source
Aleutian Islands	1965	9,700	Kenyon (1969)
	1992	8,048	Evans et al. (1997)
	2000	2,442	Doroff et al. (2003)
North Alaska Peninsula Offshore Areas	1976	11,681	Schneider (1976)
	* 1986	6,474 ± 2,003 (JUN) 9,215 ± 3,709 (AUG) 7,539 ± 2,103 (OCT)	Brueggeman et al. (1988) Burn and Doroff (2005)
	2000	4,728 ± 3,023 (MAY)	Burn and Doroff (2005)
South Alaska Peninsula Offshore Areas	* 1986	13,900 ± 6,456 (MAR) 14,042 ± 5,178 (JUN) 17,500 ± 5,768 (OCT)	Brueggeman et al. (1988), Burn and Doroff (2005).
	2001	1,005 ± 1,597 (APR)	Burn and Doroff (2005)
South Alaska Peninsula Islands	1962	2,195	Kenyon (1969)
	1986	2,122	Brueggeman et al. (1988)
	1989	1,589	DeGange et al. (1995)
	2001	405	Burn and Doroff (2005)
South Alaska Peninsula Shoreline	1989	2,632	DeGange et al. (195)
	2001	2,651	Burn and Doroff (2005)
Kodiak Archipelago	1989	13,526 ± 2,350	DeGange et al. (1995)
	1994	9,817 ± 5,169	Doroff et al. (in prep.)
	2001	5,893 ± 2,630	Doroff et al. (in prep.)
	2004	6,284 ± 1,807	Doroff et al. (in prep.)
Kamishak Bay	2002	6,918 ± 4,271	USGS in litt. (2002).

*Estimates recalculated by the Service (Burn and Doroff 2005) from original data of Brueggeman et al. (1988).

The results from the different survey areas along the Alaska Peninsula indicate various rates of change. Overall, the combined counts for the Peninsula have declined by 65–72% since the mid-1980s (Table 6). The result of an adjusted estimate of sea otter counts along the Alaska Peninsula is 19,821 as of 2001.

Kodiak Archipelago

One of the remnant sea otter colonies in southwest Alaska is thought to have occurred at the northern end of the Kodiak archipelago, near Shuyak Island. In 1959, Kenyon (1969) counted 395 sea otters in the Shuyak Island area. Over the next 30 years, the sea otter population in the Kodiak archipelago grew in numbers, and its range expanded southward around Afognak and Kodiak Islands (Schneider 1976, Simon-Jackson et al. 1984, Simon-Jackson et al. 1985). DeGange et al. (1995) surveyed the Kodiak archipelago in 1989 and calculated an adjusted population estimate of 13,526 sea otters. In 1994, there was an estimated 9,817 otters in the Kodiak archipelago (approximately 27% lower than in 1989 (Doroff et al. in prep.). A repeated survey conducted in 2001 suggested a 40% decline in from 1994 (5,893 sea otters; Doroff et al. prep.). In 2004 the population size of otters in the Kodiak archipelago is estimated at 6,284. The 2004 estimate is not significantly different from the 2001 estimate ($Z = 0.24$, $p = 0.81$; Doroff et al. in prep.).

Kamishak Bay

Kamishak Bay is located on the west side of lower Cook Inlet, north of Cape Douglas. In the summer of 2002, the U.S. Geological Survey (USGS), Biological Resources Discipline conducted an aerial survey of lower Cook Inlet and the Kenai Fiords area, in part to estimate sea otter abundance in Kamishak Bay. Sea otters were relatively abundant within Kamishak Bay during the 2002 survey (6,918 otters; USGS in litt. 2002), with numerous large rafts of sea otters observed.

Our current estimate of the size of the southwest Alaska population of the northern sea otter, which includes the 2004 estimate for the Kodiak archipelago, is 41,865 animals (Table 6). This estimate is based on range-wide survey information collected from 2000–2004, and is adjusted for animals not detected. As recent site-specific surveys indicate the decline has not abated in the Aleutian archipelago and south Alaska Peninsula study areas, it is possible that the current population size is actually lower.

Survey methods vary in different locations. Like survey efforts of most species, detection of all the individuals present is not always possible. Sea otters spend considerable time under water, and it is not possible to detect individuals that are below the surface at the time a survey is conducted. Also, observers do not always detect every individual present on the surface.

Table 6. Recent population estimates for the Northern sea otter in southwest Alaska (USFWS 2005)

Survey area	Year	Unadjusted count or estimate	Adjusted count or estimate	Reference
North Alaska Peninsula Offshore Areas	2000	4,728	11,253	Burn and Doroff (2005)
Aleutian Islands	2000	2,442	8,742	Doroff *et al.* (2003)
South Alaska Peninsula Offshore Areas	2001	1,005	2,392	Burn and Doroff (2005)
South Alaska Peninsula Shoreline	2001 a	2,190	5,212	Burn and Doroff (2005)
South Alaska Peninsula Islands	2001	405	964	Burn and Doroff (2005)
Unimak Island	2001	42	100	Burn and Doroff (2005)
Kodiak Archipelago	2004	-	6,284	Doroff *et al.* (in prep.).
Kamishak Bay	2002	-	6,918	USGS Unpublished data
Total			41,865	

Status and Distribution

Reasons for Listing

The definition of a threatened species is one that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Recent surveys conducted in 2003 and 2004 indicate that the population decline has not abated in several areas within southwest Alaska. If the decline continues at the observed rates, the

population may become extirpated throughout portions of its range within the next decade (Estes et al. 2005), at which point the DPS may be in danger of extinction.

The current distribution of sea otters is different in that they occur throughout their former range, but at extremely low densities in most areas. Otters are now absent, or nearly so at some of the smaller islands in the Aleutian archipelago to the point where it is possible that Allee effects (reduced productivity at low population densities) may occur (Estes et al. 2005).

Predation

The weight of evidence of available information suggests that predation by killer whales (*Orcinus orca*) may be the most likely cause of the sea otter decline in the Aleutian Islands (Estes et al. 1998). Data that support this hypothesis include: (1) A significant increase in the number of killer whale attacks on sea otters during the 1990s, (Hatfield et al. 1998); (2) the number of observed attacks fits expectations from computer models of killer whale energetics; (3) the scarcity of beachcast otter carcasses that would be expected if disease or starvation were occurring; and (4) markedly lower mortality rates between sea otters in a sheltered lagoon (where killer whales cannot go) as compared to an adjacent exposed bay.

The hypothesis that killer whales may be the principal cause of the sea otter decline suggests that there may have been significant changes in the Bering Sea ecosystem (Estes et al. 1998). For the past several decades, harbor seals (*Phoca vitulina*) and Steller sea lions (*Eumetopias jubatus*), the preferred prey species of transient, marine mammal eating killer whales, have been in decline throughout the western north Pacific. In 1990, Steller sea lions were listed as threatened under the Act (55 FR 49204). Estes et al. (1998) hypothesized that killer whales may have responded to declines in their preferred prey species, harbor seals and Steller sea lions, by broadening their prey base to include sea otters.

Subsistence Harvest

The best available scientific information does not indicate that the subsistence harvest has had a major impact on the southwest Alaska DPS of the northern sea otter. Some of the largest observed sea otter declines have occurred in areas where subsistence harvest is either nonexistent or extremely low. The majority of the subsistence harvest in southwest Alaska occurs in the Kodiak archipelago. Given the estimated population growth rate of 10 percent per year estimated for the Kodiak archipelago by Bodkin et al. (1999), we would expect that these harvest levels by themselves would not cause a population decline. Subsistence harvest has reportedly removed fewer than 1,400 sea otters from the southwest Alaska DPS since 1989 (average = 85/year; range = 24 to 180/year) CITATION.

Interaction with Commercial Fisheries

While there are some fisheries for benthic invertebrates in southwest Alaska, there is little competition for prey resources due to the limited overlap between the geographic distribution of sea otters and fishing effort. In addition, the total commercial catch of prey

species used by sea otters is relatively small (Funk 2003). Sea otters are sometimes taken incidentally in commercial fishing operations. Information from the NMFS list of fisheries indicates that entanglement leading to injury or death occurs infrequently in set net, trawl, and finfish pot fisheries within the range of the southwest Alaska DPS of the northern sea otter (67 FR 2410, January 17, 2002). During the summers of 1999 and 2000, NMFS conducted a marine mammal observer program in Cook Inlet for salmon drift and set net fisheries. No mortality or serious injury of sea otters was observed in either of these fisheries in Cook Inlet (Fadely and Merklein 2001). Similarly, preliminary results from an ongoing observer program for the Kodiak salmon set net fishery also report only four incidents of entanglement of sea otters, with no mortality or serious injury (Manly et al. 2003).

Commercial Over-utilization

Sea otters have rebounded from the estimated 1,000–2,000 individuals that were left after the cessation of commercial hunting (USFWS 2005). Following 170 years of commercial exploitation, sea otters were protected in 1911 under the International Fur Seal Treaty, which prohibited further hunting. As there is no commercial use of sea otters in the United States, and recreational, scientific, and educational use have been regulated under the MMPA of 1972.

Habitat

At present, no curtailment of range has occurred, as sea otters still persist throughout the range of the DPS, albeit at markedly reduced densities. There is no evidence to suggest that loss of habitat has been a contributing factor in the sea otter decline (USFWS 2005)

Research

Scientific research on sea otters occurs primarily as aerial and skiff surveys, and such surveys are conducted infrequently (once every few years). When they occur, they last for very short durations of time. During the 1990s, 198 otters were captured and released as part of health monitoring and radio telemetry studies at Adak and Amchitka (T. Tinker, University of California at Santa Cruz, in litt. 2003). In 2004, sea otters from the southwest Alaska DPS were captured as part of a multi-agency health monitoring study. All of the 60 otters captured in this study were released back into the wild (USFWS 2005).

Disease

Parasitic infection was identified as a cause of increased mortality of sea otters at Amchitka Island in 1951 (Rausch 1953). These highly pathogenic infestations were apparently the result of sea otters foraging on fish, combined with a weakened body condition brought about by nutritional stress. More recently, sea otters have been impacted by parasitic infections resulting from the consumption of fish waste. Necropsies of carcasses recovered in Orca Inlet, Prince William Sound, revealed that some otters in these areas had developed parasitic infections and fish bone impactions that contributed to their deaths (Ballachey et al. 2002, King et al. 2000).

Chronic Oiling

Traditional thinking that oil effects on sea otters is limited to short-term acute exposure of fur resulting in death from hypothermia, smothering, drowning, or ingestion of toxics during preening is being challenged. A growing body of evidence provides documentation that oil affects this species over the long term through interactions between natural environmental stressors and compromise the health of animals exposed to oil lingering well beyond the acute mortality phase (Peterson et al. 2003). The myriad studies that have been undertaken since the 1989 Exxon Valdez Oil Spill (EVOS) provide the most comprehensive data set correlating the effects to wild populations of long-term, low-level exposure to hydrocarbons. Documenting chronic effects of EVOS on sea otters is difficult due to lack of appropriate controls and natural variability among affected resources. However, until rigorous experimental control becomes feasible in assessing the impacts of unpredictable environmental perturbations, correlates will remain our best inferential tool.

Results of several studies support the hypothesis that oil persisting in habitat and prey continues to affect sea otter recovery in Prince William Sound as sublethal doses compromise health, reproduction and survival across generations. Sea otters consuming prey that occurs in habitats that serve as repositories for residual oil have a high potential to encounter subsurface oil while excavating prey from contaminated sediments. Because invertebrates do not metabolize hydrocarbons as do vertebrates, they accumulate hydrocarbon burdens in their tissues (Short and Harris 1996). Thus, sea otters are potentially exposed to residual oil through 2 pathways: physical contact with oil while digging for prey, and ingestion of contaminated prey.

Persistent exposure of sea otters to residual oil in western PWS has been confirmed. Several authors reported higher levels of P450 1A (CYP1A), a biomarker of exposure to aromatic hydrocarbons, in sea otters sampled from oiled areas of PWS compared to animals sampled from un-oiled areas (Ballachey et al. 2000a; Ballachey et al. 2000b; Bodkin et al. 2002).

Chronic exposure to oil may cause reduced productivity and reduce survival of young (Mazet et al. 2001). Similar body lengths of sea otters that attained adulthood prior to the spill suggests that food resources were approximately equivalent between the areas before the spill occurred and implies that factors other than body condition are affecting pup survival in western PWS (Ballachey et al. 2003).

Trans-generational effects may arise from direct interaction of a mutagen with the DNA of germinal cells or from selection or stochastic processes that result from living in a polluted environment, and can be expressed in populations long after removal of the causative contaminants (Bickham and Smolen 1994). Sea otters are long-lived with relatively low annual reproductive rates and high annual adult survival; factors that result in either reduced reproduction, increased mortality, or increased emigration, will eventually lead to depressed population growth rates (Riedman and Estes 1990). Finally, exposure to pollutants such as crude oil may affect sea otters at a variety of levels of organization, beginning with somatic or germinal cell mutations and leading to a cascade

of alterations that go beyond the individual or community to threaten the long-term survival of the population (Bickham et al. 2000, Clements 2000).

Range-Wide Trend

Historically, sea otters occurred throughout the coastal waters of the North Pacific Ocean from the northern Japanese archipelago around the north Pacific Rim to central Baja California, Mexico. Commercial hunting of sea otters began shortly after the Bering/Chirikof expedition to Alaska in 1741. Over the next 170 years, sea otters were hunted to the brink of extinction first by Russian, and later American, fur hunters. Prior to commercial exploitation, the worldwide population of sea otters was estimated at 150,000-300,000 animals (Kenyon 1969, Johnson 1982).

Sea otters were protected from further commercial harvests under the International Fur Seal Treaty of 1911. At that time, only 13 small remnant populations are believed to have persisted. The total worldwide population at that time may have been only 1,000-2,000 animals. Two of these remnant populations (Queen Charlotte Island and San Benito islands) declined to extinction (Kenyon 1969, Estes 1980). The remaining 11 populations began to grow in number, and expanded to recolonize much of the former range. Six of these remnant populations (Rat Islands, Delarof Islands, False Pass, Sandman Reefs, Shumagin Islands, and Kodiak Island) were located within the bounds of the southwest Alaska DPS. Because of the remote, pristine nature of southwest Alaska, these remnant populations grew rapidly during the first 50 years following protection from further commercial hunting.

The available survey data indicates that the sea otter population in southwest Alaska had grown in numbers and re-colonized much of its former range by the mid- to late-1980s. At that time, the sea otter population was believed to have numbered between 92,800 - 126,900 animals in southwest Alaska.

Recent survey data indicates that sea otters have suffered drastic population declines throughout much of southwest Alaska during the past 10-15 years. The current population appears to have declined by 60-70 percent.

Analysis of the Species Likely to be Affected

Steller’s Eider

In summary, decreasing numbers range wide, highly variable reproductive success, winter distribution patterns, suggested fidelity for wintering habitats, and known toxic effects to waterfowl from exposure to petroleum compounds all combine to make the Steller’s eider vulnerable to the effects of the proposed construction and operation of a harbor at LSA at Unalaska. Construction of a harbor at this location may adversely affect the Steller’s eider due to the release of petroleum products into the marine environment, likely resulting in reduced survivorship, direct mortality and subsequent population

declines. In addition, Steller's eiders are vulnerable to injury and mortality due to collisions with vessels and infrastructure associated with the new mooring basin.

Short-tailed Albatross

Based on the project description and considering that the harbor project is not expected to result in an increase in the number of vessels participating in the longline fisheries, we concur with your determination that the proposed action is not likely to adversely affect the short-tailed albatross. Therefore, this species will not be considered further in this Biological Opinion.

Northern Sea Otter

Sea otters occur in small numbers within the action area of the proposed project. Over a period of 3 years, a total of 7 sea otters were observed within the action area of the proposed small boat harbor. Although none were observed within the footprint or immediate area of the proposed project, three were observed in the vicinity of the existing small boat harbor, 3 more in the southern end of Iliuliuk Bay, and 1 on the western side of Amaknak Island (USFWS, unpublished data). Similarly small numbers were observed during summer surveys (Doug Burn, pers. comm.). The area is not believed to be used for pupping; in fact, sea otters may be avoiding the area due to high levels of vessel traffic and other human disturbance (Doug Burn, pers. comm.). Given our understanding of sea otter distribution and abundance in the proposed action area, we believe the redistribution of vessels is unlikely to result in more than an insignificant increase in exposure to petroleum compounds. Consequently, we concur with your determination that the proposed action is not likely to adversely affect the southwest Alaska DPS of the northern sea otter. Therefore, this species will not be considered further in this Biological Opinion.

ENVIRONMENTAL BASELINE

The "environmental baseline" section summarizes the effects of past and present human and natural phenomena on the current status of threatened and endangered species and their habitat in the action area. The information presented here establishes the baseline condition for natural resources, human usage, and species usage in the action area that will be used as a point of comparison for evaluating the effects of the proposed action.

Defining the action area of the proposed action is integral to analyzing the effects of past, present, and future actions as well as the proposed action. The action area should be determined based on consideration of all direct and indirect effects of the proposed action, and other activities that are interrelated or interdependent with that action, on the species and/or its critical habitat. Indirect effects are those that are caused by the proposed action and are later in time, but are reasonably certain to occur.

The south channel bridge presents a navigation obstacle to vessels with masts and vertical rigging exceeding 25 feet in height, functionally limiting vessel traffic south of the bridge

and around the southern tip of Amaknak Island. Increases in vessel traffic transiting these waters en route to the new harbor facilities are anticipated to occur as a result of the proposed action (USACOE 2003); thus, this increase in vessel traffic represents an action that is interrelated or interdependent with the construction of the proposed harbor. Consequently, the action area includes all areas that may be affected directly or indirectly by the activities associated with construction of the proposed harbor as well as those areas directly or indirectly affected by the increased vessel traffic around the southern tip of Amaknak Island and in the south channel. Potential direct and indirect effects of the proposed construction of a harbor at LSA include: degradation of habitat during construction, displacement of birds from habitat due to disturbance both during construction and operation, permanent loss of habitat due to construction, collisions with harbor-associated infrastructure, and acute and chronic exposure to petroleum compounds.

Assumptions Used in Analysis of Past, Present and Future Effects

Proportion of Wintering Birds from Listed Population

We are assuming that 1% of all Steller's eiders observed on the wintering grounds in Alaska are from the listed Alaska breeding population. This estimate is derived from an average of the three most recent spring migration surveys for a total population estimate of 79,721 birds (Larned 2005), and the assumed North Slope-breeding population of 500 ((500/79,721)100 = 0.63%).

Rate of Decline for Steller's Eider Populations Wintering in Alaska

For our analysis we are assuming that Steller's eider populations are and will continue to decline annually at a rate of 3.8%. This assumption is based on long-term survey data of migrating Steller's eiders (R^2 = 0.44; Larned 2005).

Patterns of Petroleum Releases

Patterns and conclusions suggested by Day's and Pritchard's (2000) summary of existing information on fuel spills in or near 10 harbors between January 1990 and November 1999 provide basis for the following assumptions regarding future patterns of petroleum releases within the action area.

Spill reporting during the 1990s revealed that the number of reported spills varied dramatically among locations. Spills were most often reported at larger harbors and boat moorages such as Akutan Harbor, Dutch Harbor/Unalaska, and St. Paul Island. In contrast, spills were rarely reported at locations such as Chignik Bay and Perryville; however, when they occurred they were substantial in size. Considering that an estimated 65% of petroleum released into marine waters is due to chronic discharges, and the remaining 35% to massive spills (Maccarone and Brzorad 1994), we assume that some underreporting occurs at all locations, that petroleum releases are reasonably certain

to occur, and that the volumes reported by Day and Pritchard (2000) are minimum estimates.

Both the number of spills and the amount of material spilled was greatest at the three harbors with greatest ship traffic (Akutan, Dutch Harbor/Unalaska, St. Paul Island); this led the authors to conclude that expansions to the 10 harbors included in the review would result in increased inputs of petroleum hydrocarbons. Consequently, we assume that projects that expand existing harbors or construct new harbors and that will result in an increase in vessel traffic in the action area will lead to an increase of petroleum releases into the environment.

Both the highest number of spills and the greatest amount of material spilled resulted first from operator error (49% of all spills with known cause) and second from equipment failure (34%). Additionally, most releases appeared to occur during refueling operations. Ninety-seven percent of all reported spills affected water. These facts led to the following three assumptions: first, that fueling stations represent a significant source of chronic petroleum contamination; second, that diesel and gasoline spills are likely to occur where refueling operations take place over water; and third, that improved fueling standards and institution of best management practices may decrease rates of product loss.

Comprising only 2% of all measured material spilled, bilge and waste oil was only a minor component of reported spills. However, it represented 6% of all spills of known type. Approximately 65% of petroleum released into waters is due to chronic dischrages, and the remaining 35% is due to massive spills. As a result, we assume that contaminated bilge water discharge represents a potential source of chronic exposure to petroleum compounds.

Diesel fuel accounted for 89% of all measured material spilled and 68% of all spills of known type; thus, we assume that diesel fuel will constitute the majority of material likely to be spilled at harbors and associated facilities.

The frequency of spills according to spill-size category, in descending order, was 1.1 to 15 gallons (42% of all spills), 15.1 – 499 gallons (30% of all spills), trace to 1 gallon (25% of all spills), and spills in excess of 499 gallons (1% of all spills). Therefore, we assume that large spills (spills in excess of 500 gallons) are rare and sporadic, and that most discharges will be less than 500 gallons.

Effect of Chronic Oiling on Steller's Eiders

Esler et al. (2002) found that during winter, harlequin duck survival was 5.4% lower in oiled areas of Prince William Sound compared to unoiled areas more than 6 years after the *Exxon Valdez* oil spill. They attributed these results to a divergence of survival probabilities during midwinter, the time period when the effects of oil are likely to be exacerbated by other stressors. Other studies document increased mortality rates in oiled waterfowl when they encounter environmental stress such as cold temperatures (Day and

Pritchard 2000). Lacking data to the contrary, we consider harlequin ducks, such as those studied by Esler et al. (2002), to be suitable surrogate species for Steller's eiders due to physiological and ecological similarities.

Lighter end petroleum compounds such as diesel are more acutely toxic than heavier end products such as crude oil, which is more chronically toxic. However, the hydrocarbons present in diesel are a lighter end subset of those present in crude oil. The more persistent components in diesel may, in fact, be similar to those remaining in Prince William Sound.

This information provides a basis for the following assumptions. First, we assume that the periodic releases of hydrocarbons from oiled beaches in Prince William Sound more than 10 years after the *Exxon Valdez* oil spill are similar in effect to periodic releases of hydrocarbons from fishing vessels and refueling spills. Second, we assume that the petroleum compounds to which Steller's eiders may be exposed due to spills from fishing vessels within harbors are of comparable toxicity to that of the persistent components of residual crude oil causing female harlequin duck mortality in Prince William Sound. Third, where chronic releases occur, we assume that Steller's eider survivorship is reduced annually by a maximum of 5.4% as a result of chronic exposure to petroleum contamination.

Boundaries of Action Area

Because the number of vessels is not expected to increase in the fishing areas from which fish are typically caught and delivered to Dutch Harbor (USACOE 2003), these areas are not included in the action area. However, the number of vessels traveling around the southern tip of Amaknak Island is expected to increase, thereby changing the spatial distribution of contaminants from a highly contaminated area (Dutch Harbor proper) to a less contaminated area (LSA project site and the south channel) (USACOE 2003). Consequently, a commensurate increase in releases of petroleum products into the marine environment is expected to occur.

In a 15-knot wind and water temperatures of 40 degrees Fahrenheit, only 35% of spilled diesel will evaporate in 4 hours, the duration of tidal movement between high and low tide. Sixty-five percent of the spilled fuel will remain through the entire cycle. Therefore, we assume that maximum potential drift of oil during one tidal cycle from contamination source defines the action area for this analysis. Maximum potential drift is determined by the following equation (John Whitney, NOAA, pers. comm.):

$$D_{nm} = (t_h(C_{nm/h} \pm (W_{nm/h} * 0.03)))$$

Where D_{nm}, the linear distance of the spill trajectory (in nautical miles), equals t_h, the duration of oil movement (assumed to be 4 hours) multiplied by the velocity of the oil (the velocity of the current ($C_{nm/h}$) plus/minus the velocity of the wind ($W_{nm/h}$) pushing the oil at the surface (assumed to be 3% of the wind speed)). Because 65% of spilled diesel will still be present after 4 hours, we consider this delineation of the action area to be conservative.

Life of the Project

We are assuming the life of the project is 50 years (USACOE 2003).

Population Modeling

To quantify effects of chronic oil exposure on Steller's eiders, we created a simple deterministic model using the following assumed inputs: 1) 1 % of the Steller's eiders in the wintering population belong to the Alaska breeding population; 2) the breeding population is declining at the same rate as the overall population (3.8% annually); 3) where chronic releases currently occur, Steller's eider survivorship is reduced annually by a maximum of 5.4% as a result of chronic exposure to petroleum contamination, and this baseline reduction in survivorship contributes to an unknown degree to the 3.8% annual decline estimated for the population; 4) an increase in the amount of petroleum released into the marine environment as a result of a proposed action represents a commensurate increase in the probability of harm due to chronic oiling and that this reduction factor is additive to the observed downward trend of the population; and, 5) the life of the project is 50 years.

The assumptions of a deterministic model are as follows: 1) there is no immigration or emigration in the population; 2) population growth rates (represented elsewhere by lambda) are linear and constant over time; 3) lambda is equally sensitive to changes in the survival rates of juveniles and adults (Morrison and Pollock 2000, Morrison et al. 1998); and, 4) lamda affects all age classes and both sexes similarly. It is likely that all of these assumptions are violated by our model.

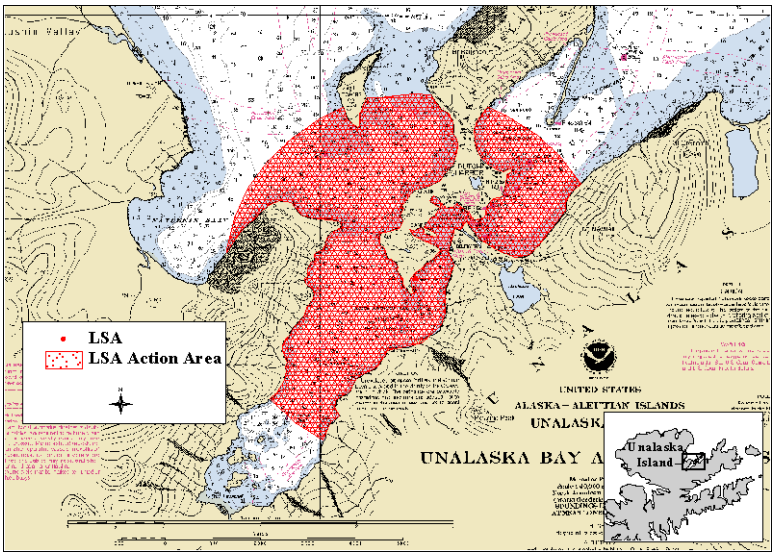
Determination of Action Area

Currents and prevailing winds must both be considered when determining the area at risk due to petroleum spills. Oceanographic information provided with the biological assessment indicates a maximum flood velocity of 0.39 cm/sec and a maximum ebb velocity of 1.2 cm/sec. Winds, which are influenced to some extent by local topography, are believed to be the primary force generating surface currents in Unalaska Bay. Winter winds predominate from the north and east, and are generally stronger than summer winds. Based on an average wind speed of 17 mph, and a maximum ebb velocity of 1.2 cm/sec (USACOE 2003), the maximum potential drift of oil during one tidal cycle in LSA would be 2.1 mi (1.8 nm).

$$[(4h(0.02684 \text{ mi/h} + (17 \text{ mi/h} * 0.03)))]$$

Therefore, the action area is comprised of the proposed harbor at LSA and all marine waters within a 1.8 nm radius of each (Figure 3).

Figure 3. Proposed LSA harbor action area, Unalaska.



Lacking data regarding the areal limits of the biologically relevant effects of contamination originating in harbors we assume that all suitable habitat within the action area will be contaminated by petroleum hydrocarbons released into the marine environment as a result of the new harbor at LSA.

Status of the Species Within the Action Area

Winter use of the marine waters of Unalaska Island by large numbers of Steller's eiders is well documented. Fairchild and Heer (U.S. Fish and Wildlife Service, Anchorage, Pers. Comm. 1997) described Steller's eiders as the most abundant species (total mean = 630) observed during three days of surveys in early March 1995. During these surveys, eider numbers were consistently high in the area southwest of the airstrip and along the northern shore of the area known as "Little South America," where numbers averaged 297, and peaked at 353. A high of 22 birds were observed in the proposed harbor site. The 2000 Christmas bird count recorded 388 Steller's eiders in this same area; in addition, 60 Steller's eiders were documented in the area proposed for harbor development.

In three surveys completed by foot around the southern end of Amaknak Island in January 2000, Steller's eiders made up 30% of all birds observed in the area. Of the approximately 600 Steller's eiders observed during surveys of the Unalaska area in February 2000, as many 134 (22%) used south Amaknak Island for feeding and loafing between November and May (Schroeder 2004).

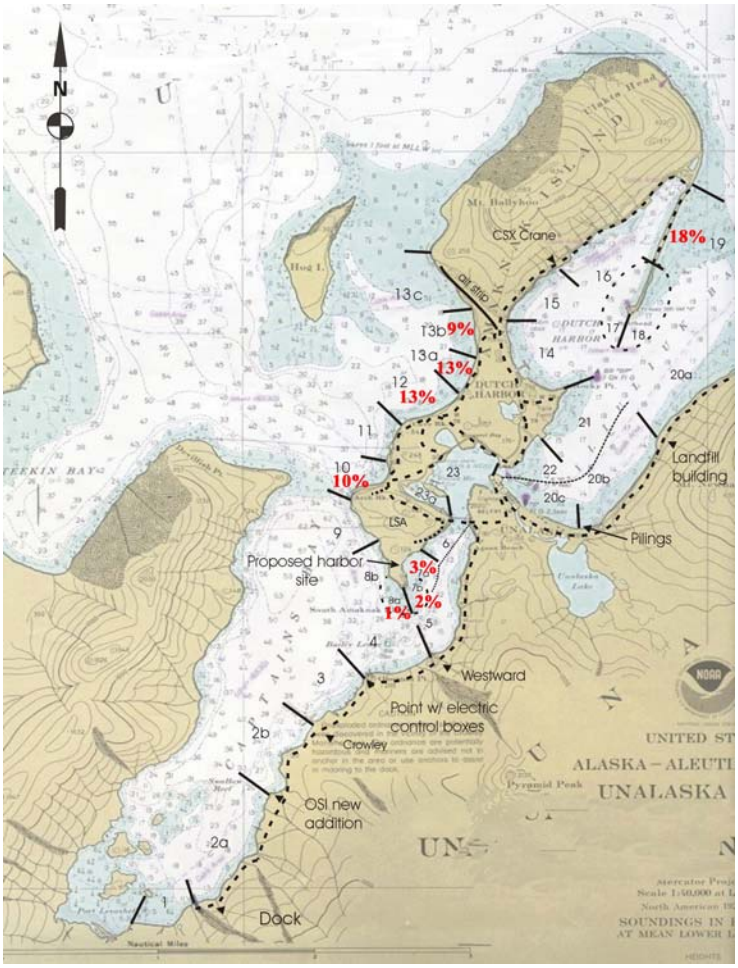
Road and boat surveys conducted between December and March over a period of 3 years (winters of 2001 through 2003) documented similar distribution patterns (USACOE 2001; USACOE 2002; USFWS 2003, unpublished data). During all three years, Steller's eider abundance peaked in February (892 in 2001; 1,175 in 2002; 701 in 2003); total estimates for the Dutch Harbor/Unalaska area ranged from 1 (April 12, 2002) to 1,175 (February 27, 2002). Numbers of Steller's eider documented within the action area for

the survey period are: 593 in 2001, 632 in 2002, and 588 in 2003. Reductions in overall numbers result from the exclusion of sector 19 observations. Distribution patterns were similar between years. While all sectors showed some use, sectors 10, 12, 13a, 13b, and 19 accounted for 64% of all observations (Figure 4). Three percent of all observations were made in the proposed harbor site (sector 7a), and sectors 7b and 8a (the southern tip of Amaknak Island) account for another 3% of all observations. Over the 3-year study period, as many 86 (February 27, 2002) and 270 (February 8, 2000) Steller's eiders were observed in the proposed harbor site and off the southern tip of Amaknak Island, respectively.

The Service conducted aerial shoreline surveys of areas in the vicinity of six proposed harbor projects including Dutch Harbor/Unalaska in 2000 (Larned 2000b). The total estimates for all project survey areas were 6,988 and 2,749 in February and March, respectively. On 8 February 2000, a total of 1,107 Steller's eiders were observed in the Dutch Harbor/Unalaska area, 1,061 (96%) of which were seen within the action area of the proposed project.

Data obtained from radio-tagged birds in the Unalaska area suggest that birds observed outside the action area may spend some portion of their time in habitats within the action area. In 2001, 6, 5, and 12 Steller's eiders were radio-tagged at the head of Captains Bay, LSA, and in the vicinity of outfalls on the north side of Amaknak Island, respectively. In 2002, 4 birds in LSA were radio-tagged. In 2001 birds moved routinely between LSA and Iliuliuk Bay, while the Captains Bay birds were never detected outside of the area where the flock was observed. Although birds marked in Captains Bay were not detected outside the bay during 2001, one individual that was originally banded in Captains Bay in 2001 was recaptured at LSA in 2002. This recapture suggests that movement between Captains Bay and other sites in the area does occur (Paul Flint, pers. comm., October 15, 2003).

Figure 4. Distribution of Steller's eiders 2001 – 2003. Expressed as percent of all observations of Steller's eider observed by sector.



We believe all birds within the action area are at risk of increased probability of exposure to petroleum compounds due to the proposed action. Based on the high estimate of 632 Steller's eiders in the LSA action area, we estimate that at least 6 (632*0.01) birds of the listed population are present in the action area of the proposed project.

Factors Affecting Species' Environment Within the Action Area

Seafood Processor Organic Waste

Past and present impacts to Steller's eiders resulting from the seafood industry infrastructure at Dutch Harbor/Unalaska may be associated with: 1) the degradation of habitat due to the release of organic waste into near shore marine waters; 2) the loss of gill nets in near shore waters; 3) the accidental release of fuels into the marine environment during refueling operations; 4) the accidental release of petroleum through the release of contaminated bilge water or from grounded/sunk vessels; and 5) collisions with lighted fishing vessels.

All observers report displacement of Steller's eiders from the areas in the vicinity of Unisea and Alyeska Seafoods outfalls when water is occluded with processor discharges.

Offshore winds disperse the plume more thoroughly and birds have been observed feeding in areas of clear water adjacent to the plume in these conditions (Chris Hoffman, pers. com. 23 January 2003). Service and USACOE personnel provided observations as to the aerial extent of occlusion during active discharges in their trip reports (USACOE 2001, USACOE 2002). Based on these observations, the Service estimated that approximately 58 and 132 acres of winter habitat have been degraded due to the release of organic waste into the near shore marine environment by Unisea and Alyeska Seafoods, respectively. Discharge from seafood processors may affect the water column, sea floor, or shore directly or indirectly through burial and smothering, putrification and decay, deoxygenation, nutrient loading and alteration of habitats, aquatic communities and food webs.

In Captains Bay, Westward currently discharges from a 150-foot multi-hole diffuser at depths between 50 and 60 feet approximately 0.25 mile offshore on Bailey's Ledge. EPA estimates that 95% of waste is at 85 feet or deeper (Burney Hill, EPA, pers. com.). No Steller's eiders have been observed in the vicinity of Westward's outfall terminus or resultant plume.

Petroleum Spills

Dutch Harbor/Unalaska has a long, and comparatively well-documented history of petroleum spills, both accidental and intentional. Four aboveground oil storage tanks near Rocky Point were destroyed when the facilities at Dutch Harbor were attacked during WWII. In addition, a large-scale intentional release of fuel in the area of the current Delta Western Dock area occurred in an effort to prevent a catastrophic fire in the event that these tanks were also hit (EPA 2000).

According to a summary by Day and Pritchard (2000) of existing information on releases of petroleum compounds in or near 10 harbors along the Alaska Peninsula and Aleutians, both the number of spills and the amount of material spilled is greatest at the three harbors involved in the Bering Sea bottom fish fishery, including Dutch Harbor/Unalaska. Over the 10-year study period, an estimated 74.2% (643/866 spills) of all spills occurred at Dutch Harbor/Unalaska; 35% (12,965.3/37,071.5 gallons) of the total volume of materials spilled was reported from Dutch Harbor/Unalaska. Between 1990 and 1999, a total of 12,965.3 gallons of petroleum products were spilled at Dutch Harbor/Unalaska in 643 separate spills. At 10,466.2 gallons, diesel accounts for 80.7% of all material spilled in Dutch Harbor/Unalaska, and 54% (349/643) of all spills there involved diesel. Data indicated that reported spills are a common event at Dutch Harbor/Unalaska, and the smallest mean diesel spill sizes (33 gallons) occur there. An average of 64.3 spills (all materials) occurred at Dutch Harbor/Unalaska annually over the 10-year study period. Operator error accounted for 49% of all spills of known cause in Dutch Harbor/Unalaska, and equipment failure accounted for 34%; average spill sizes due to operator error and equipment failure were 22.8 and 18.7 gallons, respectively.

Bilge and waste oil accounted for 5.3% (688.5 gallons) of all materials released in Dutch Harbor/Unalaska, and 79% (688.5/ 867.0) of all bilge and waste oil releases reported for

the study area occurred in Dutch Harbor/Unalaska. Other materials released in Dutch Harbor/Unalaska in incidents not directly attributable to refueling operations include hydraulic fluid (485.7 gallons) and lubricating oil (639.9 gallons).

Based on the historical record, Day and Pritchard (2000) estimated future amounts of releases of petroleum compounds in Dutch Harbor/Unalaska. Using the expected number of spills in each spill size category (0 - 1, 1.1 – 15, 15.1 – 499, >499 gallons), they predicted that approximately 3,537.1 gallons of petroleum products would be spilled in Dutch Harbor/Unalaska in an average year. We estimate that diesel will comprise 2,829 gallons of this total.

A review of Alaska Department of Environmental Conservation spill data through August 10, 2003 (ADEC, unpublished data) indicates 83 spills have been reported in Dutch Harbor/Unalaska since December 1999, 45 of which, or 54%, involved diesel. Of all spills of known cause, 56% were attributed to operator error (overfills), and 28% to equipment failure. A total of 3,391.5 gallons diesel was reported spilled during this time period with an average spill size of 75.4 gallons. An average of 14 spills were reported per year between 2000 and 2003. Between July 22 1995 and September 27 2003, 8 bilge oil spills totaling 939 gallons were spilled in the Dutch Harbor/Unalaska area. In addition to three bilge oil spills, gasoline, hydraulic oil, and an unknown substance were discharged within the confines of the small boat harbor between August 1 1995 and September 18 2001.

A similar DEC data set provided by the City of Unalaska on November 13, 2003 indicates that 79 spills have been reported in Dutch Harbor/Unalaska since December 1999, 45 of which, or 57%, involved diesel. Of all spills of known cause, 38% were attributed to operator error (overfills), and 24% to equipment failure. A total of 2,936 gallons diesel was reported spilled, with an average spill size of 65.2 gallons. An average of 13 spills were reported per year between 2000 and 2003. Between July 22 1995 and September 4 2003, 9 bilge oil spills totaling 941 gallons were reported in Dutch Harbor/Unalaska. Three bilge oil spills, 1 gasoline spill, 1 hydraulic fluid spill and 1 spill of an unidentified substance were reported for the small boat harbor.

The City of Unalaska also provided US Coast Guard spill data for the period between January 1 1999 and October 10 2003 (Figure 5). These data document 223 spills totaling 2,599.5 gallons, 82% (2,143 gallons) of which were diesel. Average spill size for the 156 reported diesel spills was 13.7 gallons. Diesel accounted for 89% (32/36 gallons) of all materials spilled at the small boat harbor; other materials reported included waste oil, gasoline, and asphalt).

In the Dutch Harbor/Unalaska area in 2000, the Environmental Protection Agency conducted a Superfund Technical Assessment to characterize potential sources and migration of contaminants. A total of 45 deep water sediment samples were collected throughout the area, 35 in Dutch Harbor proper, and 10 in other areas of concern including Iliuliuk Bay and Captains Bay (including 1 at LSA). The average levels of diesel range organics (DRO) measured were 318.8 mg/kg in Dutch Harbor, and 37.2

mg/kg for all other areas; DRO levels at the LSA harbor site were reported to be 14 mg/kg. Data suggest that the LSA harbor site has elevated levels of DRO compared to the background (English Bay) level of 7.9 mg/kg. This is to be expected given the proximity of LSA to Dutch Harbor, a highly contaminated site, and the presence of some level of vessel traffic in the area.

Although we lack empirical evidence of the direct and indirect effects of baseline contamination by hydrocarbons on Steller's eiders in Dutch Harbor/Unalaska, the EPA START report provides a basis for estimating relative exposure levels. Based on the data available, we are assuming that Dutch Harbor proper represents a worst-case scenario, and birds utilizing this area would experience a reduction in survivorship of 5.4%. Birds in all other areas combined are exposed to DRO levels 11.7% ((37.2/318.8)*100) of those reported for Dutch Harbor. Consequently, we are assuming that survivorship of birds in all other areas is reduced by 0.63% ((0.117*0.054)*100). Both of these baseline reductions in survivorship are believed to contribute, to an unknown degree, to the 3.8% annual population decline.

Figure 5. Distribution USCG reported spills, January 7 1999 to October 8 2003.

REPORTED SPILLS 1999 -OCT. 2003
SUMMER BAY ANCHORAGE
1 INCIDENT
1 GAL.
TRIDENT SEAFOODS
4 INCIDENTS
10 GAL.
NORTH PACIFIC FUEL
2 INCIDENTS
11 GAL.
WESTERN PIONEER
6 INCIDENTS
37 GAL.
SPIT DOCK
13 INCIDENTS
145 GAL. (5 UNKNOWN)
MAGONE MARINE
2 INCIDENTS
6 GAL.
UMC
9 INCIDENTS
192 GAL. (2 UNKNOWN)
ILIULIUK BAY (general)
17 INCIDENTS
185.5 GAL. (3 UNKNOWN)
NORTH PACIFIC FUEL
3 INCIDENTS
2 GAL. (1 UNKNOWN)
HOG ISLAND ANCHORAGE
1 INCIDENTS
20 GAL.
DELTA WESTERN
37 INCIDENTS
242 GAL. (6 UNKNOWN)
ROYAL ALEUTIAN SEAFOODS
5 INCIDENTS
41 GAL.
SMALL BOAT HARBOR
9 INCIDENTS
36 GAL.
(2 UNKNOWN)
ALYESKA SEAFOODS
4 INCIDENTS
99 GAL.
UNISEA
27 INCIDENTS
283.5 GAL.
(2 UNKNOWN)
CAPTAINS BAY (general)
17 INCIDENTS
271.5 GAL. (1 UNKNOWN)
ANCHORAGE-CAPTAINS BAY
1 INCIDENT
3 GAL.
WESTWARD SEAFOODS
15 INCIDENTS
185.5 GAL. (2 UNKNOWN)
NORTH PACIFIC FUEL
15 INCIDENTS
408 GAL.
CROWLEY
4 INCIDENTS
22 GAL.
OSI
32 INCIDENTS
418.5 GAL.
(3 UNKNOWN)
LEGEND: LOCATION OF SPILL
INCIDENTS TOTAL REPORT PERIOD
GALLONS TOTAL REPORT PERIOD
(# UNKNOWN) =SPILL REPORTED;AMOUNT UNKNOWN
223 INCIDENTS TOTAL REPORT PERIOD
2599.5 GALLONS TOTAL REPORT PERIOD
(27 UNKNOWN) = TOTAL REPORT PERIOD
Spill information courtesy of USCG.
Please note the spill information portrayed
is based upon spill reports made to the USCG.

Collisions with Vessels and Harbor-Related Structures

See "Life History – New Threats" for a discussion of the potential for Steller's eiders to collide with lighted vessels and harbor infrastructure.

Incidental Take from Other Federal Actions

Take resulting from other federal actions that have already undergone section 7 consultation is 66 Steller's eiders or 1 listed bird (66*0.01) per year. This represents about 0.2% (1/500) of the Alaska breeding population (Table 7). When this additional level of take is incorporated into our population model in an additive fashion to the current annual decline of 3.8% range wide, functional extinction (125 birds) is reached by year 34, approximately 1 year prior to that predicted by a 3.8% annual decline alone.

Table 7. Take of Steller's eiders anticipated from other federal actions for which formal Section 7 consultation has been completed.

ACTION	REFERENCE	PROJECT LIFE	TAKE TYPE	TAKE TOTAL	TAKE YEARLY
False Pass Harbor	USFWS 2000	50	Petroleum-sublethal	146	2.9
NPDES-GP	USFWS 2000a	5	Strikes-lethal	33	6.6
Chignik Lagoon Tank Farm	USFWS 2001	40	Petroleum-sublethal	264	6.6
Sandpoint Harbor	USFWS 2002	50	Strikes-lethal	30	6
			Petroleum-sublethal	367	7.3
			Displacement	30	0.6
Chignik Dock	USFWS 2002a	35	Petroleum-sublethal	150	4.3
Chignik Tank Farm	USFWS 2002b	30	Petroleum	170	5.7
Fairweather	USFWS 2003		Disturbance	1570	
Nelson Lagoon Tank Farm	USFWS 2003a	40	Petroleum	476	11.9
			Strikes	24	0.6
Spring Subsistence	USFWS 2003b	annually	Lethal	7	7
Akutan Mooring Basin	USFWS 2003c	50	Petroleum-sublethal	200	4
		50	Strikes-lethal	24	0.5

Research		annually	Lethal	2	2
TOTAL					**66**

EFFECTS OF THE ACTION

"Effects of the action" refers to the direct and indirect effects of the action on the species or its critical habitat. The effects of the action will be evaluated together with the effects of other activities that are interrelated or interdependent with the action. These effects will then be added to the environmental baseline in determining the proposed action's effects to the species or its critical habitat (50 CFR Part 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

Factors to be Considered

The probability of Steller's eiders being taken or harmed as a result of the construction of the harbor at LSA is a function of many factors, including: temporal and spatial overlap of Steller's eider distribution with the area affected by disturbances associated with harbor construction and operation, the nature and duration of effects, and the frequency, intensity, and severity of disturbances.

Temporal and Spatial Overlap

At least 632 Steller's eiders, and their winter foraging and resting habitat, occur within the action area of the proposed project. No designated critical habitat is located within the action area of the proposed project.

Within the action area, distribution of disturbances resulting from the proposed activities may be localized, as in the direct loss of foraging habitat, or may be diffuse resulting from the dispersal of oil in an area that heretofore has been relatively uncontaminated.

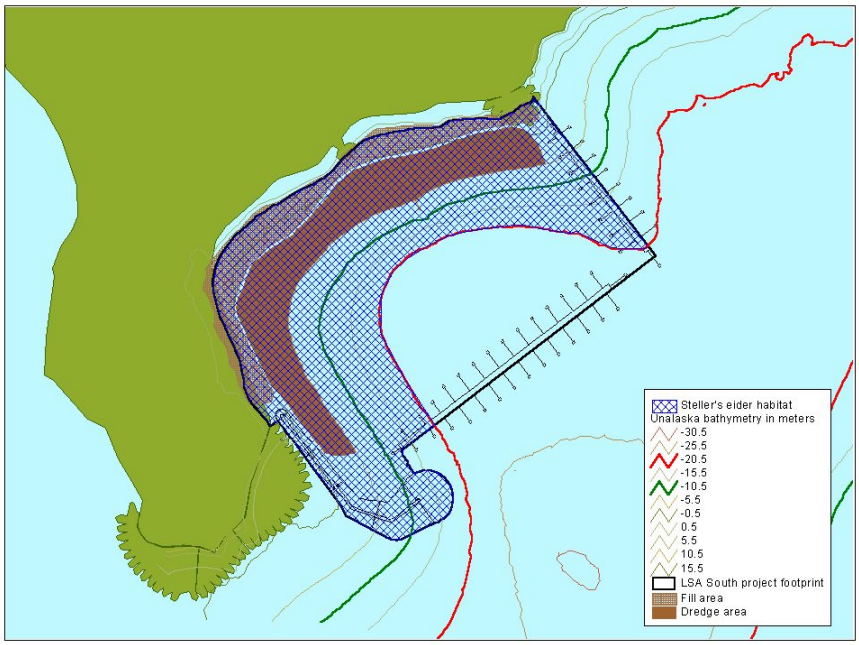
Steller's eiders are not present in the action area during the summer when construction of the proposed harbor is anticipated to occur. However, once completed, the new harbor will be operated while Steller's eiders are present (November through March). According to the "LSA Harbor Discussion Paper" (City of Unalaska web site) moorage space is at a premium during November and December, and vessel traffic is heavy and rafting occurs during the months of January, February and March, all months when large numbers of Steller's eiders have been observed in the area. The resulting temporal and spatial overlap between Steller's eider use of the area and periods of high vessel activity and moorage places the species at elevated risk of harm due to accidental fuel releases.

Nature and Duration of Effects

Potential direct and indirect effects of the proposed action considered in this Biological Opinion include: direct and permanent loss of habitat, displacement from foraging habitat through disturbance, degradation of foraging habitat and reduced survivorship due to exposure to petroleum compounds, and injury or mortality resulting from collisions with vessels or infrastructure associated with the new mooring basin.

Construction of the harbor will result in the direct loss of approximately 17 acres of habitat (nearshore habitat in waters less than 20 meters deep) (Figure 6). As many as 86 Steller's eiders have been observed in this area. The presence of eiders in an area is an indication of eider habitat whether it is used for feeding, resting, or sheltering. The loss of habitat due to construction of the harbor is anticipated to be permanent.

Figure 6. Steller's eider winter habitat within the project footprint.



Evidence suggests that Steller's eiders exhibit high wintering site fidelity (Philip Martin, Service, pers. comm.; Paul Flint, USGS, pers. comm.). Eiders displaced from foraging habitat by disturbance may not be able to relocate to alternative foraging areas of sufficient quality if these areas are limited in availability.

The potential for petroleum to adversely affect Steller's eiders represents a chronic event that is anticipated to exist for as long as the harbor is in operation (50-year project life). The accidental release of petroleum into the habitat of Steller's eiders may have both an immediate and lingering adverse effect. The oiling of a bird may result in sickness or death, depending on the degree of exposure. Petroleum products released into the marine environment can also have adverse effects that last from several months to several years. Anticipated adverse effects range from changes in prey abundance, distribution, and diversity, to the ingestion of chronic toxic levels of petroleum.

Disturbance Frequency, Intensity and Severity

According to Day and Pritchard (2000), an average of 34.9 diesel spills (average size 33 gallons) per year were reported for Dutch Harbor/Unalaska in the 1990s. Data on vessel traffic levels and corresponding spill rates are not available; however, release of petroleum products into the marine environment via contaminated bilge water is believed to be a chronic source of contamination. We have limited information on Steller's eiders recovery rate. However, decreasing numbers range wide and poor overall productivity suggest this species may be highly sensitive to frequent disturbances.

The intensity of the disturbance is a function of the species' status both before and after the disturbance. Currently, limited information makes effects resulting from habitat degradation or physiological effects of chronic exposure to oil difficult to quantify and predict. Acute effects resulting from direct external contact with oil can be more easily estimated by the application of spill trajectory analysis and known eider distribution; predictions of these events may be based on historical data. The gregarious behavior of Steller's eiders may result in large numbers of birds being affected by relatively small spills.

The severity of the disturbance is a function of the species' recovery rate. Any disturbance event that affects the species' ability to recover through decreased reproductive potential would be considered severe. Not only do Steller's eiders show high fidelity for specific molting sites within lagoons (Flint et al. 2000), but preliminary evidence also suggests that Steller's eiders show high within-season wintering site fidelity (Philip Martin, FWS, pers. comm., Paul Flint, USGS, pers. comm.). Such life history characteristics place Steller's eiders at increased risk of chronic and acute exposure to petroleum compounds where their wintering habitat and industrial developments overlap.

Once oiled, feathers lose their water repellency, reducing the ability of eiders to maintain body heat. Immune defenses, survival and almost all aspects of reproduction may be affected by the ingestion of petroleum, either while preening or through consumption of contaminated food resources. Moreover, the availability of prey may be reduced by the introduction of petroleum products into the marine environment.

Analyses for Effects of the Action

This section analyses the direct and indirect effects of the proposed and all interrelated and interdependent actions identified in the Environmental Baseline section. This includes a discussion of any beneficial effects anticipated to occur as a result of the proposed action.

Interrelated and Interdependent Actions

Although no net increase in the number of vessels in the greater Dutch Harbor/Unalaska area is anticipated, the number of vessels transiting the waters on the northwest side of

Amaknak Island, around the southern tip of Amaknak Island, and the south channel on an annual basis is expected to increase (USACOE 2003).

Direct Effects

The construction of the harbor will result in a permanent loss of approximately 17 acres of habitat known to be used by wintering Steller's eiders, and which may also be used by transient and migrating Steller's eiders. The effects of displacement on wintering Steller's eiders in Alaska have not been investigated. However, over-winter starvation resulting from displacement from feeding areas is thought to be a contributing factor to mass mortality of common eiders in the Wadden Sea (Camphuysen 2000). Thus, eiders displaced by habitat destruction resulting from harbor construction may not be able to simply relocate without being harmed. Because the action will result in the direct loss of foraging habitat known to support up to 86 Steller's eiders, **it is estimated that one Steller's eiders belonging to the listed Alaska breeding population will be taken in this manner**.

Indirect Effects

<u>Collisions with Lighted Vessels and Harbor-Related Structures</u>
Anecdotal evidence that eiders and other sea ducks may become disoriented and strike vessels and other lighted structures in adverse weather conditions supports the assumption that Steller's eiders wintering in close proximity to the proposed mooring basin and related facilities and to areas likely to be used by vessels seeking safe temporary moorage in the harbor are at increased risk of similar collisions. **It is estimated that one Steller's eider belonging to the listed Alaska breeding population will be injured or killed in this manner over the 50-year life of the project.**

<u>Acute and Chronic Exposure to Petroleum Compounds</u>
The construction of a harbor at LSA is expected to reduce the risk of catastrophic spills by providing safe moorage, thereby reducing the probability of harm due to acute exposure to bulk releases. However, the resultant spatial redistribution of vessel traffic and moorage is also expected to increase the risk of petroleum releases in an area currently not exposed to spillage. The principal indirect effect of this redistribution of contaminants in the marine environment is the contamination of benthic food resources in the action area. Additional contaminants which may be expected to be released into the marine environment as a result of the presence of these vessels include: copper from anti-fouling paints, sacrificial anodes on vessels and other protectively coated marine hardware, lead from boat batteries, engine exhaust products, cleaning agents, and grey water from holding tanks. It is known that petroleum products released into the marine environment cause adverse effects on eiders (Stout 1998), other marine birds (Yamato et al. 1996; Trust et al. 2000; Esler et al. 2002; Custer et al. 2000) and their prey (Glegg et al. 1999), and that those effects can remain for years (Hayes and Michel 1999).

Determining the Increase in Vessel Traffic in Northern Captains Bay: The south channel bridge presents a navigation obstacle to vessels with masts and vertical rigging exceeding

25 feet in height, heretofore limiting vessel traffic south of the bridge and around the southern tip of Amaknak Island primarily to those vessels that can pass under the bridge. The maximum vessel size estimated to be capable of navigating under the bridge is 32 feet in length (Scott Brown, Harbor Master, Dutch Harbor, pers. comm., October 9, 2003). All of the 75 vessels to be accommodated at LSA are anticipated to be ≥32 feet in length (USACOE data, October 13, 2003). Therefore, the construction of a harbor at LSA is anticipated to result in an increase of 75 vessels traveling around the southern tip of Amaknak Island. The current fleet of vessels ≤32 feet is estimated to be 160 (80 vessels with moorage, 40 waitlisted vessels, and 40 vessels on trailers) (Alvin Osterback, Port Director, Dutch Harbor, pers. comm., October 14, 2003). It is assumed that these vessels currently traverse the waters of the south channel and northern Captains Bay. Thus, it is estimated that the construction of a harbor at LSA will result in a 47% (75/160) increase in the number of vessels traveling these waters, and consequently we conservatively estimate a 47% increase in the probability of harm due to chronic oiling.

Determining Effects of Increased Vessel Traffic in Northern Captains Bay: To model the potential effects of chronic oiling resulting from increased vessel traffic in Northern Captains Bay, we estimated the number of eiders likely to be harmed due to a 47% increase in vessel traffic (Appendix I). In our discussion of baseline conditions we estimated that birds in the action area currently experience a 0.63% reduction in survivorship due to existing levels of contaminant exposure in the marine environment. To determine the effects of the proposed action, we increased the baseline reduction factor of 0.63% by 47%, the anticipated increase in vessel traffic in northern Captains Bay. A reduction in survivorship of 0.3% was applied in an additive fashion to the assumed overall population decline of 3.8% annually. We used 632 to represent the number of Steller's eiders in the action area in year one of the model. **Based on the calculations using these assumptions, we estimate that at least 1 Steller's eider of the listed entity will be at risk of harm or death due to chronic exposure to petroleum as a result of this project.**

Species' Response to Proposed Action

Numbers of Individuals in the Action Area Affected

Limited surveys indicated that at least 632 Steller's eiders use waters within the action area that is likely to be affected by the proposed project. Current winter population estimates do not include birds that occur here during spring and fall migration. Thus, it is unlikely that our limited observations represent the maximum number of eiders that use Dutch Harbor/Unalaska. Steller's eiders at Unalaska represent 1% of the Alaska population of Steller's eiders. This value was derived by dividing the maximum number of birds seen within the action area that are believed to be from the Alaska population (632*0.01=6.32) by the most current population estimate for the Alaskan population of this species (500).

Sensitivity to Change

Steller's eiders' behavior changes with changing environmental conditions. They have been observed foraging in close proximity to human structures, including docks, and habitation. However, it has also been reported that they maintain a distance of at least 100 meters from humans themselves. We do not anticipate total abandonment of areas due to the physical presence of structures associated with the proposed project, but anticipate some level of disturbance due to the human activity associated with the proposed project.

Resilience

Little information exists regarding the resilience of this species to perturbations. The world population of Steller's eider has declined by 90%; from 1,000,000 in the 1940s, (Tugarinov 1941 as in Solovieva 1997) to 200,000 in 1994, (Solovieva 1997) to about 104,000 in 2003 (Atlantic and Pacific populations combined). Extensive banding efforts and aerial survey efforts over the past decade indicate that the trend for the world population continues to be negative (Flint et al. 2000, Larned 2000b). Lack of resilience due to low fecundity, low recruitment, high breeding adult mortality, and other unknown causes may be contributing to their continued decline.

Recovery Rate

The natural recovery rate of Steller's eiders is not known. Long-lived species with low annual fecundity have a relatively slow recovery rate compared to short-lived species with high annual fecundity. Given the Steller's eider's observed low fecundity (i.e., small clutch sizes, high variability in nesting attempts, and generally low nest success) (Quakenbush et al. 1995, D. Solovieva pers. com. 2000), the recovery rate for this species is believed to be quite slow.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

According to the City of Unalaska's LSA Harbor Work Plan (LSA Harbor Discussion Paper, page 2; City of Unalaska Web Page), the LSA site is preferred due to availability of uplands which would allow for expansion of facilities and services including: short- and long-term parking, bathrooms, showers, laudromat, warehousing, gear and pot storage, boat haulout and dry docking, icehouse, and pumpout stations for oil and other wastes. The City of Unalaska would likely expand utility and other services to the harbor. Although most development is anticipated to occur on upland areas, some

developments may affect Steller's eiders, particularly fueling stations, seafood processing facilities, expansion of community infrastructure, and any activities directly impacting intertidal habitats such as the proposed airport access road. Affects to eiders from these projects may include direct habitat loss, increased risk of acute and chronic exposure to environmental contaminants, increased risk of bird strikes, and habitat degradation. Additionally, activities that increase foot traffic access to nearshore environments may result in displacement of Steller's eiders from foraging habitat.

CONCLUSION

This Biological Opinion assesses the effects of the construction of a new harbor at the LSA site at Unalaska on the Steller's eider. Based on this effects analysis and an analysis of the cumulative effects, the Service determines whether this proposed action is likely to jeopardize the continued existence of this species, or destroy or adversely modify designated critical habitat. A conclusion of "jeopardy" for an action would mean that the action could reasonably be expected to reduce appreciably the likelihood of both the survival and recovery of the Steller's eider. A conclusion of "adverse modification" would mean that the action could reasonably be expected to appreciably diminish the value of critical habitat for both the survival and recovery of this species.

Summary

The Steller's eider Alaska-breeding population is thought to number in the dozens or low hundreds on the Arctic Coastal Plain, and possibly tens on the Yukon-Kuskokwim Delta. The best available information leads the Service to estimate that roughly 500 Steller's eiders occupy the North Slope in most years. The high degree of variability in aerial survey data makes detecting anything but the most dramatic trends in the breeding population difficult. The Steller's eider is a relatively long-lived, periodic non-breeder with low and variable nest success, low duckling survival, poor overall productivity, and variable but low annual recruitment. Reproductive parameters estimated from birds breeding in the Barrow area appear insufficient to maintain the population.

The world population of Steller's eider has declined by 90%; from 1,000,000 in the 1940s, (Tugarinov 1941 as in Solovieva 1997) to 200,000 in 1994, (Solovieva 1997) to about 104,000 in 2003 (Atlantic and Pacific populations combined). The Pacific population of Steller's eiders likely numbers 50,000 to 60,000 Populations of Steller's eiders molting and wintering along the Alaska Peninsula have declined since the 1960's. At 79,022, the 2005 Pacific population estimate by Larned et al. (2005) was lower than the long-term average of 84,458. Long term spring survey data suggests a 3.8% annual decline in migrating Steller's eiders, and banding data from 1975 -1981 and 1991-1997 indicates a reduction in Steller's eider survival over time. At this rate of decline, the Steller's eider Alaska breeding population is projected by a simple deterministic population model to reach functional extinction (125 birds) in 35 years.

Take resulting from other federal actions that have already undergone section 7 consultation is 66 Steller's eiders or 1 listed bird (66*0.01) per year. This represents about 0.2% (1/500) of the Alaska breeding population. When this additional level of take is incorporated into our population model in an additive fashion to the current annual decline of 3.8% range wide, functional extinction (125 birds) is reached by year 34, approximately 1 year prior to that predicted by a 3.8% annual decline alone.

Take as a result of the construction of a harbor at LSA is estimated to be 1 listed Steller's eiders due to chronic exposure to petroleum compounds and 1 due to collision with harbor infrastructure. This represents approximately 0.4% (2/500) of the Alaska breeding population, and when amortized over the life of the project represents an additional 0.008% annual decline in the listed population. When modeled, this level of take does not appear to accelerate functional extinction over the baseline model (Figure 7) (Appendix II).

Conclusion

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, and is not likely to destroy or adversely modify designated critical habitat. This conclusion is based on the following factors; a discussion of the limitations of our conclusions is also included.

Although long-term data indicate a 3.8% annual decline, several assumptions fundamental to this survey design are likely violated, thereby confounding interpretation of the data. Steller's eiders that begin migration early may have departed the spring survey area prior to commencement of the survey. This situation would violate the assumption that all of the Pacific wintering population is within the survey area during the survey. Furthermore, movements by satellite transmitter-tagged birds during the survey in 2002 suggest that major migrational shifts may occur during the spring survey, violating the assumption that all Steller's eiders remain stationary on staging areas during the survey period and are not missed or double counted. Finally, the tendency for observers to progressively underestimate the size of increasingly large flocks may actually result in an underestimate of the rate of eider decline (i.e. the number of birds in large flocks were likely underestimated, but as birds become fewer and flocks become smaller, estimation of flock size may become more accurate; the actual rate of decline in this scenario would be greater than the reported rate of decline). For these reasons, reported changes in Steller's eider numbers as indicated by the spring survey may not be accurate.

Trends in fall counts of Steller's eiders at Izembek Lagoon collected during emperor goose surveys are contradictory to the spring migration counts (ABR 1998). While numbers of Steller's eiders observed during this survey declined from 1981 to 1991, they have shown an increasing trend since 1991. However, these data must be interpreted with caution. This survey was designed and is flown to maximize the number of emperor

geese encountered. Recording the abundance of Steller's eiders is an ancillary objective of this survey. Surveyors follow a flight route that maximizes the number of emperor goose that they see, attempting to arrive at emperor goose concentrations during high tides. Such flight paths and survey timing do not maximize the numbers of Steller's eiders encountered. Furthermore, it is possible that survey effort directed towards counting Steller's eiders changed over time as interest in this species increased (Robert Stehn, Migratory Bird Management, Anchorage, pers. comm. 2003). Surveys that result in population indices become problematic when effort changes over time. Thus, we acknowledge the existence of this data set that shows an increase in Steller's eider numbers at Izembek Lagoon over time, but choose to dismiss it as an indicator of overall population trend.

The breeding population of Steller's eiders in northern Alaska is estimated to number about 500. However, the imprecision of our breeding ground estimates precludes us from detecting any but the most obvious population trends for the listed entity. Populations may be overestimated due to the periodic presence of local non-breeders in non-nesting years, or may be underestimated due to observer bias. Our understanding of Steller's eider productivity is limited to reproductive parameters estimated for the breeding population near Barrow, which may not be representative of Steller's eider breeding success throughout their range in Alaska.

Uncertainties surrounding population sizes and trends, and overall productivity undermine our ability to confidently detect appreciable changes in probability of recovery and survival due to the proposed action. When modeled, the effects of the action did not appreciably decrease the time to functional extinction. Therefore, we do not reasonably expect that the continued incremental take of listed Steller's eiders resulting from this action will, directly or indirectly, reduce appreciably the likelihood of both survival and recovery of the species in the wild.

Deterministic modeling is an extreme simplification of reality that predicts one outcome based on the initial conditions of the model. Furthermore, deterministic models do not reflect the role of chance or provide confidence intervals on the results. We lack the information necessary to develop a more predictive stochastic model.

Uncertainties surrounding population sizes and trends, and overall productivity also undermine our ability to determine whether this listed entity is in jeopardy. Deficiencies in our information include: 1) a lack of information on the rate of immigration of individuals from the Russian breeding population to the Alaska breeding population; 2) projection of population decline based on the results of a (spring) survey that is not optimally designed to detect trends in this species; 3) use of a simple deterministic model that does not take into account stochasticity or the tendency of Steller's eiders to breed intermittently; and 4) the assumption that subsistence harvest will remain constant through time. Within the framework of these limitations, our best available information suggests that the Alaska breeding Steller's eiders will undergo extirpation in 34 years due to preexisting baseline conditions.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "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. Under the terms of section 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the USACOE so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The USACOE has a continuing duty to regulate the activity covered by this incidental take statement. If the USACOE (1) fails to assume and implement the terms and conditions or (2) fails to require any applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the USACOE or any applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

Amount or Extent of Take

We anticipate that incidental take of Steller's eiders will be difficult to document because: 1) Steller's eiders exposed to petroleum levels that are not immediately lethal may not die near the location of contact; 2) Steller's eiders exposed to sub-lethal levels of petroleum will not exhibit readily apparent signs of toxicity; 3) impacts to prey abundance and distribution from released petroleum products will not be readily apparent; 4) the extent to which petroleum contamination can be attributed to the proposed action will be difficult or impossible to determine, and 5) the actual number of Steller's eiders belonging to the Alaska breeding population at this site is unknown.

The Service will not refer the incidental take of any migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712) if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

Take Related to Harbor Construction

The Service expects that construction of the harbor will result in take due to permanent loss of approximately 17 acres of habitat known to be used by wintering Steller's eiders. **The take of one listed Steller's eider is expected to be in the form of harm resulting from the permanent loss of foraging and resting winter habitat because harbor construction will substantially alter or destroy the biota in this area that is currently used by eiders**.

Take Related to Acute and Chronic Exposure to Petroleum Compounds

The Service anticipates that petroleum releases will occur in association with the legal operation of the harbor due to operator error, equipment failure, sunken vessel, or contaminated bilge water discharges. This recognition by the Service is not intended to legitimize the otherwise illegal act of releasing petroleum into the environment. **We estimate that no more than one Steller's eiders of the listed Alaska breeding population will be taken as a result of petroleum releases that occur within the LSA harbor.** This take is expected to be in the form of harm or direct lethal take.

Take Related to Collisions with Vessels or Structures

The Service expects that the operation of the harbor will result in harm or direct lethal take of birds striking harbor-related facilities, including vessels moored within the new harbor. We anticipate that this take will be in association with the use of bright lights during poor weather. **We estimate that no more than one Steller's eider of the listed Alaska breeding population will be taken as a result of striking harbor-associated structures, including moored vessels.**

We are currently unable to distinguish between North American breeding Steller's eiders and Steller's eiders that breed elsewhere when the birds are present on their molting or wintering areas. Future research may enable us to distinguish between listed and non-listed populations. Absent such capabilities, we will consider the expected take levels associated with this Incidental Take Statement to have been exceeded if any of the following occur:

1. Greater than one Steller's eider belonging to the listed Alaska breeding population are harmed or killed as a result of petroleum releases that occur within the harbor at LSA, and these releases can reasonably be attributed to a vessel or vessels that would not be present in the area but for the presence of the new harbor;
2. Greater than 4 Steller's eider are harmed or killed as a result of petroleum releases that occur within the harbor at LSA, and these releases can reasonably be attributed to a vessel or vessels that would not be present in the area but for the presence of the new harbor;

3. Greater than one Steller's eiders belonging to the listed Alaska breeding population are harmed or killed as a result of striking harbor-associated structures, including vessels moored within the new LSA harbor;
4. Greater than 4 Steller's eiders are harmed or killed as a result of striking harbor-associated structures, including vessels moored within the new LSA harbor.
5. Greater than 4 Steller's eiders belonging to the listed Alaska breeding population are harmed or killed due to loss of habitat within the harbor.
6. Greater than 17 acres of habitat (the project footprint) is permanently altered or destroyed during construction of the harbor.

Effect of Take

In the accompanying Biological Opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Steller's eider.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of Steller's eider:

1. The USACOE shall minimize impacts to Steller's eiders during construction of the harbor.
2. The USACOE shall minimize impacts to Steller's eiders during operation of the harbor.
3. The USACOE shall monitor impacts of harbor operation to Steller's eiders.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, USACOE must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The following terms and conditions shall implement Reasonable and Prudent Measure No. 1: "The USACOE shall minimize impacts to Steller's eiders during construction of the harbor."
   1.1. The USACOE shall ensure that all construction activities that may harass Steller's eiders shall occur prior to the birds' arrival in the fall or after their departure in the spring. We estimate the arrival date to be November 26, but construction activities that may harass Steller's eiders shall cease as soon as eiders are observed in Captain's Bay. We estimate the date of departure from the area to be March 30. However, upon concurrence of the Ecological Services Anchorage Field Office, construction activities may commence anytime after February 28th, provided that no Steller's eiders have been observed within 0.43 nm of the construction site for 7 days prior to the commencement of

construction. The USACOE shall immediately notify the Field Office of the presence of any Steller's eider that is observed from the project area during construction.

1.2. The USACOE shall permanently install eyebolts or other devices to armor stones or other structures at any breaches or entrance channels in the harbor perimeter for rapid attachment of spill containment booms.

2. The following terms and conditions shall implement Reasonable and Prudent Measure No. 2: "The USACOE and Local Project Sponsor shall minimize impacts to Steller's eiders during operation of the harbor."

2.1. Stationary lighting that is associated with the operation of the proposed harbor shall be shielded downward such that nearly full radiation is projected downward and none is visible above the elevation of the light itself thereby minimizing attraction of birds to bright point source lights and reducing the likelihood of collisions. The Local Project Sponsor shall coordinate with the Service on the specifications for shielded lighting to be installed by the local sponsor.

2.2. The USACOE and project sponsors will participate as working group members in the development of a Geographic Response Strategy for Dutch Harbor/Unalaska prior to the commencement of harbor operations.

2.3. The City will provide a courtesy copy of the Oil Spill Response Plan to the Service as soon as it is completed.

2.4. No Transit Zone: The City will exclude vessel traffic from the waters in the vicinity of South Amaknak Rocks where as many as 270 Steller's eiders have been observed. The location and description of this "No Transit Zone" (see attached map, appendix III) will be made available to vessel operators by means determined to be most efficient by the U.S. Coast Guard.

2.5. The Local Project Sponsor shall develop a Best Management Practice (BMP) Plan for the new harbor in cooperation with the City of Unalaska. Plan developers should refer to the 1995 (Updated in 2004) publication "Alaska Best Management Practices for Harbor, Marina, and Boat Operations" (Ross et al. 1995) available online at http://www.dnr.state.ak.us/acmp/ACMPGrants/6217/docs/HarborBMPmanual.pdf, and to Best Management Practices for Oregon Marina (Oregon DEQ, 2002) available on line at http://159.121.9.10/wq/pubs/bmps/marinas.pdf, and should adapt pollution prevention strategies to meet conditions specific to LSA. The BMP Plan will include but not be limited to the following provisions:

2.5.1. Vessel Maintenance and Repair: The City of Unalaska (City) will provide clearly marked receptacles for waste oil at the LSA harbor site. The City agrees to maintain these receptacles so that they do not leak petroleum products onto the surrounding substrate, to repair or replace receptacles within one month of the detection of any leak, and to dispose of waste oil according to ADEC standards as long as vessels are using the harbor. The BMP Plan will indicate the location, identification, proper use and maintenance of these receptacles.

2.5.2. Spill Response: The City will develop an Oil Spill Response Plan for the LSA harbor designed to prevent petroleum products spilled within the harbor

from contaminating areas where eiders concentrate. The City will agree to implement this plan no fewer than 45 days prior to commencement of harbor operations.

2.5.3. Spill Response: The City will obtain all necessary equipment to implement the Oil Spill Response Plan prior to commencement of harbor operations. The City will maintain this equipment in good working order. This equipment will be clearly marked and its location provided in the BMP Plan.

2.5.4. Spill Response: The City will ensure that at least one qualified oil-spill response individual be present at the new LSA harbor or on call during harbor operations.

2.5.5. The City will enter into a contract with an Oil Spill Response Organization prior to commencement of harbor operations.

2.5.6. Spill Response: The City will include in the Oil Spill Response Plan a copy of the Service's "Protocol for Handling Dead Spectacled and Steller's Eiders." (Appendix V) The City will keep dead salvaged eiders frozen until the birds can be transferred to the Service. The Service should be contacted in the event that a sick or injured eider is observed. Do not touch or handle eiders or other birds that appear sick or injured.

2.5.7. Bilge Water and Ballast Water Management: In the BMP Plan, the City will encourage the use of in-line bilge water filter systems for removing both dissolved and dispersed hydrocarbon contamination from bilge water.

2.5.8. Fuel Handling: In the BMP Plan, the City will encourage the use of fuel collars during vessel fueling.

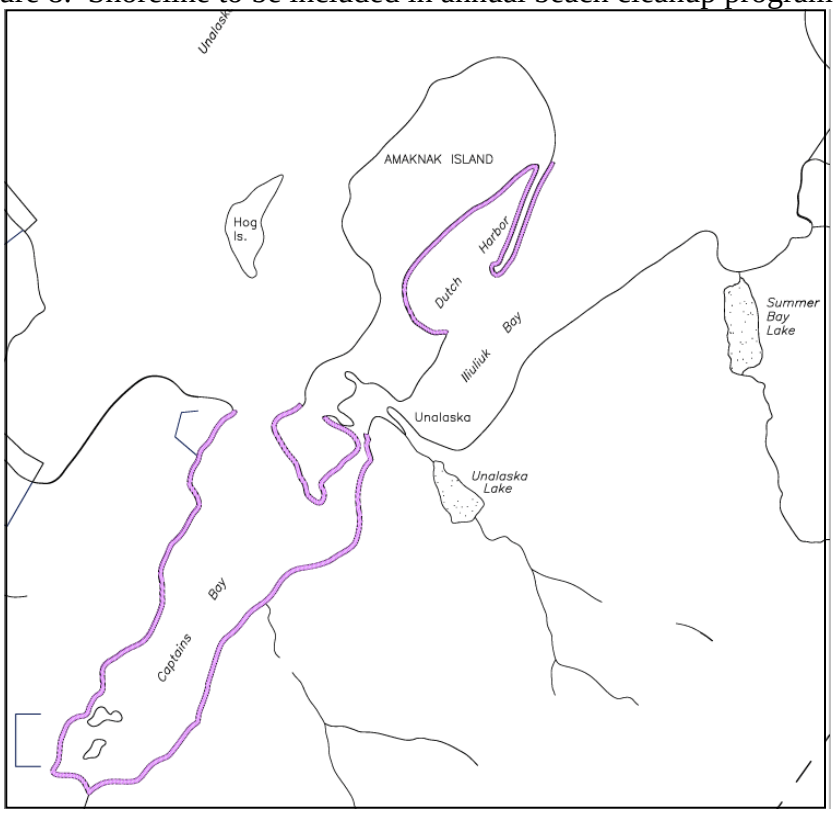
2.5.9. Fuel Handling: The City will design, produce, and install information signs or posters addressing the effects of oil on the marine environment, background information on Steller's eiders, fuel spill prevention and reduction methods, and that discharge of oil is illegal. These signs or posters will also urge the public to report dead or injured Steller's eiders. At least one sign or poster will be installed at the LSA harbor prior to commencing harbor operations there; additional signs or posters will be made available to each marine fueling facility in Dutch Harbor. The design, content, text, and placement of the signs or posters will be developed in cooperation with the Service.

2.5.10. Hazardous Materials and Waste Handling: Clearly marked receptacles for collection of lead-acid batteries will be provided and maintained by the City at the LSA harbor site. These receptacles will be maintained to prevent any hazardous material from being released into the surrounding environment, and repaired or replaced within one month of the detection of any leak. Deposited batteries will be disposed of according to ADEC standards as long as vessels are using the harbor. The BMP Plan will indicate the location, identification, proper use and maintenance of these receptacles.

2.5.11. Solid Waste Handling: An annual program to collect and dispose of discarded and derelict fishing gear that drifts ashore and could cause entanglement and/or contamination of eiders will be instituted. This program

will be undertaken on shorelines throughout the area depicted in Figure 8. The City agrees to provide and maintain containers in the LSA harbor area for the disposal of discarded and derelict fishing gear. These containers will be clearly marked and their location identified in the BMP Plan.

Figure 8. Shoreline to be included in annual beach cleanup program.



2.5.12. Wildlife: The BMP Plan will address the proper handling and disposition of injured or dead eiders in the following manner: "Eiders that have been injured or killed by colliding with harbor-related structures shall be immediately reported to the Anchorage Fish and Wildlife Field Office (907-271-4174) and handled according to the "Protocol for Handling Dead Spectacled and Steller's Eiders." Dead Steller's eiders shall be salvaged and kept frozen until they can be transferred to the Service. The City will provide for the expenses incurred in shipping and rehabilitating birds injured through collision with structures associated with the presence of the harbor.

3. The following Term and Conditions shall implement Reasonable and Prudent Measure No. 3: "The USACOE shall monitor impacts of harbor operation to Steller's eiders."
   3.1. The USACOE shall conduct pre-construction and post-construction surveys to monitor Steller's eider use of waters in the action area. These surveys should follow the survey design used by the USACOE and Service (USACOE 2001, USACOE 2002, USACOE 2003). Pre-construction surveys shall be conducted

once a month in November, December, January, February, and March during the winter prior to commencement of any construction activities. Post-construction surveys shall be conducted once a month in November, December, January, February, and March during the first two winters the harbor is fully utilized following construction. A summary report shall be submitted by the USACOE to the Service annually.

CONSERVATION RECOMMENDATIONS

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

1. Make Best Management Practices Plan available to harbor customers via the web (for example on the City of Unalaska web page) or by some other means (i.e., hard copy).
2. Partner with the Service to secure funding for the procurement of equipment needed to implement the Dutch Harbor/Unalaska GRSs.
3. Partner with the Service to establish a bird stabilization unit and to train local wildlife responders to conduct bird response in the event of a spill in areas where protection of Steller's eiders would not be possible.
4. Require in the Best Management Practices Plan under "Wildlife" that all dead waterfowl be retained until Service personnel may positively identify the carcasses (See Term and Condition 2.5.12).
5. Repeat post construction sampling and analysis of PAHs and organic contaminants in sea duck and sea otter prey samples as per Miles et al. (2007) to establish a Before-After-Control-Index for harbor-related contamination monitoring.

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) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a matter or to an extent not considered in this Biological Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Biological Opinion; or (4) a new species not covered by this opinion is listed or critical habitat designated that may be affected by this action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take should cease pending reinitiation. If the action agency is unable to fulfill the Terms and Conditions specified in the Incidental Take Statement of this Biological Opinion, consultation should be reinitiated.

Appendix I
Take Calculations

TAKE DUE TO ACTION (Annual 0.30% reduction in survivorship)

Year		1	2	3	4
Number of birds (632)		632	606.16	0.18092	0.173523
Birds lost due to overall population decline (3.8%)		24.016	23.03408	0.006875	0.006594
Reduced survivorship due to chronic oiling (0.3%)		1.823952	1.749378	0.000522	0.000501
Pop at year y=1+N	632	606.16	0.18092	0.173523	0.166428

Year	5	6	7	8	9
Number of birds (632)	0.166428	0.159624	0.153097	0.146838	0.140834
Birds lost due to overall population decline (3.8%)	0.006324	0.006066	0.005818	0.00558	0.005352
Reduced survivorship due to chronic oiling (0.3%)	0.00048	0.000461	0.000442	0.000424	0.000406
Pop at year y=1+N	0.159624	0.153097	0.146838	0.140834	0.135076

Year	10	11	12	13	14
Number of birds (632)	0.135076	0.129553	0.124256	0.119176	0.114303
Birds lost due to overall population decline (3.8%)	0.005133	0.004923	0.004722	0.004529	0.004344
Reduced survivorship due to chronic oiling (0.3%)	0.00039	0.000374	0.000359	0.000344	0.00033
Pop at year y=1+N	0.129553	0.124256	0.119176	0.114303	0.10963

Year	15	16	17	18	19
Number of birds (632)	0.10963	0.105148	0.100849	0.096725	0.092771
Birds lost due to overall population decline (3.8%)	0.004166	0.003996	0.003832	0.003676	0.003525
Reduced survivorship due to chronic oiling (0.3%)	0.000316	0.000303	0.000291	0.000279	0.000268
Pop at year y=1+N	0.105148	0.100849	0.096725	0.092771	0.088978

Year	20	21	22	23	24
Number of birds (632)	0.088978	0.08534	0.08185	0.078504	0.075294
Birds lost due to overall population decline (3.8%)	0.003381	0.003243	0.00311	0.002983	0.002861
Reduced survivorship due to chronic oiling (0.3%)	0.000257	0.000246	0.000236	0.000227	0.000217
Pop at year y=1+N	0.08534	0.08185	0.078504	0.075294	0.072216

Year	25	26	27	28	29
Number of birds (632)	0.072216	0.069263	0.066431	0.063715	0.06111
Birds lost due to overall population decline (3.8%)	0.002744	0.002632	0.002524	0.002421	0.002322
Reduced survivorship due to chronic oiling (0.3%)	0.000208	0.0002	0.000192	0.000184	0.000176
Pop at year y=1+N	0.069263	0.066431	0.063715	0.06111	0.058611

Year	30	31	32	33	34
Number of birds (632)	0.058611	0.056215	0.053917	0.051712	0.049598

Birds lost due to overall population decline (3.8%)	0.002227	0.002136	0.002049	0.001965	0.001885
Reduced survivorship due to chronic oiling (0.3%)	0.000169	0.000162	0.000156	0.000149	0.000143
Pop at year y=1+N	0.056215	0.053917	0.051712	0.049598	0.04757

Year	35	36	37	38	39
Number of birds (632)	0.04757	0.045625	0.04376	0.041971	0.040255
Birds lost due to overall population decline (3.8%)	0.001808	0.001734	0.001663	0.001595	0.00153
Reduced survivorship due to chronic oiling (0.3%)	0.000137	0.000132	0.000126	0.000121	0.000116
Pop at year y=1+N	0.045625	0.04376	0.041971	0.040255	0.038609

Year	40	41	42	43	44
Number of birds (632)	0.038609	0.03703	0.035516	0.034064	0.032671
Birds lost due to overall population decline (3.8%)	0.001467	0.001407	0.00135	0.001294	0.001242
Reduced survivorship due to chronic oiling (0.3%)	0.000111	0.000107	0.000102	9.83E-05	9.43E-05
Pop at year y=1+N	0.03703	0.035516	0.034064	0.032671	0.031335

Year	45	46	47	48	49
Number of birds (632)	0.031335	0.030054	0.028825	0.027647	0.026517
Birds lost due to overall population decline (3.8%)	0.001191	0.001142	0.001095	0.001051	0.001008
Reduced survivorship due to chronic oiling (0.3%)	9.04E-05	8.67E-05	8.32E-05	7.98E-05	7.65E-05
Pop at year y=1+N	0.030054	0.028825	0.027647	0.026517	0.025432

Year	50		
Number of birds (632)	0.025432		
Birds lost due to overall population decline (3.8%)	0.000966	Total Birds	Listed Birds
Reduced survivorship due to chronic oiling (0.3%)	7.34E-05	3.584379	0.035844
Pop at year y=1+N	0.024393		

ASSUMPTIONS

1) Maximum number of Steller's eiders at increased risk of exposure to chronic oiling (632)

2) Proportion of Dutch Harbor Steller's eiders from listed population (1%)

3) Life of project = 50 years

4) Breeding population declining at 3.8% annually

5) Reduced survivorship due to baseline chronic exposure to petroleum products = 0.63% annually (part of 3.8% annual decline)

6) Vessel traffic around southern tip of Amaknak Island to increase by 47% (75/160)

7) Additional reduction in S due to action 0.30% ((0.0063*0.47) = 0.30%)

Appendix II
Jeopardy Calculations

JEOPARDY ANALYSIS

Year		1	2	3
Number of birds		500	479.9996	460.7992
Birds lost due to overall population decline (3.8%)		19	18.23998	17.51037
Birds lost due to additional take from baseline actions (0.2%)		0.962	0.923519	0.886578
Birds lost due to LSA harbor construction (0.008%)		0.038403	0.036867	0.035392
Pop at year y=1+N	500	479.9996	460.7992	442.3669

Year	4	5	6	7
Number of birds	442.3669	424.6719	407.6846	391.3769
Birds lost due to overall population decline (3.8%)	16.80994	16.13753	15.49202	14.87232
Birds lost due to additional take from baseline actions (0.2%)	0.851114	0.817069	0.784385	0.753009
Birds lost due to LSA harbor construction (0.008%)	0.033976	0.032617	0.031313	0.03006
Pop at year y=1+N	424.6719	407.6846	391.3769	375.7215

Year	8	9	10	11
Number of birds	375.7215	360.6924	346.2644	332.4135
Birds lost due to overall population decline (3.8%)	14.27742	13.70631	13.15805	12.63171
Birds lost due to additional take from baseline actions (0.2%)	0.722888	0.693972	0.666213	0.639564
Birds lost due to LSA harbor construction (0.008%)	0.028858	0.027703	0.026595	0.025531
Pop at year y=1+N	360.6924	346.2644	332.4135	319.1167

Year	12	13	14	15
Number of birds	319.1167	306.3518	294.0975	282.3333
Birds lost due to overall population decline (3.8%)	12.12644	11.64137	11.1757	10.72867
Birds lost due to additional take from baseline actions (0.2%)	0.613981	0.589421	0.565844	0.543209
Birds lost due to LSA harbor construction (0.008%)	0.02451	0.02353	0.022588	0.021685
Pop at year y=1+N	306.3518	294.0975	282.3333	271.0398

Year	16	17	18	19
Number of birds	271.0398	260.198	249.7898	239.798
Birds lost due to overall population decline (3.8%)	10.29951	9.887523	9.492014	9.112326
Birds lost due to additional take from baseline actions (0.2%)	0.521481	0.500621	0.480596	0.461371
Birds lost due to LSA harbor construction (0.008%)	0.020818	0.019985	0.019185	0.018418
Pop at year y=1+N	260.198	249.7898	239.798	230.2059

Year	20	21	22	23
Number of birds	230.2059	220.9975	212.1574	203.671
Birds lost due to overall population decline (3.8%)	8.747825	8.397905	8.061982	7.739496
Birds lost due to additional take from baseline actions (0.2%)	0.442916	0.425199	0.408191	0.391863
Birds lost due to LSA harbor construction (0.008%)	0.017681	0.016974	0.016295	0.015643
Pop at year y=1+N	220.9975	212.1574	203.671	195.524

Year	24	25	26	27

Number of birds	195.524	187.7028	180.1946	172.9866
Birds lost due to overall population decline (3.8%)	7.42991	7.132708	6.847394	6.573493
Birds lost due to additional take from baseline actions (0.2%)	0.376188	0.36114	0.346694	0.332826
Birds lost due to LSA harbor construction (0.008%)	0.015017	0.014417	0.01384	0.013286
Pop at year y=1+N	187.7028	180.1946	172.9866	166.067

Year	28	29	30	31
Number of birds	166.067	159.4242	153.0471	146.9251
Birds lost due to overall population decline (3.8%)	6.310548	6.058121	5.815791	5.583155
Birds lost due to additional take from baseline actions (0.2%)	0.319513	0.306732	0.294463	0.282684
Birds lost due to LSA harbor construction (0.008%)	0.012755	0.012245	0.011755	0.011285
Pop at year y=1+N	159.4242	153.0471	146.9251	141.048

Year	32	33	34	35
Number of birds	141.048	135.406	129.9896	124.7899
Birds lost due to overall population decline (3.8%)	5.359824	5.145427	4.939605	4.742017
Birds lost due to additional take from baseline actions (0.2%)	0.271376	0.260521	0.2501	0.240096
Birds lost due to LSA harbor construction (0.008%)	0.010833	0.0104	0.009984	0.009585
Pop at year y=1+N	135.406	129.9896	124.7899	119.7982

Year	36	37	38	39
Number of birds	119.7982	115.0062	110.4059	105.9895
Birds lost due to overall population decline (3.8%)	4.552333	4.370236	4.195423	4.027602
Birds lost due to additional take from baseline actions (0.2%)	0.230492	0.221272	0.212421	0.203924
Birds lost due to LSA harbor construction (0.008%)	0.009201	0.008833	0.00848	0.008141
Pop at year y=1+N	115.0062	110.4059	105.9895	101.7499

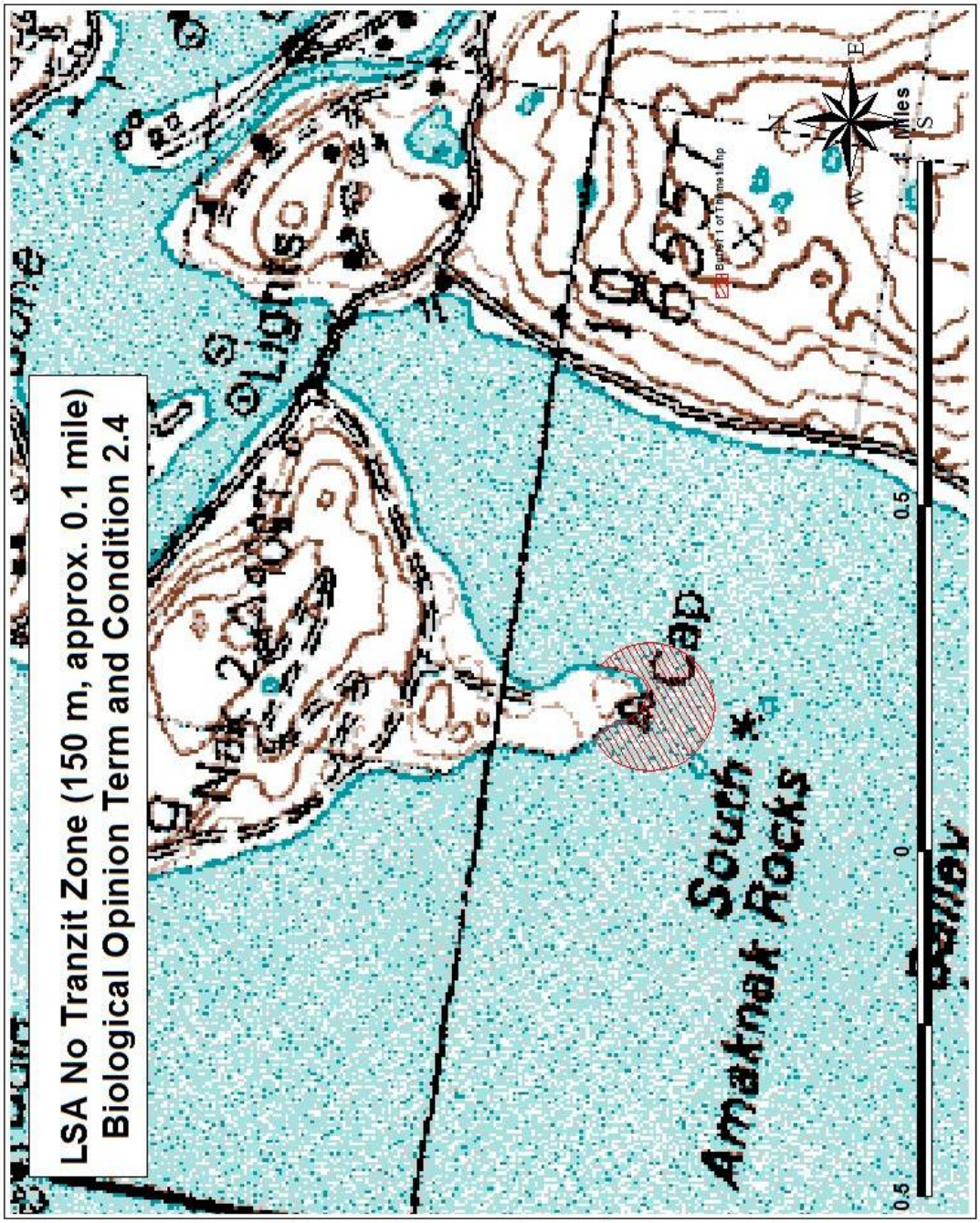
Year	40	41	42	43
Number of birds	101.7499	97.67979	93.77252	90.02155
Birds lost due to overall population decline (3.8%)	3.866495	3.711832	3.563356	3.420819
Birds lost due to additional take from baseline actions (0.2%)	0.195767	0.187936	0.180418	0.173201
Birds lost due to LSA harbor construction (0.008%)	0.007815	0.007502	0.007202	0.006914
Pop at year y=1+N	97.67979	93.77252	90.02155	86.42061

Year	44	45	46	47
Number of birds	86.42061	82.96372	79.6451	76.45924
Birds lost due to overall population decline (3.8%)	3.283983	3.152621	3.026514	2.905451
Birds lost due to additional take from baseline actions (0.2%)	0.166273	0.159622	0.153237	0.147108
Birds lost due to LSA harbor construction (0.008%)	0.006638	0.006372	0.006117	0.005873
Pop at year y=1+N	82.96372	79.6451	76.45924	73.4008

Year	48	49	50
Number of birds	73.4008	70.46471	67.64607
Birds lost due to overall population decline (3.8%)	2.789231	2.677659	2.570551
Birds lost due to additional take from baseline actions	0.141223	0.135574	0.130151

(0.2%)			
Birds lost due to LSA harbor construction (0.008%)	0.005638	0.005412	0.005196
Pop at year y=1+N	70.46471	67.64607	64.94017

Appendix III
No Transit Zone



No Transit Zone: Establish an approximately 150m buffer around the southern tip of Amaknak Island to prevent vessels from traversing this area where as many as 270 Steller's eiders have been observed.

Appendix IV
Literature Cited

LITERATURE CITED

ABR, Inc. 1999. Results of Steller's eider surveys near Barrow, Alaska. Prepared for U.S. Fish and Wildlife Service, Fairbanks, Alaska.

Agler, B. A., S. J. Kendall, P. E. Seiser, and D. B. Irons. 1994. Monitoring seabird populations in areas of oil and gas development on the Alaskan Continental Shelf: Estimates of marine bird and sea otter abundance in lower Cook inlet, Alaska, during summer 1993 and winter 1994.

Alaska Department of Environmental Conservation. 1997. Unocal Steelhead Platform 3697. Quarterly Report of Oil and Hazardous Substance Response. January 1-March 31, 1997.

Alaska Department of Environmental Conservation. 1999a. Cook Inlet Chesapeake Trader. Quarterly Report of Oil and Hazardous Substance Response. January 1-March 31, 1999. Vol. 5-No. 1.

Alaska Department of Environmental Conservation. 1999b. Unocal Dillon Platform. Quarterly Report of Oil and Hazardous Substance Response. October 1-December 31, 1999. Vol. 5-No. 4.

Alaska Department of Environmental Conservation. 1999c. Controller Bay and Redfin Groundings. Quarterly Report of Oil and Hazardous Substance Response. April 1-June 30, 1999. Vol. 5-No. 2.

Anderson et al. 1992. Philopatry, dispersal and the genetic structure of waterfowl populations. Pages 365-395 *in* B. D. J. Batt, A. D. Afton, M. G. Anderson, C. D. Ankney, D. H. Johnson, J. A. Kadlec, and G. L. Krapu (eds.), Ecology and management of breeding waterfowl. University of Minnesota Press, Minneapolis.

Begon, M. and M. Mortimer. 1986. Population ecology: a unified study of animals and plants. 2nd ed. Blackwell Scientific Publications. Cambridge, MA.

Bellrose, F. C. 1980. Ducks, geese and swans of North America. A wildlife management institute book sponsored jointly with the Illinois Natural History Survey. Stackpole Books, PA.

Bengtson, S. A. 1972. Breeding ecology of the harlequin duck (*Histrionicus histrionicus*) in Iceland. Ornis Scand. 3:1-19.

Bent, A. C. 1987. Life Histories of North American waterfowl. Two parts bound as one. Dover Publications, Inc., New York.

Brackney, A. W. and R. J. King. 1996. Aerial breeding pair surveys of the arctic coastal plain of Alaska: Distribution and abundance 1995. U. S. Fish and Wildlife Service, Migratory Bird Management.

Bustnes, J. O., M. Asheim, T. H. Bjorn, H. Gabrielsen, and G. H. Systad. 2000. The diet of Steller's eiders wintering in Varangerfjord, Northern Norway. Wilson Bull., 112(1):8-13.

Camphuysen, K. 2000. Mass mortality of Common Eiders in the Wadden Sea, winter 1999/2000: food related parasite outbreak? Atlantic Seabirds 2:47-48.

Cooke, F., G. J. Robertson, C. M. Smith, R. I. Goudie, and W. S. Boyd. 2000. Survival, emigration and winter population structure of harlequin ducks. Condor 102:137-144.

Dau, C. P., P. L. Flint, and M. R. Petersen. 2000. Distribution of recoveries of Steller's eiders banded on the lower Alaska Peninsula, Alaska. In Press. J. Field Ornithology.

Day, R. H. and A. K. Pritchard. 2000. Task 2C. Estimated future spills. Prepared for the U.S. Army Engineer District, Alaska. ABR, Inc., Fairbanks, Alaska.

Dow, H., and S. Fredga. 1983. Breeding and natal dispersal of the goldeneye (Bucephala clangula. J. Anim. Ecol. 53:679-692.

Esler, Daniel, T. D. Bowman, K.A. Trust, B. E. Ballachey, T.A. Dean, S. C. Jewett, and C. E. O'Clair. 2002. Harlequin duck population recovery following the 'Exxon Valdez' oil spill: progress, process and constraints. Mar. Ecol. Prog. Ser. 241:241-271.

Finley, D. B., G. I. Scott, J. W. Daugomah, S. L. Layman, L. Reed, M. Sanders, S. K. Sivertsen, E. D. Strozier. 1999. Case study: Ecotoxicological assessment of urban and agricultural nonpoint source runoff effects on the grass shrimp, *Palaemonetes pugio*. Pages 243-273, in, M. A. Lewis, F. L. Mayer, R. L. Powell, M. K. Nelson, S. J. Klaine, M. G. Henry, and G. W. Dickson [eds], Ecotoxicology and Risk Assessment for Wetlands. A special publication of SETAC

Flint, P. L., M. R. Petersen, and J. B. Grand. 1997. Exposure of spectacled eiders and other diving ducks to lead in western Alaska. Can. J. Zool.

Flint, P. L., M.. R. Petersen, C. P. Dau, J. E. Hines, J. D. Nichols. 2000. Annual survival and site fidelity of Steller's eiders molting along the Alaska Peninsula. J. Wildl. Manage. 64(1):261-268.

Gilpen, M. E. 1987. Spatial structure and population vulnerability, p. 125-139, in M. E. Soule, editor. Viable populations for conservation. Cambridge University Press, New York.

Glegg, G. A., L. Hickman, and S. J. Rowland. 1999. Contamination of limpets (*Patella vulgator*) following the Sea Empress oil spill. Marine Pollution Bulletin. Vol. 38. No. 2:119-125.

Goodman, D. 1987. The demography of chance extinctions. Pages 11-34, in M. E. Soule, editor, Viable populations for conservation. Cambridge University Press, New York.

Goudie, R. I., and C. D. Ankney. 1986. Body size, activity budgets, and diets of sea ducks wintering in Newfoundland. Ecology 67:1475-1482.

Hodges, J. I., J. G. King, B. Conant, and H. A. Hanson. 1996. Aerial surveys of waterbirds in Alaska 1957-94: Population trends and observer variability. U. S. Department of the Interior. National Biological Service.

Holmes, W. N. 1984. Reviews in environmental toxicology 1. Editor Ernest Hodgson, North Carolina State University. Elsevier Science Publishers, New York.

Holmes, W. N., J. Cronshaw, and J. Gorsline. 1978. Some effects of ingested petroleum on seawater-adapted ducks (*Anas platyrhynchos*). Environmental Research. 17:177-190.

Holmes, W. N., J. Gorsline, J. Cronshaw. 1979. Effects of mild cold stress on the survival of seawater-adapted mallard ducks (*Anas platyrhynchos*) maintained on food contaminated with petroleum. Environmental Research. 20:425-444.

Johnsgard, P. A. 1994. Arena birds, sexual selection and behavior. Smithsonian Institution Press, Washington and London.

Jones, R. D. 1965. Returns from Steller's eiders banded in Izembek Bay, Alaska. Wildfowl Trust 16:83-85.

Kertell, K. 1991. Disappearance of the Steller's eider from the Yukon-Kuskokwim Delta, Alaska. Arctic 44:177-187.

Laing, K. 1995. A pilot survey to determine distribution and abundance of Steller's eiders on the Alaska Arctic Coastal Plain. U.S. Fish and Wildlife Service, Migratory Bird Management.

Lande, R., and G. F. Barrowclough. 1987. Effective population size, genetic variation, and their use in population management. Pages 87-123, in M. E. Soule, editor. Viable populations for conservation. Cambridge University Press, New York.

Larned, W. W. 1998. Steller's eider spring migration Surveys, 1998. U.S. Fish and Wildlife Service, Migratory Bird Management.

Larned, W. W. 2000a. Steller's eider spring migration surveys, 2000. U.S. Fish and Wildlife Service, Migratory Bird Management.

Larned, W. W. 2000b. Aerial surveys of Steller's eiders and other waterbirds and marine mammals in southwest Alaska areas proposed for navigation improvements by the U.S.

Army Corps of Engineers, Alaska. U.S. Fish and Wildlife Service, Migratory Bird Management.

Larned, W. W. 2001. Steller's eider spring migration surveys, 2001. U.S. Fish and Wildlife Service, Migratory Bird Management.

Larned, W. W. 2002. Steller's eider spring migration surveys, 2002. U.S. Fish and Wildlife Service, Migratory Bird Management.

Larned, W. W., and G. Balogh. 1996. Eider breeding population survey, Arctic coastal plain, Alaska, 1992-96. U. S. Fish and Wildlife Service.

Larned, W. W., B. Butler, and G. Balogh. 1993. Progress report: Steller's eider spring migration surveys southwest Alaska, 1993. U. S. Fish and Wildlife Service, Migratory Bird Management Project.

Larned, W. W. and T. Tiplady. 1996. Distribution and abundance of sea ducks in Kuskokwim Bay, Alaska, September 1996. Migratory Bird Management, U.S. Fish and Wildlife Service.

Larned, W. W., T. Tiplady, R. Platte, and R. Stehn. 1999. Eider breeding population survey Arctic coastal plain, Alaska, 1997-98. U. S. Fish and Wildlife Service, Migratory Bird Management.

Larned, W. W. and D. Zwiefelhofer. 1995. Distribution and abundance of Steller's eiders (Polysticta stelleri) in the Kodiak Archipelago, Alaska, March 1994. 18pp.

Leighton, F. A. 1993. The toxicity of petroleum oils to birds. Environmental Review. Vol.1:92-103.

Leighton, F. A., D. B. Peakall, and R. G. Butler. 1983. Heinz-body hemolytic anemia from the ingestion of crude oil: A primary toxic effect in marine birds. Science. 220:271-273.

LGL Alaska Research Associates, Inc. 2000a. Abundance and distribution of Steller's eiders and other waterbirds at False Pass, Alaska, January through March of 2000.

LGL Alaska Research Associates, Inc. 2000b. Steller's eider and other waterbird numbers and distribution at Akutan Harbor, Alaska, Winter of 1999/2000.

Mallek, E. J., and R. J. King. 1999. Aerial breeding pair surveys of the Arctic coastal plain of Alaska. U.S. Fish and Wildlife Service.

Martin, P. D. and T. Obritschkewitsch. Distribution and abundance of Steller's eiders in northern Alaska. Unpublished Information. U.S. Fish and Wildlife Service.

Metzner, K. A. 1993. Ecological strategies of wintering Steller's eiders on Izembek Lagoon and Cold Bay, Alaska. A Thesis presented to the faculty of the Graduate School, University of Missouri, Columbia.

McEwan, E. H. and P. M. Whitehead. 1980. Uptake and clearance of petroleum hydrocarbons by the glaucous-winged gull (*Larus glaucescens*) and the mallard duck (*Anas platyrhynchos*). Canadian Journal Zoology. 58:723-726.

Miles, A.K. Flint, P.L., Trust, K.A., Ricca, M.A., Spring, S.E., Arrieta, D.E., Hollmen, T., and Wilson, B.W. 2007. Polycyclic aromatic hydrocarbon exposure in Steller's eiders and harlequin ducks in the eastern Aleutian Islands, Alaska. Environ. Toxicol. And Chem (Submitted).

Morrison, M.L. and K.H. Pollock. 2000. Development of a practical modeling framework for estimating the impact of wind technology on bird populations. *In* Proceedings from the National avian-wind power planning meeting III, San Diego, California, May 1998. http://www.nationalwind.org/pubs/avian98/27-Morrison_Pollock-Modeling.pdf/accessed 12 March, 2003.

Morrison, M.L., K.H. Pollack, A.L. Olberg, and K.C. Sinclair. 1998. Predicting the response of bird populations to wind energy-related deaths. Unpublished report, National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161.

Petersen, M. R. 1980. Observations of wing-feather molt and summer feeding ecology of Steller's eiders at Nelson Lagoon, Alaska. Wildfowl 31:99-106.

Petersen, M. R. 1981. Population, feeding ecology and molt of Steller's eiders. Condor 83:256-262.

Quakenbush, L. T., R. S. Suydam, K. M. Fluetsch, and C. L. Donaldson. 1995. Breeding biology or Steller's eiders nesting near Barrow, Alaska, 1991-1994. Technical Report, U.S. Fish and Wildlife Service and North Slope Borough, Department of Wildlife Management.

Rand, G. M. and S. R. Petrocelli. 1985. Fundamentals of aquatic toxicology. Hemisphere Publishing Corporation, Washington.

Robertson, G. J. 1997. Pair formation, mating system, and winter philopatry in harlequin ducks. Dissertation, Simon Fraser University, Vancouver, British Columbia, Canada.

Robertson, G. J., F. Cooke, R. I. Goudie, and W. S. Boyd. 1999. Within-year fidelity of Harlequin Ducks to a moulting and wintering area. Pages 45-51, in, R. I. Goudie, M. R. Petersen, and G. J. Robertson [eds.], Behaviour and ecology of sea ducks. Canadian Wildlife Service Occasional Paper Series No. 100, Ottawa, Ontario, Canada.

Ross, N., M. Amaral, J. Rhodes, L. Hansen, G. McCorkle. 1995. BMP Examples for Alaska. State of Alaska Department of Transportation. 39 pp.

Rocke, T. E., T. M. Yuill, and R. D. Hinsdill. 1984. Oil and related toxicant effects on mallard immune defenses. Environmental Research. (33) 343-352.

Savard, J. P. L. 1985. Evidence of long-term pair bonds in Barrow's Goldeneye (*Bucephala islandica*). Auk 102:389-291.

Savard, J. P. L. and J. M. Eadie. 1989. Survival and breeding philopatry in Barrow's and common goldeneyes. Condor 91:198-203.

Schroeder, M. 2004. Final Fish and Wildlife Coordination Act Report for Unalaska Boat Harbor. August 2004. 79pp.

Scribner, K. T., R. L. Fields, S. Talbot, J. Pearce, M. Petersen, and R. K. Chesser. 2000.Sex-biased gene flow in spectacled eiders (Anatidae): Inferences from molecular markers with contrasting modes of inheritance. Submitted to Evolution on 6-30-2000.

Shaffer, M. 1987. Minimum viable populations: coping with uncertainty. Pages 69-86, in M. E. Soule, editor, Viable populations for conservation. Cambridge University Press, New York.

Schmutz, J. A., R. F. Rockwell, and M. R. Petersen. 1997. Relative effects of survival and reproduction on the population dynamics of emperor geese. Journal of Wildlife Management 61:191-201.

Solovieva, D. 1997. Timing, habitat use and breeding biology of Steller's eider in the Lena Delta, Russia. Wetlands International Seaduck specialist Group Bulletin.

Sterns, S. C. 1992. The evolution of life histories. Oxford University Press, New York, New York, USA.

Trust, K. A., E. Esler, B. R. Woodin, and J. J. Stegeman. 2000. Cytochrome P450 1A induction in sea ducks inhabiting near shore areas of Prince William Sound, Alaska. Marine Pollution Bulletin 40:397-403.

USACOE. 2000. Sand Point Trip Report, Steller's eider Surveys Nos. 1 and 2. Unpublished memorandum for record. CEPOA-EN-CW-ER (1105-2-10b). U.S. Army Corps of Engineers, Alaska District, Anchorage.

USACOE. 2003. Biological Assessment of Steller's Eider Polysticta stelleri (Pallas) for Harbor Construction at Unalaska, Alaska. 30pp.

U.S. Fish and Wildlife Service. 1997. Endangered and threatened wildlife and plants; threatened status for the Alaska breeding population of the Steller's eider. Federal Register/Vol. 62, No. 112. 31738.

Yamato, O., I. Goto, and Y. Maede. 1996. Hemolytic anemia in wild seaducks caused by marine oil pollution. J. Wildl. Diseas. 32(2). Pp. 381-384.

Zydelis, R. and R. Skeiveris. 1997. Increasing conflict between gill-net fishery and Steller's eiders wintering along the Lithuanian coast. Wetlands International Seaduck specialist Group Bulletin.

Appendix V
Protocol for Handling Dead Spectacled and Steller's Eiders

Protocol for Handling Dead
Spectacled and Steller's Eiders
Addendum to USFWS R7 Section 10 Permits
Last Updated February 2007

Introduction

The Fish and Wildlife Service needs to document mortality of threatened species whenever possible. Fish and Wildlife Service programs that use this information include Endangered Species, Environmental Contaminants, and Project Planning (to aid in recovery plans and implementation) and Law Enforcement (for enforcing the Endangered Species Act and other wildlife-related laws), in addition to numerous related research programs. Every dead spectacled and Steller's eider can aid in its species recovery by providing evidence and samples. We have developed this general protocol to help you help us utilize every threatened eider found dead.

In the past, this protocol covered handling and transport of injured or sick eiders. Because of avian flu concerns, we cannot currently transport injured or ill eiders for rehabilitation, so we can no longer provide instructions or a protocol for handling them. To minimize your risk, we recommend that you do not contact or handle wild birds that appear to be ill or injured.

Due to concerns about contracting avian influenza from handling bird carcasses, please make sure that you have proper personal protective equipment (PPE) and training prior to retrieving a carcass. Collect carcasses under the assumption that an infectious disease or toxic substance is involved and other animals or humans may be at risk. U.S. Department of the Interior PPE guidelines are available at the following web site: http://www.doi.gov/issues/appendixOHSguidanceforAvian%20Influenza12-18.pdf. Briefly, you need to protect yourself from fluids and feces by using impermeable gloves, safety glasses, a mask if necessary, and by decontaminating yourself and equipment with a bleach solution.

Reporting

Report all dead spectacled and Steller's eiders as soon as possible. If there is no reason to suspect that the bird(s) died as the result of any illegal activity, you should attempt to contact the following people, in the order listed, until you reach someone.

1. Angela Matz, USFWS, Fairbanks: (907) 456-0442 work, (907) 457-6723 home, (907) 456-0203 msg
2. Karen Laing, USFWS, Anchorage: (907) 786-3459 work, (907) 344-9840 home
3. Ted Swem, USFWS, Fairbanks: (907) 456-0441 work, (907) 474-9324 home, (907) 456-0203 msg
4. Greg Balogh, Anchorage: (800) 272-4174 toll free, (907) 271-2778 work, (907) 345-9899 home
5. Robert Suydam (North Slope Borough Dept. of Wildlife Management), Barrow: (907) 852-0350

6. Fred Broerman, Yukon Delta NWR, Bethel: (907) 543-3151

If you encounter any dead spectacled or Steller's eiders which you suspect may have died as a result of an illegal act such as shooting, a Service, Office of Law Enforcement should be notified immediately. This notification should occur prior to the disturbance or removal of any dead birds or other evidence. You should be prepared to report any observations and/or knowledge you might have regarding the incident and you will be provided with additional instructions regarding proper custodial handling techniques, which will allow a Special Agent to follow-up with an investigation into the incident.

USFWS, Office of Law Enforcement:
Fairbanks: (877)-535-1795 toll-free, (907) 456-2335, (907)-496-3534 pager
Cell numbers: 388-2853, 347-7704, 388-2854
Nome: (907) 443-2479, (907) 443-2938 fax
Anchorage: (800) 858-7621 toll-free, (907) 271-2828, (907) 268-1158 pager
Regional Office, Anchorage: (907) 786-3311, (907) 786-3313 fax

Ensure that one of the individuals in the first list is also contacted in these instances.

Your report should include:

1. Species, age, sex, and number of birds; date, time and location (latitude and longitude and area name);
2. Suspected cause of death;
3. Circumstances under which found;
4. If known, the names of witnesses or suspects, and a description of any vehicles or boats involved (but, non-law enforcement individuals are not expected to conduct investigations or obtain information that is not readily available).

If a camera is available, photograph birds and other evidence such as shotgun shells or casings, and persons and vehicles involved. Note photo date, time, and location.

You should put all this information, plus any additional details you think important (such as location of nearest power line), in a short written narrative.

Transport

If the person you contact from one of the lists above asks you to ship dead eiders, please follow the instructions below, shipping to the address they give you.

Packaging

Place carcass in a large ziplock or other waterproof plastic bag. Tie or secure this bag. Attach a tag to this bag with the following information in pencil/waterproof ink:

- species
- date collected
- location (state, county, location name, and latitude/longitude if available)
- collector (name/address/phone)
- additional history or comments on back of tag

then wrap in a second waterproof bag. Tie or secure this bag. Thoroughly rinse the outside of the second bag with a 1% solution of household bleach [1.25 oz or about 8 teaspoons of bleach (5.25 % sodium hypochlorite) per gallon of water].

Dispose of your PPE correctly and wash your hands with soap and water or an alcohol-based (≥ 60% alcohol) hand sanitizer.

Storage

Keep the carcass refrigerated if the bird will be shipped within 48 hours, but freeze birds if the carcass is already showing signs of decay (stinks) or if shipping delays of more than 3 days are foreseen. When in doubt, refrigerate until you receive guidance. In remote field camps, place carcass in a pit dug down to permafrost.

Shipping

Ship the carcass in a sturdy, hard-sided insulated container. Pack the carcass with frozen gel or blue ice paks; do not ship with wet ice or snow. Put additional insulation in the container (such as crumpled newspaper or packing peanuts) so that there is no airspace.

Ship using Alaska Airlines Goldstreak, FedEx, or other expedited service. Notify the receiver of flight arrival times or tracking numbers so that the package can be picked up.

Expenses

If needed, USFWS (Anchorage or Fairbanks Field Offices, or the Office of Law Enforcement) will pay for shipping.