DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[FWS–R7–ES–2009–0133; MO9221050083–B2]

Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List the Yellow-Billed Loon as Threatened or Endangered

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on a petition to list the yellow-billed loon (*Gavia adamsii*) as threatened or endangered, with critical habitat, under the Endangered Species Act of 1973, as amended (Act). The petitioners provided two listing options for consideration by the Service: (1) Listing the yellow-billed loon throughout its range, or (2) listing the United States population of the yellow-billed loon as a Distinct Population Segment (DPS). After a review of the best available scientific and commercial information, we have determined that listing the yellow-billed loon rangewide under the Act is warranted but precluded by other higher priority listing actions.

DATES: This finding was made on March 25, 2009.

ADDRESSES: This finding is available on the Internet at *http://www.regulations.gov.* Data, information, comments, or questions regarding this notice should be submitted to the Field Supervisor, Endangered Species Branch, Fairbanks Fish and Wildlife Field Office, U.S. Fish and Wildlife Service, 101–12th Ave., Room 110, Fairbanks, AK 99701. The complete administrative file for this finding is available for public inspection, by appointment, during normal business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Mr. Ted Swem, Fairbanks Fish and Wildlife Field Office (see **ADDRESSES**) (telephone 907–456–0441; facsimile 907–456–0208). If you use a telecommunications device for the deaf (TDD), call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(B) of the Act (16 U.S.C. 1531 *et seq.*) requires that, for any petition presenting substantial scientific and commercial information that listing may be warranted, we make a finding within 12 months of the date of receipt of the petition on whether the petitioned action is: (a) Not warranted, (b) warranted, or (c) warranted, but that immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are threatened or endangered, and expeditious progress is being made to add or remove qualified species from the Lists of Endangered and Threatened Wildlife and Plants. Section 4(b)(3)(C) of the Act requires that we treat a petition for which the requested action is found to be warranted but precluded as though resubmitted on the date of such finding, and is, therefore, subject to a new finding to be made within 12 months and subsequently thereafter until we take action on a proposal to list or withdraw our original finding. We must publish these 12-month findings in the **Federal Register**.

Previous Federal Actions

On April 5, 2004, we received a petition from the Center for Biological Diversity (CBD) (Sitka, AK), Natural Resources Defense Council (Washington, DC), Pacific Environment (San Francisco, CA), Trustees for Alaska (Anchorage, AK), Kaira Club (Chukotka, Anadyr, Russia), Kronotsky Nature Preserve (Kamchatka Region, Russia), Taiga Rangers (Khabarovsk Region, Russia), Yuzhno-Sakhalinsk Local Public Fund (Sakhalin Region, Russia), Interregional Public Charitable Organization of Far Eastern Resource Centers (Vladivostok, Russia), Kamchatka Branch of Pacific Institute of Geography (Petropavlovsk-Kamchatsky, Russia), and Kamchatka League of Independent Experts (Petropavlovsk-Kamchatsky, Russia) to list the yellow-billed loon as endangered or threatened throughout its range, or as a Distinct Population Segment in the United States, and to designate critical habitat once listed. The petition summarizes threats to the species based on CBD's review of Fair's (2002) report, prepared for the Natural Resources Defense Council and Trustees for Alaska, on the status and significance of the species in Alaska, as well as CBD's review of the scientific literature. In September 2006, the Service completed a ''Conservation Agreement for the Yellow-billed Loon (*Gavia adamsii*)'' with Federal, State, and local partners. In response to the petition, we published a 90-day finding on the yellow-billed loon in the **Federal Register** on June 6, 2007 (72 FR 31256). In the 90-day finding we determined that the petition presented substantial scientific or commercial information to indicate that a listing may be warranted and announced that a status review would be promptly commenced. In that notice we announced the opening of a 60-day information collection period and invited the public to submit to us any pertinent information concerning the status of or threats to this species. Approximately 28,000 comments were received during the information collection period. We also consulted with recognized yellow-billed loon experts and other Federal and State agencies. We sent letters to national wildlife or natural resource agencies in Canada, China, Japan, North Korea, Norway, Republic of Korea (South Korea), and the Russian Federation, asking for information about ongoing management measures and any conservation and management strategies being developed to protect the species. We received a formal response from the government of Canada, and an informal response from a government biologist in the Russian Federation.

On June 11, 2007, we received a 60-day notice of intent to sue from the Center for Biological Diversity alleging a violation of section 4 of the ESA for failure to complete a 12-month finding on the petition. We informed the plaintiffs by letter dated July 9, 2007, that further action on the petition was precluded by higher priority listing actions but that, pending the fiscal year 2008 allocation of funds, we hoped to complete the 12-month finding within that fiscal year.

On December 19, 2007, the Center for Biological Diversity (CBD) filed a complaint alleging that the Service had failed to make a timely 12-month finding on the petition, as required under section 4 of the ESA. Consistent with a settlement agreement reached between the Service and CBD, the Court ordered the Service to submit this 12-month finding for publication to the **Federal Register** by February 15, 2009. Because the Service later received substantial new information to be evaluated and considered in the 12-month finding, we subsequently sought and were granted a one month extension with a new deadline of March 16, 2009.

This notice constitutes a 12-month finding for the petition to list the yellow-billed loon as threatened or endangered. The petitioners provided two listing options for consideration by the Service: (1) Listing the yellow-billed loon throughout its range, or (2) listing the United States population of the yellow-billed loon as a Distinct Population Segment (DPS). Because we find that listing the yellow-billed loon rangewide is warranted at this time, there is no need to conduct further analysis of whether listing the United States population of the yellow-billed loon as a DPS, which is a smaller geographic entity than the entire range, is warranted, as this consideration is subsumed by the rangewide warranted but precluded finding.

Outline of This Notice

In this notice, we first provide background information on the biology of the yellow-billed loon. Next, we address each of the categories of factors listed in section 4(a)(1) of the Act. For each factor, we first determine whether any stressors, or risk factors, appear to be negatively affecting yellow-billed loons anywhere within the species' range. If we determine they are, then we evaluate whether each of these risk factors is resulting in population-level effects that are significant to the determination of the conservation status of the species. If so, we describe it as a ''threat.'' The fact that we find a stressor to be a threat to the species does not necessarily mean that the species meets the definition of threatened or endangered. Rather, in the subsequent finding section, we then consider each of the stressors and identified threats, individually and cumulatively, and make a determination with respect to whether the species is endangered or threatened according to the statutory standard.

The term ''threatened species'' means any species (or subspecies or, for vertebrates, distinct population segments) that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The Act does not define the term ''foreseeable future.'' However, in a January 16, 2009, memorandum addressed to the Acting Director of the U.S. Fish and Wildlife Service, the Office of the Solicitor, Department of the Interior, concluded, ''* * * as used in the ESA, Congress intended the term 'foreseeable future' to describe the extent to which the Secretary can reasonably rely on predictions about the future in making determinations about the future conservation status of the species.'' In a footnote, the memorandum states, ''In this memorandum, references to 'reliable predictions' are not meant to refer to reliability in a statistical sense. Rather, I use the words ''rely'' and ''reliable'' according to their common, non-technical meanings in ordinary usage. Thus, for the purposes of this memorandum, a prediction is reliable if it is reasonable to depend upon it in making decisions'' (M–37021, January 16, 2009).

Species Biology

The yellow-billed loon is a migratory bird. Solitary pairs breed on lakes in the arctic tundra of the United States, Russia, and Canada from June to September. During the remainder of the year the species winters in more southern coastal waters of the Pacific Ocean and the Norway and North Seas. Non-breeding birds remain in marine waters throughout the year, either in wintering areas or offshore from breeding grounds.

The following information regarding the description and natural history of the yellow-billed loon (American Ornithologists' Union 1998, p. 5) has been condensed from the status assessments conducted by North (1994) and Earnst (2004), and updated with information that has become available since then.

Taxonomy and Description

The yellow-billed loon (Order Gaviiformes, Family Gaviidae) is one of the largest of the five loon species and similar in appearance to the common loon (*Gavia immer*). There are no recognized subspecies or geographic variations (American Ornithologists' Union 1998, p. 5). A field characteristic that distinguishes yellow-billed loons from common loons is their larger yellow or ivory-colored bill. Adults weigh 4,000 to 6,000 grams (8.8 to 13.2 pounds) and are 774 to 920 millimeters (30 to 37 inches) in length. Breeding (alternate) plumage of adults of both sexes is black on top with white spots on the wings and underside, and white stripes on the neck. Non-breeding (basic) plumage is gray-brown with fewer and less distinct white spots than breeding plumage, with paler undersides and head, and a blue-gray bill. Hatchlings have dark brown and gray down, and juveniles are gray with a paler head (North 1994, p. 2). Yellow-billed loons are specialized for aquatic foraging with a streamlined shape and legs near the rear of the body, and are unable to take flight from land.

Feeding Habits

Yellow-billed loons forage underwater for fish and aquatic invertebrates. Limited information exists on specific prey species consumed. Marine prey species collected from loons wintering in southeast Alaska and Canada include fish such as sculpins (*Leptocottus armatus, Myoxocephalus* sp.), Pacific tomcod (*Microgadus proximus*), and rock cod (*Sebastodes* sp.), and invertebrates such as amphipods (*Orchomonella* sp., *Anonyx nirgax*), isopods (*Idothea* sp.), shrimps (*Pandalus danae*, *Spirontocaris ochotensis*), hermit crabs (*Pagarus* sp.), and marine worms (*Nereis* sp.) (Bailey 1922, p. 205; Cottam and Knappen 1939, p. 139; North 1994, pp. 6–7; Earnst 2004, pp. 9–10). Pacific sand dabs (*Citharichthys sordidus*) were found in a yellow-billed loon collected extralimitally (*i.e.*, outside the limits of the species' range) in Baja California (Jehl 1970, p. 376) and sculpin (*Myoxocephalus scorpius*) in a specimen collected in Norway (Collett 1894, p. 280). Prey species taken in other wintering grounds, such as in the Yellow Sea (which supports 276 fish species and 54 crustacean species; UNDP 2002, p. 8) are unknown.

During the breeding season, foraging habitats include lakes, rivers, and the nearshore marine environment. Successfully breeding adults feed their young almost entirely from the brood-rearing lake (North 1994, p. 14). Ninespine sticklebacks (*Pungitius pungitius*) and least cisco (*Coregonus sardinella*) are thought to be the main foods of chicks in Alaska (Earnst 2004, p. 9). Other freshwater prey available in Alaska that are likely utilized include Alaska blackfish (*Dallia pectoralis*), fourhorn sculpins (*M. quadricornus*), amphipods, and isopods (Earnst 2004, p. 9), as well as aquatic plant material (Sjölander and Ågren 1976, p. 460). In arctic Russia, limited stomach content analysis indicates sticklebacks, salmon, crustaceans, beetles, and plant vegetation are consumed during the breeding season (Uspenskii 1969, p. 130).

Breeding Habitat and Territories

Yellow-billed loons nest exclusively on margins of lakes in coastal and inland low-lying tundra from 62° to 74° North (N) latitude. Lakes that support breeding loons have abundant fish populations. Studies of yellow-billed loon habitat have identified several characteristics that predict loon presence. These may be indirect measures or correlates of the actual characteristics necessary or preferred by loons, such as fish availability. Predictors of yellow-billed loon presence on a lake include water depths greater than 2 meters (m) or 6.5 feet (ft) allowing for unfrozen water under the ice during winter; large lake areas (at least 13.4 hectares (ha) or 33 acres (ac)); connections to streams that may supply fish; highly convoluted, vegetated, and low-lying shorelines; clear water; and dependable water levels (Earnst *et al.* 2006, pp. 230–233; Stehn *et al.* 2005, pp. 9–10; North 1994, p. 6). Probability of yellow-billed loon presence on a lake increases with the absence of Pacific loons (*Gavia pacifica*) (Earnst *et al.* 2006, p. 233; Stehn *et al.* 2005, p. 9). Breeding lakes may be near major rivers, but are usually not connected to them, possibly because greater fluctuations associated with river connections may flood nests or cause turbidity that compromises foraging success (North & Ryan 1989, p. 303). Falling water levels may also expose loon nests to increased risk of predation (Kertell 1996, p. 356).

Breeding territories (areas defended against other yellow-billed loons and other loon species, particularly Pacific loons) may include one or more lakes or parts of lakes. Territory size, likely dependent upon lake size and quality, ranged from 13.8 to greater than 100 ha (34 to greater than 247 ac) on the Colville River Delta, Alaska (North 1986, as cited in North 1994, p. 10). It is thought that individual loons occupy the same breeding territory throughout their reproductive life. Some breeding lakes are ''known to be reoccupied over long time spans'' (North 1994, p. 10), most likely by the same monogamous pair (North 1994, p. 10), similar to common loons (Evers 2004, p. 13).

Nesting Sites and Behavior

Nest sites are usually located on islands, hummocks, or peninsulas, along low shorelines, within 1 m (3 ft) of water. The nest location, which may be used in multiple years, usually provides a better view of the surrounding land and water than other available lakeshore locations. Nests are constructed of mud or peat, and are often lined with vegetation. One or two large, smooth, mottled brown eggs are laid in mid-to late June (North 1994, pp. 11–12). Egg replacement after nest predation occurs rarely; unless failure occurs very early in the season, the short arctic summer probably precludes the production or success of replacement clutches (Earnst 2004, p. 8). Hatching occurs after 27 to 28 days of incubation by both sexes. Although the age at which young are capable of flight is unknown, it is probably similar to common loons (8–9, possibly up to 11, weeks). The young leave the nest soon after hatching, and the family may move between natal and brood-rearing lakes. Both males and females participate in feeding and caring for young (North 1994, p. 13).

Life History

There is no reliable scientific information on lifespan and survivorship, but as large-bodied birds with low clutch size, yellow-billed loons are probably K-selected (long-lived and dependent upon high annual adult survival to maintain populations). On average, individuals reach sexual maturity at 3 years of age, but may not acquire breeding territories until at least 4 years of age (North 1994, p. 15). The average age at first breeding for common loons is 6 years (Evers 2004, p. 18).

Territory occupancy and nesting success of yellow-billed loons were studied on the Colville River Delta during 18 years between 1983 and 2007. Ground-based surveys in 1983 and 1984 found 76 and 79 percent of the territorial pairs nesting, respectively (Field *et al.* 1993, p. 329). The same territories studied in 1983 and 1984 were visited in 1989 and 1990, and 42 percent and 67–71 percent, respectively, of the territorial pairs were found nesting (Field *et al.* 1993, p. 329; North 1993, p. 46). Low nest occupancy recorded in 1989 may have been a result of surveys being conducted late in incubation (July 9–16, 1989) after nests of some pairs had already failed; weekly monitoring surveys of nesting yellow-billed loons on the Colville River Delta in 2005–2007 found that 19–36 percent of the nests had failed by July 10–12 of those years (Johnson *et al.* 2006, Table 5; Johnson *et al.* 2007, Table 5; Johnson *et al.* 2008, Table 4). However, low nest occupancy occurred in some years during two long-term studies of yellow-billed loons on the Colville Delta. The percentage of territorial pairs nesting ranged from 39 percent to 89 percent during a 6-year ground-based study (1995–2000; Earnst 2004, p. 9) and from 43 percent to 76 percent (average of 58 percent) during 13-years of aerial surveys (1993–2007; ABR, Inc. 2007, Table 1; ABR, Inc., unpublished data).

Reproductive success, like nest occupancy by territorial pairs, varied on the Colville River Delta. Low reproductive success has been attributed to late ice melt or extreme flooding (Earnst 2004, p. 9). Based on Mayfield survival rates (a technique for measuring nesting success in which the number of days from discovery of the nest to fledging or failure (exposure days) is used to compute a daily nest-survival rate) calculated for yellow-billed loons nesting on the Colville River Delta in 1995–2000, 4 percent to 60 percent of eggs/chicks survived from laying to age 6 weeks (Earnst 2004, p. 9). Apparent nesting success [(broods/nests) × 100] based on broods counted on aerial surveys conducted 8 weeks apart during nesting and brood-rearing ranged from 19 percent to 64 percent annually in 13 years between 1993 and 2007 (ABR, Inc. 2007, Table 1; ABR, Inc., unpublished data). During the last three years (2005–2007) of this study, weekly monitoring surveys were conducted after nests were found. Apparent nesting success calculated from these weekly surveys was 1–10 percent higher than calculations based on nesting and brood-rearing surveys conducted 8 weeks apart, because the more frequent surveys identified nests with chicks that did not survive to 5–6 weeks of age (Johnson *et al.* 2006, p. 17; Johnson *et al.* 2007, p. 16; Johnson *et al.* 2008, p. 15). The highest recorded apparent nesting success on the Colville River Delta was 71 percent in 2007 based on weekly monitoring surveys (Johnson *et al.* 2008, p. 15).

Breeding Distribution

Yellow-billed loons nest near freshwater lakes in arctic tundra of Alaska on the Arctic Coastal Plain (ACP), northwestern Alaska, and St. Lawrence Island; in Canada east of the Mackenzie Delta and west of Hudson Bay; and in Russia on a relatively narrow strip of coastal tundra from the Chukotka Peninsula in the east and on the western Taymyr Peninsula in the west, with a break in distribution between these two areas (Earnst 2004, p. 3; North 1993, p. 42; Red Data Book of the Russian Federation 2001, p. 366; Ryabitsev 2001, p. 22; Il'ichev and Flint 1982, p. 277; Pearce *et al.* 1998, p. 369). Loons are sparsely distributed across their range, although, perhaps because of non-uniform quality of habitat, at a large scale breeding birds are somewhat clumped in distribution.

Breeding Bird Densities

Most of the breeding range of the yellow-billed loon has not been adequately surveyed, and only in Alaska have surveys been conducted specifically for breeding yellow-billed loons. Unless otherwise noted, the following discussion includes data from waterfowl surveys for which loons were not focal species. In these surveys, density estimates were not corrected for visibility bias and so are minimal estimates (*see* discussion in Groves *et al.* 1996, pp. 193–194). Surveys enumerate all yellow-billed loons seen on breeding grounds, including an unknown proportion of which are non-breeders (Earnst *et al.* 2005, p. 300).

Alaska

Based on fixed-wing aerial survey data (1992 to 2003 ACP and North Slope Eider (NSE) surveys conducted by the Service), Earnst *et al.* (2005, p. 300) calculated that most of the population on the ACP of Alaska occurred within concentration areas with more than 0.11 individuals per square kilometer (km^2). Such areas comprised only 12 percent of the surveyed area yet contained 53 percent of yellow-billed loon sightings.

The largest concentration area was between the Meade and Ikpikpuk Rivers; it covered only 8 percent of the survey area, but had 38 percent of yellow-billed loon sightings (Earnst *et al.* 2005, p. 300). Other notable concentrations were on the Colville River Delta and west, southwest, and east of Teshekpuk Lake (Earnst *et al.* 2005, p. 300). In aerial lake-circling surveys designed for yellow-billed loons (fixed-wing aircraft were used 1992–2000; helicopters were used 2001–2007), the average density on the Colville River Delta (363 km^2 (140 mi^2) survey area) was 0.13 individuals per km^2 during 10 years from 1993 to 2004 (Johnson *et al.* 2005, p. 65), and 0.15 to 0.17 individuals per km^2 from 2005 to 2007 (Johnson *et al.* 2006, p. 15; Johnson *et al.* 2007, p. 16; Johnson *et al.* 2008, p. 15). Similar surveys for yellow-billed loons in a larger area (878 km^2) (339 mi^2) in the Northeast Planning Area (NE) of the National Petroleum Reserve-Alaska (NPR–A) in 2001–2004 indicated densities there were lower (0.07 individuals/km^2; Johnson *et al.* 2005, p. 68), except that the density in an area adjacent to Fish and Judy Creeks was similar to that of the Colville River Delta (Johnson *et al.* 2005, p. 68; Johnson *et al.* 2006, p. 15; Johnson *et al.* 2007, p. 16). In western Alaska, where fixed-wing aerial surveys were also designed specifically for loons, density on the northern Seward Peninsula averaged 0.058 (standard error (SE)=0.011; standard error is a measure of the variability in the data) individuals/km^2 over 2 years (Bollinger *et al.* 2008, p. 5).

Canada

In Canada, concentrations are found on parts of Victoria and Banks Islands, on the mainland, the Kent Peninsula, east of Bathhurst Inlet and west of Ellice River, the west side of Boothia Peninsula, and the lake district between Great Slave Lake and Baker Lake, including the Thelon Game Sanctuary (North 1993, p. 42). Densities obtained in 2005 and 2007 from fixed-winged aerial waterfowl surveys on southern Victoria Island and the Kent Peninsula ranged from 0.017 to 0.16 birds/km^2 (Conant *et al.* 2006, pp. 2, 7; Groves in litt. 2008); lower densities (0.004–0.027 birds/km^2) were found in surveys on the Queen Maud Gulf Migratory Bird Sanctuary, King William Island, Rasmussen Lowlands, and Kugluktuk (Conant *et al.* 2007, pp. 10, 12; Groves in litt. 2008). On western Victoria Island, Raven and Dickson (2006, p. 24) estimated densities from 0.004 to 0.08 birds/km^2 from helicopter-based waterfowl surveys. Hines (in litt. 2008) estimated 0.01 yellow-billed loons/km^2 on Banks Island from helicopter-based waterfowl surveys in 1992 and 1993.

Russia

In Russia, breeding concentrations have been identified on the Chukotka (Chukotskiy) Peninsula (Il'ichev and Flint 1982, p. 280; Solovyov 1992, p. 21), Kyttyk Peninsula and Ayon Island in western Chukotka (Solovyova 2007, p. 6), and the western Taymyr Peninsula (Krechmar 1966, p. 200; Il'ichev and Flint 1982, p. 277). Hodges and Eldridge (2001, pp. 141–142), using fixed-winged aircraft in the only aerial waterfowl survey of the eastern Siberian coast, found concentrations of approximately 0.01 birds/km^2 on the Cape Schmidt coast of the Chukotka Peninsula, between the Indigirka and Yana River Deltas, and between the Indigirka and Kolyma Deltas. Post-breeding density on Kyttyk Peninsula in western Chukotka was approximately 0.52 birds/km^2 (including young birds) during late July–August 2003–2007 (calculated from ground surveys, Solovyova 2007, p. 6). No density estimates are available for the Taymyr Peninsula.

Nest Densities

Nest density on 363 km^2 (140 mi^2) of the Colville River Delta, Alaska, ranged from 0.03 to 0.08 nests/km^2 during 13 years of aerial surveys for yellow-billed loons during 1993–2007 (Johnson *et al.* 1999, p. 44; Burgess *et al.* 2003, p. 36; Johnson *et al.* 2003, p. 43; Johnson *et al.* 2004, p. 74; Johnson *et al.* 2005, p. 64; Johnson *et al.* 2006, p. 15; Johnson *et al.* 2007, p. 16; Johnson *et al.* 2008, p. 15). Nest density in an 878 km^2 (339 mi^2) survey area of NE NPR–A was 0.03 nests/km^2 in each year during 2002–2004. Higher densities within this area were found along Fish and Judy Creeks (helicopter-based surveys; Johnson *et al.* 2005, p. 68). In Russia, Solovyov (1992) reported 0.18 nests/km^2 on a 27.6 km^2 (10.6 mi^2) plot searched from the ground on Belyaka Spit near Kolyuchin Bay on the Chukotka Peninsula. On the Kyttyk Peninsula in western Chukotka, yellow-billed loons nest on approximately 25 percent of lakes larger than 4 ha (9.9 acres) (Solovyova 2007, p. 6).

Foraging Distribution During Breeding Season

Yellow-billed loons use nearshore and offshore marine waters adjacent to their breeding areas for foraging in summer. Such habitats are likely used by both breeding adults and younger or non-territorial birds (Earnst 2004, p. 7). Earnst (2004, pp. 6–7) reviewed yellow-billed loon distribution information from fixed-wing aerial waterfowl surveys that Fischer *et al.* (2002) conducted in 1999 and 2000 off the coasts of Canada's arctic islands and the ACP of Alaska between Cape Halkett and Brownlow Point. Similar surveys conducted between Barrow and Demarcation Point in 2001 also included yellow-billed loon observations in Elson Lagoon (Fischer 2001, p. 4; Fischer and Larned 2004, p. 146). During fixed-wing aerial surveys for common eiders in late June of 1999 through 2007, between 23 and 99 yellow-billed loons were observed in nearshore waters and along barrier islands of the Beaufort and Chukchi Seas (Dau and Larned 2007, p. 18). Yellow-billed loons used lagoons and nearshore waters along the coast of St. Lawrence Island in summer in the 1950s (Fay and Cade 1959, pp. 92, 100). In Russia, Solovyova (coastal boat surveys; 2007, p. 6) reported densities of 0.24 birds/km^2 using coastal waters near the Kyttyk Peninsula and Ayon Island at the northern end of Chaun Bay in western Chukotka, and 0.04 birds/km^2 at the southern end of Chaun Bay near the Chaun River Delta in 2006. Vronskiy (1987, p. 30) observed individual yellow-billed loons and pairs in bays 100–150 m (328–492 ft) offshore of northwestern Taymyr during summer. Yellow-billed loons occurred in summer along the coast of Wrangel Island, although there were no indications of nesting on the island (Stishov *et al.* 1991, p. 20). In boat-based surveys in the Kara and Barents Seas, arctic (*Gavia arctica*) and red-throated (*G. stellata*) loons were abundant in the nearshore marine waters of the western Kara Sea and in the Ob' and Yenisey estuaries, especially in Baidaratskaya Bay, and occurred in smaller numbers in the Pechora Bay in the Barents Sea in August and September 1995, but no yellow-billed loons were observed (Decker *et al.* 1998, pp. 9, 11). In subsequent boat surveys between 1998 and 2003, only one yellow-billed loon was observed in mid-August 1998 in coastal waters northeast of Dolgy Island (west of Vaigach Island) in the Pechora Sea (M. Gavrilo, in litt. 2008).

Wintering Habitat and Distribution

Wintering habitats include sheltered marine waters less than 30 m (98.4 ft) deep, such as fiords and areas between islands on the inner coast in Norway (Strann and Østnes 2007, p. 2). Schmutz (2008, p. 1) found that throughout migrating and wintering seasons, yellow-billed loons marked with satellite transmitters occurred from 1 to 20 miles offshore. The wintering range includes coastal waters of southern Alaska and British Columbia from the Aleutian Islands to Puget Sound; the

Pacific coast of Asia from the Sea of Okhotsk south to the Yellow Sea; the Barents Sea and the coast of the Kola Peninsula; coastal waters of Norway; and possibly Great Britain (Earnst 2004, pp. 13–14; North 1993, pp. 42–43; Ryabitsev 2001, p. 22; Schmutz in litt. 2008, p. 1; Strann and Østnes 2007, p. 2; Burn and Mather 1974, p. 278; Gibson and Byrd 2007, p. 68). A small proportion of yellow-billed loons may winter in interior lakes or reservoirs in North America (North 1994, p. 3).

Winter population distribution and numbers of yellow-billed loons are not well documented, but some information is available from marine bird surveys. Earnst (2004, p. 14) summarized loon observations in boat-based marine bird population surveys in Lower Cook Inlet, Prince William Sound, and Kodiak Island. In these surveys, estimates of yellow-billed loons were in tens to low hundreds, with wide confidence limits. In many cases, loons were not identified to species. Strann and Østnes (2007, p. 3) counted 1,160–1,605 yellow-billed loons on surveys conducted off the coast of Norway from 1986 to 1994, confirming Norway as the most important known wintering area for the species in Europe. No surveys have been conducted in Asian wintering areas. In some regularly used wintering areas such as the Yellow Sea, the Aleutian Islands, and Great Britain, the yellow-billed loon's small population and scattered marine distribution may have contributed to the impression that yellow-billed loons are vagrants or rare visitors (Lepage 2008, p. 1; Gibson and Byrd 2007, p. 68; Dudley *et al.* 2006, p. 533; Scott and Shaw 2008, pp. 241–248).

Immature loons and possibly some non-breeding adults stay in wintering areas throughout the year (North 1994, p. 4). Earnst (2004, pp. 11–12) summarized yellow-billed loon observations in summer marine boat-based surveys conducted in lower Cook Inlet and Prince William Sound in southcentral Alaska, and in southeast Alaska. Estimates from all these surveys totaled only 339 yellow-billed loons, but many loons were not identified to species (Earnst 2004, p. 11). In boat-based surveys of murrelets conducted in July of 2002–2004 from Icy Bay to LeConte Bay in southeast Alaska, Kissling *et al.* (2007, Appendices 7, 8) counted 20 yellow-billed loons. Yellow-billed loons have been observed throughout summer months in the Aleutians (Gibson and Byrd 2007, p. 68). According to the Red Data Book of Kamchatka (2006, p. 92), non-breeding birds occur off the coast of Kamchatka in summer.

Migration

Yellow-billed loon migration routes are thought to be primarily marine. Schmutz (in litt. 2008, p. 1) found that yellow-billed loons marked with satellite transmitters generally remained between 1 and 20 miles from land during migration and winter. Yellow-billed loons migrate singly or in pairs, but gather in polynyas (areas of open water at predictable, recurrent locations in sea-ice covered regions), ice leads (more ephemeral breaks in sea ice, often along coastlines), and early-melting areas off river deltas near breeding grounds in spring along the Beaufort Sea coast of Alaska and Canada (Barry *et al.* 1981, pp. 29–30; Barry and Barry 1982, p. 25; Woodby and Divoky 1982, p. 406; Johnson and Herter, 1989, p. 9; Barr 1997, pp. 12–13; Alexander *et al.* 1997, pp. 15, 17; Mallory and Fontaine 2004, pp. 52–53).

These observations of yellow-billed loons in the Beaufort Sea during migration establish that at least some yellow-billed loons breeding in Canada's Arctic Islands and along the adjacent Canadian coast use this migration route. North (1993, pp. 45–46) examined evidence of alternative migration routes for yellow-billed loons wintering in southeast Alaska and British Columbia, suggesting that they could migrate overland to mainland breeding areas in Canada, particularly around Great Slave Lake. Yellow-billed loons have been observed on inland lakes in Canada and Alaska (North 1993, pp. 43, 46). The existence of this route is still hypothetical, and the number of yellow-billed loons in interior mainland Canada is highly uncertain (discussed below under Population Size).

Yellow-billed loons breeding in Alaska have been studied to determine migration routes. Nineteen yellow-billed loons captured on the ACP between 2002 and 2008 were outfitted with satellite transmitters (Schmutz in litt. 2008, p. 1). All of them migrated to Asia, predominantly south along the Russian coastline from the Chukotka Peninsula (either through the Bering Strait or across the mountains from the north side of the Chukotka Peninsula to the Gulf of Anadyr), and along the Kamchatka coast. They wintered in the Yellow Sea and Sea of Japan off China, North Korea, Russia, and Japan (near Hokkaido). All 10 yellow-billed loons fitted with transmitters on the Seward Peninsula, Alaska, in 2007 and 2008 also used the Bering Strait region after leaving breeding grounds. Five of these migrated to Asian grounds as described above for ACP breeding birds; the other 5 wintered throughout the Aleutian Islands from Shemya Island in the west to the Semidi Islands off the coast of the Alaska Peninsula (Schmutz in litt. 2008, p. 1). Most of these yellow-billed loons departed breeding areas in late September, arrived in wintering locations in mid-November, started spring migration in April, and arrived on breeding grounds in the first half of June; these dates are consistent with breeding ground arrival dates reported by North (1994, p. 5). Non-breeders or failed nesters may start fall migration in July.

The migration routes of yellow-billed loons breeding in Russia have not been studied. Because of the proximity of the Chukotka Peninsula to the ACP in Alaska, and the fact that ACP breeding yellow-billed loons use the Chukotka Peninsula during migration (Schmutz in litt. 2008, p. 1), it is likely that some or all yellow-billed loons from eastern Russia migrate through the Bering Strait to Asian wintering areas.

Population Size

ACP, Alaska

Yellow-billed loon population indices on the ACP of Alaska were determined by two independent fixed-wing aerial transect surveys conducted each year by the Service's Migratory Bird Management program. Surveys were flown in early June each year from 1992 through 2008 (NSE survey, 1992–2008, an average of 1,304 km^2 (503.5 mi^2) transect area that sampled a total area of 30,465 km^2 (11,763 mi^2), for 4.3 percent coverage) and late June each year from 1986 through 2006 (ACP survey, 1986–2006, average of 1,256 km^2 (485 mi^2) transect area which sampled a total area 61,645 km^2 (23,801 mi^2), for 2.0 percent coverage of a larger area than that covered by the NSE survey). The average population index from the NSE survey is 1,119 yellow-billed loons (95 percent confidence interval (CI) = 1,012 to 1,226, Larned *et al.* 2009, p. 24). (Note: In order to estimate the reliability of a sample statistic, such as an average, it is common to set confidence limits to it (Sokal and Rohlf 1995, p. 139). The limits will show the maximum and minimum numbers the statistic (e.g., average) is likely to be, along with a measure of that likelihood (e.g., 95 percent). So, when an average number of birds, for example, is reported, followed by a confidence interval, the confidence interval shows the statistical range of values that provides cutoff points for the likely values for the average.) The long-term mean from the ACP survey is 2,611 loons (95 percent CI = 2,218 to 3,005; Mallek *et al.* 2007, p. 10; USFWS unpublished data). The confidence intervals around these 16- and 21-year means incorporate the variation due to within-year sampling error, the spatial variability among transects and within strata, and variation among years related either to detection rate (observer ability, habitat change, weather conditions) or the availability of birds to be seen (arrival or departure of population components, behavior associated with nesting chronology). One study integrated results from both the early and late surveys, incorporating covariates adjusting for detection rates (Earnst *et al.* 2005). The 12-year mean (1992 through 2003) resulted in an estimate of 2,221 individuals (95 percent CI = 1,209–3,233) in early June and 3,369 individuals (95 percent CI = 1,910–4,828) in late June (Earnst *et al.* 2005, p. 295). Another estimate of population size was determined by lake-circling aerial searches of greater than 7-ha (17.3-acre) lakes on 7 × 7-km (4.35 × 4.35-mi) plots as part of a 2003–2004 study of yellow-billed loon habitat preferences (Stehn *et al.* 2005, pp. 1–37). This survey was flown from June 15 through 22 each year. Based on average density observed, the estimated total population index was 2,544 (95 percent CI = 1,780–3,308) yellow-billed loons (Stehn in litt. 2008, p. 1).

Western Alaska

Seward Peninsula and Cape Krusenstern fixed-wing aerial lake-circling surveys, on 12 × 12-km (7.46 × 7.46-mi) sample plots, were flown in June of 2005 and 2007, and resulted in an estimate of 431 (95 percent CI = 280–582) yellow-billed loons on these western Alaska breeding grounds (Bollinger *et al.* 2008, p. 1). Additional aerial transects sampling an area of 15,234 km² (5,882 mi²) were flown on Selawik National Wildlife Refuge and adjacent wetlands in June in the years 1996 and 1997 (Platte 1999, p. 3), but only three yellow-billed loons were sighted, resulting in an estimated mean population index of 44 birds (95 percent CI = 0–95) (USFWS unpublished data). Yellow-billed loons were documented nesting on St. Lawrence Island in the 1950s (Fay and Cade 1959, pp. 84, 100), but there is no more recent information. Adding western Alaska population figures to those from the ACP results in an estimated total of 3,000 to 4,000 yellow-billed loons on breeding grounds in Alaska.

Canada

Although overall breeding population estimates for yellow-billed loons in Canada do not exist (*http://www.bsc-eoc.org/clls-bw1.html*, accessed May 19, 2008), and yellow-billed loons are not summarized in the Waterfowl Population Status annual reports compiled by the U.S. and Canadian governments for North American Waterfowl (USFWS 2007, pp. 1–62), several recent fixed-wing aerial waterfowl surveys included loon observations in parts of Nunavut and Northwest Territories. Loons were not the focus of the surveys, so it is possible that observer effort or identification ability varied, and no visibility correction factors or seasonal timing factors were applied. Helicopter surveys yielded estimates ranging from 659 (SE 359) to 1,784 (SE 502) on northwest Victoria Island, and from 98 (SE 70) to 258 (SE 146) birds in the southwest part of the island (Raven and Dickson 2006). A fixed-winged survey included Kent Peninsula and southeastern Victoria Island in 2005, and Queen Maud Gulf, King William Island, Rasmussen Lowlands, and near Kugluktuk in 2006; all areas from both years were repeated in 2007 but with fewer transects sampled per unit area. The combined estimate for both areas from 2005–2006 fixed-winged surveys and the 2007 estimate were similar, at 2,500–3,000 birds (Conant *et al.* 2006, p. 7; Conant *et al.* 2007, p. 12; Groves in litt. 2008). Hines (in litt. 2008) estimated there were 500–1,000 yellow-billed loons on Banks Island, based on helicopter aerial surveys conducted in 1992 and 1993. The range of these point estimates suggests that between 3,750–6,000 birds occur on breeding grounds in the surveyed areas.

The rest of the yellow-billed loon's range on the Canadian mainland has not been surveyed. Based on the vast number of large, fish-bearing lakes north of treeline (an area of 500,000–750,000 km²) (193,051–289,577 mi²) minus the surveyed areas on the mainland (46,000 km²), (17,761 mi²) and using opportunistic observations of yellow-billed loons by Northwest Territory and Nunavut checklist survey cooperators over the last decade, Poter (in litt. 2008, p. 2, adjusted from Hines in litt. 2008, p. 1) calculated that a density of 0.01–0.02 birds/km² would yield an estimate of 4,500–14,000 birds in mainland breeding areas in Canada, not including surveyed areas in the arctic described in the previous paragraph. This estimate is based on a very large land area bounded at the southern end by an area of documented yellow-billed loon breeding between Great Slave Lake and Baker Lake, particularly in or near the Thelon Game Sanctuary (North 1993, p. 42). Between this area and the arctic coast is a large area where breeding has not been documented (North 1993, Figure 2). Fair (2002, p. 30) estimated the yellow-billed loon population on interior Canadian breeding grounds to be 4,800, using a density of 0.02 loons in a 100,000 km² area around the Sanctuary, and a lower density of 0.007 for the wider area of 400,000 km². Fair's estimate of 4,800 is close to the lower end of Poter's (2008, p. 1) estimate of 4,500. We believe Fair's analysis more accurately reflects likely yellow-billed loon distribution in Canada, because it reflects a lower average density for the large area where breeding has not been documented. Combining the 4,500 to 14,000 breeding birds estimated for interior Canada, and 3,750 to 6,000 breeding birds estimated for the arctic (and rounding to thousands), we conclude that the Canadian breeding population size is 8,000 to 20,000, but that it is most likely at the lower end of this range.

Russia

Information on the breeding-ground population size of yellow-billed loons for Russia is limited. Hodges and Eldridge (2001, Appendix 2) estimated 674 yellow-billed loons (coefficient of variation (C.V., a measure of dispersion in a probability distribution) 0.55) in a 157,611-km² (60,854–mi²) fixed-wing aerial survey area of the eastern Siberia arctic coast from Kolyuchin Bay to the Lena River Delta. We know of no other loon surveys within the breeding range of the yellow-billed loon in Russia. Red Data Books for the Russian Federation (2001, pp. 366–367), Yakutia (1987, p. 33), and the Northern Far East of Russia (1998, pp. 97–98) do not offer population estimates. Kondratiev (1989, p. 37) estimated that 2,000 birds nested in Chukotka, but did not give a basis or sources for his estimate. Fair (2002, p. 31) projected, based on this estimate of 2,000 birds in Chukotka (Kondratiev 1989, p. 37), that another 2,000 nested on the Taymyr Peninsula, and that perhaps another 1,000 were scattered across the arctic coast, giving 5,000 birds on Russian breeding areas. Syroechkovsky (in litt. 2008) suggested (based on field observations but not scientific surveys) that the number of birds on breeding grounds (including non-breeding birds) is around 3,000 for Chukotka, 500 for Yakutia, and about 1,200 for Taymyr, for a total of around 4,700 birds. However, Solovyova (in. litt. 2008, p. 1; calculated from Solovyova 2007, p. 6) recently estimated the post-breeding population of the Kyttyk Peninsula on Chaun Bay in western Chukotka at 1,000, and the post-breeding population of nearby Ayon Island at 900 birds. Given

Solovyova's (in. litt. 2008, p. 1) estimates for her study area in Chukotka, she estimated that the total breeding ground population in Chukotka might be as high as 5,000 birds. If the Chukotka population is 5,000, the total for Russia could be as high as 8,000 based on habitat availability. Thus, our best information suggests the Russian breeding population is between 5,000 and 8,000 birds.

In summary, the global breeding ground population size for yellow-billed loons is unknown, but probably at the lower end of the range of 16,000 to 32,000. The Alaska population estimate of 3,000 to 4,000 is derived from surveys. Less certain estimates based on the amount of available habitat (plus limited survey data) are the lower end of the range of 8,000 to 20,000 birds in Canada, and 5,000 to 8,000 in Russia.

Population Trend

Alaska

The only population trends available for yellow-billed loons breeding in Alaska are on the ACP, where the ACP and NSE waterfowl surveys are conducted. We note that because we count only the breeding component of the population, the total population could decline without being detected for a number of years. This could occur because increased mortality of breeding birds could be masked by movements of birds without territories (either sub-adult birds or adults which have not found territories) into vacated territories. With this caution, we believe the time series of at least 17 years for the surveys described below gives us a reasonably reliable data set for observing population trends, and these data represent the best information available at this time.

A population growth rate, or lambda, less than 1.00 would indicate population decline (negative ''growth''), while a lambda greater than 1.00 would indicate population growth. For the ACP survey 1986–2006, the average growth rate was 0.9886 (95 percent CI = 0.9625–1.0154) (Mallek *et al.* 2007, p. 21), and for the NSE survey 1992–2008 (a smaller area than that covered by the ACP survey, and surveyed earlier in June), the average growth rate was 1.016 (95 percent CI = 0.995–1.036) (calculated from Larned *et al.* 2009, Figure 1). Thus, these surveys provide slightly conflicting perspectives, with one suggesting a stable or slightly declining population (with a point estimate of a decline of 1.1 percent/yr.) and the other suggesting a stable or slight increasing population (with a point estimate of an increase of 1.6 percent/yr.) on the ACP.

Earnst *et al.* (2005, pp. 289–304) sought to improve the estimates above by using a statistical model that takes into account possible confounding factors of survey type, spring timing, and observer experience. They used this model to analyze ACP and NSE survey data through 2003. Controlling for these confounding factors, they (p. 298) estimated average population growth rate to be 0.991 (95 percent CI = 0.964–1.018), also indicating a stable or slightly declining population.

We also examined a subset of the NSE data through 2008 that included only the observations of the most consistent and experienced pilot-observer, who has flown all 16 early-June NSE surveys during 1992–2008. Each survey includes observations of two observers: the pilot-observer in the left-side seat of the aircraft, and a second observer in the right-side seat. There have been numerous ''right-side observers'' over the course of the NSE survey. Each of these observers has a different ability to see and identify birds, and this ability often increases over successive surveys as the observer gains experience. Our analysis of the left-side pilot-observer eliminated the necessity to estimate the variable magnitudes of influence of right-side observer experience. In addition, the increased interest in yellow-billed loons in 2002 may have influenced new right-side observers to search more intensively for yellow-billed loons than earlier observers, who focused on waterfowl. Our analysis of the pilot-observer data from the NSE survey also eliminated the need to reconcile the later timing and different survey extent of the ACP survey. The average growth rate using this subset of data was slightly lower and more precisely estimated at 0.986 (95 percent CI = 0.967–1.006) (USFWS unpublished data) than the estimate of 0.991 from Earnst *et al.*'s (2005, p. 298) model, and the results also indicate a relatively stable or slightly declining population.

In summary, the information available from the ACP does not allow us to precisely determine current population trends. Two surveys and multiple analytical approaches used to control for confounding factors provide estimates indicating trends ranging from slightly increasing to slightly decreasing, and all estimates have 95 percent CIs that include a lambda of 1.0, indicating that possible trends cannot be distinguished from population stability with reasonable certainty. Although the population trend on the ACP is uncertain, we conclude that the number of breeding yellow-billed loons on the ACP breeding grounds is either stable or declining slightly, with point estimates from models controlling for confounding factors estimating decline on the order of ~1 percent per year. We will continue to look for ways to improve our ability to detect trends. Surveys in western Alaska have not been conducted for a long enough period (2005 and 2007) to detect trends.

Russia

In Russia, recent data are fragmentary, making it difficult to determine trends. In the west, the Red Data Book of the Russian Federation (2001, p. 366) stated that the species no longer nests in European Russia where it was formerly found, such as the Kola Peninsula, the archipelago of Novaya Zemlya, and Vaigach and Ainovy Islands in the Kara Sea, although it is unclear how abundant or widespread the species was in these areas historically. (However, Kalyakin (2001, p. 10) reports finding it nesting on Novaya Zemlya, although it is ''extremely rare.'') Similarly, according to the Red Data Book of the Yamal-Nenets Autonomous District (1997) near the western end of the Russian breeding range, in the previous 20 years only a few non-breeding yellow-billed loons were recorded in the District. Strann (in litt. 2008) speculated that since the early 1990s there may have been a decline in the number of yellow-billed loons in the main Norway wintering area, which would be consistent with a western Russian breeding ground range contraction if birds nesting in western Russia migrate to Norway for winter (which seems logical). We were unable to find either the source of the Red Data Book statements or supporting evidence for this potential range contraction. In eastern Russia, yellow-billed loons apparently no longer nest along the northern coast of the Sea of Okhotsk where they occurred 30–50 years ago, nor on the Anadyr River delta (Red Data Book of the Russian Federation 2001, p. 366; Red Data Book of the Northern Far East of Russia 1998, p. 97). However, Solovyova (in litt. 2008) reported that the number of breeding yellow-billed loons may be increasing in some locations in eastern Siberia, specifically near Chaun Bay in western Chukotka, and at Belyaka Spit near Kolyuchin Bay in northeastern Chukotka.

In summary, we found unsubstantiated reports that the species may no longer be found in parts of its historical range in Russia, but there is somewhat contradictory information for some areas and a lack of survey data for all areas. Yellow-billed loons may also be increasing in some areas in Russia.

We conclude that we do not have reliable trend information for the Russian breeding grounds.

Canada

As described above for Population Size, survey data for Canadian breeding grounds cover a small portion of the range, and have not been conducted for enough years to analyze trends. We conclude that we do not have reliable trend information for Canadian breeding grounds.

To summarize rangewide population trend information, we have reliable data indicating that the ACP breeding population is stable or slightly declining. We do not have reliable evidence from other breeding areas that breeding populations are increasing or decreasing. There have been no surveys of yellow-billed loons on wintering areas, so we have no trend information from those areas.

Population Resiliency

Certain intrinsic aspects of yellow-billed loon ecology and demography, including low and variable productivity, adult survival, and low population numbers, are relevant to the species' status. Stable populations of K-selected species, such as the yellow-billed loon, are characterized by low annual productivity rates balanced with high annual survival rates, meaning that individuals must live many years to replace themselves with offspring that survive to recruit into the breeding population. Low productivity means that depleted K-selected species have lower recovery potential and slower recovery rates following population declines than r-selected species, which are characterized by high annual productivity. Factors that reduce productivity, including loss of productive breeding habitats, reduction in prey populations, and increases in nest predators, may further constrain K-selected species' recovery potential. Further, most arctic species are characterized by variable annual productivity, given the vagaries and severity of arctic weather, fluctuations in predator-prey relationships, and other aspects of arctic ecology. The population impact of threats that reduce productivity could be magnified if coincident with an infrequent year of otherwise high productivity.

Although factors that compromise productivity can cause populations to decline, adult survival is likely the more important determinant of K-selected species' population size and persistence (Smith and Smith 2001, p. 235). If enough adults are removed from the population prior to replacing themselves (i.e., adult survival is decreased), the population will decline. Perhaps most pertinent to a discussion of extinction, rare species—those with low numbers—are intrinsically closer to a threshold below which recovery is not possible (i.e., minimum viable population) (Hunter 1996, p. 137).

These intrinsic aspects of yellow-billed loon ecology and demography signal the continuing need to monitor yellow-billed loon populations, despite the fact that the species continues to be widely distributed across both its arctic breeding range, which is nearly holarctic, and in its wintering range.

Factors Affecting the Yellow-Billed Loon

Section 4(a)(1) of the Act (16 U.S.C. 1533(a)(1)) and regulations promulgated to implement the listing provisions of the Act (50 CFR part 424) set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1) of the Act. Below, we provide a summary of our analysis of threats to the yellow-billed loon.

Factor A: Present or Threatened Destruction, Modification, or Curtailment of the Habitat or Range

We considered whether yellow-billed loon habitats are threatened by oil and gas development (including disturbance, changes in freshwater chemistry and pollutant loads, and changes in freshwater hydrology), by degradation of the marine environment from pollution or overfishing, or by climate change. Potential threats from oil and gas development are addressed by the petitioners under Factor E, but are discussed here under Factor A because they are potential mechanisms for rendering breeding habitats unsuitable. Potential direct impacts on loon mortality associated with development, such as increased predation and oil spills, are discussed under Factors C and E, respectively.

Terrestrial Oil and Gas Development

Terrestrial and marine oil and gas development occurs in the range of the yellow-billed loon. Here we discuss terrestrial development in Alaskan and Russian breeding grounds. We are not aware of any terrestrial oil or gas development within the breeding range of the yellow-billed loon in Canada; planned terrestrial development on the Mackenzie River Delta is outside the breeding range, although activity there could affect loons migrating through adjacent marine waters. Marine activities related to oil and gas development are discussed under Factor E.

Much of the yellow-billed loon's breeding habitat in Alaska is within areas available for oil and gas leasing and development. Approximately three-quarters of the yellow-billed loons that nest in Alaska, and over 90 percent of those that nest on Alaska's ACP, occur within the 9.5-million-ha (23.5-million-ac) NPR–A (Earnst *et al.* 2005, p. 300), in areas that are leased or available for leasing for oil and gas exploration and development. Approximately 29 percent of yellow-billed loons breeding on the ACP nest in NPR–A tracts that have been leased (Stehn and Platte, U.S. Fish and Wildlife Service, in litt. 2008, p. 1), and 25 exploration wells were drilled during the period 2000–2007 (*http://www.blm.gov/ak/st/en/prog/energy/oil_gas/npra.html*, accessed 3 June 2008). The Northwest Planning Area (NW) NPR–A Integrated Activity Plan/Environmental Impact Statement Record of Decision (ROD) (USDOI–BLM 2004a, p. 5) has made 100 percent of the NW NPR–A available for leasing. The Final NE NPR–A Supplemental Integrated Activity Plan/Environmental Impact Statement ROD (USDOI–BLM 2008b, p. 1) allows leasing of 86 percent (1.6 million ha, or 3.94 million ac) of the NE NPR–A immediately, and an additional 9 percent beginning in 2018. Virtually all yellow-billed loon breeding habitat in the NE NPR–A is within areas currently available for leasing (USDOI–BLM 2008a, Volume 6, Maps 2–4 and 3–10).

If offshore development occurs in the Chukchi Sea, it is anticipated that a 500-km (300-mi) oil pipeline will be built across the NPR–A from the coast between Icy Cape and Point Belcher to the Trans-Alaska Pipeline (USMMS 2008, p. IV–10). The State of Alaska also leases rights to oil and gas development on its land, including the Colville River Delta (ADNR 2008, p. 1), where development has already occurred within the range and habitats of the yellow-billed loon (ADNR 2008, p.1). Thus, as a result of past and possible future oil and gas lease sales, and ongoing exploratory efforts, a significant portion of the yellow-billed loon's breeding habitat in NPR–A is subject to potential oil and gas development. Additionally, resource development in adjacent offshore areas may result in the construction of pipelines across breeding habitat in NPR–A.

Although lease sales and exploratory efforts set the stage for possible future development in yellow-billed loon breeding habitat in northern Alaska, determining the likelihood and timing of eventual development is difficult. In northeast NPR–A, several satellite production pads associated with existing infrastructure and facilities outside NPR–A at the Alpine field on the Colville River delta are in various stages of planning, permitting, and construction. It is very likely that within the next 10 to 20 years at least 5 to 7 satellite production pads feeding the existing central processing facility will be in operation, with some pads on State lands on the delta and some on adjacent Federal lands in NPR–A. Elsewhere in NPR–A the likelihood and timing of possible future development are more difficult to predict. BLM estimates that exploratory activities take roughly 10 years before construction begins (USDOI–BLM 2008c, p. 13), with roughly 70 years from the initiation of exploration until final field abandonment. Initial exploratory activities have commenced in some areas in NPR–A; exploration has yet to begin on some existing leased tracts elsewhere; and other lands have not yet been leased or offered for lease. Thus, yellow-billed loon habitat in the Colville River delta and adjacent NPR–A varies in its potential for future oil and gas development, and the timing of development, where it occurs, will be staggered starting with imminent development on and near the Colville River delta, followed by exploration, construction, and production over a period of several decades elsewhere, persisting for at least 70 years and possibly longer in various areas.

Terrestrial oil development is ongoing, and likely to increase, at the western edge of Russian yellow-billed loon breeding range. These areas have never been systematically surveyed for loons, so the historical occurrence and degree to which development areas overlaps areas used by loons is unknown. On the Yamal Peninsula, the largest gas field is the Bovanenkovskeo field, which is projected, beginning in 2011, to produce approximately 115 billion cubic meters (4 trillion cubic ft) of gas, which will be transported by new railways and a 2,451-km (1,523-mi) long pipeline currently under construction (Barents Observer 2008, p. 1). A liquefied-natural-gas plant is planned on the Kara Sea coast of the peninsula. The Yuzhnoe-Khykchuyu oil field in the Timan-Pechora province near the port of Varandey on the Pechora Sea is among the largest in Russia, and is planned as an anchor field for further development (ConocoPhillips 2008, p. 1). Major western Siberian oil fields in the Pechora River basin of the Komi Republic have operated for decades upstream of yellow-billed loon breeding range, and a large mining industry operates out of Norilsk on the Taymyr Peninsula. Gazprom, Russia's largest oil and gas company, is developing new discoveries in Chukotka near Anadyr (Gazprom Neft 2004, p. 1). In addition to these activities at the western edge of the Russian breeding area, reserves exist but are not currently planned for development in the Laptev formation on the arctic coast east of the Lena River (USGS 2007, pp. 1–2).

We are not aware of any yellow-billed loon surveys in the Taymyr, Timan-Pechora, and Yamal districts described above; so we do not know whether or to what extent yellow-billed loon breeding habitat overlaps with zones of industrial activity in this area. It is possible that the reported potential contraction at the western edge of the yellow-billed loon's range in Russia (Red Data Book of the Russian Federation 2001, p. 366) could have resulted from the effects of resource extraction in the region, but we have no evidence for or against this possibility. No data are available on potential effects of disturbance on yellow-billed loons, and we know of no special protection to prevent disturbance of yellow-billed loons or other nesting birds in Russian oil fields (Syroechkovskiy 2008, p. 1). Likewise, we have no information on the possible impacts of oil spills, facility development, and lake-water withdrawals on yellow-billed loons in Russia. Therefore, the remainder of this section will focus on available information regarding potential impacts associated with oil and gas exploration and development in Alaska.

The potential negative effects of industrial development in yellow-billed loon nesting areas includes disturbance caused by aircraft, vehicular traffic, heavy-equipment use, maintenance activities, and pedestrian traffic. Disturbance to nesting birds from oil infrastructure has been widely discussed but poorly documented (NRC 2003, p. 49; USDOI–BLM 2008a, pp. 4–890, 4–891). Loons as a genus are susceptible to disturbance, although they sometimes habituate to predictable disturbance (discussed in Vogel 1995, pp. 15–18; Barr 1997, pp. 22–23; Evers 2004, pp. 35–37; Earnst 2004, pp. 19, 31; Mills and Andres 2004, pp. 212–213; North 1994, p. 16). Human disturbance can cause yellow-billed loons to abandon reproductive efforts or leave eggs or chicks unattended and exposed to predators or bad weather (Earnst 2004, p. 19). Observations by Earnst (2004, p. 31) indicated that adults left nests when an approaching human is as much as 1.6 km (1 mi) away, or as close as a few meters (yards). These behaviors varied by individual and circumstance, and have not been subject to formal study (Earnst 2004, p. 31); more importantly, the impacts to fitness and the potential for habituation have not been studied. Preliminary observations have been made on the Colville River Delta, Alaska, where oil field development has occurred in yellow-billed loon nesting habitat. Yellow-billed loons were surveyed during nesting and brood-rearing before (1993, 1995–1997) and during (1998–2001) the oil-facility-development phase; surveys are continuing in the oil production phase that began in 2000 (ABR Inc. 2007, pp. 1–2; Johnson *et al.* 2008, p. i). Between 16 and 30 nests were identified each year. No statistical comparisons among phases are available, but the proportion of territories with nests and nest success appeared roughly comparable before and during construction and during production. Too few pairs (3) have been within 1.6 km (1 mi) of facilities to allow meaningful comparisons of potential disturbance among phases (ABR 2007, pp. 3–4).

Potential disturbance and other habitat degradation on NPR–A oil fields will likely be mitigated by stipulations and required operating procedures (ROPs) described in the RODs for the Northwest and Northeast Planning Areas and included in oil and gas leases for those areas (USDOI–BLM 1998, Appendix B, pp. 29–43; USDOI–BLM 2004a, Appendix B, pp. B–1–B–18; USDOI–BLM 2008b, Appendix A, pp. 33–74). Most of the area leased is subject to the performance-based stipulations and ROPs described here; for tracts leased in 1999 and 2002 under the 1998 ROD, prescriptive stipulations and ROPs apply (USDOI–BLM 1998, Appendix B, pp. 29–43). When lessees propose specific development plans for those tracts, there will be opportunities for the BLM to apply conservation measures for yellow-billed loons, as appropriate. For tracts leased under more recent RODs (USDOI–BLM 2004a, Appendix B, pp. B–1–B–18; USDOI–BLM 2008b, Appendix A, pp. 33–74), ROP E–11 requires facility setbacks from lakes known to harbor nesting yellow-billed loons, and E–2 and K–2 require smaller setbacks for other water bodies. The current ROP E–11 states that if yellow-billed loons are found during required aerial surveys, design and location of facilities must minimize disturbance; default mitigation is a 1-mile buffer around nest sites and a 500-meter buffer around the remainder of the lake shoreline (USDOI–BLM 2004a, Appendix B, p. B–9; USDOI–BLM 2008b, Appendix A, pp. 51–53). The size of these buffers was determined in consultation with the Service and loon experts. Deviations to ROPs and stipulations can be authorized if it is demonstrated that the conservation objective of the stipulation or ROP can be met, or if it is determined that no other options are available (USDOI–BLM 2008b, Appendix A, pp. 52–53). Such deviations are sometimes exercised (e.g., USDOI–BLM 2004b, p. 1033), but BLM has committed in writing to close collaboration with the Service in its evaluation of a deviation request that may affect yellow-billed loons (V. Galterio, in litt. 2008, p. 1). Specifically, BLM has stated in writing that any exception or deviation would be required to meet the management objective of minimizing disturbance to the species and would, at a minimum, need to provide the same level of protection that the default buffers provide (V. Galterio, in litt. 2008, p. 2). This and other ROPs and stipulations are also discussed under Factor D.

Varner (2008a, pp. 1–4) analyzed the likelihood that oil-field facilities placed randomly (i.e., without regard to loon distribution) on the landscape would occur proximal to loon nesting or brood-rearing areas. Using data from Stehn *et al.* (2005, pp. 1–38) that identified lakes within NPR–A leased tracts that have a less than 30 percent likelihood of yellow-billed loon presence (moderate-high potential yellow-billed loon lakes) and BLM's projected development scenarios for NW and NE NPR–A, Varner (2008a, p. 4) estimated that 52 percent of 12 projected facilities would occur within the 1.6 km (1 mi) buffer of a moderate-high potential yellow-billed loon lake, and 38 percent would occur within a 500-m (1,640 ft) buffer. In other words, approximately half of projected developments would require additional consideration during site layout and design to avoid yellow-billed loon buffers. We note that this development projection is uncertain, and it is possible that either a smaller or greater number of facilities could actually be built.

In summary, based on our understanding of factors affecting nest success in other species and our knowledge of loon behavior, we have identified potential impacts of disturbance to loons in NPR–A. However, the only data on the effect of oil development disturbance on yellow-billed loons are from the Colville River Delta, where small sample size and lack of controls or replicates make inference difficult. As suggested by Earnst (2004, p. 31), a well-designed study is needed to determine the most appropriate buffer distance between loon nesting lakes and oil facilities. However, we believe that current buffer distances are conservative and will protect loons from disturbance. We do not know how much development will occur in NPR–A, nor do we know the timeline over which development will occur. In NPR–A, where 90 percent of yellow-billed loons breeding on the ACP occur, we expect that adherence to current BLM regulations will ameliorate impacts by requiring that planners build facilities outside buffers or find other ways to comparably minimize disturbance.

Terrestrial oil or fuel spills occur during oil and gas extraction activities from multiple sources, including well blowouts, pipeline leaks, failure of fuel storage tanks, and accidents transporting fuel. Spills of saline water produced with oil or derived from seawater used in oil recovery also occur frequently (NRC 2003, pp. 47, 230). Marine oil spills may damage prey populations, and air and boat traffic associated with oil and gas extraction offshore could affect yellow-billed loon habitat by disturbing loons so that they decrease foraging success or avoid disturbed areas. Both non-nesting and breeding yellow-billed loons on Alaska's ACP use marine areas of the Beaufort and Chukchi Seas to forage during the nesting season. In addition, in spring yellow-billed loons gather in polynyas, ice leads, and open shorelines near river deltas offshore of breeding areas in Alaska and Canada prior to dispersing to nesting grounds. Here we discuss effects of spills on loon habitat; direct effects of oil spills on loon mortality are discussed under Factor E.

Negative effects are expected to result for bird habitats contacted by oil spills (USDOI–BLM 2008a, pp. 4–760, 4–916). Changes in freshwater chemistry or pollutant loads due to oil spills associated with oil and gas development could render breeding habitats unsuitable (NRC 2003, pp. 6–7, 73–74). Oil or saline water spills could have long-term effects on tundra waters by killing prey and shoreline vegetation (NRC 2003, pp. 95, 119, 124–125, 230–231; USDOI–BLM 2008a, pp. 4–914, 4–915), thereby reducing food availability and cover.

On Alaska's North Slope oil fields, one of the most closely regulated oil production areas in the world, there were 3,696 spills from oil production, pipeline, and oil exploration facilities between July 1995 and June 2005 totaling more than 6.8 million liters (L) (1.8 million gal) of sea water, produced water, crude and diesel oil, and drilling muds (ADEC 2007, p. 49). Most spills have been relatively small and caused minimal impacts to surrounding habitats or wildlife, although three major spills have occurred from the North Slope segment of the Trans-Alaska Pipeline (NRC 2003, p. 47), and a transit pipeline accident spilled 6,357 barrels (bbl) of crude oil in 2006 (ADEC 2008, p. 1). It is difficult to predict the likelihood of future spills, in part because technology continues to improve. Based on previous spill rates, BLM estimates that development in NE NPR–A could result in more than 2,000 small oil spills (less than 500 bbl), and approximately 3 large spills (greater than 500 bbl) (USDOI–BLM 2008a, pp. 4–60–4–62); in the next 100 years, there is a 4.2 percent chance of a very large (238,000 bbl, or 10-million-gal) blowout oil spill in NPR–A (USDOI–BLM 2008a, p. 4–910). If, as expected, development is concentrated in specific areas that overlap with high-density loon breeding habitat, the potential for oil spills affecting some loon nesting lakes exists. However, as discussed above and under Factor D, measures are in place in NPR–A to lessen this potential. For example, ROP E–11 requires minimizing disturbance to loons using setbacks of permanent infrastructure around nesting lakes that would make spills less likely to affect these lakes; other stipulations and ROPs require minimizing the potential for pipeline leaks and protecting fish-bearing water bodies (USDOI–BLM 2008b, Appendix A, pp. 33–74).

Construction of roads, gravel pads, and facilities on the North Slope of Alaska has affected freshwater flow and drainage as a result of permafrost decay consequent to infrastructure placement, vegetation damage, or fluid extraction and injection (NRC 2003, pp. 3, 10, 64–72, 126–127). North (1994, p. 16) and North and Ryan (1989, p. 303) suggested that permafrost decay consequent to infrastructure placement and disturbance of vegetation could cause breaching of rivers into yellow-billed loon breeding lakes, rendering them unsuitable due to fluctuating water levels (causing drowned nests) or increased turbidity (negatively affecting foraging success). The requirement in ROP E–11 of a 1.6 km (1 mi) buffer around nest sites and a 500-meter (1600-ft) buffer around the remainder of the lake shoreline or an equally protective alternative where no permanent infrastructure would occur (USDOI–BLM 2004a, Appendix B, p. B–9; USDOI–BLM 2008b, Appendix A, pp. 51–53) will likely lessen the chances of such damage. It is possible that ice roads on breeding lakes could compact lake ice and delay melting (USDOI–BLM 1998, p. IV–3–b–1–b), thus delaying or discouraging yellow-billed loon breeding, since loons require lakes to be largely clear of ice before they commence nesting. There are currently no regulations which would prevent ice roads on breeding lakes.

It is possible that lake-water depletion or drawdown could affect connectedness, depth, or melt date of yellow-billed loon nesting or brood-rearing lakes and could render such areas unsuitable as breeding habitats. Fluctuations in lake water levels during nesting could cause nests to flood, or alternately could leave nests stranded away from the water during incubation, making them more vulnerable to depredation or abandonment (e.g., Kertell 1996, pp. 356–366 for Pacific loons; Fair 1979, pp. 57–63 for common loons; see also discussion in Earnst 2004, p. 19). Earnst (2004, p. 19) proposed that yellow-billed loons might be less adapted to fluctuating water levels than other loons, in part because the short arctic summer does not allow the opportunity to re-nest or delay nest initiation. Water withdrawals could have additional impacts on habitat suitability by affecting fish populations that breeding yellow-billed loons depend upon for food.

Usually taken by pumping in winter, water from lakes is used in arctic oil fields for exploratory drilling, as well as winter road and pad construction and facility use. From 1999 through 2006, approximately 2 billion L (513 million gal) of water from 126 lakes were used to drill 20 wells and construct 23 ice drill pads and roads in the NW NPR–A (USDOI–BLM 2008a, p. 3–26). During development, water is needed for drilling and facility use. According to BLM, ''Drilling water demand is estimated to be 21,000 to 63,000 gal per day, or 850,000 gal per well. Water demand is estimated to be 100 gallons per day per person. Potable water demand would drop after 2 to 4 drilling seasons, when the major construction phase would be finished. Approximately 160 persons would be on site during the production and development phases for each CPF (central processing facility) and 4 to 6 satellite fields (S. Rothwell, ConocoPhillips, pers. comm.). Drilling-water demand over the 20-year production life of the field (largely for workover operations and infill drilling) would likely be less than the 21,000 gal per day estimated above'' (USDOI–BLM 2008a, p. 4–30).

During production, waterflooding (injecting water into the reservoir) is sometimes used, but it is more cost-effective to use treated sea water rather than freshwater from lakes (Varner in litt. 2008b, p. 1). BLM has included potential use of lakes for waterflooding in their consideration of environmental effects of oil and gas development in NPR–A (USDOI–BLM 2008a, pp. 4–31–4–32), but at present such use is considered unlikely, particularly considering present stipulations and ROPs protecting lake fish and wildlife habitat (Varner in litt. 2008b, p. 1). Injection water demands can be met by produced formation water (i.e., water within the pores of rock) once production begins (Varner in litt. 2008b, p. 1; USDOI–BLM 2008a, pp. 4–31–4–32).

The actual amount of water withdrawn from lakes is highly variable and dependent upon the type of water use. To build ice roads, the amount taken from a given lake may be lower than allowed limits because it is not efficient to transport water a long distance; in contrast, lakes used for facility use or drilling are pumped more frequently and throughout the year (Hinzman *et al.* 2006, pp. 14, 56; Baker Inc. 2007, p. 4; Moulton 2007, p. 11).

Most pumped lakes monitored by oil companies on the ACP have recharged completely in spring from snowmelt or river flooding; however, most removals were much less than the 30-percent volume permitted at the time by State of Alaska regulations (Hinzman *et al.* 2006, p. 143; URS 2001, p. 4–1; Baker 2007, pp. 77–79; Baker 2008, pp. 7, 38). Two adjacent lakes monitored at Alpine Development showed different patterns in 2007: One recharged adequately from estimated snowmelt runoff given the allowable withdrawal volume of 30 percent; the other lake did not do so, and would likely be below required levels if river flooding did not occur (Baker 2008, p. 38).

We examined whether current regulations will likely be adequate to protect loon nesting lakes from excessive water withdrawal. Ninety percent of yellow-billed loon nesting range on the ACP is under BLM management in NPR–A. Outside NPR–A, the Alpine development on the Colville River Delta is the only set of oil facilities in ACP yellow-billed loon nesting range under sole State of Alaska management. At this facility, the State increased the 15-percent limit on water withdrawal from one lake with nesting yellow-billed loons to 30 percent because ''the previous criterion imposed a severe constraint on the project'' (Moulton 2007, p. 4). However, since that decision, the State of Alaska has participated in the ''Conservation Agreement for the Yellow-billed Loon (*Gavia adamsii*),'' making a commitment to protect yellow-billed loons (Conservation Agreement 2006, p. 11) and, therefore, making it less likely that the State would allow such activities to occur if they might negatively affect loons.

In NPR–A, water-withdrawal stipulations and ROPs are specifically designed to protect and monitor fish-bearing lakes. The current Federal (BLM) requirements for NE NPR–A, based on State of Alaska permit regulations, allow up to 15 percent of lake volume below ice cover to be removed from lakes deeper than 2.1 m (7 ft) with ''sensitive'' fish species (i.e., fish other than ninespine stickleback and Alaska blackfish) and up to 30 percent of lake volume from lakes deeper than 1.5 m (5 ft) with non-sensitive fish species; up to 35 percent may be removed from lakes without fish (USDOI–BLM 2008b, Appendix A, pp. 44–45). Permits are based on a site-specific analysis. At present, there are no requirements to prevent pumping of known loon-nesting lakes, and no requirements for direct measurements of effects on lake biota, including fish. However, in a letter to the Service emphasizing the BLM's commitment to supporting conservation of the yellow-billed loon, the BLM State Director for Alaska expressly clarified the ROPs and stipulations in NPR–A leases concerning water withdrawal. Underscoring the importance of continued collaboration with the Service (V. Galterio, in litt. 2008, pp. 1–3), the State Director explained that it will require a water-quality monitoring plan to be developed that will outline specific physical and biological water-quality parameters to be collected in lakes harboring yellow-billed loons (V. Galterio, in litt. 2008, pp. 1–3). We believe these requirements will protect yellow-billed loon lakes from deleterious effects of water withdrawals. See discussion under Factor D, Inadequacy of Existing Regulatory Mechanisms.

In conclusion, we have identified several mechanisms by which development could affect yellow-billed loons, including disturbance, oil spills, facility development, and lake-water withdrawals. Although we believe onshore oil and gas activity is likely to increase in Alaskan and Russian breeding grounds in the foreseeable future, we do not believe these activities will result in significant population-level impacts. Although a large proportion of high-density yellow-billed loon nesting habitat on Alaska's ACP coincides with areas of high potential for oil and gas development in NPR–A, the BLM, through stipulations and ROPs required to be included in oil and gas leases, has established a number of mechanisms to protect yellow-billed loons from the effects of oil and gas activities in NPR–A, if development ultimately does overlap with yellow-billed loon breeding habitat. We believe that disturbance and spills will likely be minimized through requirements that facilities be built at least 1.6 km (1 mi) from nests, and 500 m (1,640 ft) from lake shorelines, or an equally protective alternative. The BLM and the State of Alaska have committed to work with the Service to minimize impacts through water quality monitoring. With current projections of approximately 12 facilities in NPR–A, we believe the current regulations and close consultation with the Service are sufficient to protect yellow-billed loons from population-level effects of oil and gas development on the ACP. Based on the best available information we find that oil and gas development in the ACP is not a threat to the yellow-billed loon now or in the foreseeable future.

On western Russian breeding grounds, we do not have information on whether yellow-billed loon distribution overlaps with zones of industrial activity. Due to lack of study, regulation, and available information, the environmental impacts of industrial development in the Russian yellow-billed loon breeding range are not well understood. Because the bulk of the Russian breeding population appears to occur in eastern Siberia (Yakutia and Chukotka), where little industrial development is occurring or planned, most potential impacts of industrial development in Russia are limited to the western edge of the range. Based on the best available information, we find that oil and gas development is not a threat to the yellow-billed loon in its Russian breeding range now or in the foreseeable future.

We expect large spatial and temporal variation in the level of oil and gas development activities on yellow-billed loon breeding habitat, but most such habitat will remain undeveloped in the foreseeable future. We do not expect terrestrial oil and gas development to occur in the Canadian breeding range, and Russian oil and gas development is likely to be confined to the western edge of the breeding range there. In Alaska's NPR–A, some areas are likely to be developed, particularly at the eastern edge of NE NPR–A near the Alpine development. In Alaska, we believe that existing required protective measures will protect the yellow-billed loon from impacts of development. We find that degradation of breeding grounds throughout its range from oil and gas development is not a threat to the yellow-billed loon now or in the foreseeable future.

Temperate Marine Habitat: Degradation of Marine Habitats in Migration and on Wintering Grounds

The marine environment is clearly important for yellow-billed loons, as that is where they spend their first 3 years, and subsequently at least 8 months per year. Wintering areas along the coast of Alaska and British Columbia, Canada, are relatively pristine. Two important wintering areas for yellow-billed loons, the western Pacific Ocean coastal waters of the Yellow Sea and Sea of Japan, and the North and Norwegian Seas, have recently been identified among the ocean ecosystems with the greatest human impacts, and therefore degradation, of any in the world (Halpern *et al.* 2008, p. 949). Possible effects of human activities on yellow-billed loon marine migrating and wintering habitats include depletion of the prey base through a variety of mechanisms, including pollution-induced hypoxia and destructive fishing practices, as discussed below. Potential effects on loons from depletion of the winter prey base include reduced body condition, which could result in mortality or reduced breeding propensity.

Effects of marine oil spills, other effects of marine oil and gas development, and potential direct effects of contaminants on yellow-billed loons are discussed under Factor E.

Asian seas, where 24 out of 29 Alaska-breeding yellow-billed loons with satellite transmitters wintered (Schmutz in litt. 2008, p. 11), are undergoing environmental stress. The United Nations Global International Waters Assessment (GIWA) Regional Assessment of the Yellow Sea described Yellow Sea fisheries as threatened by ''pollution and loss of biomass, biodiversity and habitat, resulting from extensive economic development in the coastal zone'' (Teng *et al.* 2005, p. 33), caused by a tenth of the world's humans (approximately 600 million) living in surrounding watersheds. For example, the East China Sea (adjacent to the Yellow Sea) is undergoing ''severe environmental degradation'' from inputs of inorganic nitrogen, phosphate, oil hydrocarbons, organic matter, and heavy metals (Li and Daler 2004, p. 107). A significant effect of pollution inputs in aquatic systems are zones of eutrophication-induced hypoxia (''dead zones''), which are among the most deleterious anthropogenic influences on marine environments, leading to mass mortality of fish and invertebrates, and major changes in community structure (Diaz and Rosenberg 2008, p. 926). Large ecosystem effects of eutrophication and hypoxia have been documented in coastal waters of Japan (*e.g.*, Ueda *et al.* 2000, pp. 906–913; Suzuki 2001, pp. 291–302; Kodama *et al.* 2002, pp. 303–313), Korea (Lim *et al.* 2006, p. 1525), and the East China Sea (Chen *et al.* 2007, p. 399). However, these effects are seasonal, occurring more often in summer, when adult breeding yellow-billed loons would have migrated from the area. These effects also vary geographically, with most severe dead zones occurring at mouths of watersheds with large population centers or that deliver large quantities of nutrients.

Unsustainable fishing practices, including overfishing, indiscriminate trawling, and use of pesticides for fishing (Teng *et al.* 2005, pp. 34–35), have resulted in significant changes in the fisheries of the intensively exploited Yellow Sea and other Asian fisheries. These changes include significant declines in fish populations and changes in community structure, with larger (and commercially important) species replaced by smaller (and less valuable) fish (Teng *et al.* 2005, p. 33). Unsustainable exploitation of marine natural resources is expected to continue over the next 20 years, causing fisheries production to decrease by 30–50 percent (Teng *et al.* 2005, p. 35).

Degradation of temperate marine wintering and migrating yellow-billed loon habitats could deplete the yellow-billed loon prey base, which could cause reduced body condition, mortality, fewer birds migrating, and reduced breeding propensity. Although information exists regarding pollution occurrence and effects on fisheries in temperate marine waters in Asian wintering areas, we do not know which species yellow-billed loons eat there. We therefore do not know whether yellow-billed loon prey species have been affected. Indeed, documented changes in community structure from large finfish to smaller forage fish could benefit yellow-billed loons, as their diet items are relatively small. Further, although pollution and declines in fisheries are documented in Asian Pacific wintering areas, the information is inadequate to assess what proportion of the habitat or wintering loons is affected. We also have no data on yellow-billed loon mortality due to habitat degradation in wintering areas or migration routes, or on body condition at any season.

In summary, yellow-billed loon mortality from marine pollution has not been documented. The only other source of information we have to evaluate this factor is population trend information from the ACP. Yellow-billed loons breeding on the ACP migrate to Asian wintering grounds (Schmutz in litt. 2008, p. 1). If deterioration of these wintering areas were resulting in population-level effects on yellow-billed loons, we would expect to see evidence of a large population decline on the Alaska breeding grounds. Instead, survey trends indicate a slightly declining or stable population. We do not have information indicating that the current effects to the species from the degradation of temperate marine waters will change in the future. Therefore, we find that degradation of temperate marine waters is not a threat to yellow-billed loons now or in the foreseeable future.

Climate Change

While climate change impacts to some environmental features (e.g., sea ice) can be reliably assessed to some degree into the future, assessment of climate-induced changes to yellow-billed loon habitat in arctic terrestrial and freshwater systems and arctic and temperate marine systems is complex, with highly variable predictions of effects. Current models suggest that global temperatures are likely to continue to rise for up to 50 years, even if greenhouse gas emissions were curbed today (Meehl *et al.* 2007, p. 749). Below, we evaluate the available information on possible climate-change effects in these systems that could affect yellow-billed loons.

I. Arctic Habitats

There is strong evidence of ongoing impacts of climate change in the arctic, all of which are predicted to continue or accelerate in the next century (Anisimov *et al.* 2007, pp. 662–663; Christensen *et al.* 2007, pp. 902–903), although with varying degrees of uncertainty and regional variation (Reist *et al.* 2006b, p. 381) in effects on different biotic communities, hydrology, and geomorphology. Impacts include rising air temperatures (Anisimov *et al.* 2001, summarized in Anisimov *et al.* 2007, p. 656) at approximately twice the global rate (McBean *et al.* 2005, p. 39), declining summer sea ice (Richter-Menge *et al.* 2008, p. 1), increasing coastal erosion (Mars and Houseknecht 2007, p. 585; Rachold *et al.* 2002, cited in Walsh *et al.* 2005, p. 233), rising sea levels (Walsh *et al.* 2005, pp. 232–234), a small increasing trend in precipitation (McBean *et al.* 2005, p. 39), warming and thawing permafrost, and decreasing extent of land underlain by permafrost (Clow and Urban 2008, p. 3; Walsh *et al.* 2005, p. 210; Jorgenson *et al.* 2006, p. 1; Jorgenson *et al.* 2008, p. 1). All of these could interact via feedback loops, as described below.

With respect to the yellow-billed loon, we are most concerned about effects of potential climate-induced changes on morphology of breeding lakes and prey fish communities. In northern areas, such as along the arctic coast in most of the yellow-billed loon's breeding habitat (Siberia, Alaska's ACP, and most of the Canadian breeding range), permafrost is continuous, and could be hundreds of meters (ft) deep. However, some habitat extends south of this region to areas of discontinuous permafrost, which is more susceptible to the effects of climate change (Seward Peninsula, southern part of the Canadian range). Yellow-billed loon breeding habitat on the arctic coast depends on a unique hydrological system, which is in turn dependent upon cold temperatures resulting in continuous and stable permafrost underlying perched (i.e., isolated above the groundwater) lakes (Rovansek *et al.* 1996, p. 316) and relatively consistent weather patterns, such as most precipitation deposited in winter as snow, and spring ice-jams and floods contributing to lake recharge (Prowse *et al.* 2006, pp. 330–331). A community of fish species has adapted to this system, overwintering in deeper lakes, but also entering or leaving some lakes during spring river floods.

Morphology of Breeding Lakes

Permafrost thawing could reduce the size, number, or suitability of lakes that yellow-billed loons use for nesting and brood-rearing, especially near the southern boundary of continuous and discontinuous permafrost. When near-surface permafrost thaws, unfrozen channels develop between and below water bodies, allowing subsurface drainage to occur. In addition, permafrost degradation around edges of lakes near river channels can cause lakes to be breached and drained (Mars and Houseknecht 2007, p. 586). Permafrost degradation has already affected lakes in some areas at the southern boundary of continuous permafrost. In Siberia, L.C. Smith *et al.* (2005, p.1) documented a decline in lake abundance and area in zones of discontinuous permafrost. Yoshikawa and Hinzman (2003, p. 151) documented numerous shrinking ponds on Alaska's Seward Peninsula, at the southern boundary of the yellow-billed loon's range, due to an increase in internal drainage following permafrost degradation between 1950 and 2000. Because a limited number of loon surveys have been conducted on the Seward Peninsula, we do not know whether these changes are affecting yellow-billed loons there. Riordan *et al.* (2006, p. 1) observed ponds shrinking throughout subarctic Alaska, and attributed this drying to permafrost warming, as well as increased evaporation during a warmer and longer growing season. The arctic zone of continuous permafrost has relatively cold air temperatures and is considered relatively stable. However, Clow and Urban (2008, p. 3) measured increases for a total average warming of 3.5 K (kelvin) (3.5 degrees C, 6.3 degrees F) during 1989–2007, and Jorgenson *et al.* (2006, p. 1) observed a recent, abrupt increase in the extent and rate of ice wedge degradation on Alaska's ACP. Ice wedges are 2–4 m deep polygons of ice, more than 3,000 years old, occurring just below the vegetation layer in ice-rich regions of the arctic. Both effects were coincident with record warm air temperatures in the late 1990s.

Permafrost warming and thawing is predicted to continue as the arctic climate warms (Meehl *et al.* 2007, p. 772). Zhang *et al.* (2007, p. 443) simulated changes in Canada's permafrost distribution using a model driven by six general circulation models. They predicted that active layer (the top layer of soil that thaws in summer) thickness would increase, the boundary between continuous and discontinuous permafrost would move north, and there would be significant impacts on surface and ground hydrology. Stendel *et al.* (2007, pp. 203, 211) used a high-resolution regional climate model to predict changes to permafrost in eastern Siberia over the next century, and concluded that under the various modeling scenarios reviewed by the Intergovernmental Panel on Climate Change (IPCC), the active layer depth would increase up to 1 m (3.1 ft) along the arctic coast. These predictions suggest that some breeding lakes, particularly in the southern part of the yellow-billed loon's range, could be altered, but overall effects will depend on the magnitude and direction of other changes (e.g., precipitation).

Arctic sea-ice loss accelerates air temperature warming, which, in turn, increases permafrost warming. Recently, Lawrence *et al.* (2008, p. 1) evaluated how periods of abrupt rapid sea-ice loss affect terrestrial arctic climate and ground thermal state in the Community Climate System Model. They found that arctic land warming trends would be 3.5 times greater during periods of rapid sea-ice loss than otherwise predicted for the 21st century. They predicted that such a warming period would increase ground heat accumulation substantially, increasing the vulnerability of permafrost to degradation (Lawrence *et al.* 2008, p. 1). The 2007 arctic summer sea-ice extent was a new record minimum since satellite measurements began in 1979, with a large reduction in area compared to the previous record set in 2005 (Richter-Menge *et al.* 2008, p. 1), and the 2008 extent was similar (National Snow and Ice Data Center, *http://nsidc.org/data/seaice_index/index.html*).

Aside from causing increased land warming trends, loss of sea ice could affect freshwater breeding lakes adjacent to marine shorelines through breaching and increased salinity, because shorelines would no longer be protected from storms by summer and fall shorefast ice (Mars and Houseknecht 2007, p. 586). Coastal erosion rates are increasing, with land loss rates in some of Alaska doubling in the last half century (Mars and Houseknecht 2007, p. 585), and parts of the Laptev Sea coast in arctic Russia are retreating at an average rate of 2.5 m (8.2 ft) per year (Rachold *et al.* 2002, cited in Walsh *et al.* 2005, p. 233), but it is not known whether yellow-billed loon breeding lakes in this region are close enough to the coast to be affected. These effects are exacerbated by rising global sea levels. The greatest sea-level increases over the next century are projected for the arctic, although with much uncertainty (Christensen *et al.* 2007, p. 914; Walsh *et al.* 2005, pp. 232–234).

The amount and timing of precipitation also influences the permafrost active layer, and is predicted to increase in the arctic (Christensen *et al.* 2007, pp. 902–906), with a greater percentage increase in winter and less in summer. Increased snow cover in winter is likely to contribute to permafrost warming, as snow limits heat exchange between the atmosphere and the ground; significant snow cover keeps the ground warmer than the air (Stieglitz *et al.* 2003, p. 1). Predicted increased frequency of rain-on-snow events in Alaska and eastern Siberia (Rennert *et al.* 2008, p. 4) would exacerbate the warming effect on permafrost, as latent heat release from a single large rain-on-snow event can constrain the soil temperature to 0 degrees C (32 degrees F) for months (Putkonen and Roe 2002, p. 1,188).

There could also be direct effects of changes in precipitation on lakes used by yellow-billed loons. Increased winter precipitation could provide more spring floodwater to recharge lake basins (Walsh *et al.* 2005, p. 188; Prowse 2006, pp. 330–331). In contrast, increased summer rainfall will likely be lost to stream flow, increased subsurface storage, and increased evaporation in warmer air temperatures (Rovansek *et al.* 1996, p. 311; Bowling *et al.* 2003, p. 2–1). Earlier snow melt from increasing air temperatures and the predicted increase in winter rain events could decrease large breakup events in the spring, perhaps reducing lake replenishment from ice-jam flooding.

Overall, it is possible that lakes at the southern boundary of continuous permafrost could be affected, that this boundary will move north, and that eventually even northern areas of continuous permafrost could experience changes that will negatively affect lakes. For the yellow-billed loons, these effects could mean reduced habitat in the southern part of its range in the near-term (an uncertain period, but perhaps the next several decades), and eventually, in the northern parts of its range. At present, however, models have not been developed to make reliable predictions about the timing or extent of such habitat reductions and associated impacts on the species. Although permafrost degradation has already occurred in southern parts of the breeding range, such as the Seward Peninsula, there have been no observed effects on loon breeding lakes, and we do not have trend information for that population (which could provide some indication of the population impacts of permafrost degradation). Therefore, based on currently available information we find that climate-induced changes to the morphology of the yellow-billed loon's breeding lake habitats are not a threat to the species now, and we cannot reasonably predict that they will become a threat to the species in the future.

Prey Fish Communities

Climate change could alter yellow-billed loon prey fish communities in breeding lakes; species potentially affected include ninespine sticklebacks, Alaska blackfish, and least cisco (considered among the most vulnerable to extirpation through changes in species composition) (Wrona *et al.* 2006, p. 413). We are uncertain, however, about the form or timing that potential effects on fish communities might have on yellow-billed loons due to the interaction of factors influencing community composition. Fish species vary with lake depth and resulting ice thickness. Shallow (less than 2 m) (less than 6.6 ft) lakes that freeze to the bottom cannot harbor overwintering fish, and even somewhat deeper lakes may have low dissolved oxygen levels, allowing only species adapted to these low levels, such as sticklebacks and Alaska blackfish, to survive. Shallow lakes that freeze to the bottom sometimes maintain fish populations via replenishment from spring river floods. If ice thickness declines in a warmer climate, deep lakes could have increased oxygen, allowing less tolerant species to overwinter, and shallower lakes would be able to harbor overwintering fish. Conversely, shallow lakes might lose replenishment with decreased spring flooding (Hershey *et al.* 2005, pp. 39, 52). Fish habitat is also dependent on basin shape, since shallow littoral zones are needed to provide food for fish; lower water levels might alter or diminish littoral habitats. Fish habitat characteristics are reflected in yellow-billed loon habitat preferences modeled by Earnst *et al.* (2006). Loons were found more often on medium or deep lakes than on shallow (less than 2 m) (less than 6.6 ft) lakes that freeze to the bottom, and for shallow lakes, loons were more likely to be present if the lake was connected to streams or other lakes. Proportion of shoreline with vegetation, indicating littoral habitat, was a positive indicator of yellow-billed loon presence. Loons preferred both 2 to 4 m (6.6 to 13.1 ft) deep lakes and greater than 4 m (greater than 13.1 ft) deep lakes, but because the latter are rare on the North Slope, 64 percent of yellow-billed loon sightings were on lakes 2 to 4 m (6.6 to 13.1 ft) deep (Earnst *et al.* 2006, p. 235). In summary, although climate change could have negative effects on prey communities, there could be positive effects. Not only is there considerable uncertainty as to the possible effects to prey communities from climate change, there is also substantial uncertainty about the timing over which changes will occur. Scientists have not yet developed the specific predictive models and empirical research to improve our understanding of these changes and enable us to predict the timing with which they might occur.

In addition to breeding lakes, yellow-billed loons in summer use shallow nearshore marine waters (less than 10 m (33 ft), roughly within 20 km (12.4 mi) of shore) adjacent to mainland habitats and near barrier islands (Earnst 2004, p. 7). Little is known about the prey species that yellow-billed loons use in these habitats, although they are known to eat a variety of species in winter marine habitats (see Feeding Habits, above; also reviewed in North 1994, p. 7 and Earnst 2004, pp. 9–10). Changes in arctic marine ecosystems, including increased primary production, introduction of new species, and population shifts in existing species could occur as the climate warms (Perry *et al.* 2005, p. 1,912; Behrenfeld *et al.* 2006, p. 752; Reist *et al.* 2006a, pp. 370–380). These changes to summer marine prey communities would be complex, and the form of potential new species assemblages cannot be reliably predicted at this time.

Increased ocean acidification as a result of increasing levels of atmospheric carbon dioxide could affect marine food webs, but the form, magnitude, and timing of such effects are unknown. Due to limited research and understanding of the processes involved (Zeebe *et al.* 2008, p. 52), it is not possible to predict effects on loon prey species from ocean acidification at this time.

Therefore, as discussed above, due to a paucity of information and models available to reliably predict effects of climate-induced changes to yellow-billed loon prey species assemblages in breeding lake and marine habitats, we find that climate-induced changes to yellow-billed loon prey species is not a threat to this species now or in the foreseeable future.

Polynyas and Ice Leads

We also considered whether polynyas and ice leads, both of which provide feeding and staging areas for yellow-billed loons in spring before the breeding season, were likely to disappear as the arctic climate changes. Arctic sea ice is projected to decline most, and surface air temperatures increase most, in summer and fall (Walsh 2008, p. S19). In 2007, there was a record sea-ice minimum in the arctic in September, and the Chukchi Sea did not freeze until early December, but an advancing ice field covered most of the eastern Bering Sea shelf by mid-January 2008. A subsequent near record maximum ice extent occurred in March 2008, and the Bering Sea was not ice free until almost July 2008 (Overland and Stabenow 2008, p. 2). Overland and Stabenow (2008, p. 5) predicted that although arctic sea ice will continue to decrease seasonally in late summer and fall, sea ice will still form in winter, extending south to the Bering Sea. If this projection is correct, polynyas and ice leads should continue to provide productive spring habitat for yellow-billed loons, even as the arctic climate continues to warm. Therefore, we find that loss of polynyas and ice lead habitats is not a threat to yellow-billed loons now or in the foreseeable future.

Shipping Traffic

We also evaluated the potential effects of increased disturbance and oil spills to arctic yellow-billed loon habitat from increased shipping traffic, as a result of summer and autumn sea-ice loss, throughout arctic marine waters near loon breeding areas. Because of the sea-ice decline discussed above, in 2008 both the Northwest passage and the so-called Northeast Passage, or Northern Sea Route, along the Russian arctic coast were ice free likely for the first time since the last ice age 125,000 years ago (NSIDC 2008). As the extent of arctic sea ice in the summer has declined and the duration of ice-free periods has increased, interest in shipping within and through arctic waters has increased (Brigham and Ellis 2004, p. 2). This potential increase in shipping could affect yellow-billed loons through habitat degradation, disturbance, or fuel spills. However, we have not found any reliable predictions about the location, type, and amount of shipping that might occur as ice-free periods increase. In addition, the wide distribution and low density of yellow-billed loons in arctic marine areas during the breeding season makes it unlikely that the population would be at increased risk if shipping traffic were to increase. Because we are uncertain about the magnitude of shipping traffic increases and because the low density of loons in the environment makes them less vulnerable to vessel accidents or disturbance, we find that increased arctic shipping is not a threat to yellow-billed loons now or in the foreseeable future.

In summary, our evaluation of climate-change effects on arctic yellow-billed loon habitats included documented and predicted climate-induced changes to various features of the environment, followed by hypothetical but reasonable suppositions about possible alterations to habitats important to yellow-billed loons. There are no data to suggest that climate-induced changes documented to date have resulted in breeding-habitat changes, and based on the stable or slightly declining trend on the ACP, it does not appear that these changes have affected the yellow-billed loon population there. At this time, we are unable to predict potential future changes to yellow-billed loons and their habitats discussed above, because, in addition to uncertainty about the magnitude, direction, and timing of climate-induced changes to the environment, no empirical data exist regarding the effects of those potential changes on yellow-billed loons or their habitats.

In arctic areas, there is strong evidence that coastal erosion is occurring, and some evidence for breaching of freshwater lakes adjacent to coasts, but little or no information on whether these environmental changes have affected yellow-billed loon breeding lakes. While there is strong evidence that climate change is causing permafrost loss, no information is available on how this could affect freshwater lake morphology and the yellow-billed loon prey base in the future. Based on the best available data, we believe that important polynyas and ice-lead spring staging habitat are likely to continue to exist in the foreseeable future. While ocean acidification will likely have long-term effects on marine communities, we do not know how it will affect loons. We believe the effects of increased shipping in arctic seas will be negligible because yellow-billed loons are widely dispersed across breeding and migrating landscapes.

II. Temperate Habitats

Global ocean temperatures increased (0.1 degrees C (0.2 degrees F) from 1961 to 2003, although with some cooling since 2003; Bindoff *et al.* 2007, p. 387), and effects on primary productivity and dissolved oxygen varied with latitude. Primary productivity in warm, low-latitude oceans declines as upper-ocean temperature increases, while warmer temperature at high latitudes increases productivity and decreases oxygen levels (Behrenfeld *et al.* 2006, p. 752; Bindoff *et al.* 2007, p. 400).

For the yellow-billed loon wintering at low latitudes in the Yellow Sea and the Japan (East) Sea, a drop in primary productivity might mean decreased prey availability. However, as already observed in northern environments (e.g., Perry *et al.* 2005, pp. 1,912–1,915), marine animals, including yellow-billed loons, might shift north to colder, more productive waters if winter sea ice is not a barrier. As noted for northern marine species (e.g., Perry *et al.* 2005, p. 1,914) the movements of species as a result of climate change will likely be complex, so predicting the form of new species assemblages is difficult.

Potential expansion of oxygen-deficient ''dead zones'' in Asian coastal waters where yellow-billed loons winter depends partly on how climate change affects water-column stratification (Diaz and Rosenberg 2008, p. 929). Warming ocean temperatures could increase stratification, deepening the depletion of oxygen, but increased storminess, such as hurricanes, could increase mixing and thereby lessen stratification.

Changes in rainfall patterns could change freshwater and nutrient inputs. At this time, available data on the effects of climate change on dead zones in winter marine habitats of the yellow-billed loon are uncertain.

In summary, climate change effects on the temperate-latitude wintering habitat of the yellow-billed loon include increases in ocean temperature and decreases in primary productivity and dissolved oxygen levels, which could potentially affect prey fish communities and their distribution. The magnitude and form of these effects are highly uncertain, but would most likely involve a northward shift of prey species, which could be mirrored by their predators, such as wintering yellow-billed loons. Therefore, while we conclude that the effects of climate change will be widespread and will likely have some impact on yellow-billed loons in temperate habitats, we find that climate-induced changes in the temperate marine habitat are not a threat to the yellow-billed loon now or in the foreseeable future.

There are multiple hypothetical mechanisms associated with climate change that could affect loons and their breeding and non-breeding habitats. Unlike documented and predicted declines in sea ice, an obligate habitat for other arctic species such as polar bears (*Ursus maritimus*), we lack predictive models on how climate change will affect yellow-billed loon terrestrial, freshwater, and marine habitats. Manifestations of climate-mediated changes throughout arctic and temperate yellow-billed loon habitats will emerge as models continue to be refined and effects are documented, but at this time the timing, magnitude, and net effect of the impacts are uncertain.

In our analysis of Factor A, we identified and evaluated the risks to the yellow-billed loon's habitats, including: Oil and gas development (i.e., disturbance, changes in freshwater chemistry and pollutant loads, and changes in freshwater hydrology); pollution; overfishing; and climate change. Based on our review of the best available information, we find that the present or threatened destruction, modification, or curtailment of the yellow-billed loon's habitat or range is not a threat to the species now or in the foreseeable future.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Subsistence harvest, as well as, bycatch of loons during commercial and subsistence fishing are discussed under Factor E.

Researchers seeking to understand the life history of yellow-billed loons have implanted 29 yellow-billed loons with satellite transmitters to date (19 birds on the ACP and 10 birds on the Seward Peninsula, Alaska; Schmutz in litt. 2008). This research is permitted by the Service under the Migratory Bird Treaty Act (MBTA) and by the Alaska Department of Fish and Game (ADFG) under State law. Although it is reasonably likely that there could be heightened risks of mortality and reduced productivity in individual birds implanted with transmitters, the number of loons in this study is not sufficient to cause population-level effects.

We do not have any evidence of risks to yellow-billed loons from overutilization for commercial, recreational, scientific, or educational purposes, and we have no reason to believe this factor will become a threat to the species in the future. Therefore, we find that overutilization for commercial, recreational, scientific or educational purposes is not a threat to the yellow-billed loon now or in the foreseeable future.

Factor C: Disease or Predation

Loons are susceptible to avian diseases, including avian cholera (from *Pasteurella multocida*), aspergillosis (from *Aspergillus fumigatus*), and avian botulism (from Clostridium botulinum) (Friend and Franson 1999, pp. 79, 130, 274), but we are not aware of any large disease-related die-offs in yellow-billed loons. Loons are susceptible to avian influenza, but in Alaska, none of six loons sampled, including two yellow-billed loons, tested positive for avian influenza viruses in 2006 (USFWS/USGS 2007, pp. 1–93; Y. Gillies in litt. 2008, p. 1), and worldwide the highly pathogenic H5N1 has not been detected in loons (*http://www.who.int/csr/disease/avian_influenza/en/*, accessed 11/24/2008).

Predation on adult yellow-billed loons is thought to be uncommon, but predation on nests on the ACP has been attributed as the primary cause of egg loss and therefore reduced productivity in some years (Earnst 2004, p. 22). Yellow-billed loon nest predators include glaucous gull (*Larus hyperboreus*), parasitic jaeger (*Stercorarius parasiticus*), and arctic fox (*Alopex lagopus*); pomarine jaeger (*Stercorarius pomarinus*), common raven (*Corvus corax*), snowy owl (*Nyctea scandiaca*), red fox (*Vulpes fulva*), and grizzly bear (*Ursus arctos horribilis*) also predate nests (North 1994, p. 11; Earnst 2004, p. 22). Many of these predators are attracted to infrastructure, which is used as nesting platforms or is associated with food sources, and so predation might be expected to increase as development in yellow-billed loon nesting habitat increases (NRC 2003, p. 6; Earnst 2004, p. 19). However, in Alaska, NPR–A ROP A–2 and A–8 require control of waste and other measures to prevent attracting wildlife to infrastructure (USDOI–BLM 2008b, Appendix A, pp. 37, 41–42), reducing the risks associated with future development. We do not know whether similar regulations would be implemented in Canada should development occur there. The extent of infrastructure increase in Russian yellow-billed loon nesting habitats, and accompanying regulation, is unknown.

In conclusion, we note that no large disease-related mortality events have been documented for yellow-billed loons. Indeed, yellow-billed loons might be relatively protected from avian disease mass mortality events that are more common in other water birds because of the loon's dispersed distribution and relatively solitary habits. We have no reason to believe that disease outbreaks will increase or will have more severe effects on yellow-billed loons in the future. Nest predation might affect current productivity, but population-level effects are more likely to results from decreases in adult survival (see Population Resiliency, above). Moreover, due to regulations associated with infrastructure development that also target increasing human safety, we believe that nest predation is unlikely to cause population-level effects in the future, at least in Alaska and Canada; no information is available that would indicate future effects of such development in Russia. Therefore, we find that neither disease nor predation is a threat to the yellow-billed loon now or in the foreseeable future.

Factor D: Inadequacy of Existing Regulatory Mechanisms

To determine if existing regulatory mechanisms protect yellow-billed loons, we evaluated existing international and United States conventions, agreements, and laws for the specific protection of yellow-billed loons or their marine and terrestrial habitats in the countries where yellow-billed loons winter, migrate, or breed. In July 2008, we sent letters to national wildlife or natural resource agencies in Canada, China, Japan, North Korea, Norway, Republic of Korea (South Korea), and the Russian Federation, asking for information about ongoing management measures and any conservation and management strategies being developed to protect the species.

We received a formal response from the government of Canada, and an informal response from a government biologist in the Russian Federation (discussed below).

The yellow-billed loon is included in the 2008 International Union for the Conservation of Nature (IUCN) Red List Category as a ''Least concern'' species; widespread and abundant taxa are included in this category. The species is not currently listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and trade is not known to negatively affect the yellow-billed loon. The species is listed under the United Nations Environment Program Convention on the Conservation of Migratory Species of Wild Animals (UNEP–CMS), although the United States, Russia, Canada, and most Asian nations are not signatories (*http://www.cms.int/*, accessed September 9, 2008).

In Asia, no specific relevant laws for North Korea or the Republic of Korea (South Korea) were found that would apply to protection of yellow-billed loons or their habitat. Chinese wildlife laws (The Law of the People's Republic of China on the Protection of Wildlife 1991; The Regulations for the Implementation of the People's Republic of China on the Protection of Terrestrial Wildlife 1992) protect species of wildlife and the environment, with provisions for hunting (including licensure), and habitat protection for species under the special protection of the state, although the yellow-billed loon is listed as ''not threatened'' by the China Species Information Service (CSIS database, *http://www.chinabiodiversity.com*; accessed Sept. 8, 2008).

The Japan-United States Convention for the Protection of Migratory Birds and Birds in Danger of Extinction, and Their Environment (1974) includes the yellow-billed loon, though it is not designated as a Japanese endangered species. The Convention prohibits the taking of migratory birds or their eggs, unless there are permitted exceptions for subsistence. The Convention also specifies that each party shall seek means to prevent damage to such birds and their environment, including, especially, damage resulting from pollution of the seas.

Lack of regulation and enforcement of fishing and pollution in marine waters of China and the Republic of Korea have been identified as barriers to recovery of the Yellow Sea ecosystem (UNDP/GEF 2007, pp. 79–84). ''In the Yellow Sea, there are clearly deficiencies in fisheries management and regulation. Furthermore, these deficiencies have contributed to environmental impacts or threats to biodiversity in sectors other than fisheries management'' (UNDP/GEF 2007, p. 80). We are concerned that these problems could cause harm to yellow-billed loons, but currently we have little information on mortality rates or loss of loon habitat in this region, and no evidence from our limited information on breeding population trends indicates that the lack of regulation in Asian waters is causing a population-level threat to yellow-billed loons.

We received a response to our letter to the Russian Ministry of Natural Resources from the Russian Academy of Sciences, which stated that there are no ongoing management measures to protect the yellow-billed loon in Russia. They stated that all the best known species' breeding sites are outside any protected areas, and no conservation and management strategies have been recently developed to protect the species (E. Syreochkovskiy, Russian Academy of Sciences, in litt. 2008).

The yellow-billed loon is listed in the Red Data Book of the Russian Federation (2001, pp. 366–367) as a category 3 species (rare, sporadically distributed species). The species is nominally protected under the 1978 U.S. Migratory Bird Treaty with the former Soviet Union (Convention between the United States of America and the Union of Soviet Socialist Republics Concerning the Conservation of Migratory Birds and their Environment; Pub. L. 95–616), which specifies that each party shall prohibit the taking of migratory birds, the collection of their nests and eggs, and the disturbance of nesting colonies. Exceptions include subsistence purposes for indigenous people. The Treaty also mandates that to the extent possible, the parties shall undertake measures necessary to protect and enhance the environment of migratory birds and to prevent and abate the pollution or detrimental alteration of that environment. Regional protection occurs in some regions where yellow-billed loons occur such as Kamchatka, Murmansk, Sakhalin, and Yamal-Nenets Autonomous District (AD), but not in Yakutia, Taymyr AD, or Chukotka AD, where nesting is concentrated (Red Data Book Bulletin 2003, p. 77). In Kamchatka, yellow-billed loons are protected in some nature reserves along the eastern and southern coasts of Kamchatka (Red Data Book of Kamchatka, p. 92), but not along the western coast where oil and gas development are planned. Yellow-billed loons are also protected under bilateral agreements between the Russian Federation and the Korean Republic, and Japan and China, respectively (Red Data Book of Kamchatka 2006, p. 92). We do not have reliable information on enforcement of regulations in Russia, and we also do not have information that insufficient regulation or enforcement has caused a population-level threat to the yellow-billed loon.

The Wildlife Act of Norway (1981), where loons winter in marine waters, specifies that all wildlife, including eggs, nests, and habitats, are protected (meaning that individuals of the species may not be collected or destroyed) unless otherwise prescribed by statutory law. Norway's marine ecosystem is managed by the Ministries of Environment, Fisheries and Coastal Affairs, Petroleum and Energy, and Labour and Social Inclusion (Royal Norwegian Ministry of the Environment 2006, pp. 46–59), which coordinate environmental laws regulating fishing and controlling pollution from development and vessel traffic (Royal Norwegian Ministry of the Environment 2006, p. 46). We do not have evidence that lack of adequate regulation in Norway has or is likely to lead to threats to the yellow-billed loon.

The yellow-billed loon is designated as ''not at risk'' under Canada's Species at Risk Act of 2002, legislation similar to the U.S. Endangered Species Act (*http://www.sararegistry.gc.ca/*; accessed January 28, 2009). In its assessment and status report on the yellow-billed loon, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) determined the yellow-billed loon was ''not at risk'' (COSEWIC 1997, p. iii). The report acknowledged that all loons are highly susceptible to pollution and destruction of wetland and coastal marine habitats (COSEWIC 1997, p. vi). According to the COSEWIC status report on the yellow-billed loon prepared by Barr (1997, p. 4), the dangers of human activities, the naturally low population, limited breeding habitat and food resources, and inability to adapt ensure that the yellow-billed loon will remain vulnerable. However, he also stated that its present low population could be normal, stable, and well adapted to its severe environment, and that there does not yet seem to have been any significant loss of critical habitat (Barr 1997, p. 4). The COSEWIC report (1997; p. iii) concluded that the yellow-billed loon is uncommon but widespread with no evidence of declines or limiting factors over widespread areas.

The Migratory Bird Treaty (or Convention) between Canada and the United States (originally ratified in 1916 and implemented in 1918, and amended in 1994 in Canada) established a legal framework protecting migratory birds. Under Canada's Migratory Birds Convention Act (1994), the Governor in Council regulates migratory nongame bird species, such as the yellow-billed loon, by prohibiting the killing, capturing, injuring, taking, or disturbing of migratory birds or the damaging, destroying, removing, or disturbing of nests; prescribing protection areas for migratory birds and nests; and requiring the control and management of those areas (*http://laws.justice.gc.ca/en/showtdm/cs/M-7.01///en*; accessed November 24, 2008). However, the Act allows for the subsistence take of birds, including the yellow-billed loon, by Aboriginal people in Canada. Currently, the species is not covered under Canadian Provincial laws or regulations and, thus, receives no additional protections or conservation considerations in Canada. There are no conservation and management strategies being developed to protect the species in Canada (V. Poter, Canadian Wildlife Service, in litt. 2008, p. 1), and no population surveys are conducted or planned. Although the two Migratory Bird Sanctuaries where yellow-billed loons breed (Queen Maud Gulf and Banks Island Migratory Bird Sanctuaries) encompass over 8 million hectares total and are remote from major human cities or other development, subsistence hunting by Aboriginal people is allowed within them (MacDonald in litt. 2008, p. 1). At present, we have some concern about subsistence harvest in Canada which appears to be unregulated, particularly in light of the lack of knowledge about loon population levels or trends, but we do not have evidence that this lack of regulation is causing a population-level threat to the yellow-billed loon breeding population in Canada.

Within the United States, the yellow-billed loon has protection under several laws and regulations. The MBTA makes it unlawful to kill or take eggs or nests of yellow-billed loons, but it does not provide protection for habitat, a potential concern in relation to development in breeding areas. Yellow-billed loons are not open for subsistence hunting in Alaska under migratory bird subsistence-harvest regulations (March 14, 2008, 73 FR 13788), but our analysis of harvest surveys (discussed under Factor E) indicates that harvest nevertheless occurs, at times at substantial levels. Although we have some concerns about the accuracy of reported harvest levels, as described in Factor E, we have concluded that harvest is higher than previously thought, and is likely unsustainable. The yellow-billed loon is a K-selected, long-lived species, that requires high adult survival and has low recovery potential and slow recovery rates once populations decline; consequently, significant mortality of yellow-billed loons, especially of adults, is a major concern. The Service and State of Alaska have recognized the yellow-billed loon as a potentially vulnerable species under the Birds of Conservation Concern (68 FR 6179) and State Comprehensive Wildlife Conservation Strategy (*http://www.sf.adfg.state.ak.us/statewide/ngplan/*, accessed September 9, 2008), respectively. These designations provide management and research funding prioritization.

Much of the yellow-billed loon's breeding range in Alaska is found on the NW and NE NPR–A (which is managed by the BLM), and the species is on the BLM-Alaska's list of sensitive species. One of the objectives of BLM's Special Status Species Policy is to ensure that actions requiring authorization or approval by BLM are consistent with the conservation needs of special status species and do not contribute to the need to list any special status species, either under provisions of the Act or other provisions of the policy. Specifically, the BLM must manage the habitat to conserve the species by: ensuring sensitive species are appropriately considered in land-use plans; developing, cooperating with, and implementing range-wide or site-specific management plans, conservation strategies, and assessments for sensitive species that include specific habitat and population management objectives designed for conservation, as well as management strategies necessary to meet those objectives; and ensuring that BLM activities affecting the habitat of sensitive species are carried out in a manner that is consistent with the objectives for managing those species.

The BLM has adopted stipulations and ROPs for the NW and NE NPR–A (USDOI–BLM 2004a, Appendix B, pp. B–1–B–18; USDOI–BLM 2008b, Appendix A, pp. 37–74) in order to minimize potential impacts to yellow-billed loons, such as disturbance of nesting birds and broods. As discussed under Factor A, these include water-withdrawal standards for deep fish-bearing lakes and setbacks for exploratory drilling and permanent facilities near fish-bearing and deep lakes (greater than 3.9 m (13 ft) deep). Both the NW NPR–A Integrated Activity Plan/Environmental Impact Statement Record of Decision (USDOI–BLM 2004a, Appendix B, p. B–11) and the NE NPR–A Supplemental Integrated Activity Plan/Environmental Impact Statement Record of Decision (USDOI–BLM 2008b, Appendix A, pp. 51–53) contain ROP E–11, an express objective of which is to minimize disturbance to yellow-billed loons from oil and gas activities in the NPR–A (V. Galterio, BLM Alaska State Director, in litt. 2008). This ROP requires oil and gas lessees to conduct multi-year surveys in order to detect nesting yellow-billed loons before the construction of development facilities will be authorized. The ROP further specifies that the design and location of facilities must be such that disturbance to yellow-billed loons is minimized. Based on the best scientific and commercial information currently available, the BLM agrees with the Service that this objective can best be achieved by prohibiting development within 1.6 km (1 mi) of detected nests and 500 m (1,640 ft) around the shorelines of lakes 10.1 ha (25 ac) or larger (Galterio, in litt. 2008).

According to the BLM (Galterio, in litt. 2008), to account for new information that might be obtained in the future (such as information about yellow-billed loons, specific development proposals, and their potential impact on yellow-billed loons), both the Northwest and Northeast Records of Decision would allow for exceptions or deviations from enumerated buffers in limited circumstances. In these circumstances, the exception or deviation would still be required to meet the management objective of minimizing disturbance to the species and would, at a minimum, need to provide the same level of protection that the existing buffers provide. The evaluation of a deviation request that could affect yellow-billed loons would be made with close collaboration and extensive discussions with subject-matter experts at the Service and academia to ensure the conservation of the species.

Although data are not available to determine how effective the stipulations and ROPs will be in minimizing or eliminating adverse impacts to the species, BLM has expressed a commitment to measures aimed at minimizing potential impacts to yellow-billed loons from activities within the purview of BLM's authority as a land management agency (V. Galterio, in litt. 2008). We believe that BLM's stipulations and ROPS will likely be adequate to mitigate potential impacts to the yellow-billed loon in Alaska, if careful monitoring and coordination with the Service continues.

The Service, National Park Service, Alaska Department of Natural Resources, ADFG, and the North Slope Borough entered into a ''Conservation Agreement for the Yellow-billed Loon (*Gavia adamsii*)'' (Conservation Agreement 2006, pp. 1–29) in November 2006. The agreement specifies the goal of protecting the yellow-billed loon and its habitat in Alaska and identifies several strategies for achieving this goal. These strategies include implementing actions to reduce the impacts of oil and gas activities; determining and reducing, if necessary, impacts from subsistence activities; and inventorying, monitoring, and conducting research on the yellow-billed loon. While the agreement demonstrates the parties' good-faith efforts to identify and undertake protective measures for the loon and its habitat, it does not require any specific actions to be undertaken to achieve its goals or specify any time frames for doing so, nor does it establish any quantifiable, scientifically valid parameters by which to measure achievement of the objectives and gauge progress. Thus, we are unable to conclude with sufficient certainty that the agreement is likely to be effective in protecting the yellow-billed loon; so we did not rely on it for our analysis in this finding. This is consistent with the Service's 2003 ''Policy for Evaluation of Conservation Efforts When Making Listing Decisions'' (PECE) policy, which sets forth criteria to be used to determine whether conservation efforts that have yet to be implemented or show effectiveness contribute to making listing a species as threatened or endangered unnecessary.

In summary, Russia is the only nation that includes the yellow-billed loon on an endangered or sensitive species list. Some countries (Canada, Japan, Norway, Russia, and the United States) have laws that prohibit the hunting of migratory birds such as the yellow-billed loon, unless specific regulations are issued, or unless the animals are harvested for subsistence. Provisions to prevent habitat degradation for wildlife and migratory birds or to protect the environment exist, but enforcement levels are unknown and in some countries may not be effective at protecting habitats. In the United States, the MBTA prohibits killing of yellow-billed loons, but does not provide for habitat protection. The Bureau of Land Management, the land management agency with authority over most of the yellow-billed loon's breeding range in Alaska, has instituted protective measures for the species and its habitat. However, existing regulatory mechanisms have not been adequate to eliminate all threats to the yellow-billed loon throughout its range. In particular, despite the fact that the species is closed to subsistence hunting in Alaska, harvest surveys have recorded a substantial level of harvest. We believe that future take at a level consistent with these prior levels would cause a population-level decline that constitutes a threat to the species (see Factor E, below). Therefore, we conclude that existing regulatory mechanisms are inadequate to protect the species.

Factor E: Other Natural or Man-Made Factors Affecting its Continued Existence

Direct Effects of Oil and Gas Development and Vessel Traffic

Yellow-billed loons spend the majority of their life in the marine environment, and are exposed to potential impacts of disturbance, collisions with oil and gas structures, and spills of oil and toxic substances from offshore oil and gas development and other vessel traffic. Offshore oil and gas development might also affect terrestrial yellow billed loon habitats (e.g., through construction of pipelines, support facilities, etc.). Those impacts are discussed under Factor A.

The magnitude of potential impacts from offshore oil and gas development is related to the type, size, and probability of development, and its location in relation to yellow-billed loon distribution and use of an area. Yellow-billed loons are widely dispersed during most of their annual cycle, so the largest potential for impacts to a number of individuals from a single environmental perturbation is in spring, when localized, temporary concentrations occur in migration. Adult loons gather in polynyas and ice leads and along open shorelines near river deltas on the coasts of northern Alaska and Canada. It is likely that there are similar movements and concentrations of yellow-billed loons near Russian breeding areas in spring, but we have not found documentation of such activity. The oil industry is active in these areas, as demonstrated by existing projects such as Pioneer's Ooogrurk field, BP Alaska's Northstar development, and exploration activities in the Chukchi and Beaufort Seas by Shell Inc., ConocoPhillips, and others.

In Alaska, exploration and production are active in Federal and State lease tracts in the Chukchi and Beaufort Seas where loons gather in spring and summer offshore from yellow-billed loon breeding areas on the ACP (USMMS 2008, p. 1; ADNR 2008, p. 1). In Canada, offshore resources are being explored and developed in the southern Beaufort Sea near the McKenzie Delta, where loons gather in polynyas and ice leads in spring to stage before arriving on breeding grounds (Canada Indian and Northern Affairs 2008, p. 1). Offshore drilling and ship traffic occur in the area of the Amundsen Gulf and Cape Bathurst Polynya, where yellow-billed loons are common in spring (Mallory and Fontaine 2004, p. 52). Development could also continue north of yellow-billed loon breeding areas in the arctic Islands, where the Sverdrup Basin contains oil and gas reserves. In western Russia, offshore projects at the western edge of yellow-billed loon breeding grounds in the Barents Sea include the Shtokman gas field currently in planning stages. Gazprom is developing offshore gas fields in the Kara Sea near the Yamal Peninsula. Undiscovered reserves are thought to occur in the East Siberian Sea and the Laptev Sea Shelf in the Arctic Ocean, but exploration has not occurred there (EIA 2008, p. 1; USGS 2007, pp. 1–2).

Oil and gas development are ongoing in migration and wintering areas. An offshore lease sale is planned for Bristol Bay near the wintering location of a yellow-billed loon tagged with a transmitter on Seward Peninsula breeding grounds (U.S. Minerals Management Service 2008, p. 1). In Russia, reserves of oil and gas in the Sea of Okhotsk are large, and just beginning to be exploited. Drilling is planned off the west coast of Kamchatka (Rosneft 2008, p. 1), where tagged yellow-billed loons have passed in migration and wintered. Development around Sakhalin Island in the southern Sea of Okhotsk includes three offshore fields under the Sakhalin I project and two fields under Sakhalin II. Sakhalin II is ''the world's largest integrated, export-oriented oil and gas project,'' including an oil terminal and Russia's first liquefied-natural-gas plant at Aniva Bay (Royal Dutch Shell 2008, p. 1) where tagged yellow-billed loons have passed in migration and wintered. Exploration continues for additional Sakhalin fields. Norway is among the 10 largest producers of oil and gas in the world, with all its production offshore in the North, Norwegian, and Barents Seas (Norwegian Petroleum Directorate 2008, p. 1–1, Figures 3.2–3.5). Production of oil is expected to decline slowly, while gas production will increase, depending on future discoveries (Norwegian Petroleum Directorate, p. 1–3). Seismic studies are occurring in the Lofoten fishing grounds currently closed to oil and gas development under a regional management plan (Royal Norwegian Ministry of the Environment 2006, pp. 1–144); this area is offshore from the largest concentrations of yellow-billed loons wintering along the Norwegian coast (Strann and Ostnes 2007, Figure 2). The management plan will be updated in 2010, with an opportunity to open the area to drilling.

Air and boat traffic associated with oil and gas development could disturb yellow-billed loons, decreasing foraging success or displacing individuals to less preferred areas at some unknown energetic costs. The severity of disturbance and displacement effects depends upon the duration, frequency, and timing of the disturbing activity. Hence, construction and operation of offshore facilities, which could persist for years, will likely have greater impacts than seismic and exploratory activities, which generally last less than one year. Depending upon the frequency of operations and routes traversed by vessels and aircraft, impacts could range from negligible (few yellow-billed loons encountered at irregular intervals) to substantial (vessels or aircraft repeatedly encounter yellow-billed loons). Expected increases in arctic shipping traffic due to reduced summer sea ice are discussed in the Climate Change section under Factor A.

Offshore oil and gas development would result in both fixed (e.g., offshore platforms) and mobile structures (e.g., supply ships) in the marine environment, posing a potential collision risk for yellow-billed loons. Birds are particularly at risk of collision with objects in their path when visibility is impaired during darkness or inclement weather, such as rain, drizzle, or fog (Weir 1976, p. 6). In a study of avian interactions with offshore oil platforms in the Gulf of Mexico, Russell (2005, pp. 266–297) found that collision events were more common and more severe (by number of birds) during poor weather. Weather conditions that increase collision risk are common in northern waters such as the Bering, Beaufort, and Chukchi Seas. Without knowing the number, location, and design of structures that would result from offshore oil and gas development, it is difficult to estimate the number of yellow-billed loons that would pass by structures during migration. Vulnerability to collision with structures probably varies among species, but we are not aware of information on the propensity of yellow-billed or other loons to collide with structures.

Spills of oil, refined petroleum products (e.g., diesel fuel), or other toxic substances (e.g., drilling mud) from offshore oil and gas development can occur as a result of well blowouts, operational discharges, pipeline failures, tanker or other vessel leaks, and numerous other potential accidental discharges (AMAP 2007, pp. 24–25). A discharge of these products could cause direct mortality of yellow-billed loons or result in indirect effects through habitat degradation or killing prey species.

Mortality following exposure to oil is common in aquatic birds, which are vulnerable to surface oil (Albers 2003, pp. 354–356). External oiling disrupts feather structure, causes matting of feathers, and permits wetting of the bird, and death typically results from hypothermia and drowning (Vermeer and Vermeer 1975, pp. 281–295; Jenssen 1994, pp. 207). Ingesting petroleum through feather preening or consumption of contaminated food or water, and inhalation of fumes from evaporating oil, might not be immediately lethal, but debilitating effects include gastrointestinal irritation, pneumonia, dehydration, red blood cell damage, impaired osmoregulation, immune system suppression, hormonal imbalance, inhibited reproduction, retarded growth, and abnormal parental behavior (Jenssen 1994, pp. 207–211; Hartung and Hunt 1966, pp. 564–569; Miller *et al.* 1978, pp. 315–317; Szaro *et al.* 1981, pp. 791–798; Leighton 1993, pp. 93–99; Fry *et al.* 1986, pp. 455–462; Eppley 1992, pp. 309–311; Fowler *et al.* 1995, pp. 383–387; Walton 1997, pp. 264–267; and Briggs *et al.* 1997, pp. 718–723). These effects can cause death from starvation, disease, or predation, especially in the harsh arctic environment.

In northern seas it is difficult to contain and clean up spilled petroleum products due to ice, high winds, and high seas. A spill can result in persistent environmental contamination by oil and its toxic breakdown products and reduced food resources, resulting in lower survival and hydrocarbon exposure years after visible oil has been abated (Esler *et al.* 2000, p. 843; Trust *et al.* 2000, pp. 399–402).

While a large spill in an area supporting large numbers of yellow-billed loons could have significant adverse effects, we consider the relative probability of such an event to be very low. First, the likelihood of development occurring in areas where loons gather is low. For example, the U.S. Minerals Management Service calculates the probability of commercial success resulting from their lease sale 193 in the Chukchi Sea to be 10 percent (USMMS 2006, p. 2). Second, if development occurs, spills are relatively infrequent, even in the arctic. To date, there have been no large oil spills in the arctic marine environment from oil and gas activities (AMAP 2007, p. 24). No exploratory drilling blowouts have occurred from the 98 wells drilled to date in Alaska's arctic offshore region (USMMS 2007, Appendix A.1, p. 2). In fact, of the 13,463 exploratory wells that have been drilled in the coastal United States, there were 66 blowouts during drilling, only 4 of which resulted in oil spills (range 1 to 200 bbl; average 78 ~ bbl) (USMMS 2007, Appendix A.1, p. 2). Finally, even if a spill occurred, the chances that it would occur close to loons in the seasonal window of time when they are present is also small.

Oil and gas exploration, production, and transportation, as well as spills from other vessel traffic, could also affect migrating and wintering yellow-billed loons, as described below, but we believe this risk factor is minimized because yellow-billed loons are widely distributed and, therefore, at extremely low densities throughout most of the year when they are at sea. The 1989 Exxon Valdez tanker spill killed an estimated 17 to 50 yellow-billed loons in Prince William Sound, Alaska (Earnst 2004a, p. 21). There is oil and gas development in the Sea of Okhotsk, including on and around Sakhalin Island and off the west coast of Kamchatka. Oil and gas development also occurs in yellow-billed loon wintering areas in Norwegian waters, and oil spills at drilling sites and due to vessel accidents occur. Due to the importance of the Norwegian fishing industry, regulation of offshore oil development has been protective. However, it is possible that in 2010 Norway will allow oil development in the Lofoten fishing grounds offshore from a yellow-billed loon wintering area. The Sea of Japan and the Yellow Sea, bordering China, North and South Korea, and Japan, have high levels of vessel traffic subject to oil spill accidents, with several ports among the world's top 25 in cargo transported. In December 2007, the crude oil carrier MT *Hebei Spirit* caused South Korea's worst oil spill to date, estimated at 71,000 bbl in the Yellow Sea near where yellow-billed loons tagged with transmitters have been located in winter. In December 2004, the freighter M/V *Selendang Ayu* grounded and broke in half in the Aleutian Islands of Alaska, spilling more than 8,000 bbl of oil. One yellow-billed loon was observed to be oiled in the vicinity of the spill (Byrd and Daniel 2008, p. 6). Yellow-billed loons wintering in marine waters off southern Alaska, British Columbia, and around Great Britain could also encounter spills, primarily from vessel traffic.

Yellow-billed loons face the possibility of oil spills throughout their range. The one breeding population for which we have population trend data, the ACP population, is stable or slightly declining at present. We would expect a steep decline if cumulative oil spills were affecting this population, which winters in Asian waters. We do not have evidence that marine oil spills are causing population-level effects to yellow-billed loons on the ACP. The Asian wintering grounds are likely to harbor the most oil spills due to vessel accidents compared to other wintering areas, so it is reasonably likely that breeding populations that winter elsewhere are not at greater risk than the birds that winter in Asia.

In summary, at present we believe the risk to yellow-billed loons from offshore oil and gas development and shipping traffic accidents to be low. Moreover, the one breeding population for which we have population trends does not appear to be declining steeply due to this risk factor. Although the amount of oil and gas development and shipping traffic will likely increase in the future, the associated risk is reasonably likely to be partly or wholly offset by improved technologies and regulation, such as the U.S. Oil Pollution Act of 1990. Also, the species' wide distribution and extremely low densities throughout most of the year when birds are at sea reduces the risk of population-level impacts from any single event. As offshore oil and gas development and shipping traffic continue, individual yellow-billed loons will likely continue to be negatively affected as a result of collisions with vessels or structures and oil spills. However, we cannot reliably predict that the species will be affected at the population level, given the considerable uncertainty of the location of such events and the effectiveness of the design and operational spill cleanup methods that may be employed. Therefore, we find that oil and gas development and vessel traffic is not a threat to the yellow-billed loon now or in the foreseeable future.

Subsistence Harvest

Subsistence harvest of yellow-billed loons in the Bering Strait has been reported at levels that we expect would cause impacts to the species in the foreseeable future. Although we have concerns about the degree of accuracy of the reported numbers of yellow-billed loons harvested, as discussed below, we believe that the likely magnitude of actual harvest levels constitutes a threat to the species rangewide.

Subsistence hunting of wild birds, including loons, is an important component of the customs, traditions, and economies of many cultural groups in the arctic. Subsistence is defined in U.S. Federal and State law as the "customary and traditional uses" of wild resources for a variety of purposes, including food, clothing, fuel, transportation, construction, art, crafts, sharing, and customary trade (Wolfe 2000, p. 1). Yellow-billed loons are generally not a preferred food in some parts of their arctic range, but their skin and feathers are used for ceremonial purposes (Paige *et al.* 1996, appendices; Georgette 2000, p. 19; Syreochkovskiy 2008, p. 2), and they are shot for other reasons, such as for taxidermy, to chase them from fishing nets, or out of curiosity (Syreochkovskiy 2008, p. 2). Discussions between St. Lawrence Island, Alaska hunters, and Service biologists confirmed that Bering Strait hunters target loons for harvest (Ostrand in litt. 2009, p. 1). A Service biologist working with hunters on St. Lawrence Island in the spring rarely observed hunters with harvested loons in their possession (Benter in litt. 2008, p. 1), although he has observed hunters targeting loons for harvest (Benter pers. comm. 2009).

Although it is clear that loons are harvested for subsistence, there are challenges to assessing the magnitude of harvest and biases inherent in the process. Harvest surveys have been conducted in many arctic communities, but they have varied in geographic coverage, methodology and analysis, and level of detail; thus, comparing among areas or detecting trends over time is difficult (SHSAC 2003, p. 5). Most survey data are collected through recall interviews conducted a month or more after harvest, resulting in varying and unknown levels of recall error. Sampling designs might inadequately survey rarely taken species (SHSAC 2003, p. 15), and there have been no surveys specifically targeting yellow-billed loons. As a result, most yellow-billed loon harvest estimates have a high level of variance and yield results of unknown accuracy. In some surveys, loons are not identified to species; in others misidentification of species harvested probably occurs but to an unknown degree. To consider misidentification issues, we present some data below on other loon species reported in harvest surveys.

I. Alaska

Surveys Conducted Prior to Migratory Bird Subsistence-Harvest Regulations

As stated in Factor D, yellow-billed loons are not open for subsistence hunting in Alaska under migratory bird subsistence-harvest regulations. Prior to the establishment of Federal regulations authorizing subsistence harvest for migratory bird species in 2003, subsistence harvest surveys for migratory birds were conducted sporadically, and coverage varied considerably among surveys.

Yellow-billed loons migrate through the Chukchi and Bering Sea, making them available for harvest during spring and fall migration in northwest Alaska. In the Northwest Arctic Borough (the area around Kotzebue, Alaska) harvest surveys (from 1994–1998; Georgette 2000, pp. 1–218), no yellow-billed loons were reported, but 71 common, 2 arctic, 6 red-throated, and 1 unknown loon were reported, with identification of species noted as uncertain at times (Georgette 2000, p. 10). Loons comprised generally less than one percent of the total bird harvest (Georgette 2000, p. 19). A one-year survey of the two villages on St. Lawrence Island in the Bering Strait from 1995–1996 reported 40 yellow-billed loons and 290 common, 81 Pacific, and 15 unknown loons harvested (ADFG and Kawerak 1997, p. 2). Concerns about misidentification of species, particularly identification of common loons, which are rare in the Bering Strait, are discussed below.

Yellow-billed loons migrate along the coast of the Yukon/Kuskokwim Delta and Bristol Bay regions, so harvest in spring and fall is possible. Because yellow-billed loons do not breed in these regions, reports of summer and egg harvest suggest misidentification. Below we report the long-term harvest survey record for these areas. Because reports give summary results overlapping the pre- and post-2003 regulation period, we report the entire survey record here, including post-2003 results.

Yellow-billed loons have been reported in almost every annual Yukon-Kuskokwim Delta harvest survey (conducted 1985 to present, except 2003, with methodology changes in 2001 and 2002; Wentworth 2007b, p. 12). The 2001–2006 5-year average yellow-billed loon harvest was 44 ± 78 *SD* (standard deviation, a measure of the dispersion of the data around the mean) (range 0–183) for the Yukon/Kuskokwim Delta (calculated from Wentworth 2007b, p. 36 and USFWS *et al.* 2008, Table 2006–17a). Yellow-billed loon eggs were reported taken in 14 of 20 years, with an annual average of 14 eggs per year estimated for 2001 through 2005 (Wentworth 2007b, pp. 37–41).

Yellow-billed loons have been reportedly taken in every Bristol Bay region survey (since 1995, except no surveys in 2000 and 2003, surveys were limited to Togiak NWR in 1996, 1998, and 2006, and methodology changed in 2001 and 2002; Wentworth 2007a, pp. 1–2). The 2001–2005 Bristol Bay region average yellow-billed loon harvest was 78 ± 128 *SD* (range 5–269) (Wentworth 2007a, p. 22). From 1995–2005, the only eggs reported in Bristol Bay were in 1997, when 27 eggs were estimated taken (Wentworth 2007a, pp. 23–24).

Harvest Surveys Conducted Subsequent to Migratory Bird Subsistence-Harvest Regulations

In 2004, a new Alaska-wide subsistence-harvest survey, including spring, summer, and fall seasons, was initiated subsequent to the 2003 implementation of migratory bird subsistence-harvest regulations. Under the new regulations, areas of Alaska eligible for migratory bird subsistence-harvest are divided into regions that are surveyed periodically (map available at *http://alaska.fws.gov/ambcc/Regulations.htm*). The new survey has yet to be conducted simultaneously within a year in all villages or all regions (USFWS *et al.* 2008, p. 3), and the 2004–2006 summary report states that the results should be used with caution due to possible inaccuracies, unreliable data, and insufficient sample size (USFWS *et al.* 2008, p. 3). Within the area covered by the new survey, yellow-billed loons are most likely to occur in the North Slope, Northwest Arctic, and Bering Strait/Norton Sound regions during nesting and in Bristol Bay and Yukon/Kuskokwim regions during migration; they were reported as harvested in the Bering Strait/Norton Sound, Bristol Bay, North Slope, and Yukon/Kuskokwim Delta regions in 2004–2006 (Table 1). The largest number of yellow-billed loons and other loon species were estimated for the Bering Strait/Norton Sound region (Table 2).

TABLE 1—ESTIMATED HARVEST OF YELLOW-BILLED LOONS (EXCLUDING EGGS) IN ALASKA REGIONS REPORTING TAKE OF THE SPECIES IN THE YEARS 2004–2006. NO OTHER REGIONS REPORTED YELLOW-BILL LOON TAKE. DATA EXTRACTED FROM TABLES IN USFWS ET AL. 2008

Region	Year							Total
	2004			2005			2006	
	Estimated harvest	95% CI	Season[a]	Estimated harvest	95% CI	Season	Estimated harvest	
Bering Strait	317	271–530	Spring Summer Fall	45	45–123	Spring Summer	NS[b]	362
Bristol Bay	10	8–30	Fall	5	2–22	Spring	0	15
YKD	4	3–16	Spring	12	([c])	Spring Summer Fall	0	16
North Slope	NS			3	2–14	Summer	NS	3
Total	331			65			0	396

CI = confidence interval
[a] Seasons that yellow-billed loons were reported as harvested.
[b] NS = region not surveyed in that year.
[c] For Yukon/Kuskokwim Delta (YKD) in 2005, 11 yellow-billed loons reported in the Kuskokwim River subregion (95 percent CI 8–53) and one reported in North Coast subregion (95 percent CI 1–23).

TABLE 2—ESTIMATED HARVEST OF LOONS FOR THE BERING STRAIT/NORTON SOUND REGION IN 2004 AND 2005. DATA EXTRACTED FROM TABLES IN USFWS ET AL. 2008

Species	Year			
	2004		2005	
	Number	95% CI	Number	95% CI
Yellow-billed loon	317	271–530	45	45–123
Common loon	405	345–889	891	871–1438
Pacific loon	498	425–772	33	18–115
Red-throated loon	26	22–89	15	10–82

We recently received preliminary subsistence-harvest estimates for 2007 (Naves 2008, pp. 1–30). For 2007, Naves (2008, pp. 1–31) reported results by subregion rather than by region as reported previously; thus these observations are not directly comparable to data in Tables 1 and 2 and are not included therein. Naves (2008, p. 7) reported that an estimated 1,077 (95 percent CI = 808–1,347) yellow-billed loons and 2,492 (95 percent CI = 2,158–2,826) common loons were harvested for a Bering Strait/Norton Sound subregion that includes two villages on St. Lawrence Island and one on Little Diomede Island, called the St. Lawrence-Diomede Islands subregion (SL-DI subregion). This estimated SL-DI subregion yellow-billed loon harvest was allocated among seasons with 5 birds estimated harvested in spring, 362 in the summer, and 711 in the fall. Estimated harvest of common loons in the SL-DI subregion were 166 in spring, 560 in summer, and 1,766 in fall (Naves 2008, p. 7). Harvest of 76 Pacific loons

(95 percent CI = 19–134) and 366 red-throated loons (95 percent CI = 221–511) was also estimated for the subregion (Naves 2008, p. 7). Yellow-billed loons were not reported for any other subregion in the Bering Strait/Norton Sound Region. The Barrow subregion of the North Slope region was the only other surveyed area that reported harvest of yellow-billed loons in 2007, with an estimated 84 (95 percent CI = 32–135) yellow-billed loons harvested (Naves 2008, p. 15).

Interpretation of the 2007 loon harvest estimates requires consideration of several factors (beyond their magnitude and potential population-level impact, which will be discussed later). First, the confidence intervals (which are mathematical estimates of the reliability of the estimate, and in this case are expressed as a percent of the estimated value) surrounding the estimates of both yellow-billed and common loons are comparatively small. The 2007 survey results for the SL–DI subregion have a 95 percent CI that is only 25 percent of the estimate for yellow-billed loons and 13 percent for common loons (Naves 2008, p. 7); these are much smaller than earlier estimates given for the entire Bering Strait/Norton Sound region (for example, the 2005 95 percent CI was 174.2 percent of the estimate for yellow-billed loons and 61.4 percent for common loons (USFWS *et al.* 2008, Table 2005–2a)). These smaller CI values indicate increased precision in the 2007 subregional estimate compared to the earlier regional estimates, which reflects large sample size (82 of 318 households (26 percent) sampled) and low variation among households (indicating that most households reported taking fairly comparable numbers of loons).

A second consideration in interpreting the large estimate of yellow-billed loon harvest for 2007 is possible misidentification. Large numbers of common loons are reported as harvested in the SL/DI subregion where they are a rare to uncommon visitor (Fay and Cade 1959, p. 100; Kessel 1989, p. 66; North 1994, p. 3; Armstrong 1995, p. 23; McIntyre and Barr 1997, p. 2; Lehman 2005, p. 15). The report described above of 290 common loons taken on St. Lawrence Island in 1995–1996 (ADFG and Kawerak 1997, p. 2) is considered by Lehman (2005, p. 15) to result from misidentification because only two verified records of this species from the island are known to date. Similarly, common loons reported as harvested from the Bering Strait/Norton Sound region in 2004 and 2005 (Table 2) likely also include other loon species, possibly including yellow-billed loons.

A potential source of misidentification is the probable presence in the fall of juvenile loons whose plumage resembles adult basic (i.e., non-breeding or winter) plumage. It is difficult to differentiate among loon species in this plumage, and survey forms do not illustrate this plumage or highlight ways to distinguish among species. It is unknown how many common loons move through the Bering Strait, but as described above, the number is thought to be small since they have rarely been seen on St. Lawrence Island. Therefore, if misidentification is attributable to confusion between yellow-billed and common loons, the actual harvest of yellow-billed loons is likely even greater than that reported. It is also possible that Pacific and red-throated loons are misidentified as yellow-billed and common loons, although they are notably smaller. If so, this would result in actual harvest of yellow-billed loons being less than that reported.

We considered the possibility that a large number of households in the subregion misidentified loons due to survey deficiencies, and we considered the possibility that this problem was worse in 2007 than in earlier years, resulting in a higher estimated harvest than in previous years. The survey forms show color pictures of birds exclusively in breeding plumage, and survey respondents are asked to mark the number taken next to the pictures. The lack of depictions of winter and immature plumages in the survey form is a likely problem for harvest reported in the fall, when immature birds are likely to be harvested. There is no need for the respondent to identify the name of the bird, making it less likely that cultural differences in nomenclature would cause systemic misidentification. The surveyors were trained in a standard manner for all surveys across the state in all years, using a manual developed over many years. In the Bering Strait/Norton Sound region, the surveyors were provided with several bird identification books to assist them, although it is unknown how and how often they used the books during surveys (Ostrand in litt. 2009, p. 1). In summary, we found that misidentification could be occurring because the survey form includes only breeding plumages. We found no reason to conclude that the survey was conducted any differently in 2007 than in previous years.

Above we noted the large inter-annual variation in harvest estimates of yellow-billed loons for the Bering Strait/Norton Sound region (Table 2); this variation is increased with the addition of the large estimated harvest in the 2007 survey (Naves 2008, p. 7). Large inter-annual variation in estimated harvest of yellow-billed loons could represent measurement error for a relatively constant rate of harvest, or it could represent actual variation in harvest among years. Schmutz (in litt. 2008, p. 1) observed that some yellow-billed loons fitted with transmitters in 2002, 2003, and 2007 on Alaskan breeding grounds moved to marine waters near St. Lawrence Island before migrating south, but others, including all eight birds fitted with transmitters in 2008, moved from Alaskan breeding grounds to Kolyuchin Bay on the north side of the Chukotka Peninsula, and crossed overland to the southwest over the peninsula and into Anadyr Bay, thereby avoiding the St. Lawrence Island area. Thus, migratory behavior may vary from year to year based on some unknown environmental factor, and loon harvest could vary with changes in the number of loons moving past hunting areas in different years.

Because the 2007 estimated harvest was substantially higher than earlier estimates, we evaluated issues specific to the 2007 survey that might help explain this difference. Other than the fact that the survey for all three seasons was conducted at the end of the fall season, survey protocols were followed, and no other factors were identified to explain the high estimate (Ostrand in litt. 2009, p. 1). Conducting the survey at the end of the year means that the respondents would have to recall what they harvested months earlier, which could reduce the accuracy of the survey, especially for the earlier seasons.

Although we examined potential flaws in the harvest survey data and concluded that some birds could have been misidentified, we believe the data are reliable enough to identify the order of magnitude of likely harvest. We conclude that on average, hundreds of yellow-billed loons are probably taken annually in the Bering Strait region. In addition, tens are likely taken in other parts of Alaska, particularly the North Slope.

To evaluate the effect of this harvest on the yellow-billed loon, we examined what we know about the number of birds that move through the Bering Strait. As described in the Species Biology section, above, all 29 marked Alaskan breeding birds used the Bering Strait or Chukotka Peninsula during migration. There are an estimated 3,000 to 4,000 Alaskan breeding birds. It is likely that, due to their proximity, 3,000 to 5,000 eastern Siberian breeding yellow-billed loons also migrate through the Bering Strait region. Observations of yellow-billed loons during migration on the Beaufort Sea provide evidence that at least some Canadian breeding birds use this migration route, most likely the 3,750 to 6,000 breeding birds estimated to occur on Banks and Victoria Islands and the adjacent arctic mainland coast. Thus, we believe it is likely that a large part of the rangewide population moves through the Strait and is subject to harvest there. We do not know whether the actual rangewide breeding population is closer to 16,000 or 32,000, but as discussed in the Population Size section, we believe it is likely closer to 16,000.

We next evaluated whether hundreds of yellow-billed loons being harvested annually would be unsustainable to the rangewide population. We examined a population model developed by the U.S. Geological Survey (USGS) to test the sensitivity or response of the population to a range of possible harvest levels (Table 3; Schmutz 2009, p. 15). The model was constructed to begin with stable populations (i.e., lambda = 1.00), and then examined whether harvest caused additional declines. The model considered a range in harvest mortality rates and population sizes to reflect our uncertainty about these parameters. We believe the model includes the entire range of possible values for the size of the affected population.

The model suggests that for all scenarios, harvest would cause an otherwise stable population to decline (i.e., lambda declines from 1.00 to values below 1.00) (Table 3). The annual average values for harvest that we believe are most likely (i.e., hundreds; best approximated in Table 3 by the column corresponding to a harvest of 317 birds) and the population size we believe is subjected to the harvest (i.e., approximately 16,000 plus 1 and 2 year old birds; best approximated in Table 3 by the row corresponding to a population size of 18,764, which includes 1 and 2 year olds) show that a hypothetical stable population that experienced added harvest of 317 birds would decline by half in 41 years, or less if the harvest is larger or varies among harvest estimates for recent years (Table 3). Even if there are 37,528 yellow-billed loons in the rangewide population subject to harvest (which we think is unlikely, as discussed above), a harvest of 317 birds would cause the population to decline by half in 83 years. We believe this harvest and associated declines would be unsustainable to the rangewide population, causing a long-term decrease in abundance that would be difficult to reverse due to the low reproductive potential of the species. It is important to note that this analysis does not take into account that additional mortality, such as harvest in other parts of Alaska, Russia, or Canada, or from other sources, could exacerbate the rate of decline from a stable population.

Table 3. Model results of the effects of various harvest scenarios on trend and population size of yellow-billed loons. The starting model predicted a stable population (trend = 1.0). This model used productivity data from yellow-billed loons on the Colville Delta, and survival rates allocated among age classes similar to Mitro et al. (2008) for common loons, but with an adjustment factor to achieve hypothetical population stability so that the model could evaluate likely population response to varying levels of harvest. Thus, the starting, stable population shown in the first column represents a population without harvest. Reference population sizes used breeding population sizes of 4,000, 10,000, 16,000 and 32,000 breeding birds, and were then adjusted to include an additional population component comprised of individuals (likely 1- and 2-year olds) that remain at sea and are not counted during summer surveys of tundra habitats. The next three data columns represent three starting levels of harvest corresponding to recent harvest estimates for the Bering Straits region. The fourth data column represents population response to harvest levels that vary among years, which reflects reported variation in harvest and satellite tracking data that indicate inter-annual variation in migratory behavior through the Bering Strait. For all harvest levels, the mortality rate, rather than mortality number, from harvest is kept constant across the years of each population projection. In each cell, there are two numbers. The first is annual population growth rate, given the indicated harvest and the population that such harvest is allocated to. Second is the number of years from present until the population falls below half of current size. These harvest estimates and corresponding predicted population responses do not consider possible additional harvest occurring outside of the Bering Straits region in other portions of the species' life cycle. This model assumes hunting mortality is additive and not compensatory. From Schmutz 2009, p. 15.

	Beginning harvest level to set mortality rate			
Reference population	45	317	1,077	Annually rotate between 45, 317, and 1,077
N = 4,508	0.9900 70	0.9297 10	0.7611 3	0.8937 6
N = 10,372	0.9957 162	0.9695 23	0.8962 7	0.9538 15
N = 18,764	0.9976 295	0.9832 41	0.9426 12	0.9745 27
N = 37,528	0.9988 601	0.9916 83	0.9713 24	0.9873 54

In summary, although there is uncertainty about the reported numbers of yellow-billed loons harvested in Alaska, these surveys represent the best information available to us at this time. We believe that the data are reliable enough to conclude it is likely that recent annual average harvest of yellow-billed loons in Alaska is in the hundreds. Based on this information, the large number of yellow-billed loons from Alaskan, Russian, and Canadian breeding areas that are likely to use the Bering Strait in migration, and the model results presented in Table 3, we conclude that the potential impact of the Alaska harvest on the rangewide yellow-billed loon population is significant. It is possible that recent high harvest estimates represent a new phenomenon not yet reflected in population trend information, although we do not have information on whether the harvest will increase or decrease in the future. Harvest at the present magnitude, even if occurring every few years, will cause a rangewide decline that constitutes a threat to the yellow-billed loon.

II. Russia

The Red Data Book of the Russian Federation (2001, p. 367) states ''during the nesting period, loons are often killed/harvested by the indigenous population for food and pelts particularly in the northeast of Russia.'' Other information comes from a recent review from the Russian Academy of Sciences to the Service, which reported current yellow-billed loon harvest of approximately 200 per year, including for protection of fishing nets (Syroechkovskiy 2008, p. 1–2). The review also noted that in former times yellow-billed loons were occasionally shot by indigenous peoples for ritual purposes and raw materials, and conversely, some tribes in the Yakutian arctic recognize loons as sacred species and never shoot them (Syroechkovskiy 2008, p. 1).

The basis for the Russian estimate of yellow-billed loon harvest above is unknown. Few surveys have been conducted (limited information from Yakutia and Chukotka), the species' range has not been adequately sampled, and the species has an uneven distribution across Russia (Syroechkovskiy 2008, p. 1). No subsistence harvest information is available from the Taymyr Peninsula, one of the two core areas of the breeding range in arctic Russia and the only region where Syroechkovskiy (2008, p. 1–2) reported hunting of the species as a food source.

Other harvest surveys have occurred in Russia, however. Unidentified loons were reported taken in two Providensky communities in 1997 and 1998 as part of subsistence harvest surveys for marine mammals (Ainana *et al.* 1999, p. 83; Ainana *et al.* 2000, pp. 66 & 71). No loons were listed in 1999 (Ainana *et al.* 2001), but this report included fewer and less detailed reports of birds. Service-funded waterfowl (eider) subsistence harvest surveys in 19 of 100 northeastern Russia (Yakutia and Chukotka regions) communities within 100 km (62 mi) of the coastline by the Goose, Swan, and Duck Study Group of Northern Eurasia from 2002–2005 (Syroechkovski and Klokov 2007, p. 8) included loons. Yellow-billed loons reported (by previous year recall of hunters) varied among villages (range 0–58), with only three villages reporting harvesting 10 or more birds. Harvest was greatest in northern Chukotka, where the species nests and where one village reported egg harvest of 44 eggs in one year. The species' range was not completely surveyed because loons were not the focus of the survey (Syroechkovski and Klokov 2007, p. 1). However, based on these surveys, as well as the nationwide estimate provided by the Russian Academy of Sciences (Syroechkovskiy 2008, pp. 2), we estimate tens to possibly 200 yellow-billed loons are harvested by subsistence hunters annually in Russia, virtually all affecting the Russian breeding population (the breeding population is estimated to be 5,000 to 8,000). The effect of an annual harvest of 200 birds on a population of this size is significant, particularly if the population is subject to additional harvest in migration through the Bering Strait (as described under the Alaska section above).

III. Canada

Yellow-billed loons are thought to breed in several of the Native Land Claims in northern Canada, but primarily in Inuvialuit and Nunavut. The land claims are in different phases of settlement, and harvest data are only available for those areas where claims have been settled and Renewable Resource Boards (RRBs) are in operation to jointly manage wildlife resources (*http://www.mb.ec.gc.ca/nature/ecb/da02s11.en.html,* accessed October 2008). The RRBs all use similar methodology to determine wildlife harvest levels for their areas of jurisdiction. Reported possible sources of error in these harvest estimates include enumeration, coverage and non-response, measurement and questionnaire design, recall failure, and strategic response bias (Priest and Usher 2004, pp. 35–42).

Harvest survey data are available from the Nunavut, Inuvialuit, and Sahtu regions, which encompass the vast majority of the yellow-billed loon's breeding range in Canada (see map at *http://www.mb.ec.gc.ca/nature/ecb/da02s11.en.html,* accessed November 25, 2008), from 1988 to 2003. Nunavut harvest surveys (Priest and Usher 2004) were conducted from 1996 through 2001. Five communities reported harvesting yellow-billed loons from May through October, while twenty-two communities did not report harvest of yellow-billed (or unidentified) loons. The estimated yearly harvest (reported as a range) was 2.6–8.2 yellow-billed and 1.4–5.8 unidentified loons (Priest and Usher 2004; tables). Inuvialuit harvest surveys were conducted from 1988 to 1997 (Inuvialuit Harvest Study 2003). Loons, including yellow-billed loons, were reported harvested from May through July in three of six communities surveyed. Estimated mean annual harvest of yellow-billed loons for the region was 10 ± 8 *SD,* and 1 ± 2 *SD* additional unidentified loons per year (Inuvialuit Harvest Study 2003; tables). Sahtu Region surveys were conducted from 1998 to 2003 (Bayha and Snortland 2002, 2003, 2004). (Yellow-billed loons occur only in the northern Sahtu region.) No yellow-billed loons were reported harvested, but a total of 5 unidentified loons were harvested over the 6 survey years (less than 1 per year) from May to August (Bayha and Snortland 2002, 2003, 2004; tables), with no extrapolation to the entire Sahtu region. Based on these data, we estimate low tens of yellow-billed loons are harvested by subsistence hunters annually in Canada.

IV. Conclusion for Subsistence

Our ability to accurately estimate the magnitude of subsistence harvest of yellow-billed loons rangewide is compromised by incomplete harvest survey coverage of the species' range, possible misidentification among species, sampling shortcomings, and our limited ability to allocate harvest during migration to source breeding populations. Correctly assessing subsistence harvest of a rare species, such as the yellow-billed loon, requires intensive surveys to adequately sample villages within the species' range to increase precision in the harvest estimate. The data do tell us that yellow-billed loons have been harvested, probably averaging in the hundreds annually, which we believe would be unsustainable relative to the overall yellow-billed loon population.

Despite the limitations described above, the best available information indicates that, throughout its range, on average, hundreds of yellow-billed loons from multiple breeding areas are harvested annually by subsistence hunters. Population modeling suggests that the number of yellow-billed loons being harvested in the Bering Strait area of Alaska alone is likely unsustainable. In addition, up to several hundred yellow-billed loons could be taken annually on Russian breeding grounds, and small amounts of harvest are reported for other areas in Alaska and Canada. The lack of precision of the population trend information for Alaska could be preventing us from detecting the impact of this harvest on the population, or the high harvest estimates could represent a new phenomenon not yet manifested in our population trend estimates. The harvest is also likely having an impact on breeding populations that are not being monitored; population trends for Canada and Russia are not known. We have no reason to believe that the current level of subsistence harvest of yellow-billed loons will change in the future. Because we believe that the rangewide population of yellow-billed loons is subject to unsustainable levels of harvest, we find that subsistence harvest is a threat to the species rangewide.

Fishing Bycatch (Commercial and Noncommercial)

Incidental take (''bycatch'') from commercial and subsistence fisheries poses a risk to yellow-billed loons due to direct mortality caused by entanglement or accidental drowning in gear. Gear type, location, and timing affect both frequency and intensity of bycatch rates. Yellow-billed loons are believed to be attracted to nets by entangled fish or other loons (J. Bacon in litt. 2008, p. 1). Yellow-billed loons spend the majority of the year foraging in coastal waters; therefore, coastal fisheries are more likely to encounter loons than pelagic fisheries. Thus, our primary concern is assessing the current level of bycatch occurring in nearshore gill-net fisheries that overlap the yellow-billed loon's range. Immature yellow-billed loons (1–2 year olds), which are thought to remain on adult wintering grounds (Earnst 2004, p. 11), might be exposed to commercial fisheries overlapping these areas year-round. Adult yellow-billed loons could be exposed to commercial fisheries on the wintering grounds and over a larger area of marine coastlines during migration, as well as to subsistence fishing during migration and while on the nesting grounds.

I. Commercial Fishing Bycatch

Loon bycatch has been documented in commercial drift-net, gill-net, trap-net, and longline fisheries. Compared to other fisheries, gill-net fisheries have the greatest potential to affect loons. For example, a 1998 study of bycatch in winter gill-net fisheries on the U.S. mid-Atlantic coast found that loons (red-throated and common) accounted for 89 percent of all avian bycatch (Forsell 1999, p. 23). While loon species have been recorded as bycatch in several longline fisheries (Brothers *et al.* 1999), in general, longlines attract surface-feeding seabirds rather than species that dive to feed.

While commercial fishing occurs across marine waters inhabited by yellow-billed loons, primarily within the species' wintering grounds, there are several challenges to assessing the impact of these fisheries on the species. Bycatch monitoring programs are infrequent and do not exist for many fisheries in the yellow-billed loon's wintering grounds. This is particularly true for the Yellow Sea, which is historically one of the most intensively fished areas in the world (LME 48 2004, p. 1). Where programs do exist, loons are often not identified to species level or are categorized as ''other.'' These problems might explain low reported levels of yellow-billed loon bycatch. In addition, actual bycatch in any given fishery is likely to be low due to the species' low densities and widespread distribution.

Alaska

The Alaskan commercial fisheries most likely to catch yellow-billed loons are gill-net fisheries in the Gulf of Alaska (Prince William Sound and Cook Inlet) and Southeast Alaska. While these fisheries overlap spatially with areas used by yellow-billed loons, they occur primarily during summer when adults and an unknown proportion of immatures have moved north to arctic habitats.

No bycatch data are available from gill-net fisheries in Southeast Alaska, but limited seabird bycatch data are available from some Gulf of Alaska fisheries with marine mammal bycatch monitoring programs. For example, salmon gill-net fisheries in Prince William Sound and Unimak Island area in 1990 to 1991 recorded low levels of loon bycatch (1 unknown loon, 2 red-throated loons, and 2 common loons from more than 9,000 sets; Wynne *et al.* 1991, p. 30; Wynne *et al.* 1992, pp. 47–48). Another program for Cook Inlet salmon drift-net and set-net fisheries (1999–2000) also recorded low loon numbers (2 common loons and 1 unidentified loon in 540 sets observed; Manly 2006, pp. 27 & 32). Of all loons observed near nets in 2000, about half were identified as common loons, and half were unknown loon species (Manly 2006, p. 40).

Alaska longline, pot, and trawl fisheries are less likely to affect this species due to the loon's foraging behaviors and location of these fisheries. While these fisheries overlap the wintering grounds of the yellow-billed loon in the Bering Sea, Aleutians, and Gulf of Alaska from September to April, they are conducted offshore. An observer program exists for the Alaskan demersal groundfish fisheries (including longline, pot, and trawl for certain groundfish species) but no loon bycatch data exist because all loon species are classified as part of the category ''other'' along with several other species not typically caught by these gear types. Less than one percent (0–351 individual birds) of all reported bycatch in these fisheries has been recorded as ''other'' for years 1993 through 2006 (AFSC 2006a, pp. 9–15; AFSC 2006b, pp. 5–8; AFSC 2007, pp. 5–9). In addition, bycatch rates in the longline fisheries have declined in recent years (highs in 1998–1999) due to the implementation of seabird-avoidance measures (AFSC 2006a, p. 2).

In summary, bycatch of loon species, as well as unknown loons, has been reported in limited observer-program coverage of Alaskan gill-net fisheries that occur within the yellow-billed loon's range. While no bycatch of yellow-billed loons has been reported, available data are limited and lacking for some parts of the species' range. In addition, there is no available information that suggests take levels will change in the future.

Washington State and British Columbia

Loon entanglement has been reported in commercial gill-net fisheries in Washington's Puget Sound, Hood Canal, Willapa Bay, Grays Harbor, and the Columbia River. At least 1 yellow-billed loon, 3 unidentified loons, and 11 common loons were documented as bycatch in the mid-1990s (Erstad *et al.* 1994, p. 6; Pierce *et al.* 1994, p. 18; Erstad *et al.* 1996, p. 12; and Jeffries *et al.* 1996, cited in Richardson *et al.* 2000, p. 20). Based on season, these birds are presumably non-breeders. Fishery-wide estimates were not extrapolated.

In British Columbia, common and Pacific loons have been identified as bycatch in sockeye gill net fisheries, but comprise less than one percent of total bycatch reported from net fisheries from 1995–2001 (one individual of each species was identified, for an estimated take of 31 of each species) (Smith and Morgan 2005, p. 25) (although a high proportion of bycatch was unidentified). Based upon known seabird and commercial fishing locations, Queen Charlotte Sound, the Scott Islands, and Cape St. James are of concern for bycatch from March–June, and the Western coast of Vancouver Island from June–September (Smith and Morgan 2005, p. 29). These areas are all in yellow-billed loon wintering grounds, and non-breeding yellow-billed loons might remain there throughout summer.

In summary, bycatch of loon species, including one yellow-billed loon, has been reported in limited observer-program coverage of Washington and British Columbia gill-net fisheries that occur within the yellow-billed loon's range. The available data indicate that individuals (particularly non-breeders) are vulnerable to bycatch in these fisheries, but do not allow estimation of the number of yellow-billed loons taken. We also have no information to predict whether current take levels will increase or decrease in the future.

Russian Far East

Russian drift-net fisheries for salmon, as well as net fisheries for herring, mackerel, and Pacific saury occur in the northwest Pacific Ocean (Northridge 1991, p. 52). Bycatch data do not exist for most of these fisheries (WWF 2004, p. 56), except for limited data from the salmon drift-net fisheries. Seabird bycatch was monitored for the Japanese salmon drift-net fishery in the Russian Exclusive Economic Zone within the Sea of Okhotsk and Kuril Islands from 1993 to 1998 and western Bering Sea from 1993 to 2001. This fishery takes place from May through July. Yellow-billed loons comprised less than or equal to 0.02 percent of reported bycatch, with an extrapolated estimate of 89 yellow-billed loons, likely non-breeders, within all fishery zones from 1993–1998, and an additional 45 individuals in the Bering Sea zone from 1999–2001 (Artukhin *et al.* 1999, pp. 96 & 101; Artukhin *et al.* 2000, p.122; Artukhin *et al.* 2001, p. 83). The highest bycatch rate (0.4 percent) for all fishery zones occurred in the area bordering the Northern edge of the Sea of Okhotsk (from 1993 to 1998) (Artukhin *et al.* 1999, p. 96; Artyukhin and Burkanov 2000, p. 108). Overall, catch rates of yellow-billed loons were similar to but slightly higher than those reported for other loons (arctic and red-throated). Unidentified birds comprised less than or equal to 0.05 percent of bycatch. No yellow-billed loons have been reported as bycatch in the Russian salmon drift-net fishery (Y. Artukhin in litt. 2008, p. 1), which exceeded the Japanese salmon harvest in 2003 (WWF 2004, p. 56).

Longline and trawl fisheries also occur in the Russian Far East by Russian, Japanese, Korean, and American companies (Artyukhin *et al.* 2006, p. 7). These year-round fisheries for cod, halibut, and rockfish are located primarily in western Bering Sea, Pacific Ocean waters of Kamchatka, and Sea of Okhotsk (Artyukhin *et al.* 2006, p. 6). A seabird observer program for the Russian longline fishery was conducted in these waters from 2003 to 2005 during a project to test methods and equipment to reduce incidental seabird bycatch (Artyukhin *et al.* 2006). No loons were reported as bycatch (Artyukhin *et al.* 2006, p. 19).

In summary, yellow-billed loon bycatch has been reported in drift-net fisheries within the Sea of Okhotsk and the western Bering Sea. Due to the timing of the fisheries, most individuals were likely non-breeders. The data indicate vulnerability of the species to incidental capture in drift-net gear, but do not allow estimation of the total number of yellow-billed loons taken. In addition, there is no available information that suggests take levels will change in the future.

Yellow Sea, Sea of Japan, and Coastal Japan

The Yellow Sea, one of the most heavily fished areas of the world, is classified by the Global International Waters Assessment as severely affected by overfishing, with major fisheries currently occurring at a low level compared to 30 years ago (LME 48 2004). Both the Yellow Sea and Sea of Japan are primarily fished by Japan, China, Korea, and the Russian Federation nearshore gill-net fleets (Northridge 1991, pp. 52–54; LME 48 2004; LME 50 2004). There are also a considerable number of Japanese gill-net fishing vessels in Japanese coastal waters, with coastal vessels estimated to be in the thousands (DeGange *et al.* 1993, p. 207). Various gill-net fisheries (i.e., Spanish mackerel (*Scomberomorus niphonius*), silver pomfret (*Pampus argenteus*), and Chinese herring (*Illisha elongata*)) occur during different months of the year (Northridge 1991, pp. 53 & 54; Zhang and Kim 1999, p. 167), including overlap in time and location with non-breeders and adult wintering yellow-billed loons. The level of seabird bycatch from most of these coastal fisheries is unknown (DeGange *et al.* 1993, p. 209). Longline fisheries conducted by Japan, China, and the Republic of Korea are also known to occur (Brothers *et al.* 1999), but bycatch information is unavailable.

In summary, no data are available on the level of yellow-billed bycatch from gill-net fisheries in the Yellow Sea, Sea of Japan, or coastal Japan. Due to the vulnerability of the species to incidental capture in gill nets and extensive activity of these fisheries overlapping in timing and location with the loon's adult wintering range, bycatch likely occurs. However, we have no means to assess the current level of take. In addition, there is no available information that suggests take levels will change in the future.

Norway

Fisheries occur along the entire coastline of Norway, with northern areas most intensively fished (Bakken 1998, p. 28). Atlantic cod (*Gadus morhua*) is the most important fishery, and other species fished include capelin, flatfish, haddock, herring, lumpsucker, and salmon (Bakken 1998, p. 28). The Lofoten fishery, a major fishery that includes one-fifth of Norway's total fishermen, primarily targets Atlantic cod, from February to April, and uses both gill nets and long lines, along with hand lines and seines (Jentoft and Kristoffersen 1989, pp. 356–357). Limited data exist on seabird bycatch in these fisheries, but loons have been reported as bycatch in the cod, herring, haddock, and flatfish gill-net fisheries all along the Norwegian coast (Bakken 1998, pp. 28 & 36). There are anecdotal reports of yellow-billed and common loon bycatch in gill nets, especially in the Lofoten Islands, and in Troms County to a lesser extent (Strann and Østnes 2007, p. 4). Although the extent of winter bycatch is unknown, Strann and Østnes (2007, p. 4) suggest, based on anecdotal observations, that take of yellow-billed and common loons might be increasing in the Lofoten Islands.

In summary, yellow-billed loons, as well as other loon species, have been anecdotally reported as bycatch in Norwegian gill-net fisheries. We have no means to extrapolate available information to estimate the total number of yellow-billed loons taken. In addition, other than anecdotal information that suggests take levels in the Lofoten Islands are increasing, we do not have evidence that take levels will change in the future.

II. Subsistence-Fishing Bycatch

Subsistence fishing is an important component of the customs, traditions, and economies of many indigenous groups in the arctic. Across the breeding range of the yellow-billed loon, rural residents fish primarily using gill nets, although some angling and ice jigging occurs (Craig 1987, p. 17). Gill-net use is localized near villages and fish camps, in marine inlets and lagoons, lakes, and rivers, depending on season and target fish species (Craig 1987, p.17, Bacon in litt. 2008). During the breeding season, yellow-billed loons will forage in large lakes close to their nests (Earnst 2004, p. 4), as well as other nearby lakes, rivers, and marine areas (Earnst 2004, pp. 6–7), where the potential for bycatch in subsistence fisheries exists. Because yellow-billed loons are widely dispersed across their nesting grounds, however, a large proportion of the breeding population is likely not exposed to localized subsistence fishing.

Limited observations confirm that yellow-billed loons have been inadvertently caught in subsistence gill nets in Canada, Russia, and the United States, although the level of bycatch is not extensively documented. In Canada, researchers on Victoria Island documented yellow-billed loon entanglement in nets on several occasions, including one instance where seven birds were found dead in nets in a single day (Sutton 1963 p.1; Parmelee *et al.* 1967). In Russia, Syroechkovski (2008, p. 2) reported that two reasons for subsistence harvest were accidental entanglement in fishing nests and deliberate shooting to scare loons from fishing areas. The Red Data Book of the Russian Federation states that yellow-billed loon mortality in fishing nets is the main threat to the species (Red Data Book 2001, pp, 366–367), with bycatch rates described as ''catastrophic'' in the Chukchi Peninsula region (Red Data Book 2001, pp, 366–367). We could not locate data or a source for that assessment.

In Alaska, information on loon bycatch from subsistence fishing is available only for the ACP, where Inupiat Eskimos use yellow-billed loon parts for subsistence and ceremonial purposes (Hepa and Bacon 2008, p. 1). With implementation of Alaska spring/summer migratory bird subsistence-harvest regulations in 2003, the yellow-billed loon was officially closed to harvest (Hepa and Bacon 2008, p. 1).

In 2005, an exception for the North Slope region was incorporated into the regulations allowing possession for subsistence use of up to 20 (total for the region each year) yellow-billed loons inadvertently caught in subsistence nets (50 CFR Part 92). As a result of this provision, the North Slope Borough Department of Wildlife Management compiles data on incidental bycatch from a variety of sources. Two to nine yellow-billed loons (and some red-throated and Pacific loons) were reported as found dead in nets in each of three years (2005 to 2007) (Acker and Suydam 2006, p. 1; Acker and Suydam 2007, p. 1; Hepa and Bacon 2008, p. 10). Small numbers of loons, including yellow-billed loons, were also reported as found alive and released. All yellow-billed loons collected in 2007 were reportedly utilized for subsistence, including ceremonial purposes (Hepa and Bacon 2008, p. 2). These numbers are likely a minimum estimate of yellow-billed loon subsistence bycatch because not all fishers were contacted (Hepa and Bacon 2008, p. 2).

In conclusion, yellow-billed loon bycatch in commercial fisheries has been documented anecdotally or by observer programs in Washington State, Russia, and Norway. No data exist from large portions of the species' wintering range (Yellow Sea, Sea of Japan, and coastal Japan), but bycatch is likely to occur in extensive gill net fisheries that overlap with wintering yellow-billed loons. We lack information to explain the difference in catch rates reported from various observer programs. We do not have enough information to extrapolate bycatch estimates to areas lacking data, or to determine the number of birds taken as bycatch over time.

For subsistence fisheries, yellow-billed loon bycatch has been documented either anecdotally or in reporting programs on the breeding grounds in Alaska, Canada, and Russia. Data are limited or non-existent for large parts of the species' range. Because yellow-billed loons are widely dispersed across the landscape on the nesting grounds, while subsistence fishing is localized, we suspect a large proportion of the breeding population is not exposed to subsistence fishing. We do not have enough information to extrapolate subsistence bycatch accounts to areas lacking data or to evaluate likely population-level affects.

Yellow-billed loon bycatch data are primarily anecdotal and cannot be extrapolated to estimate total bycatch levels or rates. Although yellow-billed loon mortality from commercial and subsistence gill-net fisheries currently affects yellow-billed loons at the individual level, we do not have enough evidence of bycatch to show population-level impacts. The ACP breeding population is the only one for which we have trend information. That trend is slightly declining or stable, and so we do not have evidence that bycatch is currently affecting the species at the population level. In addition, there is no available information that suggests take levels will change in the future. Therefore, we find that bycatch is not a threat to yellow-billed loons now or in the foreseeable future.

Direct Effects of Contaminants Not Associated With Oil and Gas

Although contaminants can affect species through a variety of mechanisms, below we discuss direct effects on individuals or reproduction, such as mortality or embryo viability, from contaminants other than those associated with oil and gas (discussed under Factor A and earlier in Factor E). Indirect effects of contaminants or pollution, such as alterations in prey abundance, were also discussed under Factor A.

Ecological characteristics can be used to estimate the relative risk of contaminants to a species. These include trophic status (species higher in a food chain are more likely to accumulate persistent pollutants), pollution point sources, location (including migratory pathways), and lifespan (long-lived individuals have more time to accumulate persistent compounds). Yellow-billed loons are relatively long-lived birds, and being piscivorous are also trophically elevated. Both arctic breeding areas and temperate wintering areas have documented pollution. It is therefore appropriate to examine potential risk to yellow-billed loons from contaminant exposure.

Yellow-billed loons spend the majority of the year in southern wintering areas, which are primarily coastal and are more likely to have elevated environmental concentrations of persistent organic pollutants (POPs), such as organochlorine pesticides and polychlorinated biphenyls (PCBs), compared to northern breeding areas. Twenty-four out of 29 yellow-billed loons fitted with transmitters on Alaska breeding grounds wintered in Asian waters (Schmutz 2008, p. 1) that have been demonstrably affected by pollution. For example, Ma *et al.* (2001, pp. 133–134) reported high levels of persistent organic pollutants (DDT and PCBs) and petroleum-derived contaminants in the intertidal zone of the Bohai and Yellow Seas off China. In Korea, PCBs were greater in fish and birds from industrially contaminated areas of the Nakdong estuary than non-industrial areas (Choi *et al.* 1999, p. 233). Other studies document contamination of Asian sea sediments and biota, including fish and birds, that support potential exposure for wintering migratory birds such as yellow-billed loons (e.g., Nie *et al.* 2005, pp. 537–546; Oh *et al.* 2005, pp. 217–222; Daoji and Daler 2004, pp. 107–113; Guruge *et al.* 1997, pp. 186–193). In a test of exposure to persistent contaminants in Asian wintering areas compared to northern breeding areas, Kunisue *et al.* (2002, p. 1,397) found that herring gulls (*Larus argentatus*) and other migratory birds nesting on Lake Baikal in Russia had higher levels of organochlorine contaminants on arrival from Asian wintering areas than at the end of the breeding season.

Further, sympatrically nesting red-throated loons from the ACP had PCB concentrations and formulations (containing the most toxic PCB congeners) great enough, when compared to thresholds developed for other species, to postulate teratogenic (causing abnormal development) or other reproductive effects (Schmutz *et al.* in review, p. 19). Preliminary satellite telemetry data indicate that these red-throated loons winter in Asian marine waters (Schmutz *et al.* in review, p. 1), similar to yellow-billed loons. These data compelled us to examine PCBs in yellow-billed loon eggs from the ACP. We found that although PCBs were present in yellow-billed loon eggs (n = 45, collected over three years), preliminary data show the most toxic individual PCB congeners (PCBs 77 and 81) present in red-throated loon eggs were generally not present in yellow-billed loon eggs, and therefore the PCB toxicity in yellow-billed loon eggs (TEQ (toxic equivalency quotient, a measure of toxicity) range = 0.176—10.39 picograms/gram (pg/g); A. Matz, U.S. Fish and Wildlife Service, unpubl. data) was much lower than in red-throated loon eggs (TEQ mean ± SE = 237 ± 129 pg/g), and lower than published thresholds for embryonic toxicity in other avian species, such as 227 pg/g in great blue heron (*Ardea herodias*) eggs (Hoffman *et al.* 1996, pp. 191). We are currently evaluating other contaminants in yellow-billed loon eggs and blood from the coastal plain and the Seward Peninsula of Alaska, but based on the red-throated loon data (presented in Schmutz *et al.* in review), we were most concerned about the PCBs.

In conclusion, we have few data on most of the contaminants that could directly affect yellow-billed loons throughout their range. Additional range-wide data on productivity, population trends, and concentrations of persistent contaminants will allow us to more fully evaluate this risk factor. However, data from an ongoing multi-agency study in Alaska show that yellow-billed loon eggs do not have concentrations of toxic PCBs thought to affect reproduction. Because yellow-billed loons nesting in Canada, and some proportion of those nesting in Russia, likely winter in Asian seas or on the Pacific coast of North America, we assume that PCB and other persistent contaminant concentrations in their eggs would be equal to or less than those from the ACP, which are known to winter in Asia. The contaminant loading for yellow-billed loons wintering in the North Sea is unknown, but those loons represent a small proportion of the total population. In the future, yellow-billed loons could continue to be exposed to the contaminants they are exposed to now, as well as emerging persistent contaminants such as polybrominated compounds. However, the Service and its partners plan to monitor contaminant exposure, mortality, and productivity in Alaska. Future contaminant risks will be identified and efforts made to address them before they cause population-level declines that threaten the continued existence of the species. Therefore, we find that contaminants other than those associated with oil and gas are not a threat to the yellow-billed loon now or in the foreseeable future.

In our analysis of Factor E, we identified and evaluated other risk factors, including: Oil and gas development and vessel traffic; subsistence harvest; commercial- and subsistence-fishery bycatch; and contaminants other than those associated with oil and gas. Based on our review of the best available information, we find that subsistence harvest is a threat to the yellow-billed loon now and in the foreseeable future.

Foreseeable Future

In considering the foreseeable future as it relates to the status of the yellow-billed loon, we considered the stressors acting on the species. We considered the historical data to identify any relevant existing trends that might allow for reliable prediction of the future (in the form of extrapolating the trends). We also considered whether we could reliably predict any future events that might affect the status of the species, recognizing that our ability to make reliable predictions in the future is limited by the variable quantity and quality of available data. Further, predictability varies significantly among risk factors, and in some cases, even geographically within a single factor.

Based on the lack of proposed onshore oil and gas development within the yellow-billed loon's range in Canada, it is reasonably likely that no population-level impacts will be incurred at least until development occurs. In contrast, in Russia, although it is likely that oil and gas development will increase in the future, our understanding of the species' distribution is so limited that it is difficult to reliably assess the likely impact of even existing oil and gas development on the yellow-billed loon, much less the impact of projected future development on the loon. In Alaska, some increased terrestrial oil and gas development is likely to occur beginning in the next decade, and the period from exploration through production to abandonment is estimated at 70 years. In the case of climate change, current models suggest that global temperatures are likely to continue to rise for up to 50 years, even if greenhouse gas emissions were curbed today (Meehl *et al* 2007, p. 749). However, we are not currently able to link projected climate changes to changes in arctic freshwater habitats or their ability to support loons, and so our ability to foresee the future is limited until research and climate modeling improve our predictive ability. Although climate-change models show continued decrease in the summer arctic ice sheet, and it is possible that shipping will, therefore, increase, we have no data to describe to what degree shipping pathways or frequency is likely to change. With respect to subsistence harvest, the best available data show substantial inter-annual variation in loons harvested in Alaska during migration, which could be related to inter-annual variation in yellow-billed loon migratory behavior. Modeled scenarios show that even when harvest varies among years within the range defined by recent harvest estimates, the yellow-billed loon population continues to decline over time. Although we have no information that subsistence harvest throughout the range of the yellow-billed loon will either increase or decrease in the future, we have no reason to believe that harvest of yellow-billed loons will not continue to vary from year to year within the range of levels incurred over recent years. Our ability to assess current bycatch in fishing nets is limited by poor data, and we have no empirical basis with which to predict even the direction of trends in the effects of this activity into the future. Although the amount of oil and gas development and shipping traffic will likely increase in the future, the associated risk is reasonably likely to be partly or wholly offset by improved technologies and regulation. We do not have evidence that marine pollution or contaminants will have an increased or decreased effect on yellow-billed loons in the future.

Available data indicate a stable or slightly declining trend for the ACP population. Available data do not allow us to establish a trend for other breeding populations. Overall numbers of yellow-billed loons are cautiously estimated between 16,000 and 32,000 birds on breeding grounds worldwide, which, considering the wide distribution of the species most of the year, is enough to make it unlikely that the species is at risk from stochastic events because of its small numbers. Thus, the foreseeable future includes consideration of the ongoing effects of current risk factors and threats at comparable levels.

Significant Portions of the Range

The Act defines an endangered species as one ''in danger of extinction throughout all or a significant portion of its range,'' and a threatened species as one ''likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' The term ''significant portion of its range'' is not defined by the statute. For the purposes of this finding, a significant portion of a species' range is an area that is important to the conservation of the species because it contributes meaningfully to the representation, resiliency, or redundancy of the species. The contribution must be at a level such that its loss would result in a decrease in the ability to conserve the species.

If an analysis of whether a species is threatened or endangered in a significant portion of its range is appropriate, we engage in a systematic process that begins with identifying any portions of the range of the species that warrant further consideration. The range of a species can theoretically be divided into portions in an infinite number of ways. However, there is no purpose in analyzing portions of the range that are not reasonably likely to be significant and threatened or endangered. To identify only those portions that warrant further consideration, we determine whether there is substantial information indicating that (i) the portions may be significant and (ii) the species may be in danger of extinction there or likely to become so within the foreseeable future. In practice, a key part of this analysis is whether the threats are geographically concentrated in some way. If the threats to the species are essentially uniform throughout its range, no portion is likely to warrant further consideration. Moreover, if any concentration of threats applies only to portions of the range that are unimportant to the conservation of the species, such portions will not warrant further consideration.

On the basis of an analysis of factors that may threaten the yellow-billed loon, we have determined that listing is warranted throughout its range. Therefore, it is not necessary to conduct further analysis with respect to the significance of any portion of its range at this time. We will further analyze whether threats may be disproportionate and warrant further consideration as an SPR at such time that we develop a proposed listing determination.

Finding

In our review of the status of the yellow-billed loon, we carefully examined the best scientific and commercial information available. We identified a number of potential threats to this species, including: Oil and gas development, marine pollution and overfishing, exposure to contaminants, climate change, subsistence- and commercial-fishing bycatch, and subsistence harvest. To determine whether these risk factors individually or collectively put the species in danger of extinction throughout its range, or are likely to do so within the foreseeable future, we first considered whether the risk factors were causing a population decline, or were likely to do so in the future.

Information on population size and trends for the yellow-billed loon is limited. Overall population size is unknown, but probably at the low end of the range between 16,000 and 32,000 loons on breeding grounds. Population trends are available for the ACP breeding grounds from waterfowl surveys, and these surveys suggest that the ACP breeding population is stable or slightly declining. Limited surveys have been conducted only in small parts of the Russian and Canadian ranges, so population sizes for these ranges are gross approximations, and no information on trends is available. There are reports of range contractions at the edges of the Russian breeding range, but these reports are unsubstantiated, and there are also unsubstantiated reports of Russian breeding areas where yellow-billed loon numbers could be increasing. Therefore, based on the best available information, we find that the only trend information we have indicates a stable or slightly declining trend for the ACP population.

We evaluated existing and potential stressors on the yellow-billed loon to determine what affects on the species were currently occurring, whether these stressors were likely to increase or decrease in the future, and which of the stressors may be expected to rise to the level of a threat to the species, either rangewide or at the population level.

We examined several stressors for which we have little information on whether they will increase in the future. We did not find that bycatch by subsistence or commercial fishing, pollution in wintering habitats, or contaminants are threats to the yellow-billed loon. An unknown number of individuals are taken in fisheries, which adds to other forms of mortality.

Next we considered whether any of the risk factors are likely to increase within the foreseeable future. We believe that oil and gas activities in various parts of the loon's range are likely to increase in the future. In Alaska, we determined that Federal and State of Alaska regulations currently in place will likely mitigate future effects of terrestrial oil and gas development, and therefore development in Alaska is not considered a threat to the species now or in the foreseeable future. In Russia, terrestrial oil and gas development is occurring at the western edge of the Russian breeding range, and it is unknown whether this activity overlaps with loon nesting habitat. Most importantly, even if a local range contraction has occurred, we find no reason to conclude impacts extend beyond the local scale at the edge of the range. In Canada, there has been little overlap between oil and gas development and the species' range, and we are aware of none projected for the near future. We also found that although marine oil and gas development is likely to increase in various parts of the loon's range, the wide distribution and low density of the species in the marine environment make it unlikely that associated impacts including marine oil spills will put the species at risk of extinction.

Climate change is likely to continue for at least the next 50 years, but there is substantial uncertainty as to how climate change, described in Factor A, will affect yellow-billed loon terrestrial, freshwater, and marine habitats. For example, if native prey fish species are extirpated, other suitable prey species may colonize the area, replacing extirpated species to some degree. We do not know whether large-scale degradation of continuous permafrost, where the majority of yellow-billed loons breed, and the subsequent impacts to lake levels and vegetation will occur on a scale that will affect loon populations in the foreseeable future. Climate-change effects on the temperate-latitude wintering habitat of the yellow-billed loon include increases in ocean temperature and decreases in primary productivity and dissolved oxygen levels, which might affect numbers and distribution of prey species. The magnitude and form of these effects are highly uncertain, but would most likely involve northward shift of prey items, which could be mirrored by their predators such as wintering yellow-billed loons.

There are multiple hypothetical mechanisms associated with climate change that could potentially affect loons and their breeding and non-breeding habitats. Unlike documented and predicted declines in sea ice, an obligate habitat for other arctic species such as polar bears, we lack predictive models on how climate change will affect yellow-billed loon terrestrial, freshwater, and marine habitats. Manifestations of climate-mediated changes throughout arctic and temperate yellow-billed loon habitats will emerge if reliable, predictive models are developed, but currently there is little certainty regarding the timing, magnitude, and net effect of impact. Therefore, given current limitations in available data and climate models, we find that climate change is not a threat to yellow-billed loons now or in the foreseeable future. However, currently unknown detrimental effects of climate change could be additive to other threats and stressors on the population.

We also considered whether any of the ongoing risk factors began recently enough that their effects are not yet manifested in a long-term decline in population numbers, but are likely to have that effect in the future. Information from recent subsistence harvest surveys indicate potentially high levels of harvest compared to earlier surveys. There are not enough years of data, and there is not enough precision in the accuracy of the surveys, to indicate whether there is a trend of increasing harvest. All marked Alaskan breeding birds used the Bering Strait or Chukotka Peninsula during migration; in addition, it is likely that most Russian breeding loons and at least some Canadian breeding birds also migrate through the Bering Strait region. Thus, we believe it is likely that a large part of the rangewide population moves through the Strait and is subject to harvest there. The best available information indicates that, on average, hundreds of yellow-billed loons from breeding areas throughout its range are harvested annually by subsistence hunters. Population modeling suggests that the number of yellow-billed loons being harvested in the Bering Strait area of Alaska alone is likely unsustainable. The lack of precision of the population trend information for Alaska could be preventing us from detecting the impact of this harvest on the population, or the high harvest estimates could represent a new phenomenon not yet taken into account in our population trend estimates. The harvest is also likely having an impact on breeding populations that are not being monitored in Canada and Russia. Because we believe that the rangewide population of yellow-billed loons is subject to unsustainable levels of harvest, we find that subsistence harvest is a threat to the species rangewide. In light of this level of subsistence harvest occurring despite existing MBTA regulations that prohibit such harvest, we also find that inadequate regulatory mechanisms are a threat to the species.

We next considered whether the existing level of threats causes us to conclude that the species is in danger of extinction now or in the foreseeable future. If population size were to decline or the range were to contract, recovery or re-colonization would likely occur slowly. Individuals in the population are so widespread during most of the year that high adult mortality is unlikely. However, during migration, yellow-billed loons are subject to subsistence harvest that appears to be unsustainable based on the best available information. The total population is uncertain, but based on the best available information, the population, estimated at 16,000 to 32,000 birds on breeding grounds, could decline substantially if unsustainable harvest continues. Future subsistence harvest in Alaska is enough in itself to constitute a threat to the species rangewide. In addition, up to several hundred yellow-billed loons could be taken annually on Russian breeding grounds, and small amounts of harvest are reported for other areas in Alaska and Canada. Other stressors discussed above may not rise to the level of a threat individually, but when taken collectively with the effects of subsistence hunting in other areas, may reduce the rangewide population even further. Given the small population and the existence of subsistence harvest and inadequate regulatory mechanisms as threats, we believe the species is likely to become in danger of extinction within the foreseeable future. Therefore, we find that listing the yellow-billed loon throughout its range is warranted.

While we find that listing the yellow-billed loon is warranted, an immediate proposal to list this species is precluded by other higher priority listing actions, which we address below.

We have reviewed the available information to determine if the existing and foreseeable threats pose an emergency. We have determined that an emergency listing is not warranted for this species at this time because, within the current distribution of the species throughout its range, there are at least some populations of the yellow-billed loon that exist in relatively natural conditions that are unlikely to change in the short-term. However, if at any time we determine that emergency listing of the yellow-billed loon is warranted, we will initiate an emergency listing.

Future Conservation

We have determined that the listing of the yellow-billed loon is warranted but precluded by pending proposals for other species with higher listing priorities and actions. Our recommendation of a listing priority number of 8 (described below) will provide time and opportunity to implement conservation and better monitor the species' status and threats. Here we provide a summary of our commitment to the conservation of yellow-billed loons.

As described in the ''Conservation Agreement for the Yellow-billed Loon (*Gavia adamsii*),'' the Service and its partners plan to: (1) Implement specific actions to protect yellow-billed loons and their breeding habitats in Alaska from potential impacts of land uses and management activities, including oil and gas development; (2) inventory and monitor yellow-billed loon breeding populations in Alaska; (3) reduce the impact of subsistence activities (including fishing and hunting) on yellow-billed loons in Alaska; and (4) conduct biological research on yellow-billed loons, including response to management actions.

We believe that the strategies outlined in the agreement demonstrate the partners' commitment to prioritize yellow-billed loon conservation in Alaska. To fulfill the first strategy, we will continue to work with partners to maintain their commitment to actions protecting loons. In particular, we will work closely with the BLM to monitor and maintain protection of loons on NPR-A, as expressed in their recent memorandum on the yellow-billed loon (Galterio, in litt. 2008, pp. 1–3). For the second strategy, we will continue to inventory yellow-billed loons through our waterfowl surveys on the ACP and through loon-specific surveys currently in operation on the Seward Peninsula, and we will investigate the potential for initiating yellow-billed-loon-specific surveys. For the third strategy, we are working closely with the Alaska Migratory Bird Co-management Council (AMBCC) and the State of Alaska to acquire reliable, verifiable information on subsistence harvest and fishing bycatch levels in Alaska, and to substantially increase education and law enforcement efforts to reduce levels of this threat. Finally, we support the ongoing research by the U.S. Geological Survey and others on yellow-billed loons in Alaska, and will continue to advocate for further research where it will inform management of yellow-billed loons, such as understanding effects of disturbance on nesting loons to ensure that buffers separating loons from human activity are adequate.

Research and management of yellow-billed loons are needed outside Alaska, and we will support and advocate for such work. In particular, we need to understand population sizes and trends for Russian and Canadian breeding populations, migration corridors, and where breeding populations winter. We also encourage managers in both countries to take an active role conserving loons where substantial industrial development occurs, or where other threats such as subsistence harvest or fishing bycatch occur. Finally, habitat conditions in wintering grounds, especially in Asia, need to be understood and managed so that they continue to support loons. In particular, it will be critical to increase awareness of pollution impacts in marine habitats in Asia, and to develop regulations to reduce pollution levels, so that these wintering areas continue to support yellow-billed loons.

Preclusion and Expeditious Progress

Preclusion is a function of the listing priority of a species in relation to the resources that are available and competing demands for those resources. Thus, in any given fiscal year (FY), multiple factors dictate whether it will be possible to undertake work on a proposed listing regulation or whether promulgation of such a proposal is warranted but precluded by higher-priority listing actions.

The resources available for listing actions are determined through the annual Congressional appropriations process. The appropriation for the Listing Program is available to support work involving the following listing actions: proposed and final listing rules; 90-day and 12-month findings on petitions to add species to the Lists of Endangered and Threatened Wildlife and Plants (Lists) or to change the status of a species from threatened to endangered; annual determinations on prior ''warranted but precluded'' petition findings as required under section 4(b)(3)(C)(i) of the Act; proposed and final rules designating critical habitat; and litigation-related, administrative, and program management functions (including preparing and allocating budgets, responding to Congressional and public inquiries, and conducting public outreach regarding listing and critical habitat). The work involved in preparing various listing documents can be extensive and may include, but is not limited to: gathering and assessing the best scientific and commercial data available and conducting analyses used as the basis for our decisions; writing and publishing documents; and obtaining, reviewing, and evaluating public comments and peer review comments on proposed rules and incorporating relevant information into final rules. The number of listing actions that we can undertake in a given year also is influenced by the complexity of those listing actions; that is, more complex actions generally are more costly. For example, during the past several years, the cost (excluding publication costs) for preparing a 12-month finding, without a proposed rule, has ranged from approximately $11,000 for one species with a restricted range and involving a relatively uncomplicated analysis to $305,000 for another species that is wide-ranging and involving a complex analysis.

We cannot spend more than is appropriated for the Listing Program without violating the Anti-Deficiency Act (see 31 U.S.C. 1341(a)(1)(A)). In addition, in FY 1998 and for each fiscal year since then, Congress has placed a statutory cap on funds which may be expended for the Listing Program, equal to the amount expressly appropriated for that purpose in that fiscal year. This cap was designed to prevent funds appropriated for other functions under the Act (for example, recovery funds for removing species from the Lists), or for other Service programs, from being used for Listing Program actions (see House Report 105–163, 105th Congress, 1st Session, July 1, 1997).

Recognizing that designation of critical habitat for species already listed would consume most of the overall Listing Program appropriation, Congress also put a critical habitat subcap in place in FY 2002 and has retained it each subsequent year to ensure that some funds are available for other work in the Listing Program: ''The critical habitat designation subcap will ensure that some funding is available to address other listing activities'' (House Report No. 107–103, 107th Congress, 1st Session, June 19, 2001). In FY 2002 and each year until FY 2006, the Service has had to use virtually the entire critical habitat subcap to address court-mandated designations of critical habitat, and consequently none of the critical habitat subcap funds have been available for other listing activities. In FY 2007, we were able to use some of the critical habitat subcap funds to fund proposed listing determinations for high-priority candidate species; however, in FY 2008 we were unable to do this because all of the critical habitat subcap funds were needed to address our workload for designating critical habitat.

Thus, through the listing cap, the critical habitat subcap, and the amount of funds needed to address court-mandated critical habitat designations, Congress and the courts have in effect determined the amount of money available for other listing activities. Therefore, the funds in the listing cap, other than those needed to address court-mandated critical habitat for already listed species, set the limits on our determinations of preclusion and expeditious progress.

Congress also recognized that the availability of resources was the key element in deciding whether, when making a 12-month petition finding, we would prepare and issue a listing proposal or instead make a ''warranted but precluded'' finding for a given species. The Conference Report accompanying Public Law 97–304, which established the current statutory deadlines and the warranted-but-precluded finding, states (in a discussion on 90-day petition findings that by its own terms also covers 12-month findings) that the deadlines were ''not intended to allow the Secretary to delay commencing the rulemaking process for any reason other than that the existence of pending or imminent proposals to list species subject to a greater degree of threat would make allocation of resources to such a petition [that is, for a lower-ranking species] unwise.''

In FY 2008, expeditious progress is that amount of work that could be achieved with $8,206,940, which is the amount of money that Congress appropriated for the Listing Program (that is, the portion of the Listing Program funding not related to critical habitat designations for species that are already listed). Our process is to make our determinations of preclusion on a nationwide basis to ensure that the species most in need of listing will be addressed first and also because we allocate our listing budget on a nationwide basis. The $8,206,940 was used to fund work in the following categories: compliance with court orders and court-approved settlement agreements requiring that petition findings or listing determinations be completed by a specific date; section 4 (of the Act) listing actions with absolute statutory deadlines; essential litigation-related, administrative, and listing program management functions; and high-priority listing actions. The allocations for each specific listing action are identified in the Service's FY 2008 Allocation Table (part of our administrative record).

For FY 2009, on September 23, 2008 Congress passed a Continuing

Resolution to operate the Federal government at the FY 2008 level of funding through March 6, 2009 (Pub. L. 110–329). Although we are currently developing the allocations for specific listing actions that we will fund during FY 2009, we anticipate funding work to comply with court orders and court-approved settlement agreements, work on statutorily required petition findings, final listing determinations for those species that were proposed for listing with funds from FY 2008, and continued work on proposed listing determinations for high-priority species.

In FY 2007, we had more than 120 species with a listing priority number (LPN) of 2, based on our September 21, 1983, guidance for assigning an LPN for each candidate species (48 FR 43098). Using this guidance, we assign each candidate an LPN of 1 to 12, depending on the magnitude of threats (high vs. moderate to low), immediacy of threats (imminent or nonimminent), and taxonomic status of the species (in order of priority: monotypic genus (a species that is the sole member of a genus); species; or part of a species (subspecies, distinct population segment, or significant portion of the range)). The lower the listing priority number, the higher the listing priority (that is, a species with an LPN of 1 would have the highest listing priority). Because of the large number of high-priority species, we further ranked the candidate species with an LPN of 2 by using the following extinction-risk type criteria: International Union for the Conservation of Nature and Natural Resources (IUCN) Red list status/rank, Heritage rank (provided by NatureServe), Heritage threat rank (provided by NatureServe), and species currently with fewer than 50 individuals, or 4 or fewer populations. Those species with the highest IUCN rank (critically endangered), the highest Heritage rank (G1), the highest Heritage threat rank (substantial, imminent threats), and currently with fewer than 50 individuals, or fewer than 4 populations, comprised a list of approximately 40 candidate species (''Top 40''). These 40 candidate species have had the highest priority to receive funding to work on a proposed listing determination. As we work on proposed listing rules for these 40 candidates, we are applying the ranking criteria to the next group of candidates with LPN of 2 and 3 to determine the next set of highest priority candidate species.

To be more efficient in our listing process, as we work on proposed rules for these species in the next several years, we are preparing multi-species proposals when appropriate, and these may include species with lower priority if they overlap geographically or have the same threats as a species with an LPN of 2. In addition, available staff resources are also a factor in determining high-priority species provided with funding. Finally, proposed rules for reclassification of threatened species to endangered are lower priority, since as listed species, they are already afforded the protection of the Act and implementing regulations.

We assigned the yellow-billed loon an LPN of 8 based on moderate magnitude and imminent threats. One or more of the threats discussed above is occurring throughout the range of the yellow-billed loon, either in its breeding or wintering grounds, or during migration. However, the primary threat to the species that caused us to conclude listing is warranted is subsistence harvest, despite the species being closed to hunting under the Migratory Bird Treaty Act. Although subsistence harvest is ongoing, the numbers taken have varied substantially between years. For the reasons discussed above, although we believe subsistence harvest is a substantial threat to the species, we have concerns about the precision of the numbers reported. In addition, if changes in management are implemented in the near future, we believe there is time to reduce this threat before it causes further population-level impacts. While we conclude that listing the yellow-billed loon is warranted, an immediate proposal to list this species is precluded by other higher priority listing, which we address below. Therefore, work on a proposed listing determination for the yellow-billed loon was, and will continue to be in the next year, precluded by work on higher priority candidate species (i.e., species with LPN of 2); listing actions with absolute statutory, court ordered, or court-approved deadlines; and final listing determinations for those species that were proposed for listing with funds from FY 2008. This work includes all the actions listed in the tables below under expeditious progress.

As explained above, a determination that listing is warranted but precluded must also demonstrate that expeditious progress is being made to add or remove qualified species to and from the Lists of Endangered and Threatened Wildlife and Plants. (Although we do not discuss it in detail here, we are also making expeditious progress in removing species from the list under the Recovery program, which is funded by a separate line item in the budget of the Endangered Species Program. As explained above in our description of the statutory cap on Listing Program funds, the Recovery Program funds and actions supported by them cannot be considered in determining expeditious progress made in the Listing Program.) As with our ''precluded'' finding, expeditious progress in adding qualified species to the Lists is a function of the resources available and the competing demands for those funds. Given that limitation, we find that we made expeditious progress in FY 2008 and are making progress in FY 2009 in the Listing Program. This progress included preparing and publishing the following determinations:

FY 2008 COMPLETED LISTING ACTIONS (SOME COMPLETED IN FY2009)

Publication date	Title	Actions	FR pages
10/09/2007	90-Day Finding on a Petition to List the Black-Footed Albatross (Phoebastria nigripes) as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial.	72 FR 57278–57283.
10/09/2007	90-Day Finding on a Petition To List the Giant Palouse Earthworm as Threatened or Endangered.	Notice of 90-day Petition Finding, Not substantial.	72 FR 57273–57276.
10/23/2007	90-Day Finding on a Petition To List the Mountain Whitefish (Prosopium williamsoni) in the Big Lost River, ID, as Threatened or Endangered.	Notice of 90-day Petition Finding, Not substantial.	72 FR 59983–59989.

FY 2008 COMPLETED LISTING ACTIONS (SOME COMPLETED IN FY2009)—Continued

Publication date	Title	Actions	FR pages
10/23/2007	90-Day Finding on a Petition To List the Summer-Run Kokanee Population in Issaquah Creek, WA, as Threatened or Endangered.	Notice of 90-day Petition Finding, Not substantial.	72 FR 59979–59983.
11/08/2007	Response to Court on Significant Portion of the Range, and Evaluation of Distinct Population Segments, for the Queen Charlotte Goshawk.	Response to Court	72 FR 63123–63140.
12/13/2007	12-Month Finding on a Petition To List the Jollyville Plateau salamander (Eurycea tonkawae) as Endangered With Critical Habitat.	Notice of 12-month Petition Finding, Warranted but Precluded.	72 FR 71039–71054.
1/08/2008	90-Day Finding on a Petition To List the Pygmy Rabbit (Brachylagus idahoensis) as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial.	73 FR 1312–1313.
1/10/2008	90-Day Finding on Petition To List the Amargosa River Population of the Mojave Fringe-Toed Lizard (Uma scoparia) as Threatened or Endangered With Critical Habitat.	Notice of 90-day Petition Finding, Substantial.	73 FR 1855–1861.
1/24/2008	12-Month Finding on a Petition To List the Siskiyou Mountains Salamander (Plethodon stormi) and Scott Bar Salamander (Plethodon asupak) as Threatened or Endangered.	Notice of 12-month Petition Finding, Not Warranted.	73 FR 4379–4418.
2/05/2008	12-Month Finding on a Petition To List the Gunnison's Prairie Dog as Threatened or Endangered.	Notice of 12-month Petition Finding, Warranted.	73 FR 6660–6684.
02/07/2008	12-Month Finding on a Petition To List the Bonneville Cutthroat Trout (Oncorhynchus clarki utah) as Threatened or Endangered.	Notice of Review	73 FR 7236–7237.
02/19/2008	Listing Phyllostegia hispida (No Common Name) as Endangered Throughout Its Range.	Proposed Listing, Endangered	73 FR 9078–9085.
02/26/2008	Initiation of Status Review for the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or Endangered.	Notice of Status Review	73 FR 10218–10219.
03/11/2008	12-Month Finding on a Petition To List the North American Wolverine as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	73 FR 12929–12941.
03/20/2008	90-Day Finding on a Petition To List the U.S. Population of Coaster Brook Trout (Salvelinus fontinalis) as Endangered.	Notice of 90-day Petition Finding, Substantial.	73 FR 14950–14955.
04/29/2008	90-Day Finding on a Petition To List the Western Sage-Grouse (Centrocercus urophasianus phaios) as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial.	73 FR 23170–23172.
04/29/2008	90-Day Finding on Petitions To List the Mono Basin Area Population of the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial.	73 FR 23173–23175.
05/06/2008	Petition To List the San Francisco Bay-Delta Population of the Longfin Smelt (Spirinchus thaleichthys) as Endangered.	Notice of 90-day Petition Finding, Substantial.	73 FR 24611–24915.
05/06/2008	90-Day Finding on a Petition to List Kokanee (Oncorhynchus nerka) in Lake Sammamish, Washington, as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial.	73 FR 24915–24922.
05/06/2008	12-Month Finding on a Petition To List the White-tailed Prairie Dog (Cynomys leucurus) as Threatened or Endangered.	Notice of Status Review	73 FR 24910–24911.

FY 2008 COMPLETED LISTING ACTIONS (SOME COMPLETED IN FY2009)—Continued

Publication date	Title	Actions	FR pages
05/15/2008	90-Day Finding on a Petition To List the Ashy Storm-Petrel (Oceanodroma homochroa) as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial.	73 FR 28080–28084.
05/15/2008	Determination of Threatened Status for the Polar Bear (Ursus maritimus) Throughout Its Range; Final Rule.	Final Listing, Threatened	73 FR 28211–28303.
05/15/2008	Special Rule for the Polar Bear; Interim Final Rule.	Interim Final Special Rule	73 FR 28305–28318.
05/28/2008	Initiation of Status Review for the Northern Mexican Gartersnake (Thamnophis eques megalops).	Notice of Status Review	73 FR 30596–30598.
06/18/2008	90-Day Finding on a Petition To List the Long-Tailed Duck (Clangula hyemalis) as Endangered.	Notice of 90-day Petition Finding, Not substantial.	73 FR 34686–34692.
07/10/2008	90-Day Finding on a Petition To Reclassify the Delta Smelt (Hypomesus transpacificus) From Threatened to Endangered.	Notice of 90-day Petition Finding, Substantial.	73 FR 39639–39643.
07/29/2008	90-Day Finding on a Petition To List the Tucson Shovel-Nosed Snake (Chionactis occipitalis klauberi) as Threatened or Endangered with Critical Habitat.	Notice of 90-day Petition Finding, Substantial.	73 FR 43905–43910.
8/13/2008	Proposed Endangered Status for Reticulated Flatwoods Salamander; Proposed Designation of Critical Habitat for Frosted Flatwoods Salamander and Reticulated Flatwoods Salamander.	Proposed Critical Habitat, Proposed Listing, Endangered.	73 FR 47257–47324.
9/9/2008	12-month Finding on a Petition To List the Bonneville Cutthroat Trout as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	73 FR 52235–52256.
10/15/2008	90-Day Finding on a Petition To List the Least Chub.	Notice of 90-day Petition Finding, Substantial.	73 FR 61007–61015.
10/21/2008	Listing 48 Species on Kauai as Endangered and Designating Critical Habitat.	Proposed Listing, Endangered; Proposed Critical Habitat.	73 FR 62591–62742.
10/24/2008	90-Day Finding on a Petition To List the Sacramento Valley Tiger Beetle as Endangered.	Notice of 90-day Petition Finding, Not substantial.	73 FR 63421–63424.
10/28/2008	90-Day Finding on a Petition To List the Dusky Tree Vole (Arborimus longicaudus silvicola) as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial.	73 FR 63919–63926.
11/25/2008	12-Month Finding on a Petition To List the Northern Mexican Gartersnake (Thamnophis eques megalops) as Threatened or Endangered With Critical Habitat; Proposed Rule.	Notice of 12-month petition finding, Warranted but precluded.	73 FR 71787–71826.
12/02/2008	90-Day Finding on a Petition To List the Black-tailed Prairie Dog as Threatened or Endangered.	Notice 90-day Petition Finding, Substantial.	73 FR 73211–73219.
12/05/2008	90-Day Finding on a Petition To List the Sacramento Mountains Checkerspot Butterfly (Euphydryas anicia cloudcrofti) as Endangered with Critical Habitat.	Notice 90-day Petition Finding, Substantial.	73 FR 74123–74129.
12/18/2008	90-Day Finding on a Petition to Change the Listing Status of the Canada Lynx.	Notice 90-day Petition Finding, Substantial.	73 FR 76990–76994.
1/06/2009	Partial 90-Day Finding on a Petition To List 475 Species in the Southwestern United States as Threatened or Endangered With Critical Habitat.	Notice 90-day Petition Finding, Not substantial.	74 FR 419–427.

FY 2008 COMPLETED LISTING ACTIONS (SOME COMPLETED IN FY2009)—Continued

Publication date	Title	Actions	FR pages
2/05/2009	Partial 90-Day Finding on a Petition To List 206 Species in the Midwest and Western United States as Threatened or Endangered With Critical Habitat.	Notice 90-day Petition Finding, Not substantial.	74 FR 6122–6128.

Our expeditious progress also included work on listing actions, which were funded in FY 2008, but have not yet been completed to date. These actions are listed below. Actions in the top section of the table are being conducted to meet deadlines set by a court. Actions in the middle section of the table are being conducted to meet statutory timelines, that is, timelines required under the Act. Actions in the bottom section of the table are high priority listing actions. These actions include work primarily on species with an LPN of 2, and selection of these species is partially based on available staff resources, and when appropriate, include species with a lower priority if they overlap geographically or have the same threats as the species with the high priority. Including these species together in the same proposed rule results in considerable savings in time and funding, as compared to preparing separate proposed rules for each of them in the future.

ACTIONS FUNDED IN FY 2008 BUT NOT YET COMPLETED

Species	Action
Actions With Court Order/Settlement Agreement Deadlines	
SW Bald Eagle DPS	12-month petition finding.
Greater and Western Sage Grouse	12-month petition finding.
Actions With Statutory Deadlines	
Phyllostegia hispida	Final listing.
Black-footed albatross	12-month petition finding.
Mount Charleston blue butterfly	12-month petition finding.
Goose Creek milk-vetch	12-month petition finding.
Mojave fringe-toed lizard	12-month petition finding.
White-tailed prairie dog	12-month petition finding.
Pygmy rabbit (rangewide)	12-month petition finding.
Wyoming pocket gopher	90-day petition finding.
Llanero coqui	90-day petition finding.
American pika	90-day petition finding.
206 species (partially completed)	90-day petition finding.
475 Southwestern species (partially completed)	90-day petition finding.
High Priority Listing Actions	
21 Oahu candidate species (16 plants, 5 damselflies) (18 with LPN =2, 3 with LPN = 3, 1 with LPN =9).	Proposed listing.
3 southeast aquatic species (Georgia pigtoe, interrupted rocksnail, rough hornsnail) [1] (all with LPN = 2).	Proposed listing.
Casey's june beetle (LPN = 2)	Proposed listing.
Sand dune lizard (LPN = 2)	Proposed listing.
2 southwest springsnails (*Pyrgulopsis bernadina* (LPN = 2), *Pyrgulopsis trivialis* (LPN = 2)).	Proposed listing.
3 southwest springsnails (*Pyrgulopsis chupaderae* (LPN = 2), *Pyrgulopsis gilae* (LPN = 11), *Pyrgulopsis thermalis* (LPN = 11)).	Proposed listing.
2 mussels (rayed bean (LPN = 2), snuffbox No LPN)	Proposed listing.
2 mussels (sheepnose (LPN = 2), spectaclecase (LPN = 4),)	Proposed listing.
Ozark hellbender [2] (LPN = 3)	Proposed listing.
Altamaha spinymussel (LPN = 2)	Proposed listing.
5 southeast fish (rush darter (LPN = 2), chucky madtom (LPN = 2), yellowcheek darter (LPN = 2), Cumberland darter (LPN = 5), laurel dace (LPN = 5)).	Proposed listing.
3 Colorado plants (Pagosa skyrocket (*Ipomopsis polyantha*) (LPN = 2), Parchute beardtongue (*Penstemon debilis*) (LPN = 2), Debeque phacelia (*Phacelia submutica*) (LPN = 8)).	Proposed listing.

[1] Funds for listing actions for 3 of these species were also provided in FY 2007.
[2] We funded a proposed rule for this subspecies with an LPN of 3 ahead of other species with LPN of 2, because the threats to the species were so imminent and of a high magnitude that we considered emergency listing if we were unable to fund work on a proposed listing rule in FY 2008.

We have endeavored to make our listing actions as efficient and timely as possible, given the requirements of the relevant law and regulations, and constraints relating to workload and personnel. We are continually considering ways to streamline processes or achieve economies of scale, such as by batching related actions together. Given our limited budget for implementing section 4 of the Act, these actions described above collectively constitute expeditious progress.

The yellow-billed loon will be added to the list of candidate species upon publication of this 12-month finding. We will continue to monitor the status of this species as new information becomes available, and information on the species' distribution, status, and threats will be evaluated every year. In particular, we will work with the AMBCC and the State of Alaska to improve the reliability of subsistence harvest data, and to substantially increase education and law enforcement efforts to reduce levels of these threats. This review will determine if the species should be removed or maintained as a candidate species, or if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

We intend that any proposed listing action for the yellow-billed loon will be as accurate as possible. Therefore, we will continue to accept additional information and comments from all concerned governmental agencies, the scientific community, industry, or any other interested party concerning this finding.

References Cited

A list of the references used to develop this proposed rule is available upon request (see **FOR FURTHER INFORMATION CONTACT**).

Author

The primary authors of this 12-month finding are the staff members of the Fairbanks Fish and Wildlife Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authority

The authority for this action is section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: March 12, 2009.

Rowan W. Gould,

Acting Director, Fish and Wildlife Service.

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