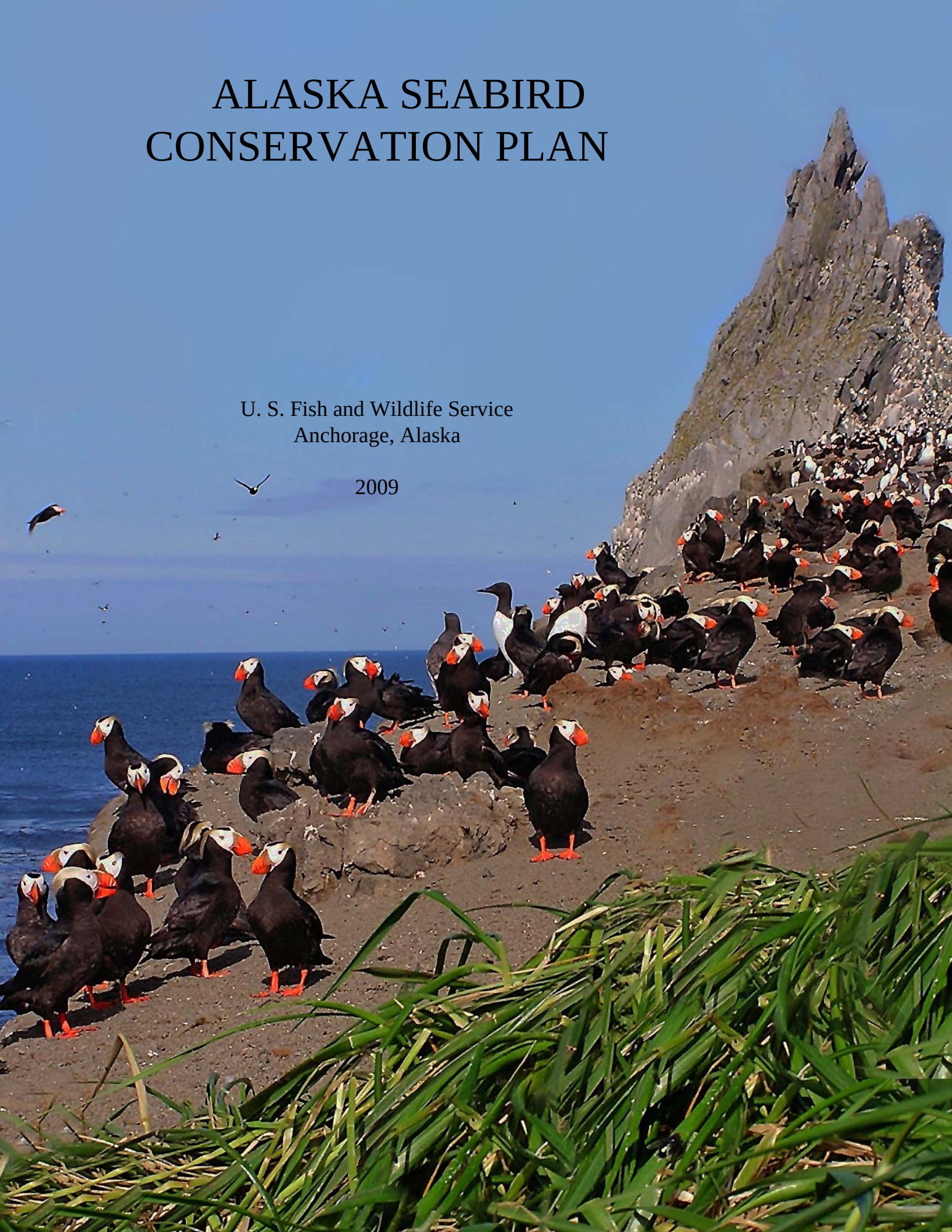
ALASKA SEABIRD CONSERVATION PLAN



U. S. Fish and Wildlife Service
Anchorage, Alaska

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ALASKA SEABIRD CONSERVATION PLAN

U.S. Fish and Wildlife Service
Region 7

Prepared by

U.S. Fish and Wildlife Service
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Taken by Michael T. Schultz on Bogoslof Island, Aleutian Islands, Alaska Maritime National Wildlife Refuge

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EXECUTIVE SUMMARY

Purpose

The U.S. Fish and Wildlife Service (Service or USFWS), Region 7 (Alaska) manages the conservation of thirty-eight breeding seabird species, with an estimated population of 40 to 50 million individuals. An additional 40 to 50 million nonbreeding seabirds use Alaska waters for some portion of their life cycle. The purpose of the Alaska Seabird Conservation Plan (Plan) is to facilitate development of a comprehensive regional approach to seabird conservation. It is intended primarily to direct Service activities, but may serve to guide and coordinate efforts by other federal and state agencies, universities, and private organizations interested in seabird issues.

Starting with a summary of current knowledge (an overview of seabird and seabird habitat resources in Alaska, a review of seabird conservation issues and threats, and a summary of current seabird conservation activities in Region 7), this document contains: goals and objectives for seabird management, monitoring, research, and outreach; and strategies to implement the objectives of the Seabird Conservation Program in Alaska.

Scope

This Plan contains information about seventy-two species of seabirds that nest, feed, or migrate through Alaska, representing three orders, nine families, 28 genera, and four feeding guilds. Loons, grebes, other marshbirds, shorebirds, and seaducks are not discussed in this plan.

The Service will use this Conservation Plan in annual work and budget planning, evaluation processes, and as the basis for operational plans for selected seabird species in Alaska. It does not provide specific guidance on measures for conserving seabird resources, mitigating specific impacts, or implementing each strategy.

Threats and Conservation Issues

Threats to seabirds in Alaska discussed in this plan include: invasive species; oil spills; other contaminants and hazardous substances; commercial fisheries; plastic pollution; avian influenza and other diseases; disturbance from vessel traffic, mining and forest development; subsistence harvest; towers and other obstructions; and climate change.

Historically, invasive species of mammals have been known to have the largest negative effect on seabird populations.[1] Deleterious effects of mammals introduced to Alaska islands were observed as early as 1811 by local Aleuts[2] and are still observed today on islands where invasive species have not been removed. An Invasive Species Removal Program and a program to prevent further introduction of rats have been initiated by the Service.[3]

Marine birds are particularly vulnerable to oil spills. The greatest hazard to seabirds in Alaska from oil spills comes from high seas shipping and oil tanker traffic. In-state fuel, cargo, and fishing vessel traffic also present a threat. Strategies for protecting migratory birds from oil

[1] Atkinson 1985, Moors and Atkinson 1984
[2] Bailey 1993
[3] Ebbert and Byrd 2002

include containing the oil before it reaches the birds, collecting oiled carcasses to protect scavenging birds from the effects of secondary oiling, hazing birds from oiled areas, preemptive capturing of unoiled birds at risk and moving them to an unoiled location, and -- as a last resort -- capturing and treating oiled birds.[4]

Threats to seabirds from contaminants and hazardous substances other than oil come primarily from abandoned military and mining sites. The Service conducts studies to investigate the effects of contaminants on seabirds and works with responsible parties to ensure cleanup of contaminated sites.

Thousands of seabirds have been killed each year in interactions with fishing gear. In recent years, regulatory actions and the implementation of deterrent devices have reduced this mortality. Additional research is being conducted to further minimize the damage. Indirect effects of fishing activities on seabird prey abundance are also of concern, but less well documented.

Ingestion of plastic by seabirds is known to cause injury and death.[5] Analysis of data from the most recent Alaska study suggests that there has been an increase in plastic ingestion by seabirds since 1969.[6]

Seabirds can be susceptible to a variety of diseases. Wild bird deaths and human fatalities in southeast Asia and Europe that were attributable directly to a highly pathogenic avian influenza (H5N1) virus prompted sampling for this virus in priority species of Alaska birds. Sampling of the selected species was conducted in 2006, 2007, 2008, and 2009.

Disturbance of seabirds from marine vessel traffic,[7] vessel strikes, and loss of habitat from forest development[8] has been documented in Alaska. Effects from mining development are also of concern, but not well documented.

Subsistence use of seabirds and their eggs is unique to Alaska in the United States. This harvest has been legally authorized since 1997 and spring and fall harvests are now regulated.

Recent proliferation in the number of communication towers being built has increased concern about avian mortality resulting from birds colliding with towers. Information about bird-tower collisions is available for some specific tower sites and for some bird species. However, no state estimate of bird-tower collisions is available for Alaska.

Records of increased temperatures, reductions of extent and thickness of sea ice, melting glaciers, thawing permafrost, and rising sea levels provide visible evidence of the dramatic changes that are occurring in Alaska's climate. The potential consequences of these changes to seabirds, prey resources, and nesting habitat have become the focus of considerable attention and the basis for new studies.

[4] Alaska Regional Response Team, Wildlife Protection Working Group 2002
[5] Connors and Smith 1982, Day 1980, Furness 1985, Peakall 1970, Sturkie 1965
[6] Robards *et al.* 1995
[7] Agness 2006, Kuletz 1996, Kuletz *et al.* 2003, Speckman *et al.* 2004
[8] Piatt *et al.* 2007

USFWS, Region 7, Seabird Programs and Initiatives

Various divisions within the Service have responsibilities for the protection and management of seabirds. Coastal refuges and the Regional Migratory Bird Management, Nongame Program conduct a statewide Inventory and Monitoring Program at seabird breeding colonies and on selected areas of the ocean to collect information on seabird distribution and long-term trends. An annual monitoring report is produced, and for easy access it is available online: http://alaska.fws.gov/nwr/akmar/whatwedo/bioprojects/publications.htm.

Various divisions of the Service also design and conduct special surveys and status assessments for activities related to potential candidate listing under the Endangered Species Act or as a Bird of Conservation Concern (BCC) as well as part of damage assessment plans resulting from deleterious environmental events from human activities such as oil spills. The following USFWS entities most often take the lead in these activities concerning seabirds: Regional Migratory Bird Management, Nongame Program; Alaska Maritime National Wildlife Refuge; various other refuges with coastal stewardship; and Fisheries and Ecological Services Field Offices. A 50-year Invasive Species Management Program has been carried out by the Alaska Maritime Refuge to eliminate invasive species and restore seabird habitat. The Contaminants Research and Monitoring Program is also carried out primarily by the Alaska Maritime Refuge.

Several large automated databases that provide information on seabird numbers and distribution are managed by the Service in Alaska and the U. S. Geological Survey, Alaska Science Center (http://alaska.usgs.gov). The databases include:

- North Pacific Seabird Colony Database (http://alaska.fws.gov/mbsp/mbm/northpacificseabirds/colonies/default.htm)
- North Pacific Pelagic Seabird Database (http://www.absc.usgs.gov/research/NPPSD)
- Pacific Seabird Monitoring Database (http://alaska.fws.gov/nwr/akmar/whatwedo/bioprojects/publications.htm)

Region 7's involvement and responsibilities with international seabird conservation have expanded in the last decade to provide more effective conservation of seabirds across their ranges.

Recommended Goals, Objectives, and Strategies, Region 7

After review of the major management issues and threats that face Alaska seabirds, five Service goals were identified along with twelve associated objectives. Seventy-six strategies were identified to accomplish the objectives. A complete list of all goals and objectives including strategies can be found on pages 91–98.

GOAL I. **Restore and maintain the natural abundance, diversity, and distribution of breeding seabird populations in Alaska.**

Objective I.1. Track changes in seabird populations, productivity, diets, and survivorship at 14 sites in Alaska annually and 15 additional sites every 3 years.

Objective I.2. Inventory at-sea distribution and abundance of seabirds in Alaska waters at appropriate spatial and temporal (seasonal) scales to assist management decisions in the face of global climate change.

Objective I.3. Monitor seabird distribution and abundance at-sea in selected oceanographic areas in Alaska.

Objective I.4. Update colony inventories every 10 years.

Objective I.5. Conduct basic research that assists in the management of seabird species in Alaska.

Objective I.6. Identify adverse effects of natural events and human activities to Alaska seabirds and protect populations.

GOAL II. In the face of global climate change and other threats, manage seabird habitats sufficient to accomplish Goal I.

Objective II.1. Protect seabird habitats on and off refuges in Alaska from adverse effects of human activities.

GOAL III. Improve coordination and collaboration directed towards the conservation and management of seabirds at international, national, regional, and local geographic scales.

Objective III.1. Establish and participate in domestic and international forums to enhance range-wide coordination of seabird conservation, management, and research issues.

GOAL IV. Promote seabird conservation through effective outreach and education.

Objective IV.1. Provide seabird viewing opportunities in Alaska.

Objective IV.2. Determine the economic effects and values of seabirds in Alaska to local, regional, and State economies (e.g., recreation, education, and tourism).

Objective IV.3. Improve public awareness and education concerning Alaska's seabird resources to meet the needs of the public, tour operators, and government agencies.

GOAL V. Provide the opportunity for rural Alaskans to harvest seabirds for subsistence purposes while maintaining healthy seabird populations.

Objective V.1. Document annually the numbers and species of seabirds and their eggs taken for subsistence use by rural Alaskans, and the seabird colonies where this harvesting takes place.

INTRODUCTION

The U.S. Fish and Wildlife Service is the federal agency with the primary responsibility for the conservation and protection of migratory birds in the United States. Region 7 of the Service manages bird resources across the vast State of Alaska with an area twice as large as the largest State in the continental United States. Alaska is bordered on the north by the Arctic Ocean and Beaufort Sea; on the east by Canada's Yukon Territory and the Province of British Columbia; on the south by the Gulf of Alaska and Pacific Ocean; and on the west by the Bering and Chukchi seas. More than 80 percent of America's national wildlife refuge lands (about 77 million acres) are in Alaska. These lands support the largest and most diverse group of seabirds in the United States and any similar region in the northern hemisphere. The immense size of Alaska and its huge seabird population carry enormous responsibilities for resource managers.

Alaska provides breeding, feeding, and migrating habitat for about 80 to 100 million seabirds. Thirty-eight seabird species breed in Alaska, totaling an estimated 40 to 50 million birds (Table 1). An additional 17 seabird species do not breed in Alaska, but use the marine and estuarine environments during a significant portion of their life cycle. Seventeen more seabird species are found casually or accidentally in Alaska waters during the breeding season (Appendix 1).

Many species of seabirds occurring in Alaska have circumpolar or southern hemisphere distributions, making them a shared resource with other nations. These species occur in similar breeding habitats, share similar management issues, and likely share common foraging and wintering areas.

The national importance of Alaska's seabirds was recognized early in the twentieth century with the creation of 10 “seabird” refuges: Bering Sea, Pribilof Islands, St. Lazaria, Tuxedni, Bogoslof, Forrester Island, Hazy Island, Chamisso, Aleutian Islands, and Semidi. These early bird reserves were established primarily to protect seabird nesting habitats. In 1980, all of those refuges (and the Afognak Forest and Fish Culture Reserve and Simeonof Island Refuge) were subsumed within the existing Alaska Maritime National Wildlife Refuge under the Alaska National Interest Lands Conservation Act (ANILCA).[9] As of 2009, there are 16 national wildlife refuges in Alaska and 10 of those contain seabird habitat. In fact, except for inland breeding gulls, terns, and jaegers, almost all seabird breeding colonies in Alaska are on national wildlife refuges or state game refuges.

The refuge system in Alaska protects seabirds nesting at colonies during the breeding season. It does not protect seabirds at sea, which is where most species spend the majority of their life cycle. At sea habitats are especially vulnerable to threats of oil and gas development, commercial fishing, coastal mining and logging, and other threats that have the potential to adversely affect seabird resources.

[9] See Page 11: Conservation History and Legal Framework

This Plan will serve to guide and coordinate Service activities to conserve seabird populations and habitats in Alaska. It will also help to promote coordination with other entities for the conservation of seabirds.

Goals of U.S. Fish and Wildlife Service Seabird Conservation Program in Alaska

I. Restore and maintain the natural abundance, diversity, and distribution of populations of breeding seabird populations in Alaska.

II. In the face of global climate change and other threats, manage seabird habitats sufficient to accomplish Goal I.

III. Improve coordination and collaboration directed towards the conservation of seabirds at international, national, regional, and local geographic scales.

IV. Promote seabird conservation through effective outreach and education.

V. Provide the opportunity for rural Alaskans to harvest seabirds for subsistence purposes while maintaining healthy seabird populations.

PURPOSE OF THIS PLAN

This Alaska Seabird Conservation Plan (Plan) is designed primarily to give decision-makers and resource managers in the Service a framework to accomplish seabird conservation. It may also serve to coordinate seabird conservation efforts with other federal, state, and international entities, non-governmental organizations (NGOs), and academia. The elements of this plan are as follows:

1. List Service goals, objectives, and strategies for seabird management, inventory and monitoring, research, and outreach in Alaska.

2. Describe existing Region 7 activities for seabird management, inventory and monitoring, research, and outreach.

3. Present an overview of seabird and seabird habitat resources in Alaska.

4. Identify threats that could put seabird populations and their habitats at risk.

SCOPE OF THIS PLAN

The North American Waterbird Conservation Plan[10] was developed in 2002 to provide a continental perspective on the status and conservation efforts for waterbirds in North America. Regional plans based on Bird Conservation Regions (BCRs) are being produced to focus on regional issues for waterbird conservation. Region 7 of the U.S. Fish and Wildlife Service encompasses all of Alaska and information in this plan covers the entire State (Figure 1).

An overview of objectives and strategies for seabird conservation is provided in this plan. It is not intended, however, to present specific methods on how to conserve seabird resources, mitigate specific harmful effects, or to implement a schedule for each strategy. It is meant to be used as the foundation for completing operational plans for selected species in Alaska as well as used in the Service's annual work planning, budgeting, and implementation processes. As required by changes in resource issues or Service policies, the Alaska Seabird Conservation Plan will be revised every 10 years. This Plan is an update of the 1992 Alaska Seabird Management Plan.[11]

Major groups of seabirds covered in this plan include albatrosses, fulmars, storm-petrels, shearwaters, cormorants, gulls, terns, jaegers, kittiwakes, and auks (murres, puffins, murrelets, auklets, guillemots). All of the seabird species breeding in Alaska and some nonbreeders that spend a portion of their life cycle in Alaska are covered in this document.

The only species in this plan that is listed under the Endangered Species Act (ESA) is the short-tailed albatross, a migrant species in Alaska. An in-depth discussion about this species is provided in the Short-tailed Albatross Recovery Plan available online: http://alaska.fws.gov/fisheries/endangered/pdf/stal_recovery_plan.pdf.[12]

In response to documented declines of Kittlitz's murrelet, an Alaska breeding bird, the U.S. Fish and Wildlife Service placed the species on the USFWS Birds of Conservation Concern List in 2002 and listed the species as a candidate for protection under the Endangered Species Act in 2004 with a Listing Priority Number of 5 (69 FR 24875).[13] In 2008, the Service upgraded the Endangered Species Listing Priority Number for Kittlitz's murrelet from 5 to 2 because threats to the species remained high in magnitude, but had increased from non-imminent to imminent (72 FR 69038).

Loons, grebes, and other marshbirds will be covered in a plan similar to the Seabird Conservation Plan at a later date. Shorebirds and seaducks are not discussed in this plan, but information about them may be found in the following references:

- Shorebirds: Alaska Shorebird Conservation Plan, Version II.[14] Available online: http://alaska.fws.gov/mbsp/mbm/shorebirds/plans.htm

[10] Kushlan *et al.* 2002
[11] USFWS 1992
[12] USFWS 2008b
[13] USDOI, FWS 2004
[14] Alaska Shorebird Group 2008

- Seaducks: Information available online: http://www.seaduckjv.org/infoseries/toc.html
- Spectacled eiders: Spectacled Eider Recovery Plan, USFWS[15]
- Steller's eiders: Steller's Eider Recovery Plan, USFWS[16]

[15] USFWS 1996
[16] USFWS 2002c

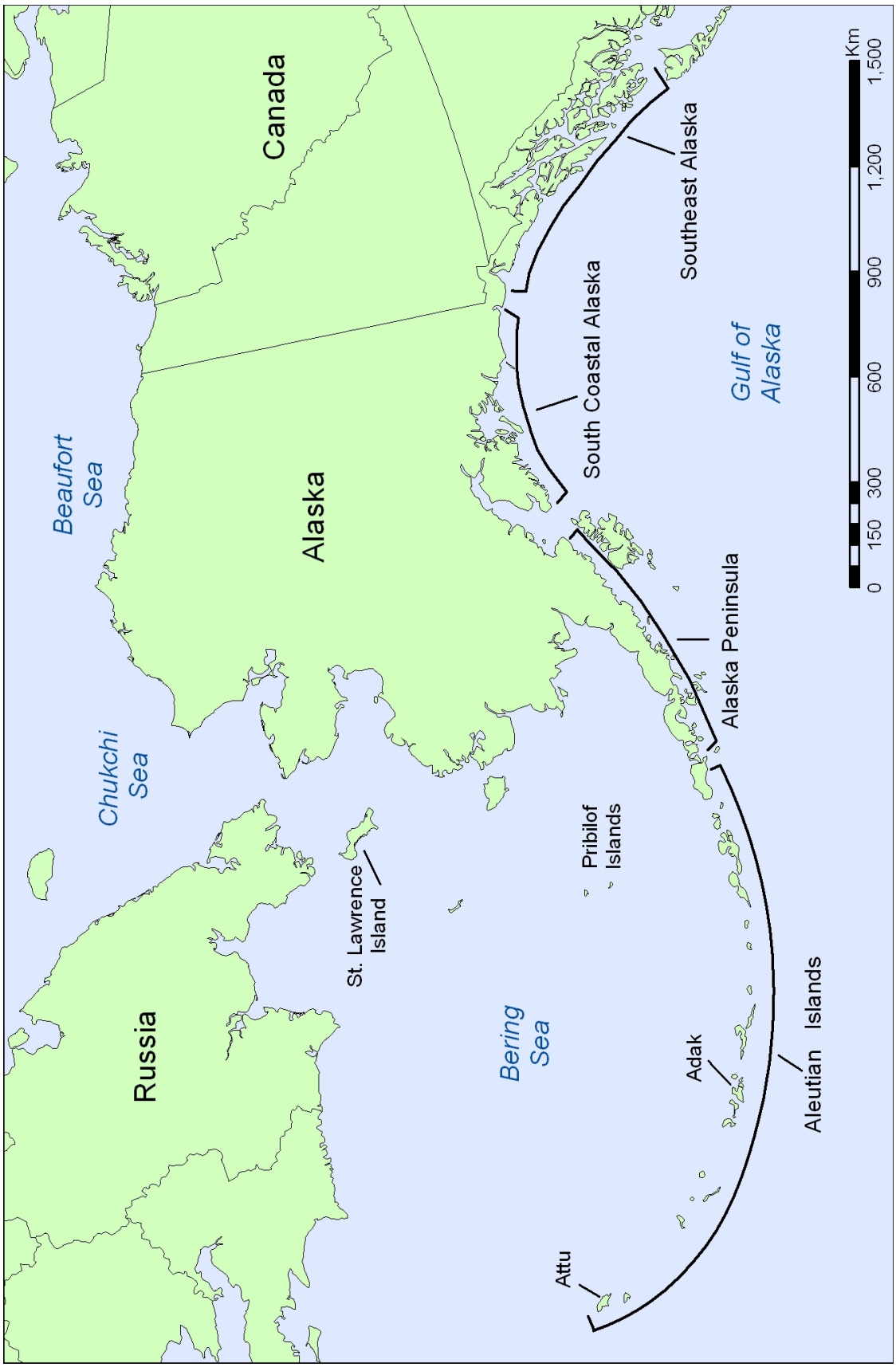

Figure 1. Map of Alaska.

CONSERVATION HISTORY AND LEGAL FRAMEWORK

Several international treaties, domestic laws, and executive orders have been enacted that provide protection for migratory birds. Implementation of the statutes and regulations derived from agreements and legislation is the responsibility of the U.S. Fish and Wildlife Service. The most important pieces of legislation that are relevant to seabirds and the Service include: the Migratory Bird Treaty Act; Fish and Wildlife Coordination Act; National Wildlife Refuge System Administration and Improvement Acts; Endangered Species Act; Alaska National Interest Lands Conservation Act of 1980; Fish and Wildlife Conservation Act; Driftnet Impact Monitoring, Assessment, and Control Act and Marine Mammal Protection Act Amendments; and the High Seas Driftnet Fishing Moratorium Protection Act. Each of these statutes is described briefly below.

There are also regional and national policies regarding management and monitoring of seabirds as well as national/international agreements and initiatives that guide Service activities. A condensed explanation of these policies is also presented below.

Migratory Bird Acts, Treaties, and Legislation

1. **Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703–718)**
   This act established Federal responsibility for the protection of migratory birds and gave effect to treaties in Canada, Mexico, Japan, and Russia. The act is basic to protecting populations and habitats of migratory birds, managing their distribution, ecological diversity, introduction and restoration, and guiding research programs. Regulations in Volume 50 of the Code of Federal Regulations implement this act and other legislation pertaining to U. S. Fish and Wildlife Service responsibilities.

2. **Fish and Wildlife Coordination Act of 1956, as amended (16 U.S.C. 661–667[C])**
   This act provides a means for protecting fish and wildlife habitats, including those of seabirds. The act requires water resource agencies to consult with the Service regarding the effect of proposed Federal projects on fish and wildlife resources, and it requires that measures to mitigate losses be included in projects.

3. **National Wildlife Refuge System Administration Act of 1966, as amended (16 U.S.C. 668dd–668jj) and National Wildlife Refuge System Improvement Act of 1997 (Public Law 105–57)**
   The first constitutes an "organic act" for the National Wildlife Refuge System and, together with the second act, ensures that the National Wildlife Refuges (NWRs) are managed as a national system of related lands, waters, and interests for the protection and conservation of our Nation's national wildlife resources.

4. **Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1544)**
   This act provides for the protection of plants and animals in danger of extinction throughout all or a significant portion of their range and the conservation of ecosystems upon which they depend. The ESA implements the United States' commitment to several international treaties and conventions including: the Migratory Bird Treaty Act;

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere; and the International Convention for the High Seas Fisheries of the North Pacific Ocean. The short-tailed albatross was listed as endangered under the ESA in 1970. The Kittlitz's murrelet was named as a Candidate for protection under the ESA in 2004.

5. **Alaska National Interest Lands Conservation Act of 1980 (94 STAT. 2371–2551, 16 U.S.C. 668dd)**
   This act established new wildlife refuges in Alaska and expanded some existing national wildlife refuges. It also defined the purpose of these refuges. Most refuges in the system were established to conserve high-quality habitat for migratory birds, including seabirds. All 16 refuges in Alaska were established, in part, to conserve migratory birds. Most were also established to provide the opportunity for continued subsistence uses of some species. This act specifically mentions marine birds as a purpose for the establishment of three refuges (Alaska Maritime, Togiak, and Yukon Delta national wildlife refuges). One purpose of Alaska Maritime Refuge is also to conserve the marine resources upon which seabirds rely.

6. **Fish and Wildlife Conservation Act of 1980, as amended in 1988 (16 U.S.C. 2901–2912)**
   This act recognized the value of nongame migratory species and the need to plan for and manage nongame resources. It provided for financial assistance to States for developing nongame conservation plans and programs and instructed all federal agencies to conserve nongame fish and wildlife and their habitats.

   In November 1988, this act was amended to include among its purposes the monitoring of all nongame migratory bird populations and identification of effects of environmental changes and human activities on nongame migratory birds.

7. **Driftnet Impact Monitoring, Assessment and Control Act of 1987 (P.L. 100–220, Title IV, Driftnet Act (16 U.S.C. 1822)**
   This driftnet impact act stipulated that the United States would pursue agreements with Japan, the Republic of Korea, and Taiwan to establish an observer program to document the mortality of marine mammals, seabirds, and other marine resources in high-seas squid driftnet fisheries. This was the first legislation expressing the United States' concern for mortality of seabirds in fishing gear, and the recognition that the mortality should be monitored.

   The Marine Mammal Protection Act Amendments in 1988 (P.L. 100–711, 16 U.S.C. 1361 et seq.)
   Amendments to the Marine Mammal Protection Act required the establishment of an observer program to monitor the incidental mortality of marine birds and mammals in selected domestic fisheries. This legislation was the first to express a concern for the mortality of seabirds in domestic fisheries.

8. **High Seas Driftnet Fishing Moratorium Protection Act of 1995 (16 U.S.C. 1826d–1826g)**
   This act addresses the United Nations resolutions and decisions establishing a global moratorium on large-scale driftnet fishing on the high seas. It prohibits the United States from entering into international agreements that would prevent the full implementation of the moratorium.

Other Acts, Treaties, and Legislation

Several other acts, treaties, and legislation designed to prevent pollution of maritime waters, regulate uses of the coastal zone, or establish marine and estuarine sanctuaries have also helped to protect and conserve Alaska and international seabird resources including:

1. **Federal Water Pollution Control Act of 1948, amended numerous times until reorganized and expanded in 1972**
   This act implements and enforces other maritime contaminant issues.

2. **Coastal Zone Management Act of 1972 has been amended eight times**
   This act manages coastal habitats where some seabirds nest.

3. **Federal Noxious Weed Act of 1974 as amended in 1988 and 1994**
   This act provides for the control and management of introduced plants that degrade nesting habitat.

4. **Magnuson-Stevens Fisheries Conservation and Management Act of 1996, originally passed as the Magnuson Fishery Conservation and Management Act of 1976**
   This act regulates federal commercial and sport fisheries.

5. **Comprehensive Environmental Response, Compensation, and Liability Act of 1980**
   This act, commonly known as "Superfund," deals with cleanups of sites containing hazardous waste.

6. **Plastic Pollution Impact, Control, and Monitoring Act of 1987**
   This act recognizes the negative effects of plastic debris on seabirds and other marine wildlife.

7. **Oil Pollution Act of 1990**
   This act identifies enhanced capabilities for oil spill response and natural resource damage assessment from the Service including the requirement that the Service, as a natural resource trustee, pursue the "immediate and effective protection, rescue, and rehabilitation of, and the minimization of risk of damage to, fish and wildlife and their habitat that are harmed or may be jeopardized by a discharge."

8. **Executive Order 13186 of 2001**
   This order outlines the responsibilities of federal agencies to protect migratory birds. "Each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations is directed to develop and implement, within two

years, a Memorandum of Understanding with the Fish and Wildlife Service that shall promote the conservation of migratory bird populations.

Service Policy

Regional Marine Bird Policy

Within its legal authority and financial constraints, the Service in Alaska is guided by the policies stated below. These policies will guide implementation of the Region's seabird objectives and help assure that decisions concerning seabirds will be consistent.

1. The Service-Region 7 recognizes the national and international importance of Alaska to the maintenance of healthy, circumpolar seabird populations. Effectively, this means that the Service will implement, to the fullest extent possible, the Migratory Bird Treaty Act, specifically, those provisions that deal with seabirds. This policy necessitates:

    a. Protection of coastal and offshore habitats and other marine resources in Alaska and in other circumpolar regions, which are important to the survival of seabirds through cooperation with international, federal, and state agencies and nongovernmental organizations.
    b. Management of seabirds (on and off national wildlife refuges) in Alaska to maintain or enhance populations and to protect habitats.
    c. Implementation of seabird management and research strategies in Alaska to develop information on seabird biology and long-term trends for distribution, abundance, productivity, habitats, and socioeconomic uses.
    d. Enforcement of prohibitions on the introduction of exotic animals and plants on Service lands to avoid adverse effects to seabird resources and continue to remove exotic animals that still exist on seabird nesting islands.
    e. Effort to alleviate threats to seabird populations to prevent any species in Alaska from becoming threatened or endangered.
    f. Response to contaminant incidents when there is a potential for significantly affecting seabird resources, including monitoring effects of contaminants on seabirds, and working towards reducing contaminant effects on seabirds.

2. The Service-Region 7 also recognizes the value of seabird resources to the public and the importance of management of those resources for the continued benefit of all Alaskans and all Americans. This policy necessitates:

    a. Providing the public with opportunities to view seabirds in natural settings and to learn about seabirds and their role in marine and coastal ecosystems in Alaska.
    b. Providing the opportunity for Alaskan Natives to harvest those seabird species that can be legally taken for subsistence uses while maintaining healthy seabird populations.

National Waterbird Bycatch Policy

In 2000, the Service established a national policy regarding bycatch of seabirds in fisheries operations. Increased concerns about the long-term ecological effects of incidental capture of non-target species in fisheries throughout the world prompted the development of this policy. Substantial numbers of waterbirds (especially seabirds, but also waterfowl, shorebirds, and

other related wading species) are killed annually in fisheries, making waterbird bycatch a serious conservation issue. The goal of the Service is the minimization of waterbird bycatch in fisheries. Since development of the policy, the Service has expanded partnerships with regional, national, and international organizations, states, tribes, industry, and environmental groups to meet this goal. The Service prepared a draft Action Plan to implement this Policy.[17] In cooperation with interested parties, the Service has been aggressively promoting public awareness of waterbird bycatch issues, and has been gathering the scientific information to develop and provide guidelines for management, regulation, and compliance.

National and International Agreements and Initiatives

1. **International Plan of Action for the Reduction of Seabird Bycatch in Longline Fisheries (IPOA) and National Plan of Action for the Reduction of Seabird Bycatch in Longline Fisheries (NPOA)**
   In 1999, the Food and Agriculture Organization of the United Nations adopted the international plan of action to address concerns over the significant mortality of seabirds worldwide in connection with longline fisheries. The objective of the international plan was to reduce the incidental catch of seabirds in longline fisheries. Each nation was to assess its own fisheries and the nations that determined they had a problem were to develop national plans of action. These plans would assess the magnitude of the problem, develop a prescription of mitigation measures, outline needed research and development, and direct education and outreach to address the problem. The Service and Department of State worked with the National Oceanic and Atmospheric Administration-Fisheries (NOAA Fisheries) to draft a national plan of action for U.S. longline fisheries in 2001.[18]

2. **Waterbird Conservation for the Americas Initiative**
   The Waterbird Conservation for the Americas Initiative (Waterbird Initiative) was launched in 1998. It is an international, broad-based, voluntary partnership dedicated to waterbird conservation. It complements the initiatives existing for other bird groups, specifically the North American Waterfowl Management Plan, Partners in Flight, and the National Shorebird Plans, all of which come together in the North American Bird Conservation Initiative.

   The North American Waterbird Conservation Plan is one product of the Waterbird Initiative. It provides a broad scale framework for the conservation and management of 210 species of waterbirds, including seabirds, coastal waterbirds, wading birds, and marshbirds using aquatic habitats throughout North America, Central America, the islands and pelagic waters of the Caribbean and western Atlantic, and the U.S. Pacific Islands and pelagic north Pacific.

3. **United States - Russia Environmental Agreement**
   In 1972, the United States and the Soviet Union signed an Agreement on Cooperation in the Field of Environmental Protection to provide a framework under which the two nations could collaborate on environmental issues of mutual interest and concern. In

[17] USFWS 2005b *Draft*
[18] U.S. Dept. of Commerce 2001

1994, the agreement was renegotiated to replace the U.S.S.R. with the Russian Federation as signatory.

4. **Declaration on the Protection of the Arctic Environment**
   In 1989, eight arctic countries, including the United States, agreed to work towards cooperative measures to protect the environment of the Arctic. One result of this initiative was development of the **Arctic Environmental Protection Strategy** in 1991. The strategy was designed to guide development in a way that would safeguard the arctic environment for future generations and in a manner comparable with nature. In 1996, the **Arctic Council** was established as a high level intergovernmental forum to provide a means for promoting cooperation, coordination, and interaction among the arctic countries. Arctic Indigenous communities and other arctic inhabitants are involved in the council and work on common arctic issues, in particular, issues of sustainable development and environmental protection in the Arctic. There are six **Working Groups** of the Arctic Council:

   - Arctic Contaminants Action Program (**ACAP**)
   - Arctic Monitoring and Assessment Programme (**AMAP**)
   - Conservation of Arctic Flora and Fauna (**CAFF**)
   - Emergency Prevention, Preparedness and Response (**EPPR**)
   - Protection of the Arctic Marine Environment (**PAME**)
   - Sustainable Development Working Group (**SDWG**)

Roles and Responsibilities

U.S. Fish and Wildlife Service

Within the Service, the Migratory Bird Management Division takes the lead on monitoring and managing for healthy migratory bird populations and ensuring that these populations do not become threatened or endangered. Populations are managed across their ranges by working with national and international partners. Federal permits which allow the use and/or possession of migratory birds (other than those listed under the Endangered Species Act) are administered by this Division.

Numerous other branches of the Service have roles and responsibilities with regards to migratory birds. If a seabird is listed as Threatened or Endangered, responsibility passes from the Migratory Birds Management Division to the Fisheries and Ecological Services offices. They have the primary responsibility for those species listed and petitioned for listing under the Endangered Species Act.

Fisheries and Ecological Services has other branches key to migratory bird management including Environmental Contaminants, Conservation Planning Assistance, and Habitat Restoration. The Environmental Contaminants Branch includes the Service's Natural Resources Damage Assessment and Restoration and Spill Response programs. In the event of oil or other hazardous substance spills, they are the primary Service contact and carry out contaminants investigations to identify and resolve or prevent contaminants from harming seabirds and other wildlife. Conservation Planning Assistance and Habitat Restoration include the Coastal and Partners programs. They work with private landowners,

municipalities, tribes, non-governmental organizations, and federal and state agencies to restore, protect, and improve fish and wildlife habitats throughout Alaska. Most personnel are located in Field Offices in the Fisheries and Ecological Services Division and local issues are usually handled at this level.

Site specific conservation of seabirds and their breeding habitats throughout their respective ranges are largely the responsibility of the National Wildlife Refuge (Refuges) System. The largest seabird colonies in the Gulf of Alaska, Bering, and Chukchi seas are located on national wildlife refuges. It is the responsibility of these Refuges to inventory and monitor seabird populations on their lands and to maintain and restore, where appropriate, the biological integrity, diversity, and environmental health of the refuges including removing introduced mammals to restore breeding seabirds. It is also the responsibility of the Refuges to promote stewardship of seabirds through interpretive and educational programs.

Other Federal Agencies

The USDA Forest Service and the National Park Service also have land management responsibilities for some seabird colony sites. Coordination of seabird management and monitoring with these federal agencies is a high priority for the Service. Sharing of personnel and resources between agencies is an effective management tool in a area as large and remote as Alaska.

There are two national forests administered by the Forest Service in Alaska. The Chugach National Forest surrounds glacier-filled Prince William Sound where many seabird colonies and nesting sites for solitary and tree-nesting marbled murrelets are located. Tongass National Forest includes the many forested islands of Southeast Alaska that also have numerous seabird colonies and tree-nesting marbled murrelets. National parks and preserves in Alaska with seabird colonies include: Wrangell-St. Elias, Glacier Bay, and Lake Clark. Kenai Fjords National Park also has seabird colonies.

SEABIRD OVERVIEW

Alaska supports North America's greatest concentration of seabirds. Thirty-eight species of seabirds with an estimated 40 to 50 million individuals breed in Alaska (Table 1). Nesting by some gulls and terns also occurs inland (lakes, rivers, streams, tundra), but is not included in the total number of birds or addressed in this plan. Of concern in this plan are the seabirds that nest at more than 1,800 coastal colonies ranging in size from a few dozen birds to more than a million[19] (Figure 2). The Gulf of Alaska and the Bering Sea are exceptionally rich in marine resources, supporting more than 20 million birds breeding in the eastern Bering Sea and about 7 million in the Gulf of Alaska.[20] The eastern Bering Sea includes the Aleutian Islands. Some species are highly clustered into a few colonies, and about 50 percent of Alaska's seabirds nest in just 12 colonies, 10 of which are in the eastern Bering Sea.

All of the breeding seabirds discussed in this document belong to three Orders of birds: the *Procellariformes* or tubenoses; *Charadriformes*, which includes gulls (family *Laridae*) and alcids (family *Alcidae*); and *Pelecaniformes*, which includes cormorants (family *Phalacrocoracidae*). The most abundant breeding species in Alaska are *Aethia* auklets, storm-petrels, murres, puffins, northern fulmars, and kittiwakes. These species also form the largest colonies in Alaska. Other groups of seabirds that breed in Alaska include cormorants, jaegers, gulls, terns, and murrelets.

Another 40 to 45 million seabirds that breed outside Alaska spend the austral winter feeding in Alaska waters (Appendix 1). Shearwaters migrate here from the southern hemisphere during our summer and are the most numerous seabirds found in Alaska waters. Other species that breed in Canada or Eurasia migrate here to spend the northern winter in waters off Alaska.

The life histories of all seabirds have some features in common. Seabirds spend approximately 80 percent of their lives at sea. They are adapted for long periods on the wing and for resting on the water. Most species obtain their food at sea, hunting across the ocean's surface to locate currents and upwellings where food is concentrated. Generally, seabirds only come to shore to nest, and even during the breeding period, most species spend at least half their time at sea.

Seabirds are also characterized by low reproductive rates, but this is balanced under natural conditions by low adult mortality rates and a long life span (20 years or more for some species). Breeding success of many seabirds is highly variable because of yearly fluctuations in environmental conditions. Poor success is normally compensated for by occasional good years. The natural factor most often associated with poor breeding success is scarcity of food; other important factors may include severe storms and heavy pressure from introduced predators.

[19] USFWS 2006b
[20] Stephensen and Irons 2003

Table 1. Breeding Seabirds of Alaska: Abundance and Estimated Percentages of Total North American Breeding Population.[1]

Species	Approximate No. of Breeders in Alaska	Approximate Percentage of N. American Breeding Birds
Northern Fulmar *(Fulmarus glacialis)*	1,400,000	70
Fork-tailed Storm-Petrel *(Oceanodroma furcata)*	3,200,000	55–65
Leach's Storm-Petrel *(Oceanodroma leucorhoa)*	3,500,000	20
Double-crested Cormorant (*Phalacrocorax auritus)*	6,100	<1
Brandt's Cormorant *(Phalacrocorax penicillatus)*	<100	<1
Pelagic Cormorant *(Phalacrocorax pelagicus)*	44,000	60
Red-faced Cormorant *(Phalacrocorax urile)*	20,000	100
Pomarine Jaeger *(Stercorarius pomarinus)*	Uncommon[2]	?
Parasitic Jaeger *(Stercorarius parasiticus)*	Common[2]	?
Long-tailed Jaeger *(Stercorarius longicaudus)*	Common[2]	?
Bonaparte's Gull *(Larus philadelphia)*	Uncommon[2]	?
Mew Gull *(Larus canus)*	14,400 (coast only)[2]	5–10
Herring Gull *(Larus argentatus)*	1,600 (coast only)[2]	<1
Slaty-backed Gull *(Larus schistasagus)*	<100	100
Glaucous-winged Gull *(Larus glaucescens)*	250,000	65
Glaucous Gull *(Larus hyperboreus)*	100,000	60
Sabine's Gull *(Xema sabini)*	Uncommon[2]	?
Black-legged Kittiwake *(Rissa tridactyla)*	1,300,000	100
Red-legged Kittiwake *(Rissa brevirostris)*	210,000	100
Caspian Tern *(Hydroprogne caspia)*	Uncommon[2]	?
Arctic Tern *(Sterna paradisaea)*	11,000 (coast only)[2]	?
Aleutian Tern *(Onychoprion aleutica)*	9,500	100
Dovekie *(Alle alle)*	<100	5
Common Murre *(Uria aalge)*	2,800,000	?
Thick-billed Murre *(Uria lomvia)*	2,200,000	30
Black Guillemot *(Cepphus grylle)*	700	<1
Pigeon Guillemot *(Cepphus columba)*	49,000	70
Marbled Murrelet *(Brachyramphus marmoratus)*	859,000*[3]	90
Kittlitz's Murrelet *(Brachyramphus brevirostris)*	9,000– 25,000*[3]	100
Ancient Murrelet *(Synthliboramphus antiquus)*	300,000	15–30
Cassin's Auklet *(Ptychoramphus aleuticus)*	473,000	13–15
Parakeet Auklet *(Aethia psittacula)*	1,000,000*[3]	100
Least Auklet *(Aethia pusilla)*	5.5–9,000,000*[3]	100
Whiskered Auklet *(Aethia pygmaea)*	116,000*[3]	100
Crested Auklet *(Aethia cristatella)*	3,000,000	100
Rhinoceros Auklet *(Cerorhinca monocerata)*	180,000	20
Horned Puffin *(Fratercula corniculata)*	900,000	100
Tufted Puffin *(Fratercula cirrhata)*	2,300,000	95

[1] Population numbers taken from Birds of N. America Species Accounts; Kushlan *et al.* 2002; USFWS 2006a, 2006b

[2] Populations are given for colonial breeders in Alaska on the coast; "coast only" means additional birds nest inland. For species without a numerical estimate, potential numbers include: "abundant" – one million or more individuals; "common" – hundreds of thousands; "uncommon" – one hundred to tens of thousands; "rare" – less than one hundred.

[3]* Populations marked with asterisk are based on total individuals not total breeders.

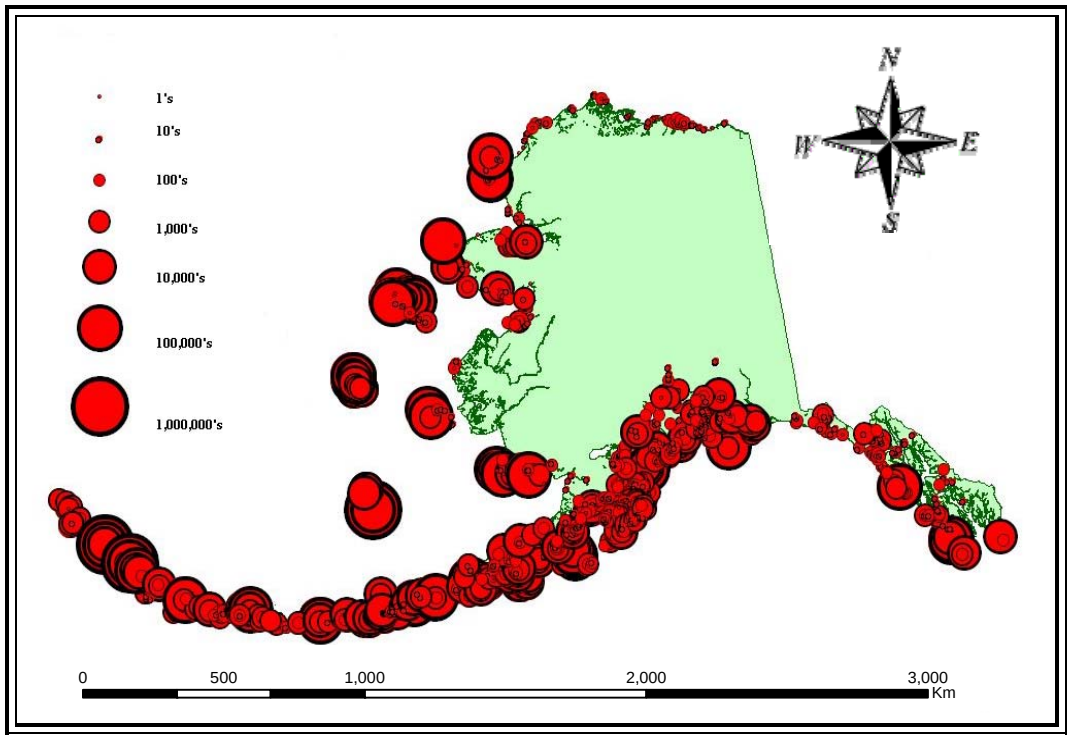

Figure 2. Seabird Colonies of Alaska.

Habitat requirements of nesting seabirds include proximity to appropriate marine foods and protection from predators and disturbance. Therefore, most colonies of seabirds are on remote islands or on steep cliffs near the open sea.

During the breeding season, most seabirds depend on abundant prey near the colony, but the foraging range varies greatly among species, sites, and seasons. Seabirds in Alaska generally fall into four feeding guilds: surface feeding and diving planktivores (birds that eat primarily macro-zooplankton and invertebrates) and surface feeding and diving piscivores (birds that primarily catch fish). Although most birds consume both plankton and fish to some degree, for some species the critical food in each breeding area may be just one or two species of fish. Species that feed only at the surface can be vulnerable to conditions that reduce the numbers of prey rising from depths, therefore, their breeding success varies more than that of diving species.

Most Alaska seabirds migrate in winter and range farther to forage than during the breeding season. Although many species move to sheltered, ice-free bays and do not leave Alaska marine waters; some range across the Pacific Ocean or migrate to the southern hemisphere. A few species migrate as far as Antarctica. During the Alaska winter, some seabird species congregate in large flocks, whereas others are dispersed in small groups or as solitary individuals.

A brief summary about the major seabird groups in Alaska is presented in this section. Detailed summaries of Alaska breeding species, including population data and trends, can be found in the species accounts in Appendix 10. Five nonbreeding species are also included in

the species accounts: Black-footed, Laysan, and Short-tailed albatrosses; and Short-tailed and Sooty shearwaters.

Tube-nosed Birds

Tube-nosed birds, a group of pelagic seabirds whose bills have horny plates and tubular nostrils, which are found in Alaska include: fulmars, storm-petrels, shearwaters, and albatrosses.

Northern Fulmars

Plumage colors of northern fulmars range from dark blue-gray to nearly all white. Every gradation of color in between can also be seen.

Northern fulmars are one of the few species in the tube-nosed group that nest in Alaska. They do not reach breeding age until 8 to 10 years old and live up to 50 years. Nesting occurs in large colonies on remote islands. One white egg is laid each year on steep, soil-covered slopes, at the tops of cliffs, or on wide rock ledges. Food items including fish, squid, jellyfish, crustaceans, and zooplankton are taken from the surface or just beneath it.[21] Fulmars probably do much of their foraging at night as their sense of smell is highly developed.[22]

These birds are relatively flexible in their food requirements and often gather in large flocks behind ships to collect fishing offal or garbage.

Northern fulmars inhabit the northern oceans of the world with separate populations in the Pacific and Atlantic oceans.[23] In the Pacific, breeding occurs from the Bering Sea southward; and also in Canada and Eurasia. Ninety-nine percent of all breeding in Alaska is concentrated at only four remote island groups: St. Matthew/Hall islands (Bering Sea), Chagulak Island (Aleutian Islands), Semidi Islands [Gulf of Alaska (GOA)], and the Pribilof Islands (Bering Sea), which are all part of the Alaska Maritime National Wildlife Refuge and therefore protected.

Storm-Petrels

Two species in this seabird group breed in Alaska, the Leach's storm-petrel and the fork-tailed storm-petrel. Both are robin-sized birds with forked tails and are found in Alaska from the western Aleutians through the Gulf of Alaska. Although found elsewhere on both sides of the Pacific Ocean, the fork-tailed storm-petrel reaches its greatest density in Alaska. Leach's storm-petrels also breed in eastern Canada and northwestern Europe; a few are also found in Asia and in some states along the Atlantic and Pacific coasts of the United States.

Storm-petrel colonies can be extremely large and dense. Both Leach’s and fork-tailed storm-petrels nest on islands and lay one egg underground. Eggs are usually laid in earthen burrows, but nesting also occurs in rock crevices. Both species use either nesting habitat.

[21] Ainley and Sanger 1979, Baird 1990, Baird and Gould 1986, DeGange and Sanger 1986, Gould *et al.*1997, Hatch 1993, Hunt *et al.* 1981b, Sanger 1986, Schneider *et al.* 1986
[22] Hatch and Nettleship 1998
[23] Harrison 1983

Nesting sites are attended nocturnally and adults often stay at sea during the day and on moonlit nights to avoid predation by gulls and other predators.[24]

Food is obtained far from the nesting colony: the fork-tail feeds over the outer continental shelf and the adjacent ocean and the Leach's storm-petrel from the shelf break seaward.[25] Both species winter from the shelf edge to the deep ocean. Storm-petrels seize prey from the surface of the water. The usual foods are small fishes, particularly juvenile lantern fish, and euphuists.[26] In parts of the Bering Sea and Gulf of Alaska, Fork-tailed storm-petrels may depend on capelin and Pacific sand lance.[27]

Shearwaters

Shearwaters do not nest in Alaska. The two species occurring in Alaska (short-tailed and sooty shearwaters), breed in the southern hemisphere. Both species nest in burrows underground, are nocturnal on the breeding grounds, and lay one, white egg annually.

Sooty shearwaters breed in New Zealand, southeastern Australia and Tasmania, the Falkland Island Group, and Chile. Short-tailed shearwaters breed in southeastern Australia and Tasmania. Both species visit Alaska waters from May to September. Tens to hundreds of thousands and occasionally more than a million birds can gather at favorable feeding sites or in migration corridors such as Unimak Pass. The populations of these two species account for over 50 percent of all seabirds in Alaska waters during summer.[28] Almost the entire population of Short-tailed shearwaters (about 23 million) spends the austral winter in the North Pacific.[29] The total population of sooty shearwaters may exceed 20 million birds[30] (most also spend their winter in the North Pacific). Short-tailed shearwaters are most abundant in the Bering and Chukchi Seas, as well as the Gulf of Alaska, while sooty shearwaters range primarily south of the Aleutian Islands and in the Gulf of Alaska.[31] Both of these small, tube-nosed bird species are dark gray with long, narrow wings.

Short-tailed shearwaters eat primarily large euphausiids, some jellyfish, and small schooling fish.[32] The spring diet in the western subarctic varies by region.[33] Sooty shearwaters eat primarily small schooling fish (e.g., Pacific saury and myctophids). On the outer shelf and shelf break this species forages on squid.[34] In the past, shearwaters in the southeastern Bering Sea have consumed a large biomass of euphausiids. More recently, short-tailed shearwaters have been taking increasing amounts of fish in the southeastern Bering Sea.[35]

[24] Boersma and Groom 1993
[25] Ainley and Sanger 1979, Hunt *et al.* 1981c, Gould *et al.* 1982, Schneider *et al.* 1986
[26] Springer *et al.* 1999
[27] Ainley and Sanger 1979, Baird and Gould 1986, Sanger 1986
[28] Sanger and Ainley 1988
[29] Everett and Pitman 1993, Marchant and Higgins 1990
[30] Heather and Robertson 1997, Marchant and Higgins 1990
[31] Eppley *et al.* 1986, Gould *et al.* 1982, Hunt *et al.* 1981c
[32] Marchant and Higgins 1990
[33] Springer *et al.* 1999
[34] Ogi 1984
[35] Baduini *et al.*2001

Both species also congregate behind ships to feed on offal, creating potential conflict with fishing vessels.[36]

Albatrosses

Albatrosses range widely in the Southern Ocean and the North Pacific. Most of the world's populations of Laysan and black-footed albatrosses breed on the northwestern Hawaiian islands. More recently, Laysan albatrosses have also been found breeding in Mexico. The endangered short-tailed albatross breeds only in Japan. During the northern summer and fall, Laysan, black-footed, and short-tailed albatrosses migrate to Alaska waters and feed from the Aleutian Islands to the Gulf of Alaska. Black-footed Albatrosses are most abundant in the Gulf of Alaska and Laysans are found throughout the Aleutian Islands. Short-tailed albatrosses are most prevalent along the Aleutian Islands and the Bering Sea shelf break from the Alaska Peninsula north towards St. Matthew Island.[37] Some juvenile albatrosses may stay in Alaska year-round.

Albatrosses are large birds with wing spans of six feet or more. Although they are among the largest of birds, they are extremely efficient fliers. Young birds remain at sea for the first several years of their lives. Once they reach sexual maturity, they come to land to breed. The diet of these birds is mostly squid, myctophids, invertebrates, fish eggs, and offal; they are known to travel immense distances in search of food for their chicks. They have the ability to concentrate and store the food they catch for the long flight back to their chicks. Parents feed the chicks by regurgitation at the nest.

By the early 1900s, short-tailed albatrosses were almost exterminated by exploitation on their breeding grounds in Japan. Today, breeding occurs on just two small islands there. The known breeding population in 1987 was 182 birds.[38] This species was listed as endangered throughout its range in 2000 by the U.S, Fish and Wildlife Service. By 2001, there were 1,200 known birds and by June of 2008, the population was estimated at about 2,400 individuals with about 450 to 500 breeding pairs.[39]

Cormorants

Four species of cormorants breed in Alaska: red-faced, pelagic, double-crested, and Brandt's cormorants. Red-faced cormorants are found only in Alaska and on the Commander and Kurile islands of Russia. Pelagic cormorants breed from the Chukchi Sea southward along the North American Coast to Baja California. They are also found on the Pacific coasts of Canada and Asia. Double-crested cormorants nest from Nunivak Island and the eastern Aleutians southward and occupy some inland lakes; they are widespread in the contiguous United States and Canada. The range of Brandt's cormorants lies mostly south of Alaska. Small colonies have been recorded in Southeast Alaska and one historically was recorded at the entrance to Prince William Sound. Currently the only known colony is on Hazy Island in Southeast Alaska where 40 nests were counted in 2000. Winter distributions of Alaska

[36] DeGange *et al.* 1993
[37] USFWS unpubl. data 2003
[38] Amaral 1988
[39] USFWS 2008b

cormorants are similar to breeding distributions, although they will move to ice-free coasts and protected waters.

Nests are built on rocky ledges. The double-crested cormorant sometimes nests in trees. Clutches containing three or four eggs are common and are the largest among cliff-nesting seabirds.

Cormorants usually forage within a few miles of shore.[40] Double-crested cormorants feed in protected bays and estuaries, whereas other species feed primarily along rocky coasts. They all dive to obtain fish near the bottom and may dive up to 120 feet.[41] However, they will also forage on surface fish (e.g., capelin, Pacific herring and sand lance, walleye pollock).[42]

Jaegers, Gulls, and Terns

Jaegers

Three species of jaegers nest in Alaska: parasitic, long-tailed, and pomarine jaegers. Parasitic jaegers nest on islands and mainland tundra along most of the coast from the Beaufort Sea to the Aleutians and northern Gulf of Alaska. Long-tailed and parasitic jaegers nest on upland tundra from the Bering Sea northwards and also in some interior mountain ranges. Pomarine jaegers nest only on the Beaufort Sea coast. All three species are also found in Canada and Eurasia. These three species winter at sea in the southern hemisphere.

The word jaeger comes from the German word *jäger*, meaning hunter. These birds are unique among seabirds in obtaining much of their food from land during the breeding season. They commonly eat lemmings and the eggs and young of other birds. Outside the breeding season they take fish, offal, and carrion and sometimes chase other seabirds to steal their prey.

All three jaeger species nest on the ground and generally lay two eggs. Each of the three species also displays several color morphs or phases.

Gulls

The principal large gulls on the Alaska coast are glaucous, glaucous-winged, and herring gulls. These three species take four years to reach adult plumage (resulting in a large variety of coloration). Hybridization appears to occur where the species overlap. All three gull species nest in a variety of habitats near shore. Normal clutch size for all of these species is two to three eggs. These large gulls are highly opportunistic feeders. A variety of prey is taken from near the surface including capelin, Pacific sand lance, and herring. Invertebrates, carrion, eggs and young of other bird species, and fishing offal are also part of their diets.

Glaucous-winged gulls breed from the Aleutian Islands east and south along the Pacific Coast to northwestern Oregon. Nesting also occurs on inland lakes on southwestern

[40] Gould *et al*. 1982, Hunt *et al.* 1981b
[41] DeGange and Sanger 1986
[42] Ainley and Sanger 1979, Sanger 1983, Schneider and Hunt 1984, Siegel-Causey and Litvinenko 1993

mainland Alaska and on the entire Alaska Peninsula. Outside North America, breeding occurs on the Commander Islands and on the Kamchatka Peninsula of Russia.[43]

In Alaska, glaucous gulls breed from Bristol Bay northward; nesting also occurs inland. These gulls also breed throughout most of low and high arctic Canada and in Eurasia. Winter distribution is dependent on access to open water, and Alaska breeding birds are generally found farther from shore than during the summer. They commonly winter on the Aleutian and Pribilof islands and are found in decreasing numbers south along the coast to Oregon and rarely as far south as California.

Herring gulls have a circumboreal breeding range. Breeding extends from southern Alaska, inland across Canada to Hudson Bay, and south to the North Carolina coast. In North America, it is a year-round resident on the Aleutian Islands, Alaska Peninsula, Kodiak Island, throughout Southeast Alaska, south through British Columbia, on the Great Lakes, and on the Atlantic Coast from Newfoundland to North Carolina. Breeding also occurs in Iceland, Europe, and Russia. The Asian race of the herring gull (*L. a. vegae*) is also a common visitor to western Alaska. This species also nests on inland lakes and rivers.

Four other gull species breed in Alaska (mew, Sabine's, Bonaparte's, and slaty-backed gulls). Mew gulls breed from Kotzebue Sound in northwest Alaska, and east through the Yukon River valley to the Yukon and Northwest Territories of Canada. South of these localities, they breed throughout most of Alaska, south to the Alaska Peninsula. Breeding also occurs in coastal Southeast Alaska, east in Canada to central Mackenzie, and south along the coast to southern British Columbia.[44] Wintering of this species occurs along the Pacific Coast from Southeast Alaska south to Baja California. In Alaska, mew gulls also winter around Kodiak Island, on the Kenai Peninsula, west (very locally) to Bristol Bay, and north to the Tanana River. Frequently they nest on the ground, but nests are also built on cliffs. They are very adaptable and eat almost anything, including human refuse.

Sabine's gulls nest on wet coastal tundra from the Yukon-Kuskokwim Delta, along the north side of the Alaska Peninsula, and northward and eastward to Demarcation Bay on the Alaska-Canada border.[45] Aquatic insects are their primary diet. North American breeding birds winter at sea in the southern hemisphere.

Bonaparte's gulls breed from the Kobuk and Yukon-Kuskokwim deltas, southwest to the base of the Alaska Peninsula, along central and south-coastal Alaska, and rarely in Southeast Alaska.[46] Wintering occurs along the Pacific Coast from southern British Columbia to the Gulf of Mexico. Nests are usually built in trees. Insects are the primary diet during the breeding season, but throughout the rest of the year they also feed on small fish, crustaceans, snails, and marine worms.

[43] Hayward and Verbeek 2008
[44] Moskoff and Bevier 2002
[45] Day *et al.* 2001
[46] Burger and Gochfeld 2002

Slaty-backed gulls breed primarily in the Russian Far East along most of the mainland coast. Nesting continues south through the Kurile Islands and Sea of Okhotsk, to Hokkaido and northern Honshu, Japan.[47] In Alaska this species is a rare spring migrant and summer and fall visitor along the Bering and Chukchi seas. The first confirmed breeding record for Alaska was from Aniktun Island in the Bering Sea in July 1996.[48] In 1997, a pair of slaty-backed gulls was again recorded nesting on Aniktun Island. Wintering of slaty-backed gulls occurs along the coasts of northeast Asia from the Kurile Islands south to China. This species frequently wanders east to the Alaska mainland and to the Aleutian and Pribilof islands.

Kittiwakes

Black-legged and red-legged kittiwakes nest in Alaska. They are gregarious birds that nest in dense colonies on steep cliffs. Both species consume small schooling fish and zooplankton by foraging at the surface of the sea or by shallow dives. Small fishes are the primary diet fed to chicks. Kittiwakes are often dispersed singly when foraging, but they also gather in large flocks over dense patches of prey and occasionally congregate near ships.[49] Flocks are usually fewer than 50 birds, but black-legged kittiwake flocks may be as large as 10,000 birds.[50]

Breeding of red-legged kittiwakes is restricted to the Bering Sea.[51] Eighty percent of the world's population nests on the Pribilof Islands, but other substantial colonies exist on Bogoslof and Buldir islands in the Aleutian Islands.[51] A few nests have been recorded recently at Amak, Koniuji, and Unalaska islands also.[52] Breeding also occurs on the Commander Islands in Russia.[51] Red-legged kittiwakes primarily prey on myctophids, a deepwater species.[53] Squid, amphipods, and euphausiids are of secondary importance at St. George and Buldir islands.[53] Walleye pollock and Pacific sand lance occur only in minor amounts in the diet.[53]

Black-legged kittiwakes breed in Alaska from Point Hope in the Chukchi Sea southwards and are also widespread on the coasts of Canada and Eurasia.[54] The largest colonies have more than 30,000 individuals; most have around 5,000.[55] Generally, black-legged kittiwakes do not forage as far from the breeding grounds as red-legged kittiwakes.[56] The diet of the black-legged kittiwakes consists primarily of walleye pollock, capelin, and Pacific herring and sand lance.[53]

Terns

Terns are slender, fork-tailed birds that are related to gulls and known for their hovering flight pattern. Three species breed in Alaska; Arctic, Aleutian, and Caspian terns. The Arctic

[47] Kondratyev 1991
[48] McCaffery *et al.* 1997a
[49] Irons 1992
[50] Baird and Gould 1986, Gould *et al.* 1982, Hoffman *et al.* 1981, Hunt and Eppley 1981a
[51] Byrd and Williams 1993a
[52] Pers. comm. Jeff Williams, Alaska Maritime National Wildlife Refuge
[53] Ainley and Sanger 1979, Baird and Gould 1986, Dragoo *et al.* 2006, Hunt *et al.* 1981b, Murphy *et al.* 1987, Sanger 1986, Springer *et al.* 1986
[54] Baird 1994
[55] USFWS 2006b
[56] Hunt *et al.* 1981b

tern is known for its extreme Arctic to Antarctic migrations. All three species nest on the ground on flat, wet meadows and sand or gravel flats.

Terns generally feed in protected bays close to their colonies and feeding occurs within a few feet of the water surface. Capelin and Pacific sand lance are the primary prey in some areas, although Arctic terns at sea also take zooplankton.[57] Arctic terns are found on all coasts of Alaska, but they also nest widely inland. The breeding range is circumpolar and extends across Canada, the northern United States, and Eurasia. Alaska breeding birds winter in Antarctica.[58]

Aleutian terns are only found on the coast in Alaska, from the Chukchi Sea to the Gulf of Alaska and in adjacent parts of Siberia.[59] The wintering grounds of the Aleutian tern are mostly unknown, but observations around Indonesia, the east coast of Japan, Brazil,[60] and around Hong Kong[61] suggest that waters in those areas may be part of the winter range.

Caspian terns breed in North American in six regions; Pacific and Atlantic coasts, central Canada, west-central interior United States, Great Lakes, and the Gulf Coast.[62] In Alaska, breeding has been rare, but increasing since the first nesting record in 1996 on the north side of Cape Romanzof in the Bering Sea.[63] The latest nesting records of this species in Alaska are from 2006. Twenty-five pairs were observed nesting at Icy Bay in Southeast Alaska[64] and about 116 pairs were recorded nesting at the mouth of the Copper River.[65] North American birds winter along the Pacific Coast from southern California to Costa Rica, along the Atlantic and Gulf coasts from southernmost North Carolina, south around the Florida Peninsula, west to southern Texas, and south along the coast of Mexico to at least northern Honduras. Breeding also occurs in Eurasia, the southwest Pacific, and Africa.

Alcids

Murres

Common and thick-billed murres nest on sheer cliffs around the coast of Alaska. They lay one egg each year on narrow rock ledges. Some of the largest colonies number over a million birds. Almost all colonies contain both species; but on a Pacific Ocean scale, common murres predominate in the south and thick-bills in the north. Distribution is also influenced by the Alaska Coastal Current with common murres being found almost exclusively at the inner shelf colonies in northern Alaska such as Bluff, Cape Peirce, Cape Newenham, and Nunivak Island.

Both species also breed in Canada and Eurasia, and the common murre nests in smaller numbers on the Pacific Coast of the contiguous United States. Major wintering areas of

[57] Baird and Gould 1986, Hunt *et al.* 1981b, Sanger 1983,
[58] Hatch 2002
[59] North 1997
[60] Hill and Bishop 1999
[61] Kennerly *et al.* 1993
[62] Cuthbert and Wires 1999, Wires and Cuthbert 2000
[63] McCaffery *et al.* 1997b
[64] Michelle Kissling, USFWS, pers. comm.
[65] Tyee, Teal, and Trae Lohse and Aaron Lang, Cordova, AK, pers. comm.

Alaska murres include the open Bering Sea south of the ice pack, open polynyas (any non-linear area of open water surrounded by sea ice) within the ice pack, bays on the north side of the Aleutian Chain and Gulf of Alaska, and in northern British Columbia.[66]

Murres forage for food over the continental shelf; thick-billed murres forage closer to the shelf edge than common murres.[67] Murres dive deep. Most dives are less than 150 feet, but dives have been recorded up to about 600 feet.[68] Prey species include fish, such as, walleye pollock, capelin, Pacific sand lance and herring, and flatfish or sculpins. Myctophids, euphausiids, and squid are also important in the diet. The frequency at which these prey groups occur varies widely between years and exhibits significant geographic variability.[69]

Dovekie

This small auklet is found in high-arctic regions, particularly Greenland. A few small colonies are also found in northeastern Canada and Eurasia. Small numbers (about 60) possibly breed in Alaska on Little Diomede and St. Lawrence islands in the northern Bering Sea; they have also been seen near King, St. Matthew, and the Pribilof islands in the Bering Sea.[70] Based on 2007 surveys of northern Bristol Bay, dovekies may be more abundant in Alaska than previously thought.[71] Little is known of this species occurrence or ecology in Alaska.

Guillemots

Two species of these medium-sized alcids breed along the coast of Alaska. Pigeon guillemots breed from south of Cape Thompson in the Chukchi Sea, south to California, throughout the Aleutian Islands, and along the eastern shores of Siberia. The breeding range of black guillemots is circumpolar. They are distributed across much of the Canadian Arctic, north to Greenland, and across Eurasia. In Alaska, black guillemots are an uncommon breeder from Cape Thompson and Cape Lisburne on the Chukchi Sea and around Point Barrow east to Igalik Island. They are found more rarely east to Barter Island. Both species generally nest near the shoreline. Two eggs are laid in crevices, under boulders or driftwood, and at the base of tree roots. Black guillemots also nest in artificial objects such as boxes.[72] Some guillemots nest with other species in large colonies, but many nest in groups of a few pairs dispersed along the shoreline. Black guillemots winter in the ice pack as far north as open water leads are present in the Bering Sea and no further south than the edge of the pack ice in the central Bering Sea. Guillemots forage in shallow water (less than 75-feet deep) near the shore in protected bays and off rocky coasts.[73] The diet of pigeon guillemots is diverse and includes Pacific herring and sand lance; capelin; bottom-dwelling fish such as sculpins; and invertebrates.[74] Black guillemots also feed on fish and invertebrates.

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[66] Forsell and Gould 1981, Gould *et al.* 1982, Hogan and Murk 1982, Trapp 1982
[67] Hunt *et al.* 1981c, Kinder *et al.* 1983, Schneider and Hunt 1984
[68] Barrett and Furness 1990, Bryant and Jones 1999, Burger 1991, Burger and Simpson 1986, Croll *et al.* 1992, Piatt 1987, Piatt and Nettleship 1985
[69] Dragoo *et al.* 2006
[70] USFWS 2006b
[71] USFWS 2007d
[72] Butler and Buckley 2002, Ewins *et al.* 1993, Kuletz 1983
[73] Ewins *et al.* 1993, G. Golet, USFWS, unpubl. data
[74] Ainley and Sanger 1979, DeGange and Sanger 1986, Golet *et al.* 2000, Kuletz 1983

Murrelets
Three species of murrelets breed in Alaska: marbled, Kittlitz's, and ancient murrelets. All of the North American and most of the world population of Kittlitz's murrelets breed from the Chukchi Sea to the southeastern Panhandle in Alaska and in nearby Siberia.[75] Marbled murrelets breed from the Aleutians south to central California. They are also found in Asia.[76] ancient murrelets nest in the Aleutian Islands, the Gulf of Alaska, and in Southeast Alaska. They also breed in Canada and Asia.[77] Sheltered bays of Kodiak Island, Southeast Alaska, Cook Inlet, Prince William Sound, and the Gulf of Alaska are important to wintering Kittlitz's and marbled murrelets.[78]

Ancient murrelets are semi-colonial and usually nest in burrows in loose soil. Kittlitz's murrelets nest on the scree of barren mountain slopes, sometimes many miles from the sea. Marbled murrelets make a nest primarily on branches of coniferous trees in old-growth and mature forests, but they also nest on the ground. Marbled and Kittlitz's murrelets are solitary nesters and lay one egg each year. Ancient murrelets usually lay two eggs.

Murrelets forage close to shore in bays and inlets. Ancient murrelets, however, also forage at sea over the continental shelf.[77] All feed on small fish such as Pacific sand lance and capelin.[79] Some zooplankton and other invertebrates are also consumed by Kittlitz's and ancient murrelets.[80] Marbled murrelets forage in shallow waters within three miles of shore and are associated with sites of upwellings or small fronts that might make prey available.[81] Kittlitz's murrelets prefer inlets and often forage near glaciers.[82]

Auklets
Five species of auklets breed in Alaska: Cassins's, crested, least, parakeet, and whiskered auklets. Together with the murrelets, these species provide Alaska with the most diverse community of small auks anywhere in the world. Least auklets are the most abundant breeding seabirds in Alaska.[83]

All of these auklets nest in cliff crevices, burrows, or in rock piles (talus) and lay one egg each year. Except parakeet and Cassin's auklets, all can be found in large flocks at sea and nest in dense aggregations.

Least, crested, parakeet, and whiskered auklets breed only in Alaska and the Russian Far East.[84] Both least and crested auklets breed from the Bering Strait to the Alaska Peninsula and the Aleutian Islands.[85] Parakeet auklets breed in those same areas and in the western

[75] Day *et al.* 1999
[76] Nelson 1997
[77] Gaston 1994
[78] Day *et al.* 1999, Ewins 1993, Forsell and Gould 1981, Nelson 1997, Trapp 1982
[79] Ainley and Sanger 1979, Gould *et al.* 1982, Sanger 1983
[80] Ewins *et al.* 1993, Gaston 1994, Sanger 1987a, Springer *et al.* 1993
[81] Kuletz *et al.* 1995, Nelson 1997
[82] Day and Nigro 2000, Day *et al.* 1999, Ostrand *et al.* 1998, Sanger 1987b
[83] USFWS 2006b
[84] Byrd and Williams 1993b, Jones 1993a, 1993b, Jones *et al.* 2001
[85] Jones 1993a, Jones 1993b

Gulf of Alaska.[86] Cassin's auklets nest from the Aleutian Islands south to Baja California.[87] The breeding range of whiskered auklets is small; they nest only in the Aleutians and the Kurile Islands of Russia. In winter, they remain near breeding areas.[88]

Crested auklets also winter near the breeding areas, whereas least auklets winter in the open Bering Sea and southward.[89] The wintering range of Cassin's auklets is poorly known. Southern populations are mostly resident, while northern populations migrate further south after the breeding season. Parakeet auklets move offshore in winter and move further south and into the central South Pacific Ocean.

Auklets forage by pursuit diving to moderate depths.[90] Prey includes zooplankton, small fish, squid, jellyfish, and invertebrates. Water structures, such as fronts, tidal rips, pycnoclines, and shallow sills concentrate these types of small prey and are sought out by auklets.[91]

Puffins

Horned and tufted puffins are familiar species in the puffin group. Despite its common name, the less familiar rhinoceros auklet is also included in this group as it is much closer in size, behavior, and anatomy to the two puffins than to other auklets. Rhinoceros auklets and tufted puffins dig burrows for their nest sites. Horned puffins usually nest in crevices in the cracks of cliffs or between talus blocks. All lay one egg each year.

Tufted and horned puffins breed throughout Alaska from the Chukchi Sea southward. Populations of both species are concentrated in Alaska, although both breed in eastern Asia and the tufted puffin also breeds in Canada and the western United States. Puffins disperse in winter to the deep waters of the central North Pacific Ocean; a few tufted puffins remain as year-round residents among islands from Kodiak to Attu.[92]

In Alaska, rhinoceros auklets breed at Chowiet Island in the Semidi Islands, Middleton Island and the Chiswell Islands in the Gulf of Alaska, and at St Lazaria and Forrester islands in Southeast Alaska.[93] They are also a probable breeder at Buldir Island in the Aleutian Islands in very small numbers (about 30 birds).[94] Breeding also occurs on offshore islands throughout the temperate waters of the North Pacific as far west as Japan and as far south as Southern California.[95] The North American breeding population winters in Pacific waters, from Southeast Alaska to southern Baja California.[96] Birds that breed outside North America

[86] Jones *et al.* 2001
[87] Manuwal and Thoresen 1993
[88] Byrd and Williams 1993b
[89] Gould *et al.* 1982, Jones 1993a,1993b
[90] Ashmole and Ashmole 1967
[91] Ainley and Sanger 1979, Gould *et al*. 1982, Hunt 1990, Hunt *et al.* 1981b and 1981c, Hunt *et al.* 1990, Hunt *et al.* 1993
[92] Piatt and Kitasky 2002a, 2002b
[93] USFWS 2006b
[94] Gibson and Byrd 2008
[95] Gaston and Deschne 1996
[96] Morgan 1989, Morgan *et al.* 1991

do not move far outside the breeding range, but occur as far south as Tokyo, and occasionally Kyushu and northeastern China.[97]

All three alcids forage near shore and over the continental shelf, but rhinoceros auklets feed primarily near shore and the puffins forage primarily over the shelf or beyond it.[98] Small schooling fish such as, capelin and Pacific sand lance are taken by all three species. The puffins also eat walleye pollock, squid, and zooplankton.

[97] Brazil 1991, Meyer de Schauensee 1984

[98] DeGange and Sanger 1986, DeGange *et al.* 1985, Gould *et al.* 1982, Hunt *et al.* 1981b, Sanger 1987b, Schneider *et al.* 1986

SEABIRD HABITAT

All descriptions of seabird nesting, feeding, and roosting habitat were taken directly from Kessel.[99]

Breeding Habitat

Most seabirds spend the largest part of their lives at sea, coming to land only to breed. To successfully reproduce, they need nesting areas that are the appropriate habitat for each species, close to concentrations of prey, and safe from predators.

Marine Areas

More than 70 percent of seabird breeding habitat in Alaska occurs on the Alaska Maritime National Wildlife Refuge (Figure 3) along with most of the breeding seabirds. This refuge stretches along Alaska's coastlines from the southeast Panhandle, west to Attu Island at the tip of the Aleutian Chain, and north through the Bering Sea to above the Arctic Circle. It is the most extensive refuge in the entire National Wildlife Refuge System and hosts about 40 million breeding seabirds.[100]

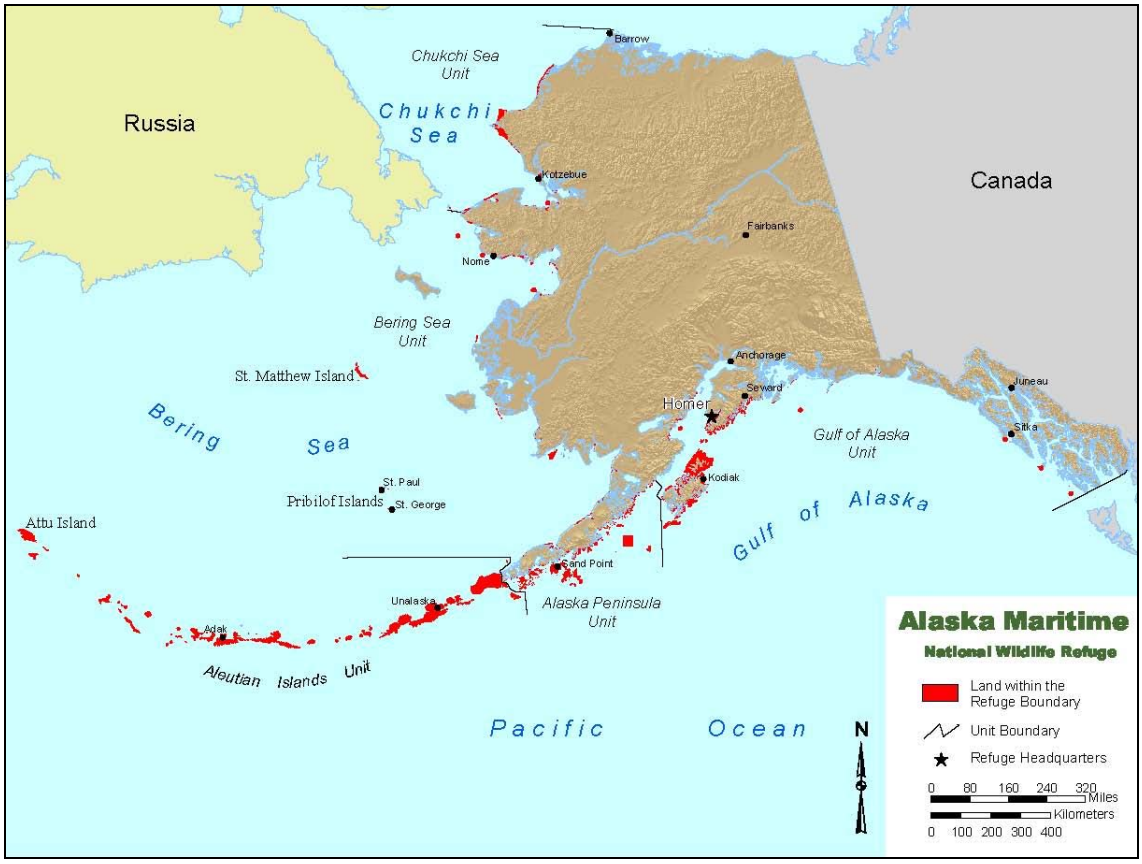


Figure 3. Map of Alaska Maritime National Wildlife Refuge.

[99] Kessel 1979
[100] USFWS 2007a

The following types of substrates are found in marine areas and provide nesting habitat for most species of seabirds that breed in Alaska. These habitats predominantly lack vascular vegetation. The surfaces may be vertical or horizontal. After the description of the habitat type are some examples of the types of seabirds found there.

Barrier Islands
Barrier islands usually have little or no vegetation and are generally formed in a series parallel to shallow coastlines by wave action and currents. Glaucous gulls, Arctic and Aleutian terns, and black guillemots are found in this habitat.

Cliffs and Block-fields (Boulder Fields)
Numerous species of seabirds use cliffs, block-fields, and associated crevices in coastal areas to nest. Least and crested auklets, northern fulmars, common and thick-billed murres, red-legged and black-legged kittiwakes, horned puffins, and cormorants all may be found nesting in such habitats.

Subterranean Soil
Burrows in soil substrate are used for nesting by leach's and fork-tailed storm-petrels, tufted puffins, rhinoceros, parakeet, and Cassin's auklets, and ancient murrelets.

Alluvia and Moraines
Unvegetated glacial deposits and alluvial deposits of gravel, sand, and silt are used by Caspian and Arctic terns for nesting. Kittlitz's murrelets nest on scree.

Fresh or Brackish Water Areas
Although seabirds generally nest on islands, cliffs, or headlands surrounded by saltwater, several species of Alaska seabirds may also nest inland near fresh or brackish waters. More than three million lakes, over 12,000 rivers, and thousands of streams and creeks provide diverse habitat of this type in Alaska.

Lacustrine Waters and Shorelines
All surface waters of lakes and ponds and their immediate shorelines are included in this habitat type. Associated aquatic meadows of submerged and floating vegetation, and open or sparse emergent vegetation are included. Bonaparte's and mew gulls use this habitat for nesting.

Shorelines of Fluviatile Waters
Immediate shorelines of all flowing surface waters such as streams and rivers comprise this habitat type. Glaucous, glaucous-winged, and mew gulls nest in this habitat.

Meadows
Dominated by herbaceous plants, most frequently graminoids.

Grass Meadows and Tundra
Relatively dry substrate dominated by grasses. Shrubs are sparse or absent. Some seabird species such as the rhinoceros auklet and ancient murrelet dig nests on slopes

and on islands covered in grass or dense forbs. Aleutian terns are also known to nest in grass or sedge meadows. Pomarine, parasitic, and long-tailed jaegers are examples of some seabird species that use the tundra regions to nest.

Salt Grass Meadows
These meadows are subject to periodic tidal inundations resulting in a saline substrate. Sabine's gulls may nest in this habitat.

Coniferous Forests
Closed or open stands of trees in which coniferous species comprise 90 percent or more of the tree canopy. Marbled murrelets use old-growth, coniferous forests for nesting.

Artificial Habitats
Some birds are willing to nest in or on human-made habitats include bridges, buildings, towers, bird nest boxes, discarded fuel barrels, garbage dumps and other refuse sources. *Larus* gulls, black-legged kittiwakes and black and pigeon guillemots nest in such habitats.

Feeding habitat
During the breeding season, seabirds are tied to their colonies to lay eggs and rear chicks. Major constraints during that time are the distance between the colony and feeding zones at sea,[101] and food abundance.[102] Therefore, most seabirds depend on one or more oceanographic feature or process (upwellings, stratification, ice and shelf edges, passes, fronts, and tidal currents) to concentrate their prey.[103] Some seabirds, such as shearwaters, nest and raise their young in the southern hemisphere, but come to Alaska in the austral winter to feast on northern oceans resources. Other species such as albatrosses and the Hawaiian dark-rumped petrel also breed outside Alaska, but make long journeys during the breeding season to Alaska to feed. Winter foraging ecology is not known for most species.[104] Limited information suggests that in winter many seabirds consume a greater variety of fish as well as higher proportions of zooplankton and invertebrates compared with summer.[105]

Marine Waters
Marine water habitats are generally defined by the distance from shore and water depth. Alaska has some of the most productive marine regions of the world including the Gulf of Alaska, the Bering, Beaufort, and Chukchi Seas. Seabirds use the following habitat types to forage.

Nearshore Waters
Nearshore waters are protected coastal waters such as bays, fjords, lagoons, and inlets. Generally, the shoreline is three times the width of the opening of the water body and

[101] Weimerskirch and Cherel 1998
[102] Cairns 1992, Croxall and Rothery 1991, Furness and Monaghan 1987, Golet *et al.* 2000, Murphy *et al.* 1984, 1987, Springer 1991
[103] Coyle *et al.* 1992, Elphick and Hunt 1993, Hunt 1997, review in Hunt *et al.* 1999, Hunt and Harrison 1990, Schneider *et al.* 1987, Springer *et al.* 1999
[104] Hunt *et al.* 1999
[105] Sanger 1986, 1987a

depths are less than 60 feet. Heavy wave action of more exposed coastlines is largely absent. *Larus* gulls, black-legged kittiwakes, Arctic terns, pigeon guillemot, and murrelets, use nearshore waters.

Inshore Waters
Inshore waters are exposed coastal waters less than 120 to 150 feet deep, generally within 3.6 miles to seaward of outer mainland coastal points and islands around major offshore land masses, but inside of the inner oceanographic front. Waters in these areas retain shore influences such as runoff and are shallow enough for some bird species to feed on or near the bottom. Cormorants, *Larus* gulls, black-legged kittiwakes, Arctic terns, common murres, pigeon guillemots, murrelets, whiskered auklets, and horned puffins use the inshore waters.

Offshore Waters
Offshore waters are generally 3.6 miles seaward of the inner oceanographic front with depths greater than 150 feet. Waters beyond this distance are outside most land influences and birds found in offshore waters have pelagic feeding habits. Offshore waters are further divided into the following:

Mid-continental Shelf
This category includes waters from the inner oceanographic front to the middle front with depths of 150 to 200 feet. Common and thick-billed murres, tufted and horned puffins, and black-legged kittiwakes forage in the mid-continental shelf.

Outer Continental Shelf
This encompasses waters from the middle oceanographic front to the shelf break front. Depths are usually 300 to 450 feet, but may be shallower where the mid-continental shelf habitat is absent. Seabirds found in this habitat are northern fulmars, flesh-footed shearwaters, fork-tailed storm-petrels, and red-legged kittiwakes.

Shelf Break
Here the outer continental shelf starts its slope or drop toward the ocean bottom. Water depths are from 450 to 600 feet. Water mixing in this dynamic front fosters a high density of food resources. Birds from both the adjacent outer continental shelf and the oceanic waters habitats frequently concentrate in this food-rich zone.

Oceanic Waters
The open sea beyond the shelf break front has water depths of greater than 600 feet, often exceeding 3,000 feet. Seabirds using the oceanic waters are albatrosses, northern fulmars, shearwaters, and storm-petrels.

Sea-ice Edge
This is the interface of marine waters and sea-ice, either at the edge of or within the sea ice front or at the edge of shorefast ice. In late winter, the undersurface of the ice

supports a dense growth of micro-algae and other organisms;[106] wind-generated upwelling may occur at sea-ice interfaces. Some seabirds normally found inshore also occur offshore in this habitat, especially during migration, using the ice platform in lieu of land (i.e., glaucous, ivory, and Ross' gulls; common and thick-billed murres; and black guillemots).

Roosting habitat

Roost sites are another important habitat for seabirds and all of the above habitats may be used to roost. Birds require these sites to rest, preen, and dry plumage. Communal roosting may facilitate finding prey and potentially benefit social functions such as mate selection.[107] Pelagic seabirds such as albatrosses and petrels return to land only to breed and use the colony for roosting at that time. Species that forage closer to shore (e.g., cormorants) return to land regularly to roost during the breeding and nonbreeding seasons.

[106] McRoy and Goering 1974
[107] Beauchamp 1999, Camphuysen 1998

SEABIRD CONSERVATION DESIGNATIONS

Birds of Conservation Concern (BCC)/Bird Conservation Regions (BCRs)

The 1988 amendment to the Fish and Wildlife Conservation Act mandated the Service to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973." The first effort to carry out this mandate resulted in the 2002 compilation of the *Birds of Conservation Concern*.[108] A revised list of the Birds of Conservation Concern was finalized in December of 2008.[109] The entire 2008 report can be found online: http://library.fws.gov/Bird_Publications/BCC2008.pdf. These two documents identify the bird species (not including those already listed as federally threatened or endangered) that represent the highest Service conservation priorities.

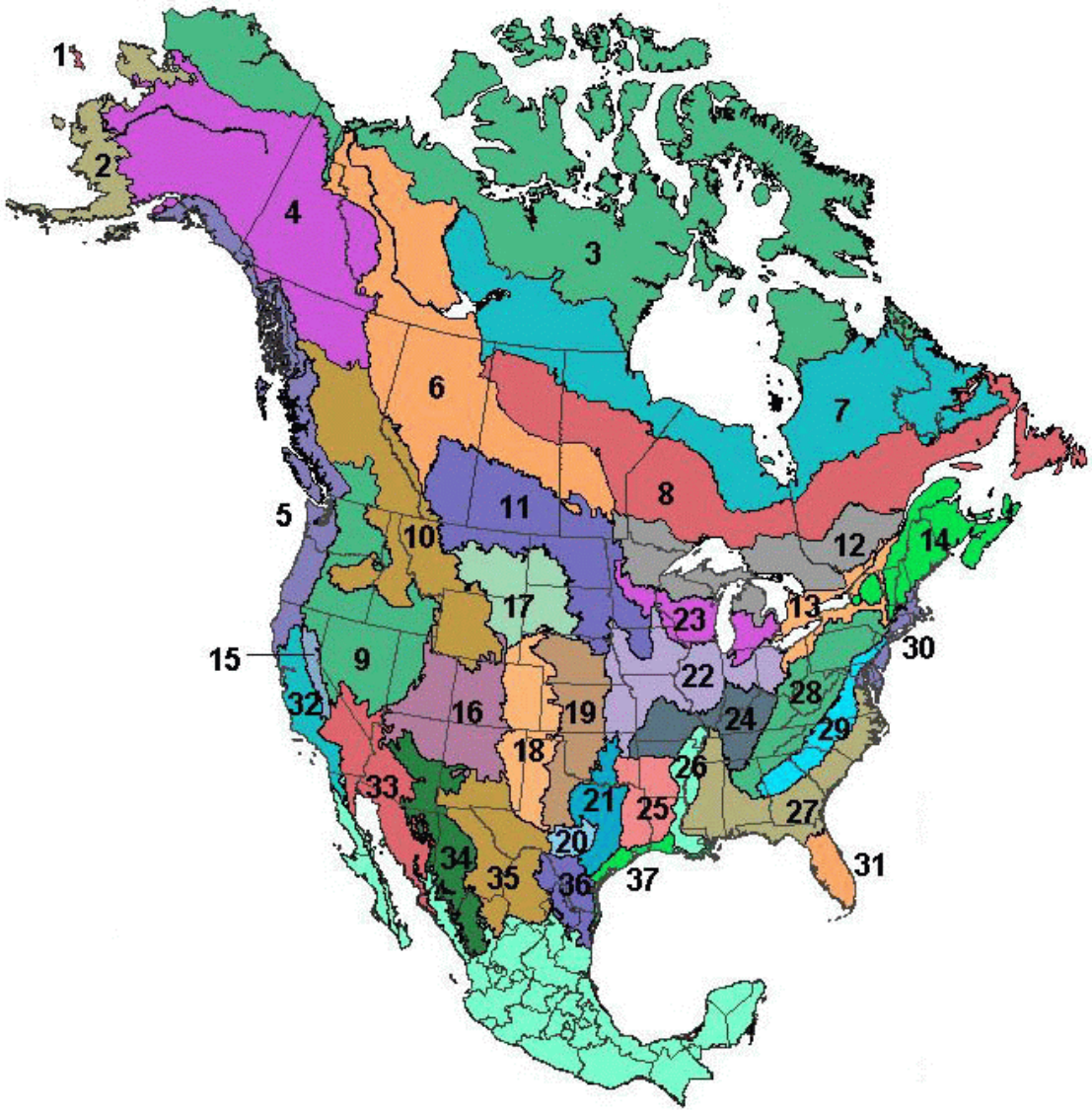
The goal of the Birds of Conservation Concern Program is to prevent or remove the need for additional Endangered Species Act listings by implementing proactive management and conservation actions for BCC listed species. The geographic scope of the BCC endeavor is the entire United States, including island territories in the Pacific and Caribbean. Three distinct geographic scales are represented in the 2008 *Birds of Conservation Concern*: North American Bird Conservation Regions (*see below*), USFWS regions, and National regions. The scales are derived from Bird Conservation Region assessment scores from three major bird conservation plans: Partners in Flight North American Landbird,[110] U.S. Shorebird Conservation,[111] and North American Waterbird Conservation[112] plans. Assessment scores are based on several factors including population trends, threats, distribution, abundance, and relative density. These assessment scores serve as the foundation on which BCC lists are built and can be used to develop a comprehensive set of integrated bird conservation priorities.

Bird Conservation Regions (BCRs) are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues. There are 37 BCRs in North America including Hawaii, Alaska, Canada, and northern Mexico (Figure 4). Two additional BCRs were created for the purposes of defining BCC for U.S. Pacific and Caribbean islands. There are eight USFWS administrative regions each encompassing multiple states in the same geographic area (except Alaska, which is its own region). The National list encompasses the entire United States.

Alaska sits within five BCRs (Figure 4, Table 2). The BCC list for BCR1 (Aleutian and Bering Sea islands) includes 10 seabird species; BCR 2 (Western Alaska) includes six seabird species; BCR 3 (U.S. Arctic Plains and Mountains) includes only the Arctic tern; BCR 4 (U.S. portion of the Northwestern Interior Forest) does not include any seabirds; and BCR 5 (U.S. portion of the Northern Pacific Forest) includes nine seabird species. Seven Alaska seabird species are on the national BCC list and 10 seabird species are on the Service-Region 7 BCC list (Table 2). Responsibilities for species on the BCC lists are shared by all of the relevant Service Divisions.

[108] USFWS 2002b
[109] USFWS 2008a
[110] Rich *et al.* 2004
[111] Brown *et al.* 2001; 2004
[112] Kushlan *et al.* 2002

Figure 4. Map of Bird Conservation Regions (BCRs) (excluding Pacific and Caribbean Regions).[113]



[113] USFWS 2008a

* This figure does not show BCR 67 (Hawaii), or the Pacific Islands or Caribbean BCRs.

Table 2. Alaska Seabird Species on 2008 Birds of Conservation Concern (BCC) Lists: National, Region 7, and BCRs 1-5.[114] Source: USFWS 2008a.

NATIONAL BCC LIST	REGION 7 BCC LIST	BCR 1 ALEUTIAN & BERING SEA ISLANDS	BCR 2 WESTERN ALASKA	BCR 3 U.S. ARCTIC PLAINS & MOUNTAINS	BCR 4 NW INTERIOR FOREST (U.S.)	BCR 5 U.S. NORTHERN PACIFIC FOREST
Black-footed Albatross Red-legged Kittiwake Aleutian Tern Marbled Murrelet[c] Kittlitz's Murrelet[a] Xantu's Murrelet[a] Whiskered Auklet	Laysan Albatross[nb] Black-footed Albatross[nb] Red-faced Cormorant Pelagic Cormorant Red-legged Kittiwake Arctic Tern Aleutian Tern Marbled Murrelet[c] Kittlitz's Murrelet[a] Whiskered Auklet	Laysan Albatross[nb] Black-footed Albatross[nb] Red-faced Cormorant Pelagic Cormorant Red-legged Kittiwake Arctic Tern Aleutian Tern Marbled Murrelet[c] Kittlitz's Murrelet[a] Whiskered Auklet	Red-faced Cormorant Pelagic Cormorant Arctic Tern Aleutian Tern Marbled Murrelet[c] Kittlitz's Murrelet[a]	Arctic Tern	None	Black-footed Albatross[nb] Laysan Albatross[nb] Red-faced Cormorant Pelagic Cormorant (*pelagicus* ssp.) Caspian Tern Arctic Tern Aleutian Tern Marbled Murrelet[c] Kittlitz's Murrelet[a]

[114] (a) ESA candidate, (b) ESA delisted, (c) non-listed subspecies or population of Threatened or Endangered species, (d) MBTA protection uncertain or lacking, (nb) non-breeding in this BCR.

Important Bird Areas (IBAs)

The Important Bird Areas Program was initiated by BirdLife International in Europe in 1989.[115] BirdLife International is a global coalition of more than 100 country partner organizations. More than 8,000 sites in 178 countries have been identified as IBAs, with many national and regional IBA inventories. As the U.S. partner of BirdLife International, the National Audubon Society launched its IBA initiative in 1995 and has selected more than 1,500 sites in the continental United States.[116]

IBAs are sites that provide essential habitat for one or more species of birds. These areas represent breeding, wintering, and/or migration habitat for birds. Sites may be a few acres or thousands of acres in size, on public or private lands, and areas may be protected or unprotected. There is no legal power attached to an IBA designation. Conservation of certain sites, however, may require a formal protected area designation. In other cases, protection may be achieved through conservation easements, land purchases, and voluntary stewardship initiatives.

Sites are first identified as Important Bird Areas through a process at the state level. Once these sites are reviewed by the state committees and determined to meet established IBA selection criteria, they officially gain the status of identified Important Bird Areas. Some IBAs are of greater significance than others. Identified IBAs are prioritized for conservation action by evaluating the data associated with each site against criteria that are relevant at a continental and global scale. The IBA identification process provides a data-driven means for cataloging the most important sites for birds throughout the United States and the world and promotes actions to safeguard key bird habitats.

To qualify as an IBA, sites must satisfy at least one of the following criteria by supporting: species of conservation concern (e.g., threatened and endangered species), restricted-ranges species (species vulnerable because they are not widely distributed), species that are vulnerable because their populations are concentrated in one general habitat type or biome, or species or groups of similar species (such as seabirds, waterfowl, and shorebirds) that are vulnerable because they occur at high densities due to their congregatory behavior.

In Alaska, 145 state IBAs have been officially designated (Figure 5). The majority of those 145 IBAs are also recognized as globally or continentally significant. In fact, Alaska has almost half of all globally significant IBAs identified in the United States. Many of the IBAs in Alaska, particularly in the Bering Sea Region, were designated for seabirds, but some include habitat for waterfowl, shorebirds, and passerines. To view a map (Figure 5) of all of Alaska's IBAs follow this link: http://www.audubon.org/bird/iba/alaska/AK_IBA_map.pdf or read short profiles for each area: http://iba.audubon.org/iba/stateIndex.do?state=US-AK.

After several years of collaboration, the United States, Russia, and Asian countries identified 137 sites (including 20 marine sites) that qualify as IBAs in the Bering Sea ecoregion. A technical committee of Russian cooperators, U.S. Fish and Wildlife Service biologists, and

[115] Birdlife International 2007
[116] National Audubon Society 2004

others reviewed the proposed sites. This resulted in approximately 90 sites being recognized as IBAs (about 50 in Alaska and about 40 in Russia).

In October 2001, Audubon Alaska initiated a second IBA project in the Cook Inlet watershed of Southcentral Alaska. Based on information provided by wildlife agencies, Audubon chapters, major landowners, and others in the Cook Inlet area, a total of 24 sites were proposed. The national IBA technical committee reviewed these sites and recognized 22 of them as IBAs.

Information about U.S. IBAs can also be queried by species, site name, or habitat type through an interactive IBA search tool online at the following website: http://iba.audubon.org/iba/siteSearch.do.

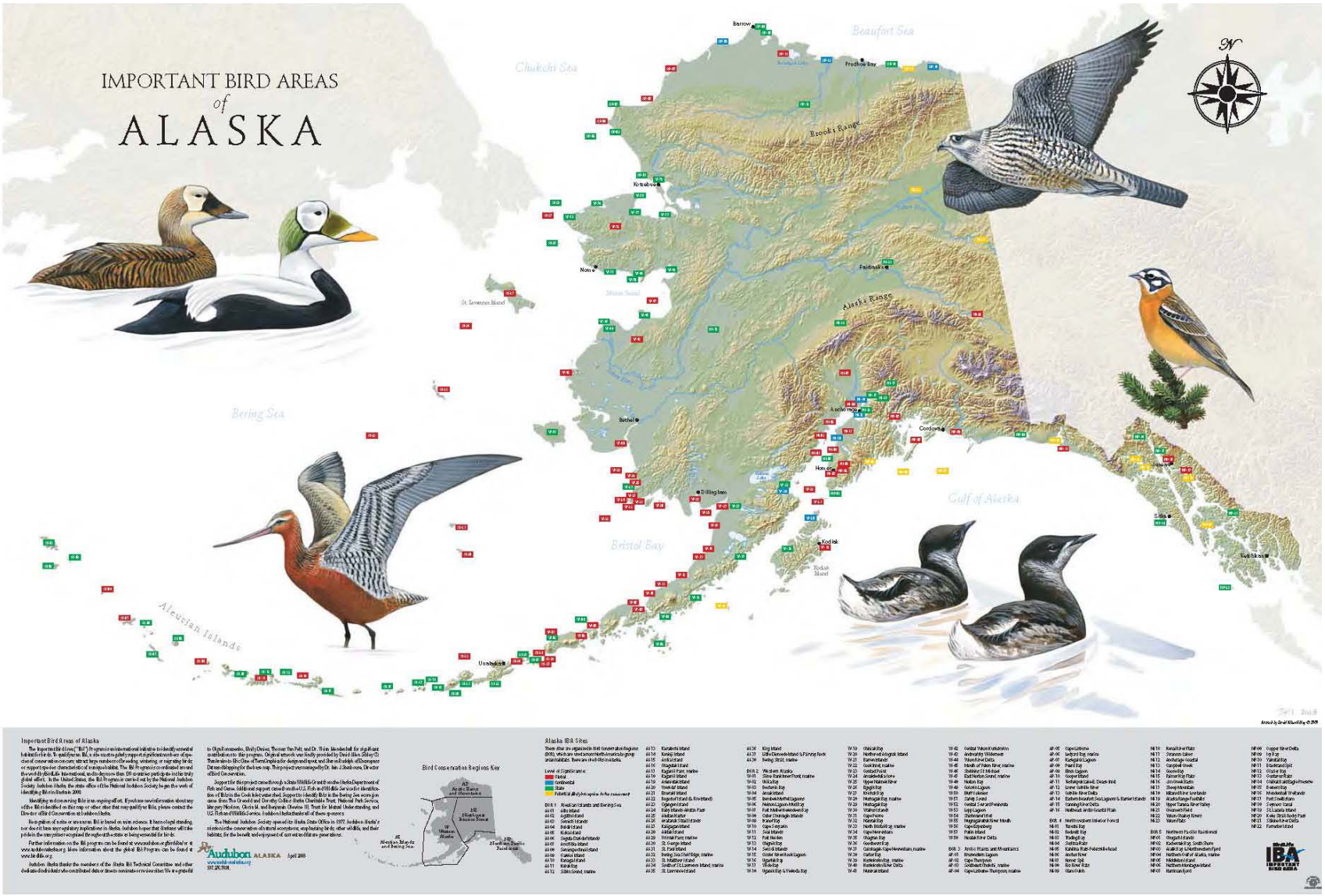


Figure 5. Map of Important Bird Areas of Alaska. Source: Audubon Alaska.

CONSERVATION STATUS ASSESSMENTS FOR SEABIRDS

Global Conservation Status

IUCN – The International Union for the Conservation of Nature has been assessing the conservation status of animal species globally for more than four decades. Assessments highlight taxa that are threatened with extinction and promote their conservation. Conservation Status Categories used in the IUCN Red List of Threatened Species have become widely recognized internationally. They are used in a range of publications and listings by the IUCN and numerous governmental and non-governmental organizations. Therefore, the IUCN Conservation Status Categories for seabirds were chosen to represent the global conservation status for the species accounts in this Alaska Seabird Plan (Table 3).

The IUCN Red List Categories and Criteria were designed for global taxon assessments. Categories used are Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, Least Concern, Data Deficient, and Not Evaluated. Detailed descriptions of the Categories and Criteria used can be found at the following IUCN website: http://www.iucnredlist.org/info/categories_criteria2001.

North American Conservation Status

The North American Conservation Status used in the species accounts in this plan (Table 3) is derived from the North American Waterbird Conservation Plan, Waterbird Conservation for the Americas.[117] The North American Plan is based on a continental framework for the conservation and management of 210 species of waterbirds. Groups of waterbirds include seabirds, coastal waterbirds, wading birds, and marshbirds. The scope of the North American Plan encompasses aquatic habitat in 29 nations throughout North America, Central America, the islands and pelagic waters of the Caribbean Sea and western Atlantic, and the U.S.-associated Pacific Islands and pelagic waters of the Pacific Ocean.

The process for assigning colonial birds to categories of conservation concern in the North American Plan was adapted from the Partners in Flight (http://www.partnersinflight.org) and U.S. Shorebird Conservation Plan guidelines (http://www.fws.gov/shorebirdplan) and accommodates the special conservation issues of species that aggregate during the breeding season and/or use extensive marine habitats.

Six factors that reflect vulnerability to population decline were used to determine conservation status. These factors were scored and each species was assigned to a category of conservation concern using a step categorization process. The factor scores do not reflect global status for those species occurring outside of the North American Plan. Three factors are based on quantitative information (population size, breeding distribution, nonbreeding distribution) and three on qualitative information (population trends, threats to breeding populations, threats to nonbreeding populations). All factors are scaled from one

[117] Kushlan *et al.* 2002

to five, with five indicating the greatest vulnerability. Each species was assigned to a category of conservation concern based on these factor scores. Five categories of conservation concern were developed (Highly Imperiled, High Concern, Moderate Concern, Low Concern, and Not Currently at Risk).

The reader is referred to the North American Waterbird Conservation Plan[118] for a species list including the factor scores, rules used for the categories of conservation concern for each species, and a detailed explanation of the protocol.

Alaska Conservation Status

Protocol used to determine the conservation status of seabirds in Alaska is the same protocol used in the North American Waterbird Conservation Plan.[118] When applied at the regional (State of Alaska) level, however, it must be recognized that a continental category may not be the same as a regional category for a particular species. For example, taxa classified as Least Concern nationally might be Critically Endangered within a particular region where numbers are very small or declining. Conversely, taxa classified as Vulnerable based on national declines in numbers or range might be Least Concern within a particular region where their populations are stable. Regional status might also vary from national status based on a species being endemic to the region or the majority of the breeding population occurring in the region.

[118] Kushlan *et al.* 2002

Table 3. Conservation Status for Alaska Breeding Seabirds.

Species	Global Status	N. American Status	Alaska Status
Aleutian Tern	Least Concern	High Concern	High Concern
Ancient Murrelet	Least Concern	High Concern	Highly Imperiled
Arctic Tern	Least Concern	High Concern	High Concern
Black Guillemot	Least Concern	Not Currently at Risk	Moderate Concern
Black-legged Kittiwake	Least Concern	Not Currently at Risk	Moderate Concern
Bonaparte's Gull	Least Concern	Moderate Concern	Not Currently at Risk
Brandt's Cormorant *	Least Concern	High Concern	Not Currently at Risk
Cassin's Auklet	Least Concern	Moderate Concern	High Concern
Caspian Tern *	Least Concern	Low Concern	Not Currently at Risk
Crested Auklet	Least Concern	Moderate Concern	Moderate Concern
Double-crested Cormorant	Least Concern	Not Currently at Risk	Not Currently at Risk
Dovekie*	Least Concern	Moderate Concern	Not Currently at Risk
Fork-tailed Storm-Petrel	Least Concern	Not Currently at Risk	Low Concern
Glaucous Gull	Least Concern	Not Currently at Risk	Not Currently at Risk
Glaucous-winged Gull	Least Concern	Low Concern	Not currently at Risk
Herring Gull	Least Concern	Low Concern	Low Concern
Horned Puffin	Least Concern	Moderate Concern	Moderate Concern
Kittlitz's Murrelet	Critically Endangered	High Concern	High Concern
Least Auklet	Least Concern	Moderate Concern	Moderate Concern
Leach's Storm-Petrel	Least Concern	Low Concern	Moderate Concern
Long-tailed Jaeger	Least Concern	Low Concern	Not Currently at Risk
Marbled Murrelet	Endangered	High Concern	High Concern
Mew Gull	Least Concern	Not Currently at Risk	Not currently at Risk
Northern Fulmar	Least Concern	Moderate Concern	Moderate Concern
Parakeet Auklet	Least Concern	Low Concern	Low Concern
Parasitic Jaeger	Least Concern	Low Concern	Low-Moderate Concern
Pelagic Cormorant	Least Concern	High Concern	High Concern
Pigeon Guillemot	Least Concern	Moderate Concern	Moderate Concern
Pomarine Jaeger	Least Concern	Low Concern	Low Concern
Red-faced Cormorant	Least Concern	High Concern	High Concern
Rhinoceros Auklet	Least Concern	Low Concern	Low Concern
Red-legged Kittiwake	Vulnerable	High Concern	Highly Imperiled
Sabine's Gull	Least Concern	Low Concern	Low Concern
Slaty-backed Gull *	Least Concern	Information Lacking	Not Currently at Risk
Thick-billed Murre	Least Concern	Moderate Concern	Not Currently at Risk
Common Murre	Least Concern	Moderate Concern	Low Concern
Tufted Puffin	Least Concern	Low Concern	Not Currently at Risk
Whiskered Auklet	Least Concern	Moderate Concern	Moderate Concern

* The reason the Alaska Conservation Status for these species is "Not Currently at Risk" is because Alaska is the edge of the breeding range and few occur within the State.

THREATS AND CONSERVATION ISSUES

Life history strategies of seabirds are characterized by low reproductive rates that make them vulnerable to factors reducing adult survival. Based on the demography of many species, adult mortality is a key determinant in population trends. Small decreases in adult survival can seriously jeopardize seabird populations, especially if population levels are already low. Therefore, to maintain or enhance breeding populations, diversity, and patterns of distribution of seabirds in Alaska requires addressing numerous threats, many of which are shared across their breeding and wintering ranges.

Some problems are already being addressed by the Service; others require better information, management actions, or both. In many cases, the only management options available are at colony sites, but whenever possible, threat management should be aimed at reducing adult mortality across the ranges to levels associated with sustainable regional populations. Twelve threats and conservation issues in Alaska are highlighted in this section. Strategies and priorities for each issue are addressed in the Goals, Objectives, and Strategies for Alaska section.

Addressing the cumulative effects of threats to seabirds will be particularly difficult but essential to the conservation of seabird populations. The combined effects of human-caused and environmental harm to seabirds are potentially far more serious than those caused by any one stressor alone[119] and is perhaps the largest gap in our understanding of the forces that threaten seabird populations.

Invasive Species

The harm of introduced mammals to Alaska seabird populations has been greater than that from any other human activity. Not only have foxes and rodents preyed heavily on seabirds, but rodents, cattle, and reindeer have also destroyed seabird nesting habitat. Burrow- and ground-nesting seabirds were eliminated from some islands, and on others they were reduced to remnant populations.[120]

A restoration program on Alaska Maritime National Wildlife Refuge has resulted in the removal of introduced foxes from 40 islands, and seabird populations are increasing on those islands where foxes have been removed.[120] Cattle and reindeer have also been removed from several islands. Additionally, programs are in progress to remove rats from some of the infested islands and to prevent further introductions. A Rat Outreach Team was established in 2006 and includes a variety of member organizations. The Team enlists help from the public to prevent further rat introductions and supports a website that promotes an awareness of the devastating effects that rats have on seabirds. More information can be found at the website: http://www.stoprats.org/resources.htm.

Red and arctic foxes were placed on more than 450 islands in southern Alaska between 1750 and the 1940s to farm their furs.[121] The fur farmers selected islands with seabirds to provide free summer food for the foxes. After fox farming largely ended in the 1930s, foxes died out

[119] Canadian Environmental Assessment Research Council 1986: Vestal et al. 1995
[120] Ebbert and Byrd 2002
[121] Bailey 1991

on many islands because of disease, lack of food, and possibly inbreeding. Vigorous populations still existed, however, on at least 46 islands.[122] Based on comparisons of recent censuses with early naturalists' reports, foxes severely reduced many seabird populations.[123] Burrow-nesting seabirds were most affected: foxes easily dug them up and ate the birds or eggs.[123] Major colonies of storm-petrels, some auklets, tufted puffins, and other burrowing seabirds were eliminated from islands with foxes. As a result, total populations of these species may have been severely reduced.[124] Ground-nesting species such as gulls and terns are also absent on most islands with foxes. Seabirds that nest in rock crevices can coexist with foxes, but have been reduced or eliminated in some places.[125] Even cliff-nesters were eliminated from some gently-sloping islands.[126]

Foxes were removed from Amchitka Island by 1960, demonstrating that complete eradication was possible.[127] Additional islands were cleared in the 1960s and 1970s, but since the late 1970s, the island restoration project has accelerated. By 2008, foxes had been cleared from about 40 islands totaling more than one million acres, mostly on Alaska Maritime National Wildlife Refuge.[128]

The benefit to seabirds where foxes have been eliminated has been great. On Alaid and Nizki islands, many seabird species increased five- to 15-fold and occupied larger areas after fox removal.[129] Whiskered auklets, for example, have increased throughout the Aleutian Islands following fox removal.[130] Some bird species recover slowly from fox predation, however. Nocturnal, burrow-nesting seabirds appear to take more than a decade to reoccupy islands. Thus many of these species are now (2008) just beginning to recover.

Arctic ground squirrels, voles, lemmings, and mice were released on many islands to feed introduced foxes, and these rodents are still flourishing.[131] They have overgrazed some islands causing vegetation changes and severe erosion. Rodents have probably prevented reoccupation by seabirds on some islands that now have no foxes.[132] Ground squirrels and voles also prey on eggs and young birds from burrows.[133] Rats are on at least 21 islands in the National Wildlife Refuge System in Alaska and are on many other islands in Alaska (especially in Southeast Alaska). They are aggressive predators of ground-nesting birds and they modify entire ecosystems. Ships run aground each year on remote Alaska islands, and any shipwreck could potentially introduce rats to an island. The harmful effects of rats on a previously rodent-free seabird colony could be devastating.

[122] Bailey 1993
[123] Murie 1959
[124] Bailey 1976, 1977, 1978, Bailey and Faust 1980, 1984, Murie 1959, Nysewander *et al.* 1982, Sekora *et al.* 1979, Sowls 1979
[125] Murie 1959, Nysewander *et al.* 1982
[126] Bailey 1993, Nysewander *et al.* 1982, Zeillemaker and Trapp 1986
[127] Bailey 1993
[128] Ebbert and Byrd 2002, pers. comm., S.E. Ebbert, Alaska Maritime National Wildlife Refuge
[129] Byrd and Bailey 1990, Byrd *et al.* 1994, Zeillemaker and Trapp 1986
[130] Williams *et al.* 2003
[131] Bailey 1993, Murie 1959, Sekora 1973
[132] Bailey 1976, Bailey and Faust 1981, Hatch and Hatch 1983
[133] Cade 1951, Sealy 1982

When foxes died out in Prince William Sound (PWS), farmers brought in mink and pine marten to several islands. The Alaska Department of Fish and Game also introduced mink to Montague Island in PWS and pine marten to three large islands in Southeast Alaska (Prince of Wales, Baranof, and Chichigof islands).[134] Following recent introductions of mink to the Naked Island Complex in PWS, pigeon guillemots, tufted puffins, and parakeet auklets have declined drastically.[135] Pine marten are arboreal and may take nesting marbled murrelets from trees.

European rabbits and marmots were also introduced to some islands in Alaska. On Middleton Island in the Gulf of Alaska, the rabbits appear to be controlled by severe winter weather.[136] They may have overgrazed Ananaluliak Island, however, and possibly other islands where they have been introduced in the eastern Aleutians (Poa and Tangik islands).[137] Effects of introduced marmots on Sud Island in the Barren islands group are unknown.

Grazing animals have been introduced to several islands for ranching or sport hunting. Cattle were introduced to 19 islands south of the Alaska Peninsula starting in the 1890s. On some of the islands, they increased until they overgrazed and trampled the range. Burrows of storm-petrels and auklets were destroyed, and nesting cover for gulls and terns was converted to scrubby heath or bare soil. The Service removed cattle from three islands in the Alaska Maritime National Wildlife Refuge in 1985. Other herds graze primarily on private and state-selected lands such as Harvester, Bear, and Sitkinak islands (near Kodiak Island) and goats graze on Village Island (near Kodiak Island). The Service does not manage their occasional use of refuge lands. Reindeer have been introduced to Umnak, Atka, and Unalaska islands in the Aleutians, the Pribilof Islands, and St. Matthew, Nunivak, and Hagemeister islands in the Bering Sea. The herd on Hagemeister Island was removed in 1993. Rangeland on Nunivak Island and on the Pribilof Islands is moderately overgrazed; the Service is working with herd owners to reduce grazing pressure. Reindeer on St. Matthew died out after severely overgrazing its range.[138] Caribou were placed on Adak Island in 1958 to provide sport hunting for Navy personnel. After the Navy reduced its presence on Adak in the mid-1990s, the herd increased and is now overgrazing the island.

Wild European boars were introduced to Marmot Island (east of Afognak Island) in 1984.[139] Seabirds nesting on the island that could be affected by soil disturbance or predation include tufted puffins and Glaucous-winged Gulls.

Oil Spills

Spills of crude oil and refined fuels from ships and from onshore and offshore oil facilities are significant threats to marine birds from the Beaufort Sea to Southeast Alaska. When an oil spill occurs within migratory bird habitat, every effort should be made to prevent birds from

[134] Burris and McKnight 1973
[135] Irons and Kuletz, unpublished data
[136] O'Farrell 1965
[137] Nysewander *et al.* 1982
[138] Klein 1968
[139] Lloyd *et al.* 1987

becoming oiled. If left untreated, birds exposed to oil will most likely die. When birds' feathers become oiled, their ability to thermoregulate is compromised and they become hypothermic. In the cold waters of Alaska, this can prove deadly to marine birds.[140] Oiled birds may also suffer toxic effects through dermal contact and ingestion depending on the type of oil and its toxicity.[141] When oiled birds are captured alive and taken to treatment centers, they often can be cleaned, rehabilitated, and released back into their natural habitat. One of the keys to survivorship of oiled birds is ensuring a bird capture and treatment program is initiated in a timely manner.[142] Even under the best rehabilitation conditions, however, this option should be used as a last resort: in most cases, long-term survival of rehabilitated birds is unknown, and these programs are logistically complicated and expensive. Preventative measures that keep birds from ever becoming oiled should be a priority for oil spill planning and response.

Seabirds exhibit obvious immediate behavioral changes in response to exposure to oil. In particular, they preen excessively to clean oil from their feathers. As a result, normal activities such as feeding, nesting, and migrating are abandoned causing the birds to weaken and become more vulnerable to exposure and predation. Oiled marine birds will often abandon the water, their natural habitat, and move to land when available, making them more vulnerable to predation. Oil on the feathers of a breeding birds can be transferred to the birds' eggs and cause nest failure. Dermal contact with oil can cause burns and lesions that can compromise birds' feather structure, resulting in hypothermia. Ingestion of oil while preening may affect birds' metabolic processes and acute exposure can lead to death. Ingestion can also have long-term or chronic consequences based on the amount of oil ingested and length of exposure.

The severity of oil contamination on migratory birds will depend on many factors including, but not limited to the following: degree of oiling and length of exposure, health of the birds prior to exposure, natural hardiness of the species, toxicity of the product spilled, and distribution of the spilled product in the environment.

Based on their physiology and behavior, different bird species exhibit different levels of susceptibility to oiling. Members of the auk family (murres, puffins, murrelets, and others) suffer the highest mortality from oil because they rest on the water in flocks and dive more than they fly.[143] Birds such as gulls and kittiwakes that are surface feeders can avoid oil slicks more easily.[144]

Strategies for protecting migratory birds from oil include: containing the oil before it reaches the birds, collecting oiled carcasses to protect scavenging birds from the effects of secondary oiling, hazing birds from oiled areas, preemptive capturing of unoiled birds at risk and

[140] Nero and Associates Inc. 1987
[141] Piatt *et al*. 1985, Szaro 1977
[142] American Petroleum Institute 1985, 1986; International Bird Rescue Research Center 1990; Tri-State Bird Rescue and Research, Inc. 1990; USFWS 2002d
[143] King and Sanger 1979, Vermeer 1976
[144] Bourne 1968, King and Sanger 1979

moving them to an unoiled location; and capturing and treating oiled birds. Capturing and treating oiled birds is the strategy of last resort.
Birds concentrate in various areas, depending on the species and season. If possible, the following types of areas where birds concentrate should be protected following an oil spill:

- Seabird colonies:
  Alaska seabirds nest in more than 1,800 colonies in the spring and summer. The number of seabirds in these colonies ranges from a few dozen to several million birds. Birds are vulnerable to oil contamination when they are in large flocks on the water near the colony. Highest priority should be given to colonies containing rare species, the largest colonies in a region, and those with a high diversity of species.

- Major seabird feeding areas:
  Most seabirds obtain their food at sea away from land. While they may feed in areas that are close to land or more than 100 miles offshore, they are often concentrated in small areas. As a result, the presence of oil in some feeding areas could negatively affect the majority of seabirds in the region. Feeding areas shift with the tides and seasons. Therefore, the position of large flocks hovering over or sitting on the water should be carefully noted during reconnaissance flights and avoided when applying dispersants (assuming dispersants are approved for use).

- Wintering areas of marine birds:
  These include the sheltered, ice-free inlets of southern Alaska, especially around Kodiak Island, Prince William Sound, and southeastern Alaska; localized parts of the Aleutian Islands and Bering Sea; the edge of the ice pack; and open leads in the pack ice. Concentrations of seabirds vary during the winter. Locations of large flocks should be recorded during reconnaissance flights and avoided when applying dispersants (assuming dispersants are approved for use). Important coastal seabird habitats that are sensitive to oil contamination should be protected even when no seabirds are present.

Historically, the greatest hazard to seabirds from oil spills in Alaska comes from the shipping of petroleum fuels by tankers and barges. In 1989, 10 major oil spills totaling 18 million gallons fouled the shores of the Alaska Maritime National Wildlife Refuge. Oil tankers in the Gulf of Alaska caused three of the largest spills releasing over one million gallons each. The grounding of the *Exxon Valdez* in 1989 released 11 million gallons of crude oil into Prince William Sound. More than 200 miles of shoreline were heavily or moderately oiled, with another 1,100 miles of shoreline lightly oiled. To date, it remains the largest oil spill in North America. About 35,000 birds were recovered dead after the spill, but estimates of total mortality are between 300,000 and 645,000.[145] For all bird species combined, the carcasses found during the *Exxon Valdez* oil spill were estimated to represent 10 to 30 percent of actual mortality.[146] Alcids had the highest mortality. Six species of small alcids were identified from carcass retrievals and marbled murrelets had the highest mortality in this group.[147]

[145] Ecological Consulting, Inc. 1991, Piatt *et al.* 1990
[146] Piatt *et al.* 1990
[147] Ford *et al.* 1996, Piatt *et al.* 1990

Twenty-five percent of the small alcid carcasses retrieved had no discernible oiling on their bodies.[148]

In addition to oil tankers crossing Prince William Sound from the terminus of the Alaska pipeline in Valdez, tankers also travel along the outer coast of Southeast Alaska. Fortunately, there have been no tanker accidents in this region. Other tankers also travel past the Alaska Peninsula and eastern Aleutian Islands enroute to Asia from the Drift River terminal in Cook Inlet. This latter route passes major concentrations of seabirds.[149]

Alaska waters are also the crossroads of international marine shipping, particularly along the North Pacific Great Circle Route that crosses through the Aleutian Islands. More than 2,700 ships travel through the Aleutians each year. Ship traffic includes up to 1,600 voyages by container ships with a typical fuel capacity of 1.8 million gallons of oil, and as many as 30 to 40 voyages by tankers that can carry as much as 800 million gallons of oil as cargo and fuel. In-state fuel cargo and fishing vessel traffic also present a risk. About 300 million gallons of fuel oil (about 130 voyages) are moved into and through the Aleutian Islands as cargo for use in Alaska. About 400 fishing vessels operate in the rich Aleutian fisheries and are valued at more than $1.5 billion. Fishing vessels typically have a fuel capacity of about 30,000 gallons.[150] Severe storms with gale force winds and seas greater than 30 feet, strong tidal currents between island passes, and uncharted rocks and reefs make ship travel in the North Pacific and Bering Sea risky. Throughout this century, marine traffic has increased in Alaska waters and is predicted to grow another 20 percent by 2020.[150]

Since 1960, more than 50 documented shipwrecks have occurred within or near the Alaska Maritime National Wildlife Refuge.[150] In 2004 a 738-foot cargo vessel, M/V *Selendang Ayu*, ran aground and broke in half off Unalaska Island in the Aleutians. The vessel, bound for Asia, dumped an estimated 340,000 gallons fuel oil and 15,000 gallons of marine diesel and miscellaneous oils into the coastal waters. Estimates of bird mortality resulting from this spill remain confidential pending litigation.

In February 1996, the M/V *Citrus* collided with another vessel while loading cargo offshore from the Pribilof Islands. The collision punctured some of the *Citrus's* fuel tanks resulting in an undetermined amount of fuel oil leaking into the Bering Sea. The spill caused the oiling and killing of wintering seabirds. Among the species injured were pelagic and red-faced cormorants, glaucous-winged gulls, common and thick-billed murres, crested and parakeet auklets, and pigeon guillemots. A total of 1,367 injured birds were recovered onshore as a result of the incident. Specifically, 1,202 dead birds were recovered on beaches, and 165 live but oiled birds were captured and underwent rehabilitation. The injured bird total includes sea duck species.

During the summer months when fishing, tourism, and recreational activities increase, small oil spills also increase.[150] According to Alaska Department of Environmental Conservation data, smaller spills occur more frequently than large spills. The F/V *Windy Bay* oil spill in Prince William Sound in August 2001 was a relatively small spill, but it occurred when the

[148] Ford *et al*. 1996
[149] USFWS 2006b
[150] ADEC 2005

peak number of marbled murrelet adults and juveniles were in the Sound.[151] Six of the seven bird carcasses retrieved during response activities were marbled murrelets. It has been suggested, however, that this number represents only a portion of the total mortality for marbled murrelets. Direct mortality for this species was estimated at about 100 birds.[151]

Documenting oil spill mortality of smaller species of seabirds such as alcids is difficult. Smaller species sink faster offshore than larger seabird species.[152] They are also more difficult to see on beaches, making recovery more difficult during response activities.[153] In Alaska there are also many carnivores and avian predators, increasing scavenging rates of smaller seabird species.[154]

The potential effects of chronic oil pollution (smaller, but frequent spills) on seabird populations have also been discussed since the 1960s.[155] Some of the literature suggests that although the incidence of oiled seabirds from chronic oil spills is probably not high, it often goes undetected and can have large detrimental effects on population.[156]

In addition to the immediate harmful effects of oil spills on seabirds, secondary and long-term effects have also been documented. A secondary effect of oil spills that was obvious after the M/V *Exxon Valdez* oil spill, was the effect on seabirds from the large number of vessels in oiled areas during response, clean-up, and monitoring activities. Vessel disturbance displaced some seabird species (e.g., marbled murrelets) from key foraging areas.[157]

The indirect effects on marbled murrelets from the *Exxon Valdez* oil spill by immediate and long-term damage to forage fish populations was reviewed in 1995.[158] Pacific herring and sand lance are important forage species for marbled murrelets and numerous other seabirds. Post-spill studies in oiled areas of Prince William Sound showed sublethal damage and larval deformities in herring and an absence of spawning at some historic sites. Following a series of declines, the herring stock collapsed in 1993.[159] The cause of the collapse is not agreed upon, but a combination of factors in addition to the *Exxon Valdez* oil spill were probably responsible.[160] It has been suggested that the decline of marbled murrelets in the Sound between 1989 and 2004 is coincident with the decline in the PWS herring population during the same period.[161] Sand lance is also a valuable prey species because of its high energy-density,[162] and in the Sound it comprises 50 percent of the prey fed to murrelet chicks.[161] Because sand lance burrow daily into sandy substrates in nearshore waters, they would be exposed to contaminants that settle into benthic habitats.[163] Fewer fledged juvenile marbled

[151] Kuletz 2001
[152] Ford *et al.* 1996
[153] Carter and Kuletz 1995, Piatt *et al.* 1990
[154] Ford *et al.* 1996
[155] Bourne 1968, Croxall 1975, Camphuysen 1989, Dunnet 1982, Albers 1995, Newton 1998)
[156] Wiese *et al.* 2004
[157] Carter and Kuletz 1995, Kuletz 1996
[158] Carter and Kuletz 1995
[159] Thomas and Thorne 2003
[160] Paine *et al.* 1996, Spies *et al.* 1996
[161] Kuletz 2005
[162] Van Pelt *et al.* 1997
[163] Robards *et al.* 1999

murrelets at Naked Island, in the Sound in 1989 and 1990 suggested a relationship between effects on forage fishes and direct marbled murrelet mortality prior to the breeding season.[164]

Plastic Pollution

Plastic pollution in the marine environment has risen dramatically during the past few decades. This may be due to more plastic being discarded,[165] more plastic being transported, and the slow degradation of plastic in the ocean.[166] A majority of plastics are made from a synthetic material and do not biodegrade; they are broken down by photodegredation into smaller particles. New plastic entering the North Pacific Ocean may remain there indefinitely because there are few islands where the plastic could wash up, and dominant eddy currents serve as a retention system.[167]

In addition to large, obvious pieces of plastic floating on the surface of the ocean, debris surveys have revealed minute fragments mixed with plankton (neustonic plastic).[168] The highest concentration of neustonic plastic is in areas with oceanographic convergences and eddies, where the debris fragments naturally accumulate.[168] A comparison of plastic and plankton in the North Pacific central gyre showed six pounds of plastic for every pound of naturally occurring zooplankton.[167] Numerous species of seabirds forage over such areas, greatly increasing the potential for birds to ingest plastic.

Consumption of plastic by numerous species of seabirds has been documented since the mid-1970s.[169] Seabirds may consume plastics because they resemble or are mixed with food items.[170] They could also indirectly consume plastic by feeding on prey items that ingest the plastic.[171] Adult birds may pass plastic particles to their chicks by regurgitation.[172] The plastic polymers commonly used in consumer products are indigestible by any known organism and can obstruct the passage of food or cause stomach ulcers in birds.[173]

Other effects of plastic on seabirds include entanglement and the bioaccumulation of polychlorinated biphenyls (PCBs), dichloro-diphenyl-trichloroethane (DDT), and other lipophilic pollutants. Japanese investigators discovered that floating plastic fragments accumulate non-water-soluble toxic chemicals to levels as high as one million times their concentrations in the water as free-floating substances.[174]

Alaska seabirds were first discovered with plastic in their stomachs in the Aleutian Islands in 1974.[175] Awareness of the problem increased in 1976, when a variety of seabirds breeding in the Shumagin Islands in the eastern Aleutian Islands were also found to contain plastic

[164] Kuletz 1996
[165] Day and Shaw 1987, Robards *et. al* 1995
[166] Andrady 1990, U.S. EPA 1992
[167] Moore *et al.* 2001
[168] Day 1988, Day and Shaw 1987, Day *et al.* 1986, Moore *et al.* 2001, Shaw and Maples 1979
[169] Baltz and Morejohn 1976, Day 1980, Day *et al.* 1985, 1990, Moser and Lee 1992, Robards *et al.* 1995
[170] Day *et al*. 1985, 1990
[171] Kartar *et al.* 1976, Moore *et al.* 2001
[172] Fry *et al*. 1987
[173] Fry *et al*. 1987, Ryan 1987
[174] Endo *et. al* 2005, Mato *et. al* 2001
[175] Ohlendorf *et al.* 1978

particles in their stomachs.[176] In 1980, the stomach contents of 1,968 Alaska seabirds of 37 species were examined.[176] A total of 448 individuals of 15 species had plastic in their stomachs.[176] Ingestion rates were generally highest among surface-feeders, although parakeet auklets had ingested the largest amounts of plastic.[176] Of the 15 species that contained plastic, seven had ingested plastic at particularly high rates. Northern fulmars, sooty and short-tailed shearwaters, fork-tailed storm-petrels, Cassin's and parakeet auklets, and horned puffins had ingestion rates ranging from 35 percent to 100 percent of birds sampled.

The most recent study of plastic ingestion by seabirds in Alaska was conducted between 1988 and 1990.[177] Data collected from 1969 to 1977 were compared to those collected from 1988 to 1990.[177] Results suggested that plastic ingestion by seabirds had increased significantly in the period between studies.[177] Increases were demonstrated in the following: the total number of species ingesting plastic, the frequency of occurrence of plastic particles within species found to ingest plastic in both studies, and the mean number of plastic particles for individuals of those species.[177]

Monitoring marine debris is a crucial part of dealing with the persistent problem of plastic pollution. Section 2204 of the Marine Plastic Pollution Research and Control Act of 1987 (Public Law 100-220, Title II, Sec. 2204) authorized the U.S. Environmental Protection Agency, NOAA, and the U.S. Coast Guard to conduct programs to encourage formation of volunteer groups to assist in monitoring, reporting, cleanup, and prevention of ocean and shoreline pollution. In 1995, the National Marine Debris Monitoring Program (conducted by the Ocean Conservancy) was developed to standardize marine debris data collection in the United States. The program was conducted from 1996 to 2007, divided the nation into nine regions, and used volunteers to collect data. Region 8 included the southern coast of Alaska and the Aleutian Islands.

Although the entire range of data is not yet available from the Marine Debris Monitoring Program, a five-year timeframe was selected for analysis (2001–2006) and those data are available. Overall, there was no significant change in the total amount of debris monitored during the five-year period. There was an increase, however, in general source items (primarily composed of plastic materials) and greater use of these type of products over the last 10 years was reflected in debris items surveyed on beaches. The most abundant debris items were plastic straws, balloons, and metal beverage cans. [178]

Mining

Alaska's mining history began in the late 1800s. Gold is the metal most often associated with Alaska's mineral resources, but the state also contains some of the world's largest deposits of lead, zinc, silver, and copper. Large-scale, operational mines and numerous small mining operations are distributed along parts of the Alaska coastline from Northwest to Southeast.

Although the effects of mining on Alaska seabirds are mostly unknown, mines located on or near coastlines could possibly affect seabirds in the area through pollution, habitat damage, or

[176] Day 1980
[177] Robards *et al.* 1995
[178] Sheavly 2007

disturbance. Effect on seabirds from mines are likely localized and occur where colonies and foraging ranges are located near mining operations.
Gold mines that use cyanide to extract the gold from low-grade ore produce large amounts of waste in the form of contaminated tailings. The long-term effects of cyanide mining techniques, and the associated hard rock mining tailings and wastes, are not known. Contaminants from the milling process or an accidental release of cyanide or other harmful chemicals could potentially deplete some forage fish stocks and effect seabirds in the area.

Abandoned mining operations could also have potential, long-term environmental effects. For example, acid mine drainage and mercury-contaminated tailings from abandoned, coastal mining sites could negatively affect seabirds. Historically, gold miners used mercury (quicksilver) to recover gold at both placer and hardrock mines. Some mercury was lost through spills and has accumulated in the tailings. Concentration of mercury generally increases by a factor of 10 or less with each step up the food chain. Therefore, even though concentrations of mercury in water may be low, concentration levels in fish, especially predatory species such as walleye pollock, may reach levels that are harmful to fish-eating seabirds. Other potentially toxic mining-related elements include arsenic, cadmium, copper, lead, and zinc.

Other Contaminants and Hazardous Substances

Much of Alaska seabird habitat remains well-preserved. Some past human activities, however, have left behind contamination on Service lands. Military activities represent one of the longest-term and most geographically widespread contaminants-related sources. During World War II, military activities escalated in Alaska and spread out over an extensive area that continued to expand throughout the Cold War era. The military has since closed many remote operations, leaving behind hazardous materials such as petroleum fuels, solvents, polychlorinated biphenyls, munitions, radioactive materials, metals, dry-cleaning chemicals, and herbicides. Exposure to these contaminants can have consequences on seabirds ranging from individual acute mortality to more insidious, population-level effects resulting from responses such as lower reproductive success.

The Alaska Department of Environmental Conservation's (ADEC) Contaminated Sites Program has regulatory authority over cleanup of all contaminated sites in the state. Sites are grouped into management units based on ownership and the party or parties responsible for cleanup. A number of sites have been remediated by the U.S. Army Corps of Engineers, the U.S. Navy, the U.S. Air Force, and the U.S. Department of Energy. Reviews of specific contaminated sites, which may include seabird colonies or habitat, can be found online at the ADEC website: http://www.dec.state.ak.us/SPAR/csp/index.htm.

Alaska Maritime National Wildlife Refuge contains 34 military cleanup sites within or near its boundaries and is also home to 80 percent of Alaska breeding seabirds. At some of these cleanup sites, the Service has identified potentially contaminated areas, investigated the effects of contaminants on fish and wildlife resources, and worked with responsible parties to ensure cleanup. In 1999 the Maritime Refuge also initiated the Seabird Tissue Archival and Monitoring Project (STAMP) to compile baseline monitoring information on contaminant

exposure levels in breeding seabirds. The STAMP program is explained in more detail in the Contaminants Monitoring section of this document.

Commercial Fisheries

In Alaska, commercial fishing is an important component of the economy and an integral part of the Alaskan lifestyle. A variety of fisheries takes place including longline, trawl, pot, gillnet, and purse seine. These fisheries target numerous species of fish [e.g., Pacific salmon (*Oncorhynchus spp.*), Pacific herring (*Clupea pallasi*), walleye pollock (*Theragra chalcogramma*), Pacific cod (*Gadus macrocephalus*), sablefish (*Anoplopoma fimbria*), Atka mackerel (*Pleurogrammus monopterygius*), lingcod (*Ophiodon elongates*), Greenland turbot (*Reinhardtius hippoglossoides*), and many additional rockfish and flatfish species] and occupy much of Alaska's coastline as far north as the southern Chukchi Sea.

Baited long-line fishing gear can attract more than the target species of fish. Some species of seabirds are drawn to the easy meal of bait being deployed and/or offal discarded by fishing vessels. Interactions between seabirds and fishing operations can lead to birds being injured or killed as a result of being caught on hooks or entangled in nets. The magnitude of the effect that fisheries have on seabirds depends on the following: the type of fishing gear used, and the mitigation measures employed, and the spatial and temporal distribution of fishing vessels and their overlap with the spatial and temporal distribution of seabirds. Biology and life history characteristics of each seabird species also affect the probability of incidental capture in fishing gear and whether or not the fishery-related mortality will cause harm to populations.

Fishery-related incidental mortality by a variety of fishing gear (e.g., longline, trawl, gillnet, driftnet) -- also referred to as *bycatch* of seabirds -- has been recognized as a problem by the Service since the early 1970s. Congress officially recognized the need to assess bycatch of non-target species in driftnet fishing gear in foreign and domestic fisheries when it passed the Driftnet Impact Monitoring, Assessment, and Control Act of 1987 (16 U.S.C. 1822). This act required that mortality of non-target species in driftnet fishing gear be monitored at sea and that effects on seabird populations be evaluated. The act also addressed foreign fishery agreements and plastic pollution. In 1995, the U.S. Congress passed the High Seas Driftnet Fishing Moratorium Protection Act establishing and reaffirming the United Nations resolutions and decisions establishing a global moratorium on large-scale driftnet fishing on living marine resources and seabirds (16 U.S.C. 1826d–1826g).

NOAA Fisheries began placing observers on foreign fishing vessels operating off the Pacific Northwest and Alaska coasts in 1973. In 1978 U.S. fishermen began large-scale fishing for groundfish through joint ventures with foreign processing vessels. NOAA Fisheries began placing observers on domestic groundfish vessels in 1986. These vessels use longline, trawl, and pot gear to harvest groundfish species. The current domestic observer program was authorized in 1989. Under this program, NOAA Fisheries provides operational oversight, certification, training, definition of observer sampling duties and methods, debriefing of observers, and management of data. Since 1990 fisheries observers have been placed on groundfish fishery vessels based on the overall length of the vessel. Any vessel less than than 60-feet in length is not required to carry an observer. Vessels between 60- and 125-feet are

required to carry an observer for 30 percent of their fishing days, and all vessels greater than 125-feet must carry observers for 100 percent of all fishing days.

The goal of the NOAA Fisheries North Pacific Groundfish Observer Program is to provide information essential for the management of sustainable fisheries, associated protected resources, and marine habitat in the North Pacific. A key objective is to provide accurate and precise catch, bycatch, and biological information for conservation and management of groundfish resources and the protection of marine mammals, seabirds, and protected species. Information on the bycatch of seabird species is subsequently used to calculate annual estimates of bycatch of select seabird species or species groups.[179]

The Pacific halibut fishery does not have an observer program to monitor seabird bycatch although some vessels that fish both halibut and sablefish may have observers onboard to fulfill requirements for observer coverage when fishing for sablefish. The halibut fishery is managed by the International Pacific Halibut Commission (IPHC) and regulated by NOAA Fisheries. In recent years, the Service required NOAA Fisheries to investigate options for monitoring bycatch of the endangered short-tailed albatross in the Pacific halibut fishery in waters off Alaska. NOAA Fisheries contracted and is working with the IPHC to conduct this on-going investigation.

In the early 1990s, NOAA Fisheries began the Alaska Marine Mammal Observer Program. The program was initiated to obtain reliable estimates of the level of incidental serious injury and mortality of marine mammals and seabirds during Alaska salmon gillnet fishing operations. At the request of the Service, NOAA Fisheries incorporated seabird identification as part of its observer training program. In addition to information about bycatch, observers also record opportunistic observations of all seabird interactions with fishing operations.

Since the early 1990s, cooperative efforts by NOAA Fisheries, the North Pacific Fishery Management Council, the North Pacific Research Board, fishers, universities, and the Service have resulted in the reduction of seabird bycatch in Alaska.[180] Efforts have included: collection of bycatch data by fishery observers, public and industry outreach and education, research into (and implementation of) seabird avoidance devices, development of regulations and regulatory actions, and participation in the development of international and national plans of action to reduce the bycatch of seabirds in longline fisheries.

Following is an abbreviated review of the direct and indirect effects on seabirds from commercial fisheries in Alaska.

Specific Commercial Fisheries and Their Direct Effects on Seabirds

Groundfish Fisheries

Alaska groundfish fisheries take place in the Gulf of Alaska, the Bering Sea/Aleutian Islands, and in many bays, sounds, and straits that indent the coastline and form the inside waters of Alaska. Fish are taken from the sea floor to the mid-water column by various methods including longlines, trawls, and pots.

[179] NPFMC, NMFS, AFSC 2006
[180] AFSC 2007

In general, groundfish fisheries in the U.S. Exclusive Economic Zone (EEZ) (3 to 200 nautical miles offshore) fall under federal authority, whereas the State of Alaska manages groundfish fishery resources within state territorial waters (0 to 3 nm offshore). The North Pacific Fishery Management Council is one of eight regional councils under NOAA Fisheries. It has responsibility for managing fisheries resources for conservation purposes over the 900,000 square miles of federal waters in the U.S. Exclusive Economic Zone off Alaska.

Longline (Hook-and-Line) Fisheries

Longliners in Alaska catch bottomfish (Pacific cod, sablefish, Greenland turbot, Pacific halibut) via a line up to a mile in length with numerous baited hooks attached to it. In the Bering Sea, longline vessels are typically larger than in the Gulf of Alaska, stay at sea up to 30 days, have onboard processing capabilities, use auto-bait systems, and deploy up to 55,000 hooks per day.[181] Gulf of Alaska longline vessels are generally smaller, make shorter trips (about 6 days), deliver fish to shore-side processing plants, use tub or hand bait gear, and deploy up to 10,500 hooks per day.

Annual estimates of seabird bycatch from the Alaska groundfish fisheries have been completed each year since 1990 by NOAA-Alaska Fisheries Science Center staff (AFSC).

AFSC estimated seabird bycatch for all demersal longline fisheries in Alaska from 1993 to 2006. Those data are summarized in Appendices 2, 3, 4, and 5. A brief overview of the data will be provided here.

At least 20 seabird species or species groups have been taken in the groundfish fisheries including: albatrosses, northern fulmars, shearwaters, gulls, kittiwakes, murres, puffins, and smaller numbers of other birds (Appendices 2, 3, 4, and 5).

Between 1993 and 2005 the average annual seabird bycatch in the combined (Gulf of Alaska, Bering Sea, Aleutian Islands) Alaska longline fisheries was estimated at 13,646 birds.

The 2006 total combined (all Alaska waters) estimated bycatch of seabirds in the demersal longline fishery was 4,531 birds (Appendix 5). This is a 29 percent reduction of seabird bycatch from the 6,370 birds taken in 2005, 9 percent lower than the estimated 4,979 seabirds taken as bycatch in 2004, and well below the overall average of 13,646 seabirds from 1993 to 2005.[182]

These data suggest that the implementation of streamer lines as a seabird bycatch mitigation measure may have resulted in a reduction in seabird bycatch in the demersal longline fishery.[182] Although paired streamer lines were required for all vessels greater than 58-feet in February 2004, many freezer longline operators

[181] Melvin *et al*. 2001
[182] AFSC 2009

began voluntarily deploying paired streamer lines in 2002. During the period when there was extensive use of paired streamer lines (2002 to 2006), the average overall bycatch of seabirds was 5,138 birds.[182]

Trawl Fisheries

Trawling is a fishing method which involves towing trawl nets either mid-water (pelagic trawl) or near the sea floor (bottom trawl). Before 2004, on trawl vessels only, fisheries observers could use any one of three different sample sizes of groundfish catch to monitor bycatch of seabirds in a haul. This resulted in discrepancies of seabird mortality. Beginning in 2004, AFSC standardized seabird bycatch data collection protocol for trawl sampling. Because of the varying observer data collection protocols, a comparable estimation procedure cannot be applied to the overall 1993 to 2006 average.[183]

Estimated seabird bycatch in the 2006 trawl fishery was 2,872 birds for all species and all areas combined. The Pacific cod fishery accounted for the highest number of seabirds taken as bycatch with 75.7 percent of the total. This was opposite the 2005 season where the pollock fishery accounted for 61.7 percent of the total seabird bycatch and the cod fishery accounted for 8.9 percent of the total.[183]

The 2006 bycatch was an 84 percent increase from the 2005 estimated bycatch of 1,562 birds and about 4 times higher than the 2004 bycatch estimate of 714 seabirds.[183]

There are several differences in the estimated seabird bycatch between 2005 and 2006. In 2005 there was only one unidentified bird, with an estimate of three for the fleet. In 2006 there was a large increase in unidentified birds, primarily due to one haul in the Pacific cod fishery. In one basket sampling, 23 unidentified seabirds were counted, resulting in an estimate of 2,086 birds. Thus, the bycatch of alcids was estimated at just three birds in 2006 compared with 2005 when 833 alcids taken as bycatch in the Bering Sea. From 1993 to 2006, the estimated annual average bycatch of alcids was 216 birds.[184]

Collisions with trawl door cables and the cable that runs between the net monitoring device and the vessel (trawl sonar cable or third wire) are also known causes of seabird mortality. The extent of the mortality, however, is still unknown. AFSC is currently developing estimates of interaction rates and mortalities. Additionally, a collaborative project was started in 2004 between AFSC and the Pollock Conservation Cooperative to promote development of seabird mitigation measures for groundfish catcher-processor vessels.[185]

Pot Fisheries

Pot fisheries are another type of bottom fishery. The pot line is also laid on the ocean bottom. Crab in Alaska are commonly harvested using this method, but some species of

[183] AFSC 2007
[184] AFSC 2009
[185] AFSC 2007

groundfish (e.g., Pacific cod) are also harvested using pots. Seabird bycatch from pot fishing has generally been very low in Alaska. The overall average bycatch in this fishery from 1993 to 2006, was estimated at 73 birds per year (mostly northern fulmars).[185]

Gillnet Fisheries

Gillnetters in Alaska catch salmon by setting curtain-like nets perpendicular to the direction in which the fish are traveling. Two types of gillnets are used to fish for salmon in Alaska: drift gillnets and setnets. Driftnets are typically 900-feet in length and are deployed from boats, which are usually 25- to 40-feet long. The net hangs from the surface on a corkline and drifts (attached to the boat) for 15 minutes to 4 hours;[186] sometimes the net is left out overnight. Setnets also hang at the surface, but are anchored to the beach on one end. The offshore end is secured to anchors and buoys. Setnets are usually allowed to fish through all tides. Skiffs are used to retrieve fish. Setnets can be up to 210-feet in length, but a fisher is allowed to fish 3 to 4 nets, not exceeding, a total length of 630 feet.[186]

Most gillnet fisheries operate from early June through August, but can extend into October depending on the fish species targeted. The summer fishing season overlaps with the breeding season of most seabirds. In late summer, adults and newly fledged juveniles of some species of seabirds forage in inshore waters. The late summer fisheries have the potential to overlap with juvenile and molting seabirds that forage near shore, especially murrelets and loons.

Salmon gillnet fisheries were monitored by NOAA Fisheries between 1990 and 2008 at five areas in Alaska. These areas were South Unimak along the Alaska Peninsula and east Aleutian Islands (1990), Prince William Sound (1990, 1991), Cook Inlet (1999, 2000), Kodiak Island (2002, 2005), and Yakutat District (2007, 2008).

Estimates of seabird mortality in South Unimak during 1990 ranged from 158 to 516 birds (95% CI). Half of the birds drowned in nets were common murres. Other species of alcids, shearwaters, and unidentified birds comprised the remaining 50 percent of birds drowned in nets. In driftnet fisheries of Prince William Sound and the Copper River, an estimated 1,468 total marine birds (CI 836–2100) were taken as bycatch. Most of the drowned seabirds were marbled murrelets; the other species or species groups killed were Kittlitz's murrelets, unidentified murrelets, and common loons. No birds died in the Prince William Sound setnet salmon gillnet fisheries during 1990.

In 1991, an estimated 993 total seabirds were taken as bycatch in the PWS driftnet fishery. Murres and murrelets were the species most frequently taken. Due to low bycatch rates, extrapolation of the marine bird encounter data are statistically difficult and resulted in wide confidence intervals (95% CI 334–2097).[187]

[186] Wynne *et al.* 1991
[187] Wynne *et al.* 1992

Seabird-fisheries interactions are of concern in the Kodiak area because an estimated 256,000 seabirds nesting at 192 colonies have been documented on Kodiak Island.[188] Ten species of seabirds were taken as bycatch in the Kodiak Island salmon gillnet fisheries in 2002 and 2005, including common and thick-billed murres, horned and tufted puffins, Kittlitz's and marbled murrelets, pelagic and red-faced cormorants, pigeon guillemots, sooty shearwaters, harlequin ducks and white-winged scoters.[189] An estimated total bycatch of 528 birds (95% CI 309–747) was reported for 2002 and 1,089 birds (95% CI 699–1480) in 2005.

The extensive geographic overlap of the Cook Inlet fisheries with large populations of breeding seabirds, high seabird densities in some areas, and the declining numbers of some bird species (such as marbled murrelets) poses potential for risks to some seabirds.[190]

Less than two percent of the Cook Inlet gillnet fishery was monitored in 1999 and 2000, resulting in wide confidence intervals and suspect mortality estimates of marine birds in these fisheries.[191] Despite this inadequate coverage, seabird bycatch results suggested that common murres, gulls, and marbled murrelets were being taken as bycatch.[187]

Additional Direct Effects on Seabirds from Various Commercial Fisheries

Some additional direct effects on seabirds from commercial fisheries are difficult to quantify. For example, *ghost nets* -- fishing nets that have been lost or discarded at sea -- may continue to "fish" for years until they wash up on shore, sink, or degrade. While afloat, they can travel long distances and entangle and drown seabirds. The monofilament line used in commercial fisheries may also be lost and ingested by birds, resulting in a range of physical problems and possible death. No data exist to quantify these additional direct effects.

Lights on fishing vessels may also directly affect nocturnal seabird species by causing them to collide with the vessel. This problem may be exacerbated by inclement weather.[192] The additional visibility provided by bright lights on fishing vessels may also increase predation on nocturnal seabirds enroute to and from the colony by predators such as gulls or owls.[193] Data are gathered on interactions between fishing vessels and seabirds through use of seabird notes recorded by NOAA Fisheries observers.[194] The Service consolidated these observer notes from 1993 to 2003 into a Seabird Observer Notes database (SON).[195] These records have been useful in obtaining anecdotal records of interactions between fishing vessels and seabirds and in providing at-sea records of species considered to be at risk by the Service. Data from the SON suggest that auklets, shearwaters, and northern fulmars comprised most of the records of fishing vessel strikes from 1993 to 2003.[196]

[188] USFWS 2006b
[189] Manly *et al.* 2003
[190] Agler *et al.* 1998, Speckman *et al.* 2005
[191] Manly 2006a
[192] USFWS unpubl. data
[193] Anderson *et al.* 2001
[194] Labunski and Kuletz 2004
[195] Labunski and Kuletz 2004
[196] USFWS unpubl. data

Indirect Effects on Seabirds from Various Commercial Fisheries

Not all fishery effects on seabirds are direct. Indirect effects (e.g., changes in abundance or availability of prey species, disturbance at colonies or foraging areas, introduction of contaminants into the marine environment, introduction of invasive species, and habitat alteration) have all been difficult to substantiate and quantify. Some indirect effects of fisheries on seabirds may be positive. Fisheries targeting predatory fish could result in greater availability of forage fish to some seabird species.[197] The indirect effects of some fisheries-seabird interactions (e.g., fish processing waste discarded from fishing vessels) may be both negative and positive. Fish processing waste discarded by vessels might augment feeding opportunities for some seabird species,[198] but increase the possibility of hooking or entangling birds in fishing gear.[199]

Seabird Prey Abundance

The indirect effects of commercial fishing on seabird prey abundance are difficult to quantify, and could be both negative and positive. Forage fish, such as sand lance, capelin, and juvenile pollock; and myctophids (among others) are important prey species for some seabirds. The prohibition of a targeted fishery in Alaska on forage fishes was implemented after passage of the Magnuson-Stevens Fisheries Conservation and Management Act, thus reducing the direct competition between seabirds and humans.[200] Some commercially fished species, however, are also important prey to seabirds.

Pacific herring is an important prey for several seabird species in Alaska, and juvenile herring may be essential to successful chick rearing for some species, such as marbled murrelets.[201] The herring population in Prince William Sound has fluctuated widely over the years and the stock finally collapsed in 1993.[202] There are several hypotheses about the cause of the herring collapse: competition with hatchery-raised salmon smolts, overharvest of herring when stocks were low,[202] and negative efects from the 1989 *Exxon Valdez* oil spill.[203] The commercial herring fishery could have an effect on murrelets by reduction of local fish populations and harvest of herring sac-roe on kelp.[204] The marble murrelet population in Prince William Sound declined concurrently with the herring biomass.[205]

[197] Furness 1982
[198] Camphuysen *et al.*1995
[199] Moreno *et al.* 1996, Wahl and Heinemann 1979
[200] Witherell and Pautkze 1997, Witherell *et al.* 2000
[201] Kuletz 2005
[202] Thomas and Thorne 2003
[203] Paine *et al.* 1996, Spiese *et al.* 1996
[204] Woodby *et al.* 2005
[205] Kuletz 2005

A more complex effect of fishing on seabirds is the food web cascade resulting from the removal of large fish that consume smaller species such as Pacific sand lance.[206] Seabird species feeding on sand lance could potentially benefit by a reduction in competition with fish predators for this forage species.
Juvenile walleye pollock are a common prey species consumed by many seabirds, and fishing of adult pollock is the largest commercial fishery in Alaska seas. Pollock prey on forage fish including their own juveniles,[207] which may reduce forage fish populations. Because adult pollock are a large proportion of the biomass in Alaska waters, it has been hypothesized that harvesting pollock could make forage fish more available to other predators such as seabirds.[208] For example, a positive relationship was found between black-legged kittiwake productivity and pollock catch levels in the Pribilof Islands.[208]

Food Provisioning to Seabirds

Some seabird species may benefit from other alterations in the food chain caused by commercial fishing.[209] One example of this is food provisioning by fishing vessels. Northern fulmars are known to follow fishing vessels and feed extensively on offal. It has been suggested that increases in fulmar numbers in the boreal zone of the Atlantic Ocean are a result of increased food provisioning by an expanding fishing industry.[210]

Gulls are also known to feed on waste from fish processors, potentially increasing survival of the birds, particularly juveniles in winter.[211] The increased benefit to gulls can, however, adversely affect other species of birds. More gulls can result in heavier predation on other bird species as documented in Europe.[212]

There have been a series of regulations implemented over the years that affect discards and offal, but how these changes may have affected seabirds is not known.

Habitat Damage

Bottom trawling has the potential to damage benthic habitats as the net drags along the ocean bottom.[213] The National Academy of Sciences concluded that bottom trawling reduces the complexity and diversity of the sea floor with the most harm done to long-lived slow-growing species such as corals and sponges.[214] In 1996, the Sustainable Fisheries Act was passed requiring NOAA Fisheries to do the following: describe and identify Essential Fish Habitat (EFH); minimize, to the extent practical, adverse effects on essential fish habitat caused by fishing; and identify other actions to encourage the conservation and enhancement of such habitat.

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[206] Furness 1984
[207] AFSC 2004
[208] Hunt and Stabeno 2002
[209] Melvin *et al.* 2001
[210] Hatch and Nettleship 1998
[211] Patten and Patten 1982
[212] Spaans 1959
[213] Friese *et al* 1999
[214] NRC 2002

In Alaska, protection of benthic habitats has included: no-trawl restrictions at haul-outs for Steller's Sea Lions and selected seamounts,[215] establishment of the Aleutian Islands Habitat Conservation Area in 2006 covering about 279,000 square miles, the 2007 NPFMC closure of the "Northern Bering Sea Research Area," and promotion of research on these changing ecosystems.

Pressure to expand trawling into new habitats, including areas with high seabird concentrations (e.g., St. Lawrence and Little Diomede islands, etc.), may accompany the shift in the commercial fisheries.

Towers, Powerlines, and Obstructions

Communication towers in the United States include radio, television, cellular, microwave, paging, messaging, open video, public safety, wireless data, government dispatch, and emergency broadcast. Recent proliferation in the number of towers being built has intensified concern about avian mortality resulting from birds colliding with towers. Past research regarding birds killed by towers has shown that most collisions happen at night or in inclement weather. Towers that are the most dangerous to birds are greater than 200-feet-tall, lighted with red lights, supported by guy wires, and located in migration corridors near wetlands.[216] Towers in areas with fog, low clouds, and precipitation also have more bird strikes.[216] In the United States there are more than 140,000 towers and related bird mortalities are estimated by the Service at 4 to 5 million annually.[217] In Alaska, 418 towers are registered with the Federal Communication Commission (FCC).[218] Only towers taller than 200 feet above ground level must register, so an additional number of unknown towers exist. There are 87 towers taller than 200 feet above ground level in Alaska and the tallest tower is 1,358-feet in height at Port Clarence on the Seward Peninsula.[219] An estimate of total bird mortality caused by towers in Alaska is not available.

A sea-based x-band radar (SBX) mounted onto one of the world's largest modified oil drilling vessels will be home ported in Kulik Bay, Alaska. The port site is located in Sitkin Sound at Adak Island in the Aleutian Islands. The radar vessel will be deployed as needed around the Pacific to support missile defense activities.[220] From the keel to the top of the radar's dome measures 280 feet, its width is 240 feet, and the length is 390 feet. After receiving modifications outside Alaska, the SBX is expected to return to Adak in 2009 and subsequently support the Missile Defense Agency tests in the Pacific.[221] Adak is part of the Aleutian Islands Unit of the Alaska Maritime National Wildlife Refuge. Sitkin Sound is a broad bay enclosed on three sides by Adak Island and is an Audubon Important Bird Area (IBA). The Sound is key habitat for the whiskered auklet, a species whose breeding range in the United States is restricted to the Aleutian Islands. The area is also used by seabirds that breed at large colonies nearby, including Kasatochi and Koniuji islands, and is visited by many species of nonbreeding seabirds. A few seabird nesting colonies are also located in

[215] Federal Register 1999
[216] Avery *et al.* 1978, 1980, Banks 1979, Hebert *et al.* 1995, Kerlinger 2000, Manville 2000, Trapp 1998
[217] Manville 2000
[218] Federal Communication Commission 2007
[219] Federal Aviation Administration 2007
[220] U.S. Dept. of Defense 2005
[221] Alaska State Legislature Joint Armed Services Committee 2008

Clam Lagoon, north of the proposed SBX mooring location. Seabird species that nest on Adak Island include pelagic and red-faced cormorants, Arctic and Aleutian terns, marbled murrelets, and tufted puffins.[222]
Another source of concern for bird collisions is wind turbines. Wind-based power is a rapidly growing area of energy production. Growth of this industry is expected to continue as governments and corporations search for alternative methods of reducing greenhouse gas emissions. Interest in wind power in Alaska grew dramatically as rural power costs soared because of high fuel prices. In 1997, the first successful utility wind farm was constructed in the northwestern community of Kotzebue. Six additional Alaska communities are now creating energy from the wind: St. Paul, Toksook Bay, Kasigluk, Selawik, Pilot Point, and Wales. These installations are the first stage in a broader effort by the Anchorage-based Alaska Village Electric Cooperative to integrate wind energy into more of the 51 Alaska communities to which it provides electric power.

Several factors influence the potential for bird mortality to occur at wind farms: location, size of the project, turbine design (tower design, tower height, blade size and rotation speed), turbine arrangement, lighting requirements, and others. Because turbines are not supported by guy wires and are rarely lit, most studies indicate that bird mortality rates are very low.[223] The total annual avian mortality in the United States from wind turbines has been estimated in the low thousands,[224] but this would be expected to increase as the number of turbines increases. To date, there are no reports of single event mass kills of birds at any wind farm anywhere in the world.[225] In contrast, mass kills are regularly reported from communication towers.

Collisions with other types of structures are far more frequent than with wind turbines. The following estimates[226] for collision-associated bird mortalities in the contiguous United States provide some perspective about the various sources that may also be causing bird collisions in Alaska.

- vehicles, 60 to 80 million/year
- buildings, 100 million to 1 billion/year
- power lines, up to 174 million/year
- communication towers, 4 to 5 million/year
- wind turbines, low thousands

Information about bird collisions with towers, powerlines, and obstructions in Alaska is patchy and no state-wide records are available. Reports of bird collisions that are reported to the Service are kept in a database that is maintained by the Fish and Wildlife Service Field Office in Anchorage.

Avian Influenza

[222] USFWS 2006b
[223] Erickson *et al*. 2001, 2002, 2003, Johnson *et al.* 2002, Kingsley and Whittam 2002, Kirtland 1985, Moller and Poulsen 1984, NWCC 1999, Thomas 2003
[224] Kerlinger 2001
[225] Erickson *et al* 2003
[226] Erickson *et al.* 2001, Kerlinger 2001

Seabirds can be susceptible to viral, bacterial, fungal, and algal diseases that occur naturally in the environment. Exposure to a variety of diseases could be greater for seabirds that cover thousands of miles on extensive migrations. Potential for rapid spreading of disease could also be higher for seabirds because of large aggregations at breeding and foraging areas. Disease outbreaks among seabirds in Alaska are not common, however.

An outbreak of the H5N1 strain of highly pathogenic avian influenza (HPAI) occurred in 1997 at chicken farms and live bird markets in Hong Kong. This outbreak resulted in the first reported case of human influenza and fatality attributable directly to an avian influenza virus.[227] From 2002 to 2005, subsequent outbreaks occurred in Southeast Asia. In 2005, the virus killed many wild birds (bar-headed geese) in China.[228] Since 2005, the virus has appeared in domestic poultry across Asia, Europe, the Middle East, Russia, and in several African countries. Wild bird deaths have also been reported in several of these countries. The H5N1 strain of HPAI that originated in poultry in Southeast Asia has caused mortality in more than 60 species of wild birds[229] and has been transmitted to 288 humans leading to 170 deaths as of 2 April, 2007.[230]

Whether HPAI influenza is spread by wild migratory birds, or by movement of domestic poultry and smuggled birds has been highly controversial.[231] Recent data suggest that apparently-healthy wild birds are carriers of HPAI H5N1.[232] These data have refueled concerns that wild, migrating birds may spread this virus on their long-distance, intercontinental migrations.[233] Viruses in domestic poultry have evolved into distinct, regional sublineages, however, suggesting that transmission within poultry is the major mechanism for sustaining H5N1 endemicity in Southeast Asia.[233] This finding supports the "influenza epicenter" hypothesis,[234] which argues that southern China is the epicenter from which influenza pandemics emerge.

Migratory flyways of Asia and North America overlap in Alaska. This state is the breeding grounds for numerous species of birds that winter in southern Asia; it also hosts bird species that winter in North America and spend some portion of the summer in Asia. Therefore, if H5N1 is distributed by wild, migratory birds, Alaska was identified as the first location that it would occur in North America.[235]

In 2006, an Alaska Interagency Avian Influenza Working Group was formed to select priority bird species to be sampled for H5N1 in Alaska. Type A influenza viruses occur worldwide in wild birds and have been recorded in most bird families,[236] however, the prevalence and diversity of avian influenza subtypes is not evenly distributed among

[227] Jong *et al.* 1997
[228] Liu 2005
[229] Ellis *et al.* 2004, Liu 2005, Sturm-Ramirez *et al.* 2004
[230] World Health Organization 2007
[231] Chen *et al.* 2005, Kilpatrick *et al.* 2006, Muzaffar *et al.* 2006, Normile 2005, Van Borm *et al.* 2005
[232] Gilbert *et al.* 2006
[233] Chen *et al.* 2006
[234] Shortridge and Stuart-Harris 1982
[235] Interagency Working Group 2006
[236] Olsen *et al.* 2006

them.[237] Influenza viruses have been isolated in 12 bird orders, but most isolations have been reported in *Anseriformes* (especially ducks, geese, and swans) and *Charadriiformes* (particularly gulls, terns, and waders).[238] Therefore, the majority of species selected to be sampled in Alaska for H5N1 in 2006 were birds from these groups that migrated between Asia and Alaska.[239]

Two seabird species were chosen for the sampling project in 2006, Aleutian terns and glaucous gulls. During the spring subsistence harvest, several other species of seabirds were also opportunistically sampled. Most Aleutian terns breed in Alaska and migrate to Australasia in winter via the East Asian Flyway. One of the 302 Aleutian tern samples tested positive for avian influenza; it was not H5 or N1 positive.[239] This sample was from a live bird and represents less than 1 percent prevalence of avian influenza. Glaucous gull populations that breed in western Alaska winter along Australasian coastlines, feed in land fills, and scavenge dead birds. Glaucous gulls (n = 139) were sampled from St. Lawrence Island, Barrow, and the Yukon Delta. Of those, 33 were live birds and 106 were killed by spring and fall subsistence hunters. None of the live bird samples tested positive for avian influenza; of the hunter samples, 5 tested positive for avian influenza, but were not H5 or N1 positive. This represents a 3.6 percent prevalence of avian influenza in the glaucous gulls.[239] Both thick-billed (n = 235) and common murres (n = 76) were also sampled in 2006 during the spring subsistence harvest. Interestingly, two common murres (2.63 percent) and 10 thick-billed murres (4.3 percent) tested positive for an avian influenza virus, although none of them were H5 or N1 positive.[240]

Glaucous gulls were the only priority seabird species sampled for H5N1 in 2007. Ten samples were collected from live birds and four samples were collected from subsistence harvested birds. None of the samples tested positive for avian influenza.[241] In 2008, 35 glaucous gull, 21 common murre, and 196 thick-billed murre samples were collected for H5N1 testing. Totals include samples taken from live birds and subsistence harvested birds. None of the 2008 samples tested positive for avian influenza.[242]

Seabird Die-offs

Die-offs of seabirds (also known as seabird wrecks) are defined as the washing ashore of significantly larger numbers of seabirds than would be expected for the time of year. In Alaska, they are reported every few years and often occur in association with severe storms. Evidence from extensive die-offs in 1970, 1983, 1993, 1997, and 2004 supports starvation as the cause of death rather than disease.[243] Unusually warm oceanographic conditions, resulting in changes in the food web, are thought to have been the cause of the starvation.[243] The most common Alaska seabird species recorded in die-offs include: common and thick-

[237] Stallknecht and Shane 1988
[238] Webster *et al.* 1992
[239] USFWS/USGS 2007
[240] Ip *et al.* 2008
[241] USFWS/USGS 2008
[242] USFWS/USGS 2009
[243] Baduini *et al.* 2001, Hatch 1987, Piatt and Van Pelt 1997, NWHC and USFWS unpubl. data

billed murres, short-tailed and sooty shearwaters, black-legged kittiwakes, horned puffins, pigeon guillemots, herring gulls, northern fulmars, and cormorants.

Due to the tremendous size and remote nature of Alaska's coastline, much of the bird mortality may go unreported. Even when mortality events are reported, birds may die at sea, sink, or be scavenged before they can be picked up. Of the birds that are recovered, relatively few are sent to the National Wildlife Health Center (NWHC) for analysis and diagnosis for cause of death. Furthermore, many of the carcasses collected are not fresh enough for testing. These factors may bias the number of reported deaths and the incidence of disease. Both may be substantially higher than reported.

The Coastal Observation and Seabird Survey Team (COASST) is a volunteer science program originally established to track beached bird carcasses along the coast of Washington, Oregon, and California. This project is run by the University of Washington, Seattle, in partnership with the Olympic Coast National Marine Sanctuary. In 2007 the project expanded to Alaska. The North Pacific Research Board funded the Alaska project in 2007 and 2008. The COASST Program will assist the Service in establishing a baseline on "normal" patterns of beaching that may be compared with various known events such as oil spills, El Niños, and others.

Disturbance and Habitat Loss

Vessel Traffic

In Alaska, marine vessel traffic includes: oil tankers; oil rig support, cargo, fishing, and recreational vessels; and cruise ships. The traffic varies seasonally, regionally, and in vessel size. During the summer months, fishing, recreational, and cruise vessel activity increases and overlaps in some areas with peak numbers of seabird species during their breeding season.

In Prince William Sound, commercial fishing vessel activity increased during the 1980s due to development of salmon hatcheries. During this same period, tourism activity increased in the Sound with the heaviest vessel traffic in fjords with tidewater glaciers.[244] These natural features are a great tourist attraction in Alaska. In other remote areas with tidewater glaciers (e.g., Kenai Fjords and Glacier Bay national parks and preserves) vessel traffic has also grown.

The increased vessel traffic caused concern and subsequent Service investigations into the effects on seabirds, particularly marbled and Kittlitz's murrelets. Potential effects to seabirds are species-specific, however, and have been difficult to quantify.

Studies conducted in Prince William Sound, Kachemak Bay, and Glacier Bay National Park and Preserve suggest that marbled and Kittlitz's murrelets are displaced by vessel traffic[245] and possibly affected energetically.[246] For example, when boats were present in Prince William Sound, fewer Kittlitz's murrelets were observed making foraging dives and more

[244] Murphy *et al.* 2004
[245] Agness 2006, Kuletz *et al.*1996, Kuletz *et al.* 2003, Speckman *et al.*2004, USFWS unpubl. data
[246] Agness 2006, Speckman *et al.*2004

birds flew off the water compared with undisturbed groups.[247] In Southeast Alaska, marbled murrelets holding fish, probably for their chicks, were observed swallow the fish and dive when boats were present.[248] This response could affect reproductive success and the energetic cost of raising chicks.[248]

Limited effects from vessel disturbance have been recorded on *Brachyramphus* murrelets in Alaska, but population-level, regional implications, and long-term effects of vessel traffic on murrelets remain unknown. Moreover, effects of vessel disturbance on most Alaska seabird species also remain largely unknown.

Forest Development

The Tongass and Chugach national forests in Alaska are unique forests in the United States in their extensive shoreline habitats and association with marine waters and glaciers. The most economically valuable timber in Alaska is found along the coasts of these two national forests and consists of dense stands of high volume, high age-class hemlock and spruce trees.

The major direct effect of coastal logging on seabirds is destruction of marbled murrelet habitat. Over most of its range, the marbled murrelet nests in old-growth, coniferous forests. Loss of this type of nesting habitat is believed to be a key factor in the decline of marbled murrelets in some areas.[249] In Alaska, tree-nesting by marbled murrelets has been documented in Prince William Sound, on Kodiak and Afognak islands, and in Southeast Alaska. Marbled murrelets also nest on coastal alpine tundra from the Kenai Peninsula southwestwards, but populations in tundra-nesting areas are much lower than in areas of old-growth timber.[249]

In Washington, Oregon, and California, the marbled murrelet was declared a Threatened species in 1992 under the Endangered Species Act. This species was considered threatened due to loss and modification of its nesting habitat (primarily from commercial harvest of old-growth timber) and mortality from gillnet fisheries and oil spills. In Alaska the marbled murrelet has no special status, but is a species of management concern for the Service. It was listed as one of the species injured by the 1989 *Exxon Valdez* oil spill in Prince William Sound. By 2002, the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) considered the species to be recovering. Recently, the recovery status was changed to unknown[250] and the EVOSTC considers breeding birds in Prince William Sound to be in decline.[251]

Nesting habitat of pigeon guillemots could also be damaged by logging. These seabirds nest in small scattered colonies or as isolated pairs. As many as 40 percent of their nests on Naked Island (Prince William Sound) are in root cavities at the forest edge,[252] and nest cavities may extend nine feet into the forest.[253] Because of their nesting habitat, scattered distribution, and

[247] Kuletz *et al.* 2003
[248] Speckman *et al.* 2004
[249] McShane *et al.* 2004
[250] *Exxon Valdez* Oil Spill Trustee Council 2006
[251] Integral Consulting, Inc. 2006
[252] Oakley and Kuletz 1979
[253] Kuletz unpubl. data

use of shallow, protected waters for feeding, pigeon guillemots could be susceptible to disturbance by logging activities.

Murrelets, guillemots, and other species of Alaska seabirds that feed in the nearshore environment could also be affected by disturbance from logging activities if log transfer sites are constructed near important colonies or habitats. Additional changes to nearshore marine habitats created by commercial forestry, including increased run-off and sediment, could indirectly affect seabirds by altering prey abundance or distribution.

Subsistence Harvest

Eskimo, Aleut, and Indian groups in Alaska have gathered eggs and taken birds for food and raw materials for thousands of years. These traditional uses of birds continue to be part of a unique socioeconomic system in Alaska today.[254] Subsistence harvest of migratory birds occurs in rural areas that are generally inaccessible by road, and where fishing and hunting are major components of the regional economy.

In the early 1900s, the migratory bird harvest across North America was not federally regulated, and commercial hunting of birds was reducing populations. To stem the declines in several bird species, the United States signed international treaties on migratory bird conservation with Great Britain (for Canada) in 1916, Mexico in 1936, Japan in 1974, and the U.S.S.R. (Russia) in 1976. All four Conventions have been implemented in the United States primarily by the Migratory Bird Treaty Act of 1918, as amended, and the Fish and Wildlife Act of 1956.

These treaties prevented market hunting, opened regulated sport harvest of "game" species (primarily waterfowl), and protected birds during the nesting season. The Conventions with Canada and Mexico did not acknowledge the traditional harvesting of migratory birds and their eggs by indigenous people during the spring and summer periods. Consequently, hunting of migratory birds between March 10 and September 1 was closed. Despite the closed season, the traditional subsistence harvest continued during these periods.

In 1997, protocol amendments to the Canadian and Mexican Conventions were approved that recognized the customary and traditional harvest of migratory birds and their eggs during spring and summer by indigenous people (later defined as Alaska Natives and permanent non-Native residents living in designated subsistence hunting areas). These amendments authorized the United States to establish regulated spring and summer harvests of migratory birds.

In keeping with the amendment requirements, the Alaska Migratory Bird Co-management Council (AMBCC) was established to ensure that subsistence users would have an effective role in the development and implementation of regulations. Management bodies comprised of Native, federal, and State of Alaska representatives were developed to accomplish this mandate.

[254] USDOI 1980, Wolfe and Walker 1987

The first annual harvest regulations opening a legal spring/summer subsistence migratory bird season were implemented in 2003. Development of harvest regulations has continued annually since 2003. Additional information can be found on the following website: http://alaska.fws.gov/ambcc/index.htm.

The Service has been designated as the trust resource management agency for migratory birds frequenting the United States. Trust responsibilities have included gathering accurate geographical and temporal data on various characteristics of migratory bird harvests. To accomplish this task in Alaska, in addition to sport harvest surveys, the Service has monitored the migratory bird subsistence harvest for the past 14 years through the use of annual household surveys.

Data on the subsistence harvest of seabirds from the 1995 to 2000 survey period indicate the total annual estimated harvest of seabirds in Alaska was more than 21,000 birds and the seabird egg harvest was about 98,000 eggs (Appendix 6). Seabird and seabird egg harvests represented about 9 percent and 85 percent, respectively, of the total estimated annual harvest of migratory birds and eggs in Alaska during the 1995 to 2000 period.

During the 2001 to 2005 survey period the annual harvest estimates of seabirds and seabird eggs increased to about 30,000 and 145,000, respectively (Appendix 8). These estimates should be considered minimum harvest numbers because all regions in Alaska and all communities within the surveyed regions were not surveyed. The annual estimated numbers of harvested seabirds and eggs for the 2001 to 2005 survey period was more than 30 percent higher than the 1995 to 2000 survey period. The two harvest periods, however, are not comparable due to changes in survey methods during the 2001 to 2005 period.

Auklets and murres were the most harvested seabirds in Alaska during both survey periods (Appendices 6 and 7). The region with the highest seabird harvest during the 1995 to 2000 period was the Bering Strait/Norton Sound Region with about 85 percent of the total statewide seabird harvest (Appendix 8). That same region also had the highest seabird harvest (85 percent) during the 2001 to 2005 period (Appendix 8). There were no seabirds or seabird eggs reported taken in the Southeast Alaska region from 2001 to 2005.

Continuation of the annual household surveys to monitor the migratory bird subsistence harvests will enable tracking of any significant changes or trends in the levels of harvest and user participation since legalization of the harvest.

As of 2008, there were 30 species of seabirds open for subsistence harvesting and egging by rural residents in designated subsistence harvest regions in Alaska (Appendix 9).

Climate Change

Recently changes in climate have become more obvious and the focus of considerable worldwide attention. Climate change has the potential to drastically affect our planet including marine ecosystems and their fauna. Documenting the effects of climate change on seabird populations is important, but seabirds also are good indicators of marine ecosystem

status and change.[255] As global warming and climate change continue to emerge as key issues, seabirds will serve as sensitive and cost effective ecosystem indicators.

Average annual air temperatures in Alaska have increased by 3 to 4 °Fahrenheit over the last 50 years, six times the worldwide rate.[256] Ice covered regions of the world are among the most sensitive to temperature change. The Arctic has been intensely affected by the warming with extensive melting of glaciers,[257] thawing of permafrost,[258] and reduction in the extent of sea ice in the Arctic Ocean.[259] The reduction in extent and thickness of sea ice is most important to seabirds. Since 1979, National Aeronautic and Space Administration (NASA) satellite observations have shown that the Arctic's perennial sea ice cover has been declining at 9.6 percent per decade. [260] In a particularly warm period (2004 to 2005), ice declined by about 14 percent.[261] In addition to the reduction in summer sea ice coverage, the ice has thinned about 15 percent per decade,[262] and the melting of the ice in the spring has occurred earlier by as much as three weeks.[263]

Because sea ice floats on the surface of the ocean it moves with changes in atmospheric circulation and weather. Air temperatures affect the extent, thickness, and timing of sea ice. In turn, these three factors determine sea surface temperatures, which affect marine biological communities.

The effects of sea ice changes are apparent in Alaska in the Bering, Chukchi and Beaufort Seas that are home to more than 20 million seabirds.[264] Over the last 50 years, the climate and ecosystem of these northern seas has changed from a primarily cold arctic ecosystem, dominated by sea ice, to sub-arctic conditions.[259] Seabird biologists have hypothesized about some of the ways that climate change and the resulting change in ice conditions might affect seabird populations living in this region.[265] There could be shifts in distribution of birds and their prey at sea, northern shifts in breeding distribution of some species, changes in wintering areas for ice-associated species, and the associated effects on the demographics of these seabirds.

Correlations between climate patterns and responses of marine ecosystems have been subject to more intense investigation in the last 15 years. Atmospheric circulation and weather are closely linked to surface pressure. The primary features of sea-level pressure in Alaska's

[255] Boersma 1978, Cairns 1987, Chapdelaine and Brousseau 1989, Crawford and Shelton 1978, Croxall *et al.* 1988, Fredericksen *et al.* 2007, Furness and Camphuysen 1997, Hamer *et al*. 1991, Harding *et al.* 2007, Harris and Wanless 1990, Iverson *et al.* 2007, Kitasky *et al.* 2007, Monaghan *et al*. 1989, Montevecchi 1993, 2007, Newman *et al.* 2007, Parrish *et al.* 2007, Piatt *et al.* 2007a, 2007b, Renner *et al.* 2008, Ricklefs *et al.* 1984, Robinette *et al.* 2007, Springer *et al.* 2007
[256] National Assessment Synthesis Team 2000, Stafford et al. 2000
[257] Molina 2006
[258] Osterkamp 1994
[259] Rothrock *et al.* 1999, Vinnikov *et al.* 1999
[260] NASA 2008
[261] NASA 2008
[262] Rothrock *et al.* 1999
[263] Grebmeier *et al.* 2006
[264] Stephensen and Irons 2003
[265] Meehan *et al.* 2008

winter are the oceanic Aleutian Low and the continental Beaufort High. The Bering Sea also responds to cyclical climate patterns**:** the Pacific Decadal Oscillation (PDO) and the Arctic Oscillation. The PDO has a strong influence on the southern Bering Sea. The 40- to 50-year oscillation in the PDO led to higher sea surface temperatures in the North Pacific from 1925 to 1947 and 1977 to 1998; colder conditions occurred in 1899 to 1924 and 1948 to 1976.[266] During the last warm regime (1977 to 1998), a shift in the location and intensity of the Aleutian Low Pressure system resulted in stronger westerly winds and warmer surface waters in the Gulf of Alaska. A major reorganization of the food web in the Gulf of Alaska ecosystem was initiated by this shift.[267] Recruitment responses of groundfish species improved markedly and Pacific salmon catches were greatly increased.[268] Conversely, important forage species such as capelin and herring declined by 95 percent or more in less than 15 years and never recovered in much of their range.[269]

Apparently, the reorganization of the marine ecosystem negatively affected some piscivorous birds in the Gulf of Alaska.[270] During the cold regime prior to 1970, seabirds relied on fatty forage species such as capelin. In the early 1980s, forage biomass declined and fatty forage species were largely replaced in some seabird diets with juvenile pollock.[271] Wide spread reproductive failure of black-legged kittiwakes and population declines in several other species of seabirds in the Gulf of Alaska (marbled and Kittlitz's murrelets, common murres, cormorants, *Larus* gulls, pigeon guillemots, horned puffins) followed the trophic reorganization.[271] Because juvenile pollock are not as energy rich as species such as capelin, some seabird declines could be attributable to the changes in diet.[271]

Scientists have discovered that the timing and magnitude of the spring phytoplankton bloom is changing in the Bering Sea and that there has been about a 50 percent decrease in the amount of carbon being produced.[272] Warming water temperatures in the Bering Sea may also profoundly change the distribution and abundance of fish, another primary prey of seabirds.[273]

In southeastern Bering Sea, the Pribilof Islands have populations of black- and red-legged kittiwakes and common and thick-billed murres exceeding two million birds. St George Island contains more than 80 percent of the world's population of red-legged kittiwakes. All four species of seabirds at these colonies have been studied over the past 30 years as part of the Seabird Monitoring Program conducted by the Alaska Maritime National Wildlife Refuge and others. Past analyses of seabird trends at these colonies indicated population declines following a period of relatively cooler sea surface temperatures (SST) in the mid-1970s. The decade-long decline was followed in the mid-1980s to mid-1990s by population numbers stabilizing at levels lower than before the warming trend. These patterns were attributed to

[266] Mantua *et al.* 1997, NASA 2007, Minobe 1997
[267] Hare and Mantua 2000, Hollowed and Wooster 1995, Hollowed *et al.* 2001
[268] Francis and Hare 1994
[269] Anderson *et al.* 1997, Bechtol 1997
[270] Francis *et al.* 1998, Piatt and Anderson 1996
[271] Piatt and Anderson 1996
[272] Grebmeier *et al.* 2006
[273] Livingston and Wilderbuer 2008

changes in prey availability due to warmer SST.[274] Kittiwake and murre numbers on St. George have rebounded, but birds have continued to decline on St. Paul Island. Since the 1976 to 1977 regime shift and escalating in the last decade, the extent of the sea ice in the Bering Sea has been highly variable and has failed to reach the Pribilofs in a number of winters.[275] The more northern St. Paul Island colony is likely more closely tied to ice-edge productivity and ice-edge-associated forage fish than the St. George Island colony.[276]

Recent examination of seabird trends at these colonies using a longer dataset (trends over the last 30 years) hypothesized that the differences in seabird productivity or survival were due to differences in environmental changes on an island scale, mediated through the food web. Analyses also found that winter and spring SST is inversely related to breeding success, but that summer (chick-rearing phase) SST was positively related. Winter SST is also positively related with timing of breeding (birds breed later when winter SST is higher).[277] Specific mechanistic links are still being investigated by the Bering Sea Integrated Ecosystem Research Program (BSIERP) (http://bsierp.nprb.org).

Climate change effects also occur and can be measured at the hemispheric scale. A recent broadscale, long-term study on two species of murres throughout the circumpolar north examined population trends after climate shifts. The authors found in areas where the winter SST changed little (0.0° to 32.9° Fahrenheit) from one phase to the next, the size of the colony increased, but when the shift in SST was large (32.9° to 33.8° Fahrenheit) murres declined whether the shift was to a warm or cool phase.[278]

[274] Hunt and Byrd 1999
[275] Overland and Stabeno 2004
[276] Byrd *et al*. 2008a
[277] Byrd *et al*. 2008b
[278] Irons *et al*. 2008

USFWS INVENTORY, MONITORING, RESEARCH, AND MANAGEMENT PROGRAMS AND INITIATIVES

USFWS, Region 7 is committed to conserving its vast seabird resources. This responsibility is partly fulfilled through inventories and monitoring that collect information on seabird distribution, population trends, patterns of reproduction, survival, chronology, and diets. Research provides additional knowledge and insight into the health of millions of seabirds that occur in Alaska. The condition of Alaska's seabirds serves as an indicator of the relative health of the marine ecosystem[279] and of how well the Service is managing one of its most abundant resources.

Most of Region 7's management activities and initiatives are directed toward limiting threats to seabirds and implementing seabird conservation across their range. These goals are accomplished through programs that promote coordination, collaboration, education, and information sharing with other countries, state and federal agencies, nongovernmental organizations, universities, and the general public.

Inventories

Inventories in Alaska include information on the distribution and relative abundance of various species of seabirds during different seasons. The inventories are conducted at colonies and on sections of the ocean throughout the state. Standard protocols for inventories at colonies and at sea have been described by Region 7.[280]

Breeding Colonies

Colony inventories consist of at least a one-time count or census of all species at each colony. To ensure that estimates do not become out of date due to major changes or shifts in populations, inventories should be repeated at intervals of no more than 10 years. In Alaska, the majority of inventories were done between 1975 and 1983 when more than 1,500 colonies were counted. The data are of variable quality, including particularly imprecise data for nocturnal and crevice nesting birds. The 1998 Alaska Seabird Colony Recensus Plan selected and prioritized colonies to be re-examined. [281] Due to the remote nature of seabird colonies in Alaska, inventories are costly. Funding has only been available for a few dedicated expeditions, but many colonies have been recensused as opportunities arise during other field work. Data are stored and are available on the internet in the North Pacific Seabird Colony Database.[282]

Inventories at Sea

Comprehensive geographic data on the distribution of seabirds at sea are crucial for assessment of breeding populations of non-colonial breeders and wintering species. At-sea data are also vital to understanding seabird's basic ecology and role in marine ecosystems,

[279] Ashmole 1971, Boyd and Murray 2001, Bost and le Maho 1993, Cairns 1987, Croxall et al. 1988, Frederiksen et al. 2007, Furness and Nettleship 1991, Harris and Wanless 1990
[280] Gould and Forsell 1989, Irons *et al.* 1988, Klosiewski and Laing 1994, USFWS 1999, 2002a
[281] Stephensen and Mendenhall 1998
[282] USFWS 2006b

identifying critical marine habitats for seabirds, and assessing some human effects (i.e., oil spills, fishing, tourism).

Bird distributions and abundance at sea are surveyed during all seasons by standardized surveys from vessels.[283] Surveys at sea require considerable time and money to cover vast areas; even when using ships of opportunity, the high cost of traveling among remote ports of call can be prohibitive.

North Pacific Pelagic Seabird Database & North Pacific Pelagic Seabird Observer Program

At a coarse scale, some marine waters in most marine ecosystems in Alaska have been surveyed for seabirds at sea, particularly in summer. Data have been recorded in the North Pacific Pelagic Seabird Database (NPPSD).[284] Like colony data, most at-sea data were primarily collected in the 1970s to 1980s, during the Outer Continental Shelf Environmental Assessment Program (OCSEAP). After the OCSEAP program concluded, at-sea data were collected opportunistically during cruises for other purposes. In the 1980s to 2000s, the USFWS and USGS-Alaska Science Center focused most of their survey efforts on inshore waters such as Cook Inlet, Prince William Sound, and areas of Southeast Alaska.

In 2002, additional at-sea data were collected by the Washington Sea Grant Program and collaborators to complete "bird-feeder" type surveys on charter vessels conducting halibut and sablefish surveys. Counts of seabird abundance (for select groups) were performed after each fish set was brought aboard and within a standardized area astern. In 2004, the program was expanded to include groundfish charters operated by the NOAA Fisheries. The resulting data were used to examine the distribution of seabird species susceptible to longline bycatch,[285] and subsequently, in a proposal to the North Pacific Fisheries Management Council to reduce mitigation devices for seabirds in "inside waters."

From 1994 to 2006, Alaska Maritime National Wildlife Refuge conducted nearshore marine bird surveys within 25 miles of annual colony monitoring sites.

In 2006, the Service received a grant from the North Pacific Research Board (NPRB) to update the pelagic seabird database with current information on the spatial and temporal distribution of seabirds in pelagic waters of Alaska. This work was extended from 2008 to 2010, as part of NPRB's Bering Sea Integrated Ecosystem Research Program (BSIERP) (http://bsierp.nprb.org). From May 2006 through October 2008, USFWS observers were placed on 33 cruises covering more than 67,000 km^2 of survey transects. Coverage included waters in the Bering, Chukchi, and Beaufort seas, Aleutian Islands, and smaller areas of the northern Gulf of Alaska.

[283] Gould and Forsell 1989, USFWS 2002a
[284] Piatt *et al.* 2006 *Draft*
[285] Melville *et al.* 2004

The at-sea program is a cooperative venture with NOAA Fisheries that provides space for the seabird observers on their fisheries research vessels. The U.S. Coast Guard also provides a survey platform via several projects funded by the National Science Foundation and onboard ice-breakers conducting ocean floor mapping expeditions in the Arctic. Other collaborators include the Bering-Aleutian Salmon International Survey (BASIS), the Global Ocean Ecosystem Dynamics project (GLOBEC), and the Alaska Maritime Refuge. Seabird densities and distribution will eventually be combined with the associated oceanographic and fisheries data. More information on the North Pacific Pelagic Seabird Database can be found in the Information Management section.

At-sea Inventories of Non-colonial Birds

Marbled and Kittlitz's murrelets breed solitarily at scattered, well-concealed sites on tundra and (marbled only) in forests. Therefore, their breeding populations are generally estimated on the water. Inventories of breeding murrelet abundance have been done for many forested shorelines and associated feeding areas in Alaska.

Wintering Concentrations

Seabirds spend the winter (approximately October through April) in all ice-free waters of the Alaska, including open water within the ice pack. Statistically valid inventories have been done in the major seabird wintering areas of Cook Inlet and Prince William Sound. More recently, the BSIERP surveys have provided new data on pelagic distributions of birds in the Bering Sea during the non-breeding season.

Seabird, Marine Mammal, Oceanography Coordinated Investigations (SMMOCI)

Alaska Maritime National Wildlife Refuge has conducted the Seabird, Marine Mammal, Oceanography Coordinated Investigations (SMMOCI) around designated colony sites on the refuge since 1995. Sites are chosen where time-series data have been collected for breeding seabirds and sea lions. Surveys are conducted within the average foraging range of seabirds from the colony (15 to 25 miles depending upon target species). The following investigations are used to characterize the marine environment: estimating the biomass of potential seabird and marine mammal prey, identifying common prey organisms, assessing oceanographic characteristics of water masses (e.g., sea surface temperature, salinity), characterizing bottom fauna, recording feeding distribution of birds and marine mammals, and assessing food web relationships.

SMOCCI surveys have been conducted in winter and summer months at Buldir, Kasatochi, Aiktak, Semidi, Barren, Pribilof, and St. Lazaria islands and at Norton Sound. In addition to adding survey data to the NPPSD, a full report of results is completed for each SMOCCI survey, including oceanographic data.

Monitoring

Monitoring entails the collection of reliable time-series data for seabird numbers, productivity, chronology, diet, and survivorship of indicator species. Data are collected in a standardized manner that permits statistical comparison among years and sites. Standardized

monitoring methods for colonies have been written by the Alaska Maritime National Wildlife Refuge.[286]

The objective of monitoring is to detect trends in seabird populations, or to detect changes in seabird breeding parameters that reflect responses to food web fluctuations that lead to changes in populations. Monitoring data should allow identification of problems in the ecosystem or in a particular species while management actions may still be effective.

Colonies that are monitored in Alaska were selected to represent all major marine regions. Population trends in colonies are influenced by nearby oceanographic features such as currents and upwellings. Therefore, trends in colonies that are near each other and have similar oceanography tend to be correlated, whereas colonies affected by different oceanographic features usually exhibit unrelated trends. To adequately represent overall ecosystem trends, monitoring sites were selected approximately 240 to 360 miles apart. A total of 10 sites are scheduled for annual surveys on the Alaska Maritime National Wildlife Refuge. Four other sites in Alaska are also scheduled for annual monitoring. At least some data are available from all of these sites in most years. The annual sites are Cape Lisburne and Bluff and St. Paul, St. George, Buldir, Kasatochi, Aiktak, Chowiet, E. Amatuli, and St. Lazaria islands on Alaska Maritime Refuge; Cape Peirce in the southern Bering Sea is monitored by Togiak National Wildlife Refuge; Middleton Island in the Gulf of Alaska is monitored annually by USGS-Alaska Science Center; and Shoup Bay in Prince William Sound and St. Lawrence Island in the Bering Sea are scheduled to be monitored annually by the USFWS, Migratory Bird Management (Figure 6). Colonies between the annual sites are identified for less frequent surveys to "calibrate" the information gathered at the annual sites (Figure 6). Data provided from other research projects (e.g., those associated with evaluating the effects of oil spills on marine birds) also supplement the monitoring database. To detect trends, monitoring must be continued long-term at the same colonies, using the same permanently-marked sample plots and standardized methods.

Most monitoring sites target species that are relatively easy to observe, abundant (so that statistically valid samples can be obtained), and widespread (so that trends can be compared among areas). Index species were selected to represent major feeding guilds (e.g., surface-feeders and divers) and those that rely on fish and invertebrates during the breeding season. Species monitored in a region differ among areas of Alaska, but at least one group in each feeding guild is usually present. Timing of nesting, productivity, and other demographic parameters in seabirds are often linked to food availability. Therefore, information such as species of prey and amounts or frequency of feeding assists in interpreting seabird trends.

Reproductive success and timing of nesting events are responses to interannual fluctuations in food webs. Understanding these patterns facilitates predicting future population change. Productivity data are stored in the Pacific Seabird Monitoring Database. At least one or two publications per year result from these data and are summarized annually in a web-based report: http://alaska.fws.gov/nwr/akmar/whatwedo/bioprojects/publications.htm. Data from this database can be used by scientists to test hypotheses about ecosystem processes.

[286] Williams *et al.* 2002

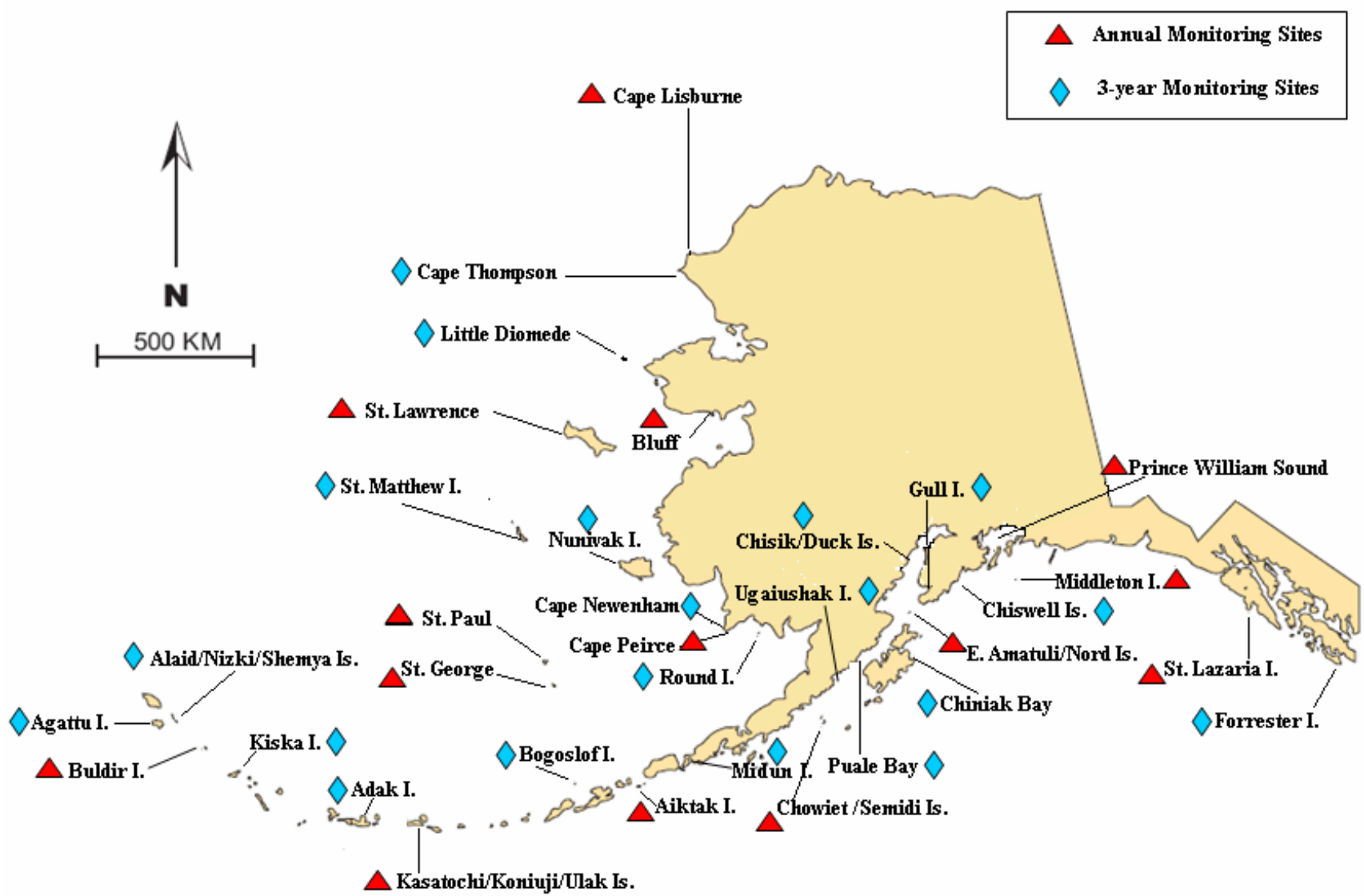

Figure 6. Map of Proposed Seabird Monitoring Sites and Schedules.

Wintering Concentrations

Seabirds are concentrated in winter in sheltered, ice-free waters along the ice edge of the Bering Sea and at pelagic oceanic fronts. Winter monitoring is designed to assess changes in areas used by seabirds. Monitoring winter concentrations is expensive and long-term; cost-effective monitoring of pelagic concentrations (including along the ice edge) have yet to be developed. Currently, winter surveys are conducted primarily in Prince William Sound.

Status Assessments

Special surveys and status assessments are designed and conducted for Endangered and Threatened Species, potential candidates for Endangered Species Act (ESA) listing, Birds of Conservation Concern (BCC) listed seabirds, and as part of damage assessment plans resulting from environmental events such as the *Exxon Valdez* oil spill.

Marbled Murrelet

Marbled murrelets breed along the coast from the Aleutian Islands in Alaska, south through British Columbia to central California. In 1990, this species was listed as threatened in British Columbia because of the loss of breeding habitat and declining populations; that status was renewed again in 2000. In 1993, the marbled murrelet was listed by the Service as a threatened species under the ESA within the southern part of its range (Washington, Oregon, and California). The Alaska murrelet population was not included in the listing because, in relation to the other States, Alaska had a large population with no information on population trends at that time.

The 1993 listing determination for the marbled murrelet was made prior to the Service's 1996 Distinct Population Segment (DPS) policy. That policy states that DPS designations made prior to the 1996 policy would be reviewed as a part of any five-year review. In 2003, the Service initiated a five-year review of the status of the murrelet population in Washington, Oregon, and California.[287] Based on that review, the Service concluded that the population of marbled murrelets in Washington, Oregon, and California did not satisfy the criteria for designation as a Distinct Population Segment. In September 2004, the Service announced its intention to pursue delisting the murrelet in Washington, Oregon, and California. Before any action is made to change the status of the marbled murrelet as a Threatened Species under the ESA, several important questions remain to be answered about the entire population. In March 2006 the Service requested a review of the status of the marbled murrelet in Alaska and British Columbia using existing information. The current status and trends of marbled murrelets in Alaska are important for determining the future legal status of this species. The status review was completed in 2007.[288]

Kittlitz's Murrelet

Concerns about possible declines in the Kittlitz's murrelet prompted the Service to examine the best available data on their population trends and resulted in the listing of this species as a candidate for listing under the Endangered Species Act in 2004.[289] Originally, this species was listed as a candidate with Listing Priority Number 5. In 2007, new survey information

[287] McShane *et al.* 2004
[288] Piatt *et al.* 2007
[289] USDOI, USFWS 2004

supported and strengthened the negative population trend estimates that had been previously reported for Kittlitz's murrelets.[290] Based on this observed population trajectory and the severity of threats, U.S. Fish and Wildlife Service now considers the threats to this species to be not only high in magnitude, but imminent. This change upgraded the Kittlitz's status from Listing Priority Number 5 (threats to a species are high in magnitude, but not imminent) to a Listing Priority Number 2 (threats are high in magnitude and imminent). In December 2008 the Service reviewed the Kittlitz's murrelet candidate status (Federal Register /Vol. 73, No. 238/December 10, 2008) and decided to retain the candidate listing, but not to list the species as threatened or endangered.

Contaminants Monitoring

Several of the largest seabird colonies in Alaska are located on islands or coasts with historic military activity. Military sites (both existing and historic) may play a role in local pollution patterns in Alaska. In addition to contaminants locally leaching into the environment, toxic materials are carried north and east from more southerly latitudes by water and air currents into the Gulf of Alaska and southern Bering Sea. Contaminants are also carried into the western Chukchi and Bering seas from the northern and eastern coasts of Siberia via oceanic transport.[291] All of these sources of pollution probably affect contaminant patterns and levels found in Alaska seabirds.

Although the monitoring of contaminants in seabird tissues and eggs has been included as part of environmental monitoring in Europe and Canada, few data exist on contaminants in Alaska seabirds. In 1998, the international Arctic Monitoring and Assessment Programme (AMAP) identified alcid eggs as key materials for circumpolar monitoring of persistent organic pollutants (POPs) by all arctic nations. Subsequently, in 1999, Alaska Maritime National Wildlife Refuge partnered with USGS-Alaska Science Center, the National Institute of Standards and Technology (NIST), the Bureau of Indian Affairs, Alaska Region Subsistence Branch, and 19 Alaska communities to initiate the Seabird Tissue Archival and Monitoring Project (STAMP). The project compiles baseline information on exposure levels in breeding seabirds, identifies the source of contaminants, and measures the effects on seabirds. About 100 potentially harmful contaminants in several species of Alaska seabirds, including some important in rural subsistence diets, are identified and tracked by the STAMP program. The project will be ongoing at varying levels of effort for 100 years and has been supported by the North Pacific Research Board since 2005.

Nesting colonies in the Bering and Chukchi seas and the Gulf of Alaska are monitored for long-term trends in environmental quality by collecting seabird eggs in these regions. Targeted species to be included in the project over the next several years include common and thick-billed murres, black-legged kittiwakes, black guillemots, and glaucous and glaucous-winged gulls, storm-petrels and auklets. Samples are processed and banked under conditions that ensure chemical stability during decadal storage. Subsamples are analyzed by NIST to provide real-time data on baseline contaminant levels and geographic patterns, with the remainder reserved for future retrospective analyses. Public participation has become a

[290] Kissling et al. 2007a, 2007b, 2005; Kuletz et al. 2005; Piatt et al. 2007, 2005; Romano and Piatt 2005; Romano et al. 2005; Speckman et al. 2005; Van Pelt and Piatt 2005

[291] AMAP 2004, Morison *et al.* 1998

key component of STAMP and will be expanded to include other coastal and insular areas of Alaska and the Russian Far East.

Analyses of murre egg samples collected in Alaska suggest that there are substantial geographical differences between concentrations of anthropogenic contaminants between regions.[292] Eggs collected from the Gulf of Alaska showed significantly higher mercury levels than those collected in the Bering Sea.[293] Mercury data from each colony were normally distributed, suggesting a ubiquitous regional deposition of mercury and corresponding incorporation into local food webs.[293] Additional STAMP colonies and more seabird species are being analyzed for total airborne mercury (Hg), organic mercury, methylmercury (MeHg), and POPs. This analysis will lead to a better understanding of the factors that may be influencing the preferential deposition and uptake of Hg and organic contaminants into colonial seabirds in Alaska.[293]

Other than the STAMP project, few contaminant studies are consistently implemented for seabirds. Baseline information is needed near areas of potential mining and in species that are declining. More robust studies are needed in seabirds that frequent areas known to be contaminated such as abandoned military sites. Potential effects of contaminant exposure on survival and reproductive success are largely unknown.

Alaska Research Initiatives

In addition to inventories and monitoring of seabirds, research provides additional scientific information that enables the Service to achieve its goals for the Alaska Seabird Conservation Program. Research initiatives address a number of conservation threats and issues, either directly or indirectly. The various scientific studies conducted in the Region have also provided opportunities for high quality graduate student research. Numerous Master's and Doctorate degree projects have already been completed based on research conducted in Alaska, and several more Master's and Doctorate degrees are in progress. A range of research topics has been addressed. The following are examples of some of the focal topics:

- Adult survival
- Productivity
- Diet
- Foraging Behavior
- Introduced Predators
- Oil Spills
- Fisheries/Seabirds Interactions
- Disturbance
- Seabird Die-offs
- Subsistence
- Climate Change

[292] Christopher *et al.* 2002, Kucklick *et al.* 2002, Roseneau *et al*. 2008, Vander Pol *et al.* 2004
[293] Christopher *et al.* 2002, Roseneau *et al*. 2008

International Initiatives

Many species of seabirds that breed in Alaska migrate outside the state for some part of their annual cycle (Table 4). In fact, approximately 89 percent of Alaska breeding seabird species migrate beyond the jurisdiction of the United State's 200-nautical-mile limit during the nonbreeding season.[294] Additionally, during the Alaska summer, Alaska hosts numerous species of seabirds that breed outside Alaska, but come to feed in the rich waters of the state.

There are often different population threats and conservation priorities in the various countries which host seabirds for some part of the year. Therefore, ensuring healthy populations of seabirds requires a multi-national approach that manages seabirds throughout their breeding, migrating, and nonbreeding areas.

Table 4. Wintering areas of Alaska's breeding seabirds including at-sea areas beyond the U.S. 200 nautical mile limit.

WINTERING AREAS OF ALASKA BREEDING SEABIRDS

	Alaska Breeding Seabirds	Alaska Breeding Seabirds Wintering Outside the U.S.	Pelagic North Pacific	Pelagic South Pacific	Canada	Mexico	Caribbean	South America	Russian Far East	East Asia
# of Species of Seabirds	38	36	26	5	2	2	1	1	8	2

Some species occur in more than one region outside the U.S. during the nonbreeding season. **Source**: Kent Wohl, USFWS, unpubl. data.

Region 7's International Seabird Program has expanded significantly over the years. Activities have primarily focused on the initiatives below. A detailed account of these initiatives can be found in the 2005 Service report.[295] Below is a list of some of our international partnerships.

- Arctic Council, Conservation of Arctic Flora and Fauna Program (CAFF), Circumpolar Seabird Expert Group
- Partnership for the East Asian-Australasian Flyway, Seabird Working Group
- United States-Japan Migratory Bird Treaty, Short-tailed Albatross Working Group
- United States-Russia Migratory Bird Treaty/U.S.-Russia Environmental Agreement (AREA V), Beringian Seabird Working Group
- United States-Canada-Mexico Trilateral Committee

[294] Wohl 2006
[295] USFWS 2005b

- South Pacific Regional Environment Program, Central Pacific Flyway Bird Working Group
- Sister Refuge Agreement between Alaska Maritime National Wildlife Refuge and Commander Island Reserve
- Network of Global Seabird Databases Agreement

The most significant and well-coordinated international seabird program is the Circumpolar Seabird Expert Group (CBird), which was created as a working group of the Conservation of Arctic Flora and Fauna Program in 1993. This group has met annually, produced an annual report and work plan, and has collaborated to produce several publications. The major seabird issues and initiatives that have been promoted by Seabird Expert Group include:

- Seabird bycatch in fisheries
- Seabird subsistence harvest
- Seabird conservation outside the Arctic
- Human disturbance at seabird colonies
- Seabird conservation plans and status assessments for several species
- Effects of climate change on seabirds
- Circumpolar Seabird Monitoring Plan
- Arctic seabird status and trends
- Contaminants
- A circumpolar seabird information website: http://arcticportal.org/en/caff/caff-expert-groups/caff-seabird-expert-group-cbird

United States-Russia collaboration on common seabird issues has been longstanding. Recent seabird initiatives in the Russian Far East have focused on cooperative work with the Commander Islands Wildlife Refuge. In 2008, a Sister Refuges Agreement was signed by the Alaska Maritime National Wildlife Refuge and the Commander Islands Wildlife Refuge. Collaboration has included monitoring of seabird colonies and data collection on seabird harvests of common and shared populations.

Recently, collaboration on seabird issues in the East Asian Flyway has been initiated with the advent of the Partnership for the East Asian-Australasian Flyway in 2006. Seabird initiatives with Japan have focused primarily on the endangered Short-tailed Albatross, a shared population.

Alaska has taken the lead in creating a Network of Global Seabird Databases in conjunction with the World Seabird Conference, 2010. Region 7 has also taken a leadership role in planning the World Seabird Conference.

Management

All of the major seabird colonies in Alaska are protected by the Service, other federal agencies, and the State in national wildlife refuges, national parks, monuments, and sanctuaries, or as wildlife areas. Alaska Maritime National Wildlife Refuge manages the majority of the Alaska seabird population with more than 80 percent of the birds breeding on Alaska Maritime Refuge lands. All refuges with breeding seabirds within their boundaries

work with communities, industry, the military, state agencies, and indigenous groups to educate them on the effects of disturbance and to enforce regulations that protect nesting seabirds and their nest sites.

Because access is difficult to the majority of the offshore rocks and islands on most of the Alaska's national wildlife refuges, habitat alteration and disturbance is limited and active habitat management is typically not necessary. Generally, seabird management activities are directed toward limiting or eliminating threats and include: invasive species eradication, coordinating with other agencies and industry to minimize the negative interactions between seabirds and fisheries, minimizing disturbance to colonies, response to oil spills, and identification and investigation of contaminant sites on national wildlife refuges. These activities are carried out by various refuges and Region 7, Migratory Bird Management, Nongame Program and Fisheries and Ecological Services.

Invasive Species

Invasive species management to protect seabirds is carried out primarily by Alaska Maritime Refuge. The program involves prevention and removal of the invasive species and restoration of the native seabirds.

When ships go aground, the refuge staff goes to the site in sensitive areas to prevent "rat spills" -- much like an oil response team heads out to contain oil. On the Pribilof Islands, the tribal government and residents of the islands have joined the refuge in efforts to keep rats off their islands. The State of Alaska has also taken an active role in rat prevention. In 2007, the Alaska Department of Fish and Game completed "Wildlife and People at Risk: a Plan to Keep Rats out of Alaska." The plan can be found on the following website: http://www.adfg.state.ak.us/special/invasive/invasive.php.

Removal of foxes, rats, reindeer, and cattle have also taken place on refuge lands. On Alaid and Nizki islands, many seabird species increased five- to 15-fold and occupied larger areas after fox removal.[296] Seabirds are also returning to other fox- and rat-free islands.

In 2007 and 2008, a mink removal project was undertaken on islands in Prince William Sound to protect and restore seabirds.

Contaminant Response

The Natural Resource Damage Assessment and Restoration Program and the Oil Spill Response Program conduct spill response and associated injury assessment and restoration for Region 7 whenever releases of oil or toxic chemicals, potential or actual, come into contact with birds. These programs are conducted in coordination with other federal and state trustees, Alaska Native interests, and local communities and are lead by the Region 7 Fisheries and Ecological Services office. Through the damage assessment process, funds are obtained from the parties responsible for the contaminant releases to restore injured natural resources such as seabirds.

[296] Byrd and Bailey 1990, Byrd *et al.* 1994, Zeillemaker and Trapp 1986

The Service also works with other agencies and facility managers to help develop contingency plans before spills occur. This approach ensures that Service issues are considered throughout the planning process. Spill response contingency planning in Region 7 is coordinated by the Alaska Regional Response Team (http://akrrt.org).

Commercial Fisheries

Seabird bycatch in commercial fisheries continues to be a major source of mortality for some seabird species. The Service and NOAA Fisheries are working at the regional level to address this issue. Activities include monitoring seabird populations to assess effects, and coordinating with the State of Alaska and fisheries councils to develop regulations and mitigation measures to minimize seabird bycatch. Activities also include training fisheries observers in bird identification, research into new gear types or mitigation measures to reduce seabird bycatch, and educating industry and the public about bycatch and potential solutions. Region 7 staff members are also represented on the interagency Seabird Working Group along with staff members from NOAA Fisheries, the North Pacific Fisheries Management Council, and the U.S. Department of State to implement the National Plan of Action for the Reduction of Seabird Bycatch in Longline Fisheries which can be found on the following website: http://www.fakr.noaa.gov/protectedresources/seabirds/npoa/npoa.pdf.

Invasive species, contaminant response, and commercial fisheries management activities are discussed in more detail in the Threats and Conservation Issues section of this plan.

Information Management

Several large automated databases, which provide information on seabird numbers and distribution, are managed by the Service and USGS-Alaska Science Center in Alaska. The North Pacific Seabird Colony Database produces information on seabird species, numbers, and colony locations around Alaska and the Russian Far East. The North Pacific Pelagic Seabird Database is one of the Region's largest biological databases and provides information on distribution and abundance at sea. The Pacific Seabird Monitoring Database includes seabird monitoring data (population size, chronology, productivity, chick growth, population parameters) from a large area of the northern hemisphere. Users of seabird database products include Service field stations, regional office staff, other federal and state agencies, field response personnel during oil spills, and researchers throughout North America and the Russian Far East.

North Pacific Seabird Colony Database

Data on seabird colonies of Alaska and the Russian Far East are stored in the North Pacific Seabird Colony Database. This computer database is a joint project of the Region 7, Migratory Bird Management, Nongame Program and the Russian Academy of Sciences, Institute of Biological Problems of the North. Data on seabirds are stored in two linked programs: a relational database, and a Geographic Information System that produces maps. The database is now available to the public online: http://alaska.fws.gov/mbsp/mbm/northpacificseabirds/colonies/default.htm. This website is interactive and reports and maps can be produced for any species and area. An earlier version of the Alaska portion of the database has been published.[297]

[297] Sowls *et al.* 1978

Information in the printed atlas is now out of date, however, because many areas have been recensused since its publication.

North Pacific Pelagic Seabird Database

During the 1970s in Alaska, millions of dollars were spent to gather data on the pelagic distribution of seabirds in advance of oil development on Alaska's continental shelves. This work culminated in an atlas on the "Pelagic Distribution and Abundance of Seabirds in the Gulf of Alaska and Eastern Bering Sea.[298] More recently USGS-Alaska Science Center and Region 7 joined forces to update the distribution atlas. Data were collected by hundreds of observers and numerous organizations in the United States, Canada, and Russia between 1974 and 2003 and were organized as the online North Pacific Pelagic Seabird Database (http://www.absc.usgs.gov/research/NPPSD). In 2006, an at-sea program called the North Pacific Pelagic Observer Program was developed to add current data to the NPPSD. Future at-sea surveys will continue to be integrated into the NPPSD.

The current 1.0 Version of the NPPSD includes: data from 456 individual studies, comprising 65,644 transects conducted in Alaska and the North Pacific that include observations of 6,995,932 seabirds and 29,739 marine mammals.[299] A preliminary draft "Atlas of Seabird Distribution At Sea in Alaska" includes pelagic distribution maps of 31 seabird species. The final Atlas will contain distribution maps for about 80 species with seasonal distribution maps for common species, and species accounts that interpret pelagic distribution patterns in light of seabird life history, feeding ecology, oceanographic setting, and human activities.[299]

Pacific Seabird Monitoring Database

The Pacific Seabird Monitoring Database (PSMD) stores information from seabird monitoring conducted over a large expanse of the northern hemisphere. The format is annual observation records, grouped as time-series for a given species and location. Parameters monitored include population indices, overall productivity, components of productivity, breeding chronology, adult survival, and prey indices. A web-based data entry program (http://seabirds.usgs.gov) is used to enter new data, edit existing records, and facilitate exchange of records between contributors and a database manager.

Annual Seabird Monitoring Report

Data are collected annually for selected species of marine birds at breeding colonies on the Alaska Maritime National Wildlife Refuge and at other areas in Alaska to monitor the condition of the marine ecosystem and to evaluate the conservation status of seabirds. Monitoring includes estimating timing of nesting events, rates of reproductive success, population trends, and diet composition of representative species of various foraging guilds at geographically-dispersed

[298] Gould *et al.* 1982
[299] Piatt *et al.* 2006 *Draft*

breeding sites. The Annual Seabird Monitoring Program has sufficiently long-time-series data to describe patterns for these long-lived species. Annual reports can be found online at the following website: http://alaska.fws.gov/nwr/akmar/whatwedo/bioprojects/publications.htm.

Outreach and Education

Seabirds rank in popularity with glaciers and marine mammals as an important component of the natural environment attracting visitors and residents to coastal areas of Alaska. Maintaining seabird populations for public enjoyment is one of the management purposes of coastal wildlife refuges. To maintain seabirds for this purpose without negatively affecting the bird species requires education and outreach. Education can also result in a public with greater appreciation for the unique characteristics of seabirds and interest in addressing/ reducing threats that may jeopardize seabirds' existence. Outreach and education can also result in increased support for funding of critical management and research programs.

Public information programs on marine resources are offered at the Alaska Maritime National Wildlife Refuge's Alaska Islands & Ocean Visitor Center in Homer and at the Alaska SeaLife Center in Seward. Educational programs for K-12 and adult audiences are available.

Alaska Maritime Refuge also offers school programs for other communities on the refuge periodically. In addition, the refuge partners with local communities and schools to offer summer stewardship camps to local children at villages in the Aleutian and Pribilof islands.

Most seabird colonies are remote and difficult to access, as a result, the average person requires a commercial vessel or tour to view them. Small businesses run scheduled and chartered tours throughout the summer to nearby colonies from Sitka, Valdez, Cordova, Whittier, Homer, Kodiak, Nome, and many other communities. Ferries of the Alaska Marine Highway System also pass near seabird colonies on their summer routes. Cruise ships and package tours feature visits to colonies in Southeast Alaska, the Pribilofs, and elsewhere. Tour operators are often sympathetic to, and generally well-informed about, marine wildlife issues and pass this information along to tourists. The Service can benefit from the outreach and education about seabirds disseminated by tour operators.

Individuals who cannot make a trip to seabird colonies can benefit from virtual visits through web-cameras, allowing them to view seabirds at their colonies, live and in real time. As of 2007, web-cams have been set up at Gull Island in Kachemak Bay and can be viewed at the Alaska Islands & Ocean Visitor Center and at the Pratt Museum, both in Homer.

Additional outreach and educational seabird activities conducted by Region 7 include:

- International Migratory Bird Day conducted each May at the Alaska Zoo in Anchorage. General information about birds is distributed relevant to the year's theme. In 2004 the theme was seabirds.
- Seabird Earthwatch Program is based at Shoup Bay in Prince William Sound, Alaska, where volunteers are involved in seabird research activities.
- Seabird biologists present seabird information at teacher training sessions around Alaska.

- Seabird page is featured on the Region 7's internet website: http://alaska.fws.gov/mbsp/mbm/seabirds/seabirds.htm
- Development of the Alaska Seabird Information Series (ASIS). This series is a compilation of species accounts of Alaska breeding seabirds. It is available online: http://alaska.fws.gov/mbsp/mbm/seabirds/species.htm and through the USFWS Region 7 office, 1011 E. Tudor Road, Anchorage AK 99507.
- At-sea surveys have been highlighted by the "Teachers At-Sea Program" which can be found online at the following website: http://www.polartrec.com/bering-sea-predators.

Coordination, Collaboration, and Communication

Many elements in the Service, other federal agencies, the State of Alaska, academic institutions, and nongovernmental organizations are involved in seabird issues, research, and management activities. For example, the Service shares common concerns with the following: the USDA-Forest Service for seabirds occurring in the Tongass and Chugach national forests; the National Park Service for seabirds occurring in the Kenai Fjords, Katmai, Lake Clark, Aniakchak, Wrangell-Saint Elias and Glacier Bay national parks and preserves; and with the Minerals Management Service for seabirds occurring on Alaska's outer continental shelf. Alaska Department of Fish and Game has also conducted seabird studies and is involved in the permit process to allow the take or possession of migratory birds.

Collaboration with researchers from numerous universities provides the opportunity to learn more about issues important to conserving seabirds such as marine and island ecosystem processes, the interaction among species, and the ecology of little-known species. NOAA Fisheries is concerned with commercial fisheries-seabird interactions. This agency and the Service are continuing to cooperate in the assessment of seabird mortality in domestic and foreign fisheries, and the implementation of mitigation devices to reduce seabird bycatch.

Several professional and conservation organizations are also concerned with Alaska seabird issues: the National Audubon Society/Alaska Audubon; Pacific Seabird Group; and the International Council for Bird Preservation, Conservation of Arctic Flora and Fauna (CAFF), among others.

Coordination between groups working on Alaska seabird issues has improved over the last two decades. This collaboration enhanced response to the highest priority management, conservation, and research needs. The Service's seabird programs, however, could benefit from further improved coordination with all entities concerned about seabird conservation. Region 7 is committed to continue to improve coordination, communication, and collaboration to achieve the conservation and management of seabirds at international, national, regional, and local geographic scales.

Funding of seabird work has also been collaborative. Requests for funding of seabird projects are developed with other federal agencies, the State of Alaska, Fisheries Councils and Boards, nongovernmental organizations, and universities, based on shared funds and/or personnel.

Seabird Information Technical Support

Information on seabirds, seabird policies and issues, and methods for studying seabirds is requested frequently by various programs inside the Service, other federal and state agencies, private organizations, schools, and the public. Technical support is provided by the Region 7, Migratory Bird Management, Nongame Program and the Alaska Maritime National Wildlife Refuge. Specific examples of technical support services include advice on seabird monitoring techniques and improved standardization of those techniques; access to files containing unpublished reports on Alaska seabirds; and access to information on current laws, regulations, and pending legislation.

GOALS, OBJECTIVES, AND STRATEGIES FOR ALASKA

The goals, objectives, and strategies in this plan were updated from the 1992 Alaska Seabird Management Plan[300] by the U.S. Fish and Wildlife Service, Migratory Bird Management, Nongame Program and Alaska Maritime National Wildlife Refuge. The Alaska Seabird Conservation Plan, including the goals, objectives, and strategies, was reviewed by other Region 7 divisions (Refuges, Contaminants, Avian Influenza, Subsistence), Region 9, and bird specialists from other government agencies and nongovernmental organizations including: Audubon Alaska, Minerals Management Service, NOAA Fisheries, and the North Pacific Research Board. The goals, objectives, and strategies will be updated when the Alaska Seabird Conservation Plan is updated in 2019.

GOALS of the USFWS Seabird Conservation Program in Alaska

I. Restore and maintain the natural abundance, diversity, and distribution of breeding seabird populations in Alaska.
II. In the face of global climate change and other threats, manage seabird habitats sufficient to accomplish Goal I.
III. Improve coordination and collaboration directed towards the conservation of seabirds at international, national, regional, and local geographic scales.
IV. Promote seabird conservation through effective outreach and education.
V. Provide the opportunity for rural Alaskans to harvest seabirds for subsistence purposes, while maintaining healthy seabird populations.

Goal I. Restore and maintain the natural abundance, diversity, and distribution of breeding seabird populations in Alaska.

Objective 1. Track changes in seabird populations, productivity, diets, and survivorship at 14 sites in Alaska annually and 15 additional sites every 3 years.

Strategies

I.1.a Continue to implement the statewide plan for monitoring populations, productivity, diets, and survivorship of selected seabirds at colonies and other breeding sites.

I.1.b Determine through monitoring whether any seabird species is unstable or is declining. Propose those species as Birds of Conservation Concern, initiate studies to identify problems, and develop strategies to mitigate them.

I.1.c Use seabird monitoring data as indicators of marine ecosystem health and effects of global climate change.

I.1.d Develop methods to determine trends in selected species of seabirds that cannot be monitored reliably now.

[300] USFWS 1992

I.1.e Participate in the Alaska Beached Bird Survey Program to monitor seabird mortality events at selected locations in Alaska.

I.1.f Archive photographs and maps of monitoring plots and of whole colonies to ensure that this documentation is available for continued monitoring.

I.1.g Revise the Alaska Seabird Monitoring Plan every 10 years.

Objective 2. Inventory at-sea distribution and abundance of seabirds in Alaska waters at appropriate spatial and temporal (seasonal) scales to assist management decisions in the face of global climate change.

Strategies

I.2.a. Develop an at-sea inventory plan that anticipates and responds to management information needs.

I.2.b. Continue development and support of Service collaboration with vessel-based research programs (i.e., NOAA, National Science Foundation, Alaska Department of Fish and Game) that will enable collection of at-sea seabird data in conjunction with oceanographic and prey data during all seasons.

I.2.c. Support the analysis of at-sea data that will increase our understanding of seabird distribution and abundance relative to oceanographic and biological variables and global climate change.

I.2.d. Revise the Alaska At-sea Seabird Survey Manual as appropriate for new technologies and objectives.

Objective 3. Monitor seabird distribution and abundance at-sea in selected oceanographic areas in Alaska.

Strategies

I.3.a. Develop a long-term at-sea monitoring plan for selected geographic areas that include historically surveyed sites as well as additional sites identified as important to assist management of seabirds.

I.3.b. Continue surveys that will enable the Service to monitor seabird populations at sea in Prince William Sound, Cook Inlet, Southeast Alaska; and continue the Seabird, Fish, Marine Mammal and Oceanography Coordinated Investigations (SMMOCI).

I.3.c. Build a Service at-sea monitoring program by continuing cooperation and collaboration with funding and research sources such as the North Pacific Research Board, *Exxon Valdez* Oil Spill Trustee Council, NOAA, Alaska Department of Fish and Game, and university research programs.

Objective 4. Update colony inventories every 10 years.

Strategies

I.4.a Revise the Seabird Colony Recensus Plan every 10 years.

I.4.b Implement the Seabird Colony Recensus Plan.

I.4.c Revise the Alaska Seabird Colony Inventory Manual every 10 years.

Objective 5. Conduct basic research that assists in the management of seabird species in Alaska.

Strategies

I.5.a Study life history strategies and demography of Alaska seabirds.

I.5.b Study foraging ecology and marine habitat requirements of Alaska seabirds during the breeding and nonbreeding seasons.

I.5.c Study reproductive ecology of Alaska seabirds.

I.5.d Continue to determine seabird responses to climate change and model habitat requirements of Alaska seabirds.

I.5.e Determine how to use seabirds as indicators of marine ecosystem health.

I.5.f Develop indices of seabird population health.

I.5.g Participate in the North Pacific Research Board (NPRB) Program of studies.

I.5.h Participate in the *Exxon Valdez* Oil Spill Program (EVOS) of studies.

I.5.i Study factors that limit seabird populations on the Service's Birds of Conservation Concern (BCC) and focal species lists.

Objective 6. Identify adverse effects of natural events and human activities on Alaska seabirds and protect their populations.

Strategies

I.6.a Determine responses of seabird populations to natural events and human activities in selected locations.

I.6.b Obtain information on the sensitivity of diving seabirds to underwater seismic exploration methods and determine the distance at which there is no injury and little disturbance to seabirds.

I.6.c Encourage extension of the Service's jurisdiction for seabirds under the Migratory Bird Treaty Act from 12 miles to 200 miles offshore (to coincide with the United States' Exclusive Economic Zone).

I.6.d Continue to identify factors causing the incidental mortality of seabirds in gillnet and longline fisheries in Alaska and determine effects of that mortality on seabird populations.

I.6.e Continue to coordinate with NOAA Fisheries, Alaska Sea Grant, and other entities in investigating mitigation techniques to reduce seabird mortality in gillnets and longline fisheries in Alaska.

I.6.f Evaluate and recommend mitigation measures to reduce the effects of human development on seabird populations.

I.6.g.1 Participate in Alaska Regional Response Team Area Contingency Planning efforts including area subcommittees (Sensitive Areas Work Group and Wildlife Protection Work Group) to ensure that the Service's issues and concerns regarding seabirds and their habitats are identified and adequately addressed.

I.6.g.2 During a spill response, participate in the Incident Command System: identify seabirds and sensitive habitats at risk; develop appropriate protection measures; collect oiled seabird carcasses; develop and oversee appropriate seabird hazing, rescue, and rehabilitation programs; and initiate Natural Resource Damage Assessment and Restoration activities.

I.6.h Determine effects of aircraft, vessels, visitors, towers, and other disturbances on seabirds at breeding colonies and foraging areas.

I.6.i Monitor contaminants in selected seabird species and continue implementing the Seabird Tissue Archival and Monitoring Program (STAMP).

I.6.j Work to reduce the incidence of plastic ingestion by seabirds and continue determining the status, trends, and effects of plastic debris on seabird populations in Alaska.

I.6.k Continue to remove exotic mammals from selected seabird nesting islands and monitor population recoveries to restore seabird populations.

I.6.l Prevent new introductions of exotic species to islands with seabird colonies.

GOAL II. In the face of global climate change and other threats, manage seabird habitats sufficient to accomplish Goal I.

Objective 1. Protect seabird habitats on and off refuges in Alaska from adverse effects of human activities.

Strategies

II.1.a Continue to participate in interagency planning, permitting, and monitoring of selected economic developments and other human activities to ensure that seabird habitats are considered during mitigation planning and that necessary strategies are implemented to effect their protection.

II.1.b Continue to participate in interagency oil spill contingency planning to ensure that seabird habitats are considered during oil spill response activities.

II.1.c Continue to participate in Natural Resource Damage Assessment and Monitoring projects to assess damages and implement appropriate restoration to seabirds after catastrophic hazardous substance releases.

II.1.d Restore seabird habitats damaged by introduced mammals (e.g., rodents, foxes, mink, rabbits, cattle, reindeer, and caribou) and prevent additional introductions.

II.1.e Continue to limit access to, and monitor seabird habitats (on Service lands) that are likely to be adversely affected by visitors or other human uses.

II.1.f Promote protection of lands and waters that are important seabird habitats in Alaska through acquisition of title, exchanges, or cooperative agreements with landowners.

II.1.g Cooperate with land owners to designate selected seabird habitats for inclusion in conservation systems to give visibility to their importance and enhance their protection (e.g., Important Bird Areas (IBAs), State Critical Habitat Areas, National Estuarine Reserve System, Wetlands of International Importance, Biosphere Reserve System).

II.1.h Cooperate with fisheries management entities (North Pacific Fisheries Management Council, Alaska Department of Fish and Game) to monitor and reduce the effects of commercial fisheries on seabirds.

II.1.i Cooperate with management entities to identify and protect marine habitats that are important for seabird foraging, migrating, and wintering areas (e.g., Large Marine Ecosystems, National Marine Sanctuary System, Marine Protected Areas, and Fishing Areas Restrictions).

GOAL III. Improve coordination and collaboration directed towards the conservation and management of seabirds at international, national, regional, and local geographic scales.

Objective 1. Establish and participate in domestic and international forums to enhance range-wide coordination of seabird conservation, management, and research issues.

Strategies

III.1.a Coordinate and implement priority circumpolar arctic seabird initiatives and encourage coordination of seabird programs, activities, and issues by maintaining the Alaska Seabird Working Group and Region 7's participation in the Circumpolar Seabird Expert Group.

III.1.b Coordinate seabird issues and exchange seabird information on common species and shared populations with seabird managers and investigators through existing migratory bird Conventions and international agreements and initiatives.

III.1.c Cooperate with federal and state agencies and Native, conservation, and industry partners on the protection and management of seabirds.

III.1.d Continue to improve the recognition of seabird resources and their protection in domestic and international fishery agreements and other mechanisms between the United States and appropriate foreign nations.

III.1.e Participate in North Pacific Fisheries Management Council reviews and management proposals to better coordinate seabird information with fisheries actions.

III.1.f Continue to promote and participate in the International Fisheries Forum, Agreement on the Conservation of Albatrosses and Petrels, and other international seabird working groups and initiatives.

III.1.g Promote establishment of a Seabird Working Group under the aegis of the Partnership for the East Asian-Australasian Flyway Program.

GOAL IV. Promote seabird conservation through effective outreach and education.

Objective 1. Provide seabird viewing opportunities in Alaska.

Strategies

IV.1.a Encourage governmental and non-governmental entities to develop facilities for seabird viewing in Alaska.

IV.1.b Provide seabird interpretive specialists at strategic bird viewing locations.

Objective 2. Determine the economic effect and values of seabirds in Alaska to local, regional, and state economies (e.g., recreation, education, and tourism).

Strategies

IV.2.a Conduct a study to determine the non-consumptive uses of seabirds in Alaska and their financial contribution to the state economy.

Objective 3. Improve public awareness and education concerning Alaska's seabird resources to meet the needs of the public, tour operators, and government agencies.

Strategies

IV.3.a Enhance the dissemination of seabird information to large numbers of users by providing additional interpretive programs, displays, and personnel at key refuges, visitor centers, marinas, and on ferries.

IV.3.b Communicate with tour operators who provide seabird viewing opportunities, and advise tour operators about the biology, conservation, protection, and viewing etiquette of seabirds.

IV.3.c Disseminate seabird information materials and school curricula for residents of coastal Alaska, and visit communities periodically to discuss seabird issues.

IV.3.d Develop and disseminate non-technical seabird information materials such as videos, popular articles, brochures, bird lists, posters, and statewide school curricula.

IV.3.e Disseminate information to commercial users of coastal areas such as pilots, fisherman, and fishing guides to enhance protection of seabirds from disturbance and other hazards using brochures, radio and television announcements, and cooperation with regulatory agencies.

IV.3.f Enhance communication with users of seabird habitats to promote practices and policies that mitigate harmful effects on seabirds.

IV.3.g Implement the Urban Migratory Bird Treaty Program in selected communities in Alaska with access to seabird resources.

IV.3.h Provide technical assistance and disseminate information to all Service units, other federal and state agencies, non-governmental organizations, tour operators, and citizens regarding seabird viewing opportunities.

IV.3.i Maintain and improve the North Pacific Seabird Colony Database, periodically republish the North Pacific Seabird Colony Catalog, and make its information available to the public via a website.

IV.3.j Develop and maintain the North Pacific Pelagic Seabird Database (NPPSD); periodically publish an Atlas of the NPPSD; and make the information available to the public via a website.

IV.3.k Maintain a web-based bibliographic database of unpublished literature on Alaska's seabirds.

IV.3.l Continue to synthesize selected information on Alaska seabirds annually (e.g., populations, productivity, survivorship, socioeconomic uses, habitats, and mitigation measures) and make the information available to the public.

IV.3.m Develop and maintain a web-based Seabird Diet Database.

IV.3.n Develop and maintain a web-based Seabird Monitoring Database.

GOAL V. Provide the opportunity for rural Alaskans to harvest seabirds for subsistence purposes while maintaining healthy seabird populations.

Objective 1. Document annually the numbers and species of seabirds and their eggs taken for subsistence use by rural Alaskans as well as the seabird colonies that are used for harvest.

Strategies

V.1.a Continue to participate in international migratory bird forums to document the harvest of shared seabird populations, and develop a harvest strategy for each shared seabird population across its range.

V.1.b Continue to participate in the Alaska Migratory Bird Co-Management Council (AMBCC) and its Harvest Committee and the Service's Harvest Survey Program.

V.1.c Continue to document the socioeconomic, cultural, and spiritual values of subsistence harvested seabirds as well as uses of seabirds and the harvest of seabirds in select rural communities in Alaska.

V.1.d Continue to monitor selected seabird colonies that are traditionally used for harvesting (e.g., Little Diomede and St. Lawrence islands).

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Appendix 1. List of Alaska Seabird Species.[301]

ALASKA BREEDING SPECIES

Tube-nosed Birds

Northern Fulmar (*Fulmarus glacialis*)
Fork-tailed Storm-Petrel *(Oceanodroma furcata)*
Leach's Storm-Petrel *(Oceanodroma leucorhoa)*

Cormorants

Double-crested Cormorant (*Phalacrocorax auritus*)
Pelagic Cormorant (*Phalacrocorax pelagicus*)
Red-faced Cormorant *(Phalacrocorax urile)*
Brandt's Cormorant (*Phalacrocorax penicillatus*)

Jaegers, Gulls, and Terns

Pomarine Jaeger *(Stercorarius pomarinus)*
Parasitic Jaeger (*Stercorarius parasiticus)*
Long-tailed Jaeger *(Stercorarius longicaudus)*
Bonaparte's Gull *(Larus philadelphia)*
Mew Gull *(Larus canus)*
Herring Gull *(Larus argentatus)*
Slaty-backed Gull *(Larus schistasagus)*
Glaucous-winged Gull *(Larus glaucescens)*
Glaucous Gull *(Larus hyperboreus)*
Sabine's Gull *(Xema sabini)*
Black-legged Kittiwake *(Rissa tridactyla)*
Red-legged Kittiwake *(Rissa brevirostris)*
Caspian Tern *(Hydroprogne caspia)*
Arctic Tern *(Sterna paradisaea)*
Aleutian Tern (*Onychoprion aleutica*)

Alcids

Dovkie *(Alle alle)*
Common Murre *(Uria aalge)*
Thick-billed Murre *(Uria lomvia)*
Black Guillemot *(Cepphus grylle)*
Pigeon Guillemot *(Cepphus columba)*
Marbled Murrelet *(Brachyramphus marmoratus)*
Kittlitz's Murrelet *(Brachyramphus brevirostris)*
Ancient Murrelet *(Synthliboramphus antiquus)*
Cassin's Auklet *(Ptychoramphus aleuticus)*
Parakeet Auklet *(Aethia psittacula)*
Least Auklet *(Aethia pusilla)*
Whiskered Auklet *(Aethia pygmaea)*
Crested Auklet *(Aethia cristatella)*
Rhinoceros Auklet *(Cerorhinca monocerata)*
Horned Puffin *(Fratercula corniculata)*
Tufted Puffin *(Fratercula cirrhata)*

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Appendix 1. List of Alaska Seabird Species (*continued*).

NONBREEDING SPECIES - Seabirds reported in Alaska waters (at least once)
★ = Infrequent

Tube-nosed Birds
Laysan Albatross *(Phoebastria immutabilis)*
Black-footed Albatross *(Phoebastria nigripes)*
Short-tailed Albatross *(Phoebastria albatrus)*
Tube-nosed Birds
Mottled Petrel *(Pterodroma inexpectata)*
Cook's Petrel *(Pterodroma cookii)* ★
Hawaiian Dark-rumped Petrel *(Pterodroma phaeopygia sandwichensis)* ★
Pink-footed Shearwater *(Puffinus creatopus)*
Flesh-footed Shearwater *(Puffinus carneipes)* ★
Buller's Shearwater *(Puffinus bulleri)*
Sooty Shearwater *(Puffinus griseus)*
Short-tailed Shearwater *(Puffinus tenuirostris)*
Manx Shearwater *(Puffinus puffinus)* ★
Pelicans
American White Pelican *(Pelecanus erythrorhynchos)* ★
Frigatebirds
Magnificent Frigatebird (*Fregata magnificens)* ★
Skuas, Gulls, and Terns
South Polar Skua *(Catharacta maccormicki)* ★
Laughing Gull *(Larus atricilla)* ★
Franklin's Gull *(Larus pipixcan)* ★
Little Gull *(Larus minutus)* ★
Black-headed Gull *(Larus ridibundus)*
Heermann's Gull *(Larus heermanni)* ★
Black-tailed Gull *(Larus crassirostris)* ★
Ring-billed Gull *(Larus delawarensis)* ★
California Gull *(Larus californicus)*
Thayer's Gull *(Larus thayeri)*
Lesser Black-backed Gull *(Larus fuscus)* ★
Western Gull *(Larus occidentalis)* ★
Great Black-backed Gull *(Larus marinus)* ★
Ross's Gull *(Rhodostethia rosea)*
Ivory Gull *(Pagophila eburnea)*
Forster's Tern *(Sterna forsteri)* ★
Sooty Tern *(Sterna fuscata)* ★
White-winged Tern *(Chlidonias leucopterus)* ★
Black Tern *(Chlidonias niger)* ★
Alcids
Long-billed Murrelet *(Brachyramphus perdix)* ★

Appendix 2. Seabird Bycatch Aleutian Islands Longline Fishery.

Year	No. Obs.	Albatrosses: Laysan	Albatrosses: Black-footed	Albatrosses: Unid.	Northern Fulmar	Shear-waters	Unid. Procel-larids	Gulls	Alcids	Other Sea-birds	Unid. Seabirds	Totals
1993	550	571 (437-746)	12 (5-29)	355 (228-555)	1,017 (611-1,695)	0	0	184 (133-253)	3 (1-13)	0	343 (157-746)	2,485 (1,927-3,204)
1994	388	307 (228-414)	37 (17-78)	76 (50-116)	434 (300-628)	27 (8-94)	0	24 (21-30)	0	0	535 (348-823)	1,440 (1,170-1,771)
1995	390	316 (176-567)	23 (11-50)	26 (16-43)	1,006 (689-1,469)	22 (10-48)	10 (2-42)	99 (62-156)	0	0	29 (14-61)	1,531 (1,170-2,004)
1996	222	106 (72-155)	20 (6-70)	34 (18-64)	160 (100-254)	304 (148-623)	2 (1-7)	23 (13-42)	0	0	142 (78-258)	791 (573-1,088)
1997	179	270 (185-394)	8 (2-36)	10 (3-32)	599 (373-963)	20 (5-73)	9 (3-28)	10 (3-32)	0	0	32 (16-64)	958 (698-1,318)
1998	460	449 (295-683)	4 (1-18)	0	638 (474-859)	125 (83-188)	4 (1-18)	167 (109-257)	0	4 (1-15)	379 (243-591)	1,770 (1,472-2,129)
1999	399	232 (178-301)	18 (7-41)	0	1,535 (933-2,527)	9 (2-41)	4 (1-18)	100 (48-210)	0	0	5 (1-23)	1,903 (1,267-2,856)
2000	325	196 (144-268)	11 (3-35)	5 (1-23)	1,149 (772-1,712)	27 (13-56)	0	110 (71-171)	0	0	47 (24-92)	1,545 (1,144-2,087)
2001	245	131 (79-215)	0	0	946 (678-1,319)	65 (40-103)	0	43 (24-76)	0	0	5 (1-22)	1,189 (894-1,547)
2002	18	47 (25-86)	0	0	10 (4-25)	5 (1-23)	0	4 (1-15)	0	0	0	66 (41-107)
2003	74	135 (63-290)	0	0	216 (118-394)	0	0	0	0	21 (6-74)	0	372 (236-586)
2004	24	52 (27-100)	0	0	28 (13-61)	16 (3-78)	0	10 (3-32)	0	0	18 (8-40)	124 (81-193)
2005	40	50 29-87	0	0	32 13-77	16 6-43	0	85 48-151	0	0	0	184 129-262
Average Annual Estimates												
1993-2005	na	239 (209-272)	11 (7-16)	42 (31-59)	648 (553-759)	53 (36-77)	2 (1-5)	72 (60-85)	0 (0-1)	2 (1-6)	128 (98-167)	1,196 (1,087-1,317)
2001-2005	na	83 (60-115)	0	0	246 (186-326)	21 (13-32)	0	28 (19-42)	0	4 (1-15)	5 (2-10)	387 (318-471)

Estimated Incidental Take and Actual Number of Seabirds Observed Taken in the Aleutian Islands Fishery Management Region Groundfish Demersal Longline Fishery, 1993 Through 2005. Numbers in Parenthesis are the 95% Confidence Intervals. Printed with Permission from AFSC.

Appendix 3. Seabird Bycatch Bering Sea Longline Fishery 1993-2005.

Yr	No. Obs.	Albatrosses Short-tailed	Albatrosses Laysan	Albatrosses Black-footed	Albatrosses Unid.	Northern Fulmar	Shear-waters	Unid. Procel-larids	Gulls	Alcids	Other Sea-birds	Unid. Seabirds	Totals
1993	1,392	0	49	0	0	3,153	65	0	647	11	4	1,435	5,364
			(29-83)			(2,582-3,849)	(34-123)		(430-974)	(4-36)	(1-16)	(1,200-1,716)	(4,683-6,142)
1994	2,312	0	4	0	0	4,555	656	351	1,718	4	4	2,101	9,393
			(1-20)			(3,954-5,247)	(495-870)	(247-499)	(1,333-2,214)	(1-20)	(1-18)	(1,568-2,814)	(8,446-10,448)
1995	4,442	0	148	43	12	8,811	308	474	3,892	4	45	4,207	17,944
			(104-210)	(19-96)	(5-31)	(7,884-9,847)	(221-429)	(295-760)	(3,268-4,635)	(1-17)	(24-84)	(3,538-5,003)	(16,664-19,323)
1996	1,780	4	130	0	27	5,571	185	14	1,484	46	50	303	7,814
		(1-19)	(79-216)		(13-53)	(4,806-6,457)	(118-288)	(6-37)	(1,250-1,762)	(14-144)	(25-103)	(235-389)	(7,004-8,716)
1997	3,944	0	125	4	3	15,187	354	169	3,429	0	9	907	20,187
			(86-183)	(1-19)	(1-15)	(13,505-17,079)	(206-609)	(112-257)	(2,667-4,408)		(3-28)	(606-1,356)	(18,404-22,145)
1998	5,390	8	982	5	4	14,955	1,018	17	4,252	53	45	1,573	22,912
		(3-24)	(720-1,339)	(1-23)	(1-17)	(13,391-16,701)	(846-1,226)	(8-39)	(3,626-4,985)	(31-90)	(23-89)	(1,288-1,926)	(21,185-24,780)
1999	2,565	0	315	0	0	6,082	451	418	2,177	4	49	902	10,396
			(253-387)			(5,048-7,329)	(353-575)	(224-778)	(1,810-2,618)	(1-15)	(23-102)	(625-1,302)	(9,202-11,746)
2000	3,537	0	260	5	10	9,864	539	86	4,454	5	16	1,527	16,766
			(172-391)	(2-21)	(3-29)	(8,558-11,369)	(415-698)	(54-137)	(3,853-5,151)	(1-22)	(8-35)	(1,171-1,992)	(15,278-18,399)
2001	1,742	0	290	5	5	4,602	394	96	2,436	2	33	1,026	8,888
			(204-412)	(1-21)	(1-21)	(3,907-5,420)	(293-528)	(61-153)	(2,053-2,890)	(1-8)	(15-74)	(765-1,376)	(8,020-9,849)
2002	859	0	5	0	5	695	149	20	2,537	10	17	367	3,805
			(1-24)		(1-22)	(585-826)	(102-219)	(7-53)	(2,095-3,071)	(3-32)	(7-40)	(277-485)	(3,327-4,351)
2003	1,047	0	47	10	0	2,768	292	14	1,374	11	45	257	4,818
			(23-94)	(3-32)		(2,427-3,158)	(222-383)	(4-46)	(1,089-1,734)	(4-29)	(26-76)	(192-343)	(4,348-5,339)
2004	894	0	37	11	3	1,934	710	97	1,260	39	23	580	4,694
			(18-74)	(4-36)	(1-10)	(1,661-2,253)	(558-904)	(59-160)	(1,055-1,505)	(20-76)	(11-51)	(448-750)	(4,284-5,141)
2005	1,209	0	18	5	0	2,596	511	0	2,283	16	19	314	5,762
			7-44	1-23		2,288-2,945	422-619		1,958-2,663	6-41	9-40	221-445	5,288-6,278
Average Annual Estimates													
1993-2005	na	1	201	7	6	6,731	469	146	2,662	17	30	1,291	11562
		(0-3)	(173-234)	(5-12)	(4-9)	(6,442-7,033)	(432-510)	(117-182)	(2,516-2,817)	(12-25)	(24-38)	(1,189-1,403)	(11,228-11,906)
2001-2005	na	0	79	6	2	2,519	411	45	1,978	16	27	509	5,593
			(60-105)	(3-13)	(1-6)	(2,335-2,712)	(364-464)	(33-62)	(1,819-2,151)	(10-25)	(20-39)	(438-590)	(5,334-5,865)

Estimated Incidental Take and Actual Number of Seabirds Observed Taken in the Bering Sea Fishery Management Region Groundfish Demersal Longline Fishery, 1993 Through 2005. Numbers in parenthesis are the 95% Confidence Intervals. Printed with Permission from AFSC.

Appendix 4. Seabird Bycatch Gulf of Alaska Longline Fishery 1993-2005.

Year	No. Obs.	Albatrosses: Laysan	Albatrosses: Black-footed	Albatrosses: Unid.	Northern Fulmar	Shear-waters	Unid. Procel-larids	Gulls	Alcids	Other Sea-birds	Unid. Sea-birds	Totals
1993	318	128 (78-211)	29 (15-57)	3 (1-14)	842 (648-1,094)	59 (31-114)	0	45 (23-90)	0	3 (1-11)	213 (131-346)	1,322 (1,090-1,606)
1994	126	169 (106-269)	7 (2-22)	8 (3-24)	258 (181-368)	26 (10-70)	0	30 (7-127)	0	0	33 (13-84)	531 (419-676)
1995	374	68 (42-109)	239 (181-317)	378 (290-493)	529 (381-733)	40 (20-81)	6 (1-25)	105 (67-166)	0	4 (2-11)	175 (120-256)	1,544 (1,341-1,779)
1996	250	155 (104-233)	665 (490-903)	0	674 (424-1,071)	15 (4-52)	0	121 (30-498)	0	0	19 (6-57)	1,649 (1,273-2,137)
1997	74	31 (7-127)	97 (51-187)	0	281 (177-449)	8 (2-24)	0	47 (24-93)	0	0	10 (3-33)	474 (339-663)
1998	184	241 (117-495)	321 (125-825)	4 (1-18)	952 (506-1,788)	13 (4-42)	0	57 (29-116)	0	0	0	1,588 (1,016-2,480)
1999	159	214 (147-312)	184 (91-370)	0	242 (165-354)	50 (21-118)	0	249 (145-430)	0	9 (2-43)	16 (5-55)	964 (765-1,216)
2000	72	96 (47-195)	155 (89-271)	0	317 (140-716)	0	0	180 (55-592)	0	0	34 (7-174)	782 (484-1,262)
2001	45	69 (29-165)	73 (36-146)	17 (4-86)	191 (116-314)	20 (4-99)	0	96 (25-365)	6 (1-29)	0	3 (1-14)	475 (318-710)
2002	51	0	33 (17-65)	0	107 (52-219)	0	0	81 (27-237)	0	0	17 (6-44)	238 (143-396)
2003	37	12 (5-30)	155 (58-417)	0	233 (124-436)	0	0	49 (16-149)	46 (8-270)	0	16 (3-80)	511 (328-798)
2004	17	31 (11-88)	24 (10-58)	0	0	0	0	93 (35-244)	0	0	13 (3-62)	161 (84-307)
2005	67	15 6-38	38 9-150	0	156 95-256	33 15-76	0	160 107-239	0	0	23 5-13	424 314-573
Average Annual Estimates												
1993-2005	na	102 (83-127)	168 (134-212)	34 (26-44)	398 (334-475)	22 (16-31)	1 (0-2)	110 (80-149)	4 (1-22)	1 (1-4)	48 (36-63)	888 (803-984)
2001-2005	na	26 (14-45)	65 (37-113)	4 (1-17)	137 (101-186)	11 (5-25)	0	96 (61-149)	10 (2-53)	0	14 (6-33)	362 (296-443)

Estimated Incidental Take and Number of Seabirds Observed Taken in the Gulf of Alaska Fishery Management Region Groundfish Demersal Longline Fishery, 1993 Through 2005. Numbers in Parenthesis are the 95% Confidence Intervals. Printed with Permission from AFSC.

Appendix 5. Seabird Bycatch Estimates for 2006 Longline Fishery by Region.

Species/ Species Group	Region						Total (All Alaska Combined)	
	Aleutian Islands		Bering Sea		Gulf Of Alaska			
Short-tailed Albatross	0		0		0		0	
Laysan Albatross	44	(24–82)	3	(3–3)	10	(3–32)	57	(33–97)
Black-footed Albatross	3	(1–12)	5	(1–24)	126	(54–298)	134	(60–303)
Unidentified Albatross	0		0		0		0	
Northern Fulmar	89	(55–144)	1,154	(917–1,452)	212	(120–374)	1,455	(1,186–1,782)
Shearwater spp.	0		424	(331–541)	5	(1–20)	429	(336–546)
Unidentified Procellarids	0		0		0		0	
Gull spp.	45	(25–81)	1,692	(1,002–2,858)	423	(208–859)	2,160	(1,396–3,343)
Alcid spp.	0		6	(1–28)	0		6	(1–28)
Other Species	0		5	(1–23)	0		5	(1–23)
Unidentified Seabirds	0		245	(183–327)	40	(14–116)	285	(212–383)
Total Birds	181	(132–248)	3,534	(2,706–4,615)	816	(531–1,252)	4,531	(3,624–5,661)

Estimated Incidental Take and Number of Seabirds Observed Taken in the 2006 Alaska Groundfish Demersal Longline Fishery by Fishery Management Region. Numbers in Parenthesis are the 95% Confidence Intervals. Observers record all birds hooked on gear within the sample regardless of whether the bird was landed or fell off the gear alongside the vessel (dropoff). Printed with Permission from AFSC.

Appendix 6. Estimated Annual Average Seabird and Egg Harvest by Species/Species Group in Alaska, 1995-2000.

	Northwest Alaska		Bering Strait/ Norton Sound		Yukon/ Kuskokwim Delta		Bristol Bay		Aleutian/ Pribilof Islands		Kodiak		Cook Inlet		Gulf of Alaska		Totals	
Species	Eggs	Birds	Eggs	Birds	Eggs	Birds	Eggs	Birds	Eggs	Birds	Eggs	Birds	Eggs	Birds	Eggs	Birds	Eggs	Birds
Yellow-billed Loons	-	-	10	39	14	74	4	44	-	-	-	-	-	-	-	-	28	157
Red-throated Loons	-	6	-	-	10	24	-	3	-	-	-	-	-	-	-	-	10	33
Common Loons	8	71	79	215	61	270	19	30	-	-	-	-	-	-	-	-	167	586
Arctic/ Loons	8	2	-	70	5	26	240	-	-	-	-	-	-	-	-	-	253	98
Unknown Loons	-	-	20	12	-	-	-	-	-	-	-	-	-	2	-	3	20	17
Auklets	-	1	151	9,031	-	-	-	-	38	110	-	54	-	-	-	-	189	9,196
Murres	4,141	23	27,394	6,760	291	41	5,352	15	593	422	-	-	-	-	-	-	37,771	7,261
Guillemots	81	-	-	6	-	-	-	-	37	-	-	-	-	-	-	-	118	6
Cormorants	4	-	-	1,671	-	-	-	-	18	82	-	-	-	-	-	-	22	1,753
Black-legged Kittiwakes	-	-	-	37	-	-	-	-	-	386	39	-	-	-	-	-	39	423
Red-legged Kittiwakes	-	-	-	-	-	-	-	-	-	657	-	-	-	-	-	-	-	657
Murrelets	-	-	-	-	-	-	-	-	84	28	-	-	-	-	-	-	84	28
Unknown Gulls	4,563	-	9,776	8	-	-	-	-	2,653	4	-	-	-	-	333	-	17,325	12
Mew Gulls	2,034	40	-	-	407	48	3,098	57	-	-	1,150	-	-	-	-	-	6,689	145
Sabine Gulls	52	-	-	-	344	39	2,910	19	-	-	-	-	-	-	-	-	3,306	58
Glaucous Gulls	1,283	-	-	377	1,610	226	14,838	103	-	-	-	-	-	60	-	-	17,731	766
Glaucous-winged Gulls	-	-	-	71	-	-	848	-	2,322	-	2,116	-	921	-	962	-	7,169	71
Herring Gulls	-	-	-	62	-	-	-	-	2,276	-	177	-	-	-	-	-	2,453	62
Arctic Terns	8	-	185	-	381	69	1,662	11	195	-	-	-	120	-	26	-	2,577	80
Puffins	-	-	93	78	-	-	-	-	55	148	-	-	-	-	-	-	148	226
Unknown Seabirds	61	-	2,106	41	-	-	-	-	-	-	46	20	-	-	-	-	2,213	61
Red-necked Grebes	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	-	-	4
Total	**12,243**	**143**	**39,814**	**18,480**	**3,123**	**817**	**28,971**	**282**	**8,271**	**1,839**	**3,528**	**74**	**1,041**	**62**	**1,321**	**3**	**98,312**	**21,700**

Estimated Annual Average Seabird and Egg Harvest by Species/Species Group in Alaska, 1995-2000[1]

[1] Southeast Alaska Harvest Region was not surveyed during the 1995-2000 period. North Slope, Copper River Basin, and Interior Harvest Regions did not report harvesting seabirds or their eggs during the 1995-2000 period. **Sources:** ADF&G 2001; ADF&G and Kawerak, Inc. 1997; Brower and Opie 1996, 1997; Brower *et al.* 2000; Georgette 2000; Hepa *et al.* 1997; ; Paige *et al*. 1996; Stovall 2000; Wentworth 2007; Wentworth and Wong 2001; Wong and Wentworth 2001; Wong and Williams 2000.

Appendix 7. Estimated Annual Average Seabird and Egg Harvest by Species/Species Group in Alaska, 2001-2005.

	North Slope[2]		Bering Strait/ Norton Sound[3]		Yukon/ Kuskokwim Delta[4]		Bristol Bay[5]		Aleutian/ Pribilof Islands[6]		Cook Inlet[7]		Copper River Basin[8]		Totals	
Species	Eggs	Birds	Eggs	Birds	Eggs	Birds	Eggs	Birds	Eggs	Birds	Eggs	Birds	Eggs	Birds	Eggs	Birds
Yellow-billed Loons	-	3	-	181	14	55	-	78	-	-	-	-	-	-	14	317
Red-throated Loons	-	-	27	21	25	41	-	13	-	-	-	-	-	-	52	75
Common Loons	-	-	238	648	68	150	1	14	-	-	-	-	-	-	307	812
Arctic Loons	-	-	164	266	96	214	22	4	-	-	-	-	-	-	282	484
Auklets	-	-	125	8,890	-	-	797	-	-	-	-	-	-	-	922	8,890
Murres	3,610	29	79,726	8,854	241	62	3,532	4	-	-	-	8	-	-	87,109	8,957
Guillemots	-	-	8	258	-	1	3	2	-	-	-	-	-	-	11	261
Cormorants	-	-	27	3,916	-	32	4	-	-	-	-	-	-	-	31	3,948
Black-legged Kittiwakes	-	-	604	1,577	32	1	385	-	194	-	-	58	-	-	1,215	1,636
Red-legged Kittiwakes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Murrelets	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unknown Gulls	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mew Gulls	-	-	2,193	60	2,386	147	9,222	145	-	-	-	-	-	-	13,801	352
Sabine Gulls	-	-	10	4	407	24	286	-	-	-	-	-	-	-	703	28
Glaucous Gulls	229	-	8,400	998	2,577	193	12,034	259	13,423	130	-	506	-	-	36,663	2,086
Glaucous-winged Gulls	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Herring Gulls	-	-	-	-	-	-	37	-	1,428	-	-	659	-	-	1,465	659
Arctic Terns	84	11	817	20	542	44	857	11	108	-	-	371	-	-	2408	457
Puffins	-	-	168	57	4	121	-	-	259	1,212	-	29	-	-	431	1,419
Unknown Seabirds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red-necked Grebes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	**3,923**	**43**	**92,507**	**25,750**	**6,392**	**1,085**	**27,180**	**530**	**15,412**	**1,342**	-	**1,631**	-	-	**145,414**	**30,381**

Estimated Annual Average Seabird and Egg Harvest by Species/Species Group in Alaska, 2001-2005[1]
[1]Survey periods vary by region (see below). More current data for Kodiak, Interior, Northwest Arctic, Gulf of Alaska, and Southeast Alaska regions are not available, [2]2005 survey, [3]Average of 2004-2005 surveys, [4]Average of 2001, 2002, 2004, and 2005, [5]Average of 2001, 2002, 2004, and 2005 bird surveys and 2004-2005 for egg surveys, [6]2005 survey, [7]2003 survey, [8] 2004 survey**, Sources:** ADF&G 2001; ADF&G and Kawerak, Inc. 1997; Brower and Opie 1996, 1997; Brower *et al.* 2000; Georgette 2000; Hepa *et al*. 1997; Paige *et al*. 1996; Stovall 2000; Wentworth 2007; Wentworth and Wong 2001; Wong and Wentworth 2001; Wong and Williams 2000.

Appendix 8. Estimated Annual Average Seabird Egg Harvest in Alaska by Region, 1995–2000 and 2001–2005.

	Total Rural Communities	Community Surveys	1995–2000		2001–2005[2]	
			Estimated Annual Seabird Harvest	Estimated Annual Seabird Egg –Harvest	Estimated Annual Seabird Harvest	Estimated Annual Seabird Egg Harvest
North Slope	8	1992–1993, 1995, 2005	0	0	43	3923
Northwest Arctic	11	1997–1998	143	12243	No New Data	No New Data
Bering Strait/Norton Sound	16	1994–1996, 2002, 2004–2005	18480	39814	25750	92507
Interior	42	1998–2000, 20042–005	0	0	0	0
Yukon/Kuskokwim Delta	38	1995–2005	817	3123	1085	6392
Bristol Bay	30	19952–001, 20042–005	282	28971	530	27180
Aleutian/Pribilof Island	11	1992, 1994, 1996, 2005	1839	8271	1342	15412
Kodiak	7	1999, 2003	74	3528	No New Data	No New Data
Cook Inlet	4	2000, 2004–2005	62	1041	1631	0
Gulf of Alaska	3	2000	3	1321	0	0
Copper River Basin	5	2000, 2004	0	0	0	0
Southeast Archipelago	4	None	No Data	No Data	0	0
TOTAL:	**179**		**21700**	**98312**	**30381**	**145414**

Eiders and other sea ducks are not included: loons and grebes are included as seabirds. Sources: ADF&G 2001; ADF&G and Kawerak, Inc. 1997; Brower and Opie 1996, 1997; Brower *et al.* 2000; Georgette 2000; Hepa *et al.* 1997; Paige *et al.* 1996; Stovall 2000; Wentworth 2007; Wentworth and Wong 2001; Wong and Wentworth 2001; Wong and Williams 2000.

Appendix 9. List of Alaska Seabird Species Open to Subsistence Harvest.

Northern Fulmar
Double-crested Cormorant
Pelagic Cormorant
Pomarine Jaeger
Parasitic Jaeger
Long-tailed Jaeger
Bonaparte's Gull
Mew Gull
Herring Gull
Slaty-backed Gull
Glaucous-winged Gull
Glaucous Gull
Sabine's Gull
Black-legged Kittiwake
Red-legged Kittiwake
Ivory Gull
Arctic Tern
Aleutian Tern
Common Murre
Thick-billed Murre
Black Guillemot
Pigeon Guillemot
Cassin's Auklet
Parakeet Auklet
Least Auklet
Whiskered Auklet
Crested Auklet
Rhinoceros Auklet
Horned Puffin
Tufted Puffin

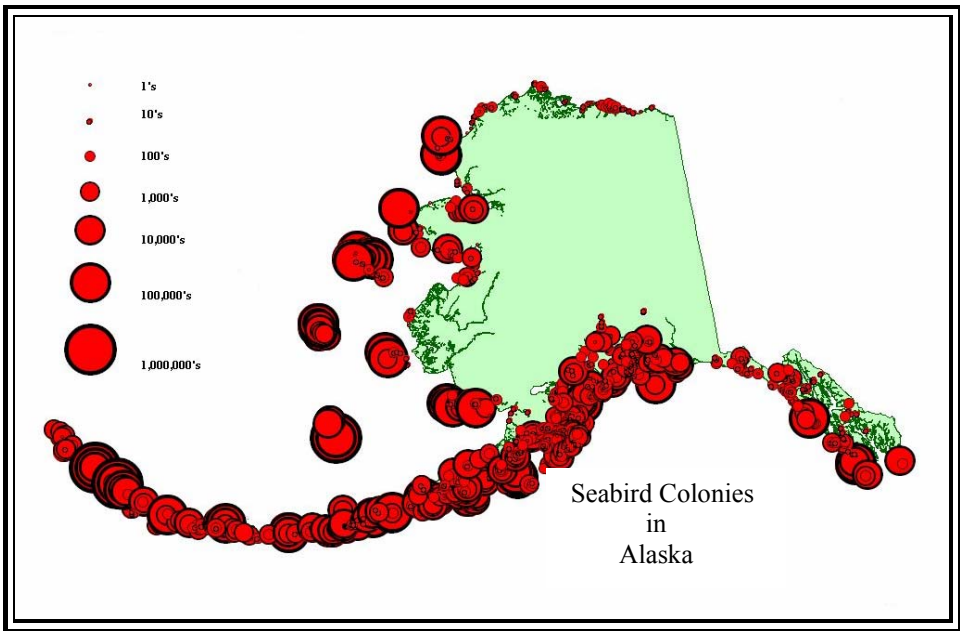
Appendix 10. Alaska Seabird Species Accounts.

Appendix 10 is the Alaska Seabird Information Series,[302] printed in 2006. It is also available online: http://alaska.fws.gov/mbsp/mbm/seabirds/pdf/asis_complete.pdf. It has its own table of contents and literature cited sections.

[302] USFWS 2006a

Alaska Seabird Information Series
(*ASIS*)

Compiled by Lynn Denlinger



U.S. Fish and Wildlife Service
Migratory Bird Management
Nongame Program
1011 E. Tudor Road
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99503-6199

November 2006

Suggested Citation: Denlinger, L.M. 2006. Alaska Seabird Information Series. Unpubl. Rept., U.S. Fish and Wildl. Serv., Migr. Bird Manage., Nongame Program, Anchorage, AK.

Cover Photo: Alaska Maritime National Wildlife Refuge
Crested Auklets — Aleutian Islands

TABLE OF CONTENTS

PREFACE

The Alaska Seabird Information Series (ASIS) is a compilation of seabird species accounts for all seabirds breeding in Alaska and five important nonbreeders. Conservation status, life history, distribution, population size and trends, conservation concerns, and recommended management actions are included in the accounts. The nonbreeders were selected not only because they spend a large part of their life cycle in Alaskan waters, but also due to concerns about bycatch in Alaskan fisheries. These nonbreeders include the Black-footed Albatross, Laysan Albatross, Short-tailed Albatross, Short-tailed Shearwater, and Sooty Shearwater. The Short-tailed Albatross is of special concern because of its endangered status.

Originally, the species accounts were written to be used as an appendix for the U.S. Fish and Wildlife Service (USFWS), Alaska Region, Seabird Conservation Plan. As the accounts developed, it was thought that they might also serve as stand alone documents to be handed out to the public for educational purposes. To that end, it was decided that one page, front and back, would be the appropriate length. As an additional educational and informational tool, it was determined that the ASIS should be posted on the USFWS website. Consequently, the accounts developed into a multi-purpose document.

Serving the management function and making the accounts “user friendly” for the general public presented various challenges. An effort was made to keep scientific language and formatting to a minimum and at the same time present the most up to date and factual information possible. Shortened, abbreviated references were used on the individual species accounts, again to make the document more appealing to the general public. A full list of literature cited is presented at the back of this document; it will also be included in the Seabird Conservation Plan and posted with the ASIS on the USFWS website.

Detailed information on many aspects of each seabird species is available in numerous documents and unpublished USFWS data. However, prior to this time, current information had not been compiled in a single document for each of the Alaskan breeding species. Another objective of the ASIS was to summarize these data while putting them in one document. Limiting the individual species accounts to one page made it impossible to include all pertinent information. Rather, it is hoped that the ASIS may serve as a quick reference or starting point for managers needing information on the individual species and as an introduction to the public on the full range of Alaskan breeding seabirds.

ACKNOWLEDGEMENTS AND CREDITS

Many thanks to the people who shared in editing the ASIS which include, Dan Roby, Oregon State University; Robert Day, Alaska Biological Resources, Inc.; Larisa Zelenskaya, Magadan, Russia; Vernon Byrd, Heather Renner, Leslie Slater, and Jeff Williams from the Alaska Maritime National Wildlife Refuge; Scott Hatch and Bob Gill, USGS, Alaska Science Center; and Kathy Kuletz, David Irons, and Liz Labunski from USFWS, Alaska Migratory Bird Management. Special thanks to Vivian Mendenhall for editing and continued involvement in seabird conservation since retirement from USFWS.

Shawn Stephensen and Liz Labunski, USFWS, Alaska Migratory Bird Management produced the maps used in this document. Shawn was responsible for the Beringian Seabird Colony Catalog database maps and Liz created the pelagic distribution maps for seabird species that do not breed in Alaska. John Piatt and Gary Drew, USGS, Alaska Science Center have invested a great deal of time in the construction of North Pacific Pelagic Seabird Database (NPPSD) maps. We appreciate their efforts and thank them for access to the database.

Gratitude also goes to Robert H. Armstrong and Alaska Northwest Books for permission to use the Alaska Seasonal Distribution Charts in the ASIS. The multitude of hours spent by Mr. Armstrong in the compilation of the charts for the *Guide to the Birds of Alaska* is recognized along with many thanks to Mr. Armstrong and the publisher for saving us this time.

Much appreciation goes to Donna Dewhurst, USFWS-AMBCC for design of the cover and for help with photo application and to Lisa Grandbois, USFWS, Information Technology Management for help with graphics setup. The cover photo is a USFWS photo, photographer unknown.

Special thanks to the following photographers from the private sector who generously allowed use of their photographs in this document:

Bruce Craig	Rhinoceros Auklet	Jeff Poklen	Herring Gull
George Divoky	Black Guillemot	Jeff Poklen	Laysan Albatross
Bryan Guarente	Glaucous Gull	Jeff Poklen	Pomarine Jaeger
Ian Jones	Ancient Murrelet	Jeff Poklen	Sooty Shearwater
Ian Jones	Cassin's Auklet	Eric Preston	Black-footed Albatross
Ian Jones	Fork-tailed Storm-Petrel	Eric Preston	Parasitic Jaeger
Ian Jones	Leach's Storm-Petrel	Eric Preston	Short-tailed Shearwater
Ian Jones	Least Auklet	Barb Putnam	Brandt's Cormorant
Ian Jones	Whiskered Auklet	Mark Rauzon	Double-crested Cormorant
Guy Monty	Marbled Murrelet	Dan Tallman	Ancient Murrelet
Nial Moores/Birds Korea	Slaty-backed Gull (2)	Glen Tepke	Black Guillemot
Dennis Paulson	Pelagic Cormorant	Mike Yip	Rhinoceros Auklet

Thanks also to photographers from USFWS, National Park Service (NPS), and USGS/Alaska Science Center* for their photos.

Greg Balough	Laysan Albatross
Tim Bowman	Long-tailed Jaeger (2)
Chris Dau	Thick-billed Murre
Donna Dewhurst	Bonaparte's Gull
Donna Dewhurst	Mew Gull (2)
Donna Dewhurst	Red-faced Cormorant
Donna Dewhurst	Tufted Puffin
Bob Gill*	Aleutian Tern
Bob Gill*	Arctic Tern
Scott Hatch*	Northern Fulmar
Lee Karney	Caspian Tern
Max Kauffman	Black-legged Kittiwake
Rodney Krey	Double-crested Cormorant
Meg Laws	Sabine's Gull
Mark Rauzon	Dovekie
Mason Reid (NPS)	Kittlitz's Murrelet
Lisa Sheffield	Common Murre
Art Sowls	Crested Auklet
Art Sowls	Horned Puffin

BLACK-FOOTED ALBATROSS *Phoebastria nigripes*

Conservation Status

ALASKA: Highly Imperiled **N. AMERICAN: Highly Imperiled** **GLOBAL: Endangered**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
Nov-June	1	~ 65 d	140 d	ground scrape	surface dip, scavenge	fish eggs, squid, fish, crustaceans, fish waste

Life History and Distribution

Although the Black-footed Albatross *(Phoebastria nigripes)* nests primarily in the Hawaiian Islands, it forages in Alaskan waters during the summer months. Nonbreeders may remain in Alaska throughout the year and breeding birds also journey as far as Alaska to find food for their young (a flight of >5,000 miles roundtrip). While the Black-footed Albatross does not breed in Alaska, it is an Alaskan Bird of Conservation Concern because of recent declines and the occurrence of mortality in longline fisheries.

This species is one of three albatrosses found in Alaskan waters. The other two species are the Laysan Albatross (*Phoebastria immutabilis)* and the much rarer, federally endangered, Short-tailed Albatross (*Phoebastria albatrus).* The Black-footed Albatross is distinguished from the others by its entirely chocolate-brown plumage, legs and feet. The dark appearance is offset with a narrow strip of white at the base of the bill and under the eyes. About 10% of adults also have white at the base of the tail and under the tail. Males, females, and juvenile birds have similar plumage. Black-footed Albatrosses nest in colonies with Laysan Albatrosses and hybridizations occur rarely.

Nesting is restricted to the remote Northwestern Hawaiian Islands with the exception of small breeding colonies off Japan. This species prefers to nest on low coral and sand islands.

Once fledged, juveniles leave the breeding grounds and remain on the open seas until they are about three years old. At that time, they return to where they were born, but do not begin to breed until they are around five years old. Pair bonds are established through ritualized display postures or "dances." The pair bond remains intact until a mate dies or disappears.

Except during the breeding season, Black-footed Albatrosses do not come to land. Perfectly adapted for a life at sea, they utilize dynamic soaring to remain airborne for hours. Birds land on the water only to rest or feed. They forage predominantly during the day for flying fish eggs, squid, crustaceans, fish, and zooplankton found on the surface of the ocean. Fish waste discarded from fishing vessels is also part of the diet.

In Alaska, Black-footed Albatrosses are found primarily in the northern portion of the Gulf of Alaska. Fewer numbers have also been observed near Nunivak Island in the northern Bering Sea, along the Aleutian Islands, and in Southeast Alaska.

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Alaska Seasonal Distribution

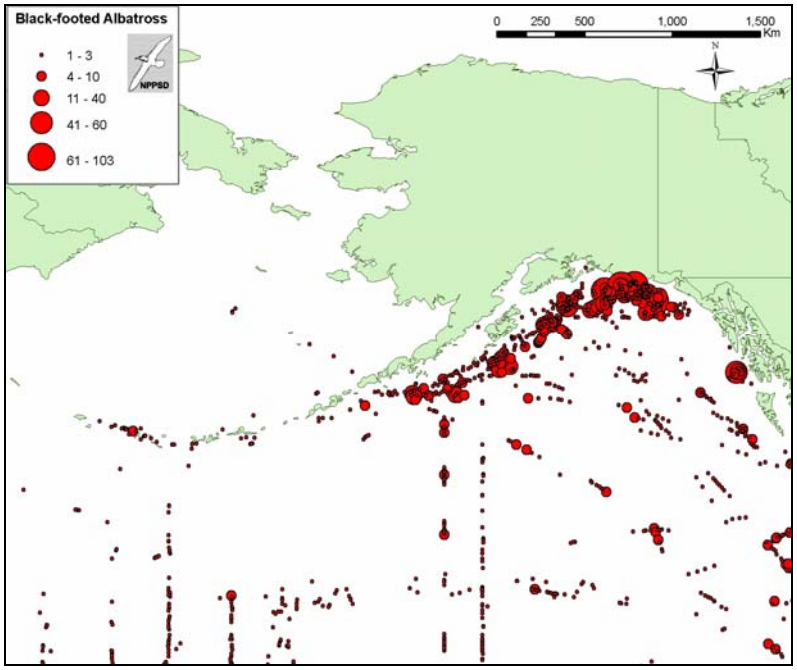
AK Region	Sp	S	F	W
Southeastern	C	C	C	-
Southcoastal	C	C	C	R
Southwestern	C	C	C	R
Central	-	-	-	-
Western	R	R	R	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. © **Armstrong 1995.**

Population Estimates and Trends

In 2003-2004, the total breeding population was estimated at 58,000 breeding pairs. More than 95% of the population breeds in the Hawaiian Islands. The largest colonies are found on Laysan Island (19,500 pairs) and Midway Island (20,400 pairs).

At the turn of the 20th century the population was decimated by feather hunters, and later, by the introduction of rabbits, which destroyed nesting habitat. In the 1950s and 1960s the population was decreased by tens of thousands of birds in order to reduce the incidence of collisions with military aircraft. The population rebounded from these dramatic population declines, but over the last decade, populations at the largest Hawaiian colonies appear to have slightly declined.



Distribution of Black-footed Albatrosses in Alaska as determined from boat-based surveys conducted between 1974-1989. Seabird distribution maps created from data provided by the North Pacific Pelagic Seabird Database (NPPSD) Version 1.0, 2005. USGS Alaska Science Center & U.S. Fish and Wildlife Service, Anchorage, Alaska. http://www.absc.usgs.gov/research/NPPSD

Conservation Concerns and Actions

The greatest current threat to this species is mortality from accidental bycatch in the commercial longline fisheries in the North Pacific. Mortality of Black-footed Albatrosses has been recorded from the longline fisheries in Hawaii and Alaska. This probably only represents a portion of the fishing mortality that occurs. Bycatch in longline fisheries conducted in the North Pacific by Japan, Taiwan, Korea, Russia, and China also occurs.

Between 1990 and 1994, it is estimated that >23,000 Black-footed Albatrosses were drowned after being caught on longline hooks set by the North Pacific swordfish fishery. An estimated 1,800 were killed annually, by the Hawaiian longline fishery alone, between 1994 and 1998. Additionally, between 133-216 Black-footed Albatrosses were killed annually in the Gulf of Alaska demersal longline fisheries between 1993-2003.

Considerable effort has been made towards decreasing seabird bycatch. The Hawaiian longline fisheries for swordfish was closed in 2001 and bycatch of Black-footed Albatrosses decreased to <100 birds per year. In Alaska, research and development of methods to reduce seabird bycatch in the longline fisheries has met with favorable results. In 1997, the National Marine Fisheries Service initiated mandatory employment of seabird deterrent devices. Regulations were for longline vessels fishing for groundfish in Alaskan waters, adjacent to the Bering Sea/Aleutian Islands and the Gulf of Alaska.

A serious conservation concern is plastics ingestion. If nestlings are fed plastics that parents find at sea (entangled with food), their food and water intake is reduced. This can potentially cause dehydration, starvation and death of the chicks.

Recommended Management Actions

- Monitor populations and distribution in Alaskan waters.
- Continue monitoring of breeding populations in the Hawaiian Islands.
- Compile, analyze, and report data on Black-footed Albatrosses from the North Pacific Pelagic Seabird Database and NOAA Seabird Observer Program to identify summer and fall distribution of the species in Alaskan waters.
- Support efforts to estimate and minimize mortality from all U.S. and foreign fisheries.
    - Support seabird bycatch reduction workshops for other countries in the North Pacific.
    - Support continued research and development of mitigation measures to prevent mortality in fisheries.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; IUCN Internet Website (2005); Kushlan *et al.* 2002; NOAA Internet Website (2005); U.S. Fish and Wildlife Service 2005, 2002; Whittow 1993a.

Full credit for the information in this document is given to the above references.

LAYSAN ALBATROSS *Phoebastria immutabilis*

Conservation Status

ALASKA: High **N. AMERICAN: High Concern** **GLOBAL: Vulnerable**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
Nov-July	1	~ 65 d	165 d	ground scrape	surface dip	fish, squid, fish eggs and waste

Life History and Distribution

Laysan Albatrosses *(Phoebastria immutabilis)* breed primarily in the Hawaiian Islands, but they inhabit Alaskan waters during the summer months to feed. They are the most abundant of the three albatross species that visit Alaska.

The albatross has been described as the "true nomad of the oceans." Once fledged, it remains at sea for three to five years before returning to the island where it was born. When birds are eight or nine years old they begin to breed. The breeding season is November to July and the rest of the year, the birds remain at sea. Strong, effortless flight is the key to being able to spend so much time in the air. The albatross takes advantage of air currents just above the ocean's waves to soar in perpetual fluid motion. It may not flap its wings for hours, or even for days. The aerial master never touches land outside the breeding season, but it does rest on the water to feed and sleep. To avoid predators such as whales and sharks, this bird can even sleep while flying.

The Laysan Albatross is a large bird with a wingspan of six feet or more and weighs up to 22 pounds, but that is small for an albatross. The birds' underparts are white and the back and upperwings are uniformly dark. Similar species found in Alaskan waters are the Black-footed Albatross (*Phoebastria nigripes*) and the much rarer, endangered, Short-tailed Albatross (*Phoebastria albatrus).* Hybridizations have been recorded between Laysan and Black-footed Albatrosses. The latter may be distinguished by a uniformly dark brown plumage. The Short-tailed Albatross has all white underwings and back, a yellow wash on the back of the neck, and a larger, heavier bill.

Laysan Albatrosses live from forty to sixty years and are capable of breeding annually. The birds are monogamous and the pair bond is established by an elaborate courtship "dance." Once mated, the bond is only broken by death or disappearance of the mate. They rendezvous each year with their partner at the same location and establish a new nest within a few feet of the original nest site.

In the U.S., Laysan Albatross nesting is limited to islands in the Hawaiian Archipelago. Colonies also exist on the Bonin Islands in Japan and on Guadalupe Island off the coast of Baja California. Between July and November, Laysan Albatrosses disperse widely throughout the North Pacific Ocean and adjoining seas. In Alaska, they are most

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commonly seen in the southern Bering Sea, Aleutian Islands, and the northwestern Gulf of Alaska. Nonbreeders may remain in Alaska throughout the year and breeding birds are known to travel from Hawaii to Alaska in search of food for their young. Albatrosses have the ability to concentrate the food they catch and store it in their bellies for the long flight back to their chicks in Hawaii. When the parents arrive back at the nest, they feed the chick by regurgitation.

This species eats mostly fish, fish eggs, and squid often feeding at night when the prey rises to the surface. They also feed on fish waste disposed of by fishing vessels.

Alaska Seasonal Distribution

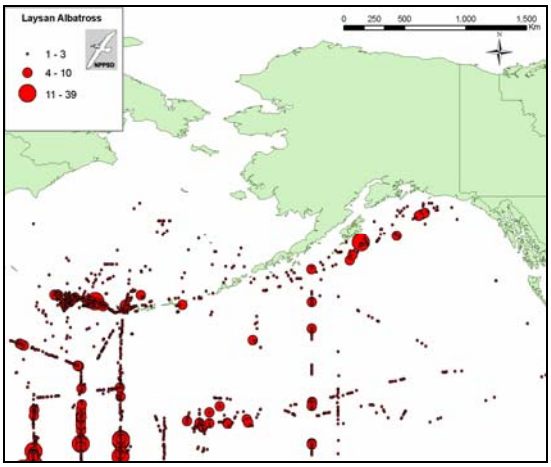
AK Region	Sp	S	F	W
Southeastern	R	+	-	-
Southcoastal	R	R	R	-
Southwestern	U	U	U	R
Central	-	-	-	-
Western	R	R	R	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. © **Armstrong 1995.**

Population Estimates and Trends

A 2003-2004 population estimate for breeding pairs worldwide was approximately 630,000 pairs. The largest colonies are on Laysan (145,000 pairs) and Midway islands (441,000 pairs).

There is concern that the population may be declining, however, trend data are not available. More rigorous monitoring is needed before trends can be accurately



Distribution of Laysan Albatrosses in Alaska as determined from boat-based surveys conducted between 1974-1988. Seabird distribution maps created from data provided by the North Pacific Pelagic Seabird Database (NPPSD) Version 1.0, 2005. USGS Alaska Science Center & U.S. Fish and Wildlife Service, Anchorage, Alaska. http://www.absc.usgs.gov/research/NPPSD

assessed. The breeding range is expanding with small colonies forming on islands off central Mexico and birds are recolonizing Johnston Atoll and Wake Island in the central Pacific Ocean.

Conservation Concerns and Actions

Feather hunting and military developments decimated colonies on some islands earlier this century, but are no longer a threat to the Laysan Albatross. However, the species continues to encounter human caused mortality from a variety of causes.

In 1990, an estimated 17,500 Laysan Albatrosses were killed in high seas driftnets (0.7% of the population). A ban on this fishery in 1993 substantially reduced overall bycatch in the U.S. fisheries. Laysan Albatrosses are also killed as bycatch in longline fisheries. During the 1990s, thousands of Laysan Albatrosses were killed each year in Hawaiian longline fisheries. In Alaskan waters, an estimated 413-508 Laysan Albatrosses were killed per year in the Bering Sea/Aleutian islands demersal groundfish longline fisheries and an estimated 81-127 were killed annually in the Gulf of Alaska. Most of the bycatch occured in the longline fisheries, but the trawl groundfish fishery has occasionally shown relatively high bycatch levels. In the Gulf of Alaska, Bering Sea, and Aleutian Islands combined trawl fisheries, 186-253 Laysan Albatrosses were killed annually between 1998-2003. Alaska and Hawaii represent only a portion of the incidental fishing mortality that occurs in the North Pacific. Bycatch in fisheries conducted in the North Pacific by Japan, Taiwan, Korea, Russia, and China is also a concern.

Collisions with airplanes threaten albatrosses and are a serious threat to humans as well. Between 1954 and 1964, 54,000 birds were killed at Midway Island to reduce the risk of collisions with military aircraft. This problem has diminished in some areas, but continues to remain a problem at the Pacific Missile Range (Kauai), Dillingham Airfield (Oahu) and the Marine Corps Base Hawaii (Oahu). Nesting efforts are thwarted in these areas by egg collection and relocation of adults.

Predation by dogs, cats, and rats *(Rattus spp.)* is still a threat on some Hawaiian Islands. Rats have been eradicated on all Northwestern Hawaiian Islands, but some large islands still have rats. Tiger sharks (*Galeocerdo cuvier)* are also an important predator of albatross chicks. On Midway Island, nearly 10% of the fledglings fall prey to tiger sharks in the waters surrounding the island.

A serious conservation concern is plastics ingestion. If nestlings are fed plastics that parents find at sea (often entangled with food), their food and water intake is reduced. This can potentially cause dehydration, starvation and death of the chicks.

Recommended Management Actions

- Monitor population trends in Alaskan waters.
- Continue monitoring of breeding populations in the Hawaiian Islands.
- Compile, analyze, and report data on Laysan Albatrosses from the North Pacific Pelagic Seabird Database and NOAA Seabird Observer Program to identify summer and fall distribution of the species in Alaskan waters.
- Work with state and federal agencies and fisheries councils to better understand and minimize the impacts of fisheries interactions.
    - Support seabird bycatch reduction workshops for other countries in the North Pacific.
    - Support continued research and development of mitigation measures to prevent seabird bycatch.
- Support efforts to minimize the incidence of fuel spills.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; IUCN Internet Website (2005); Kushlan *et al.* 2002; NOAA Internet Website (2005); U.S. Fish and Wildlife Service 2006, 2002; Whittow 1993b.

Full credit for the information in this document is given to the above references.

USFWS Greg Balough

SHORT-TAILED ALBATROSS *Phoebastria albatrus*

Conservation Status

ALASKA: Endangered **N. AMERICAN: High Concern** **GLOBAL: Vulnerable**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
Oct-June	1	64-65 d	~ 5 months	ground	surface seize, scavenge	squid, shrimp, fish, fish eggs

Life History and Distribution

The Short-tailed Albatross *(Phoebastria albatrus)* was formerly the most abundant albatross in the North Pacific, numbering in the millions. Currently, the world population is less than 2000 individuals.

Breeding occurs mainly on two remote islands, south of the main islands of Japan. Eighty to eighty-five percent of the nesting takes place in one colony on an active volcano named Torishima. This volcano has erupted five times in the last century and most recently in 2002. The volcanic activity has destroyed much of the original nesting site, leaving sparsely vegetated, eroded slopes. Nests are now more prone to destruction from monsoon storms.

Japanese scientists have used decoys and recorded colony sounds to encourage breeding in a more stable area, on the northwest side of Torishima Island. Nine pairs have successfully nested at this site. The other established breeding site is on Minami-kojima Island, which is southwest of Torishima. In 2002, one Short-tailed Albatross chick was fledged on Kita-kojima Island which is near Minami-kojima. Both islands are in the Senkaku Island chain which may be slated for future oil development.

Repeated egg-laying has also occurred on Midway Island in the Northwestern Hawaiian Islands. To date, the reproductive attempts have not been successful. Midway Atoll would be a likely candidate for establishment of a new breeding site.

Outside the breeding season, the species spends much of its time feeding in the Alaskan waters of the Bering Sea, Aleutian Islands, and Gulf of Alaska.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	+	+	+	+
Southcoastal *	+	+	+	+
Southwestern *	R	R	R	+
Central	-	-	-	-
Western	-	-	-	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. Data provided by the North Pacific Pelagic Seabird Database **(NPPSD)**. USGS/ASC.

USFWS

The Short-tailed Albatross is the largest of the three albatrosses that occur in the North Pacific. It has a wing span of over seven feet and a body length of up to 37 inches. A massive, pink bill with a hooked, bluish tip easily identifies this species. Adults have an entirely white back, white or light golden crown and nape, and black and white wings. It is the only North Pacific albatross to develop an entirely white back in adulthood. Juveniles have chocolate brown plumage and could be confused with the Black-footed Albatross *(Phoebastria nigripes)*, but the large, pink bill, pink legs, and large size are identifying characteristics.

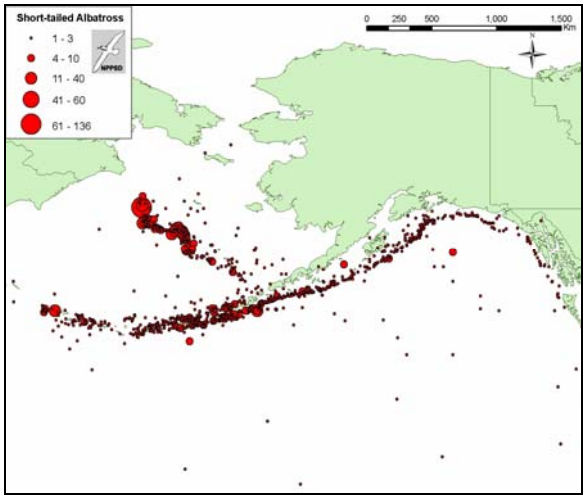
Long, narrow wings make the albatross perfectly adapted for dynamic soaring. Wind currents close to the surface of the ocean are used to cover huge distances in search of food. The bird can remain at sea indefinitely and only comes to land to breed.

Like other albatross species, Short-tailed Albatrosses are slow to reproduce, long-lived, monogamous, and mate for life. Breeding does not begin until age five or six (on average) and birds can live for forty years or more.

The marine regions preferred by Short-tailed Albatrosses for feeding are areas of upwelling and high productivity, such as continental shelf breaks. The diet includes squid, shrimp, fish eggs, fish, and crustaceans. Food is generally seized from the surface, but the species is also known to scavenge fish waste from fishing vessels.

Population Estimates and Trends

Short-tailed Albatrosses have survived numerous



Distribution of Short-tailed Albatrossess in Alaska as determined from boat-based surveys conducted between 1940-2003. Seabird distribution maps created from data provided by the North Pacific Pelagic Seabird Database (NPPSD) Version 2005.06.07 USGS Alaska Science Center, U.S. Fish and Wildlife Service, Migratory Bird Management Office, Anchorage Alaska, and the Anchorage Fish & Wildlife Field Office http://www.absc.usgs.gov/research/NPPSD

population pressures. Between 1885 and 1903, approximately five million Short-tailed Albatrosses were harvested from Torishima for their feathers. By 1949, Short-tailed Albatrosses no longer nested at any of their historical sites and the species was thought to be extinct. After years at sea, however, the immature birds returned to their natal colonies, and in 1950, they were nesting on Torishima. By 1954, there were 25 birds and at least 6 pairs. The population slowly increased (~6-8% per year) because of habitat management projects, strict regulations, and no major volcanic eruptions. By 2001, there were 1,200 known birds and by fall of 2005, the population was estimated at about 2,000 individuals (1,712 from Torishima and 340 from the Senkakus).

Conservation Concerns and Actions

The Short-tailed Albatross was listed as endangered throughout its range in 2000 by the U.S. Fish and Wildlife Service. The Japanese Government declared the species a Natural Monument in 1958 and a Special Bird for Protection in 1972. The government-owned island of Torishima is also a Natural Monument and is managed for conservation. A multi-national Short-tailed Albatross Recovery Team (START) has been formed and a recovery plan is being finalized.

Currently, the main threat to the Short-tailed Albatross is the possibility of a major eruption at the main breeding site. Japan has improved the nesting habitat by planting grass to stabilize soils and provide cover. The other breeding site in the Senkaku Island group is not threatened by volcanism. However, there is a potential for oil development and a political dispute between Japan and China over ownership of the island is currently underway.

Longline fisheries for demersal groundfish in the North Pacific Ocean were a known cause of mortality of Short-tailed Albatrosses. During the 1980s, fishermen reported two takes of Short-tailed Albatrosses, one in the Bering Sea, and one in the Gulf of Alaska. Since 1990, National Marine Fisheries Service (NMFS) observers recorded five Short-tailed Albatrosses taken in Alaskan waters.

The endangered status of the Short-tailed Albatross has engendered positive changes in the fishing industry and as a result, seabird bycatch of all species has been reduced. Ongoing efforts to reduce bycatch in Alaska include: continued collection of bycatch data via onboard observers, research on seabird deterrent devices, required use of the protective measures, and outreach and education for fishermen. Coordinated effort between state, federal, and international governments, fishermen, scientists, and fisheries managers has been made to reduce bycatch of seabirds.

Satellite telemetry indicated that Short-tailed Albatrosses move north after the breeding season to the southern tip of the Kamchatka Peninsula, then east to the western Aleutian Islands. The albatrosses spend considerable time in the western Pacific where they could be exposed to additional fisheries encounters. Thus, the Alaskan bycatch represents only a portion of the fishing mortality that occurs. Bycatch in longline fisheries conducted in the North Pacific by vessels representing Japan, Taiwan, Korea, Russia, and China also occurs.

Other human induced threats to Short-tailed Albatrosses include; ingestion of plastics, oil spills, and collisions with cables on fishing vessels.

Recommended Management Actions

- Complete a Short-tailed Albatross recovery plan update in five years (2010).
- Support ongoing population monitoring and habitat management on Torishima Island.
- Continue working with the Alaska commercial fishing industry and National Marine Fisheries Service to minimize accidental take of Short-tailed Albatrosses.
- Continue cooperation with the Japanese Ministry of Fisheries, and encourage other international fisheries organizations to attend START meetings.
- Support seabird bycatch reduction workshops for other countries in the North Pacific.

Regional Contact

U.S. Fish and Wildlife Service, Anchorage Fish and Wildlife Field Office, 601 W. 4th Ave., Rm. G-61, Anchorage, Alaska 99501
Telephone (907) 271-2888

References

IUCN Internet Website (2005); Kushlan *et al.* 2002; NOAA Internet Website (2005); NPPSD Internet Website (2005); U.S. Fish and Wildlife Service 2005a, 2005b, 2002.

Full credit for the information in this document is given to the above references.

SOOTY SHEARWATER *Puffinus griseus*

Conservation Status

ALASKA: Not At Risk **N. AMERICA: Moderate Concern** **GLOBAL: Near Threatened**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
Nov-Apr	1	52-56 d	86-106 d	burrow, crevice	pursuit plunge, surface dive	squid, fish, crustaceans

Life History and Distribution

The Sooty Shearwater *(Puffinus griseus)* is one of the most abundant seabirds in the world and is common in the pelagic waters of Alaska during the northern summer. Although this large, solid-bodied shearwater is found in oceans throughout the world, it is only known to breed in the Southern Hemisphere (during the northern winter).

This species appears uniformly dark brown above and below; the bill and feet are also dark. The underwing is lined with white, which is variable in size and shape, but usually continuous. In some light, the wing lining may appear silver. The bill is long and slender and the upper bill is curved to a sharp hook. Short-tailed Shearwaters (*Puffinus tenuirostris)* closely resemble Sooty Shearwaters and are also found in Alaskan waters during the summer. However, the Short-tailed are slightly smaller, have a shorter bill, and generally less white on the underwing.

Socially gregarious, Sooty Shearwaters nest in dense colonies on subtropical and sub-Antarctic islands and on the New Zealand mainland. It is a burrow-nesting bird that nests on cliffs and coastal slopes, wherever the soil is deep enough for burrowing. At most colonies, coming and going to the burrow is strictly nocturnal.

Breeding of Sooty Shearwaters occurs along the coast of Chile, around Cape Horn, in the Falkland Island group, in Tasmania and New South Wales, Australia, and on numerous New Zealand islands.

A few Sooty Shearwaters remain in the Southern Hemisphere all year (particularly south of Africa, South America, and Australia). However, by May, most birds head north to make the most of another summer. Massive migration flocks may form and continuous passages of more than 200,000 birds have been recorded. Stiff-winged flight with frequent gliding is a tell-tale sign of these birds. Slender, narrow-wings enable them to skim the surface of the waves, hence the name "shearwater."

From the Australasian breeding grounds, birds probably head directly north towards the Kurile Islands (north of Japan) and across the North Pacific Ocean. During the nonbreeding season, they are mainly concentrated from the Sea of Okhotsk, east through the Aleutian Islands and Gulf of Alaska.

In Alaska, Sooty Shearwaters concentrate primarily over the continental shelf of the Gulf of Alaska, and to a lesser extent over the outer shelf of the Bering Sea. They are less common than Short-tailed Shearwaters in the Bering Sea.

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Some nonbreeding birds may remain in Alaska throughout the year.

Alaska Seasonal Distribution

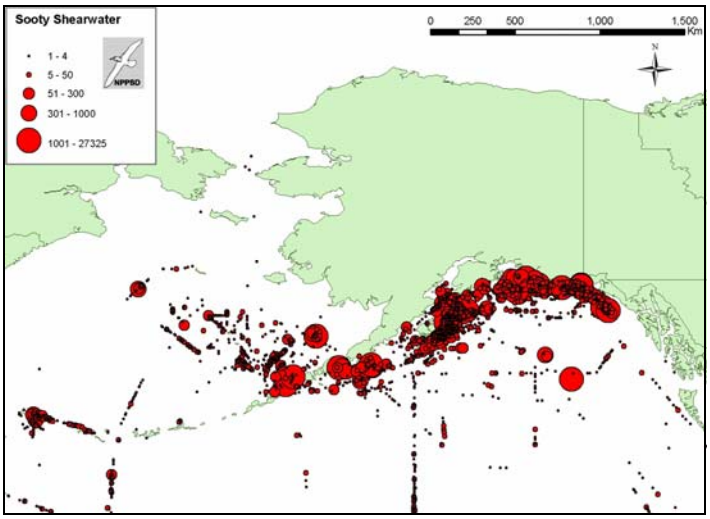
AK Region	Sp	S	F	W
Southeastern	C	C	C	-
Southcoastal	C	C	C	-
Southwestern	C	C	C	+
Central	-	-	-	-
Western	-	-	-	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Birds breeding around Chile, probably travel up the Humboldt Current along the west coast of South America, until they reach California and Oregon. They remain there until September. A portion of this group may cut across the tropical Pacific around Peru and continue on to the arctic.

Population Estimates and Trends

The world population is estimated at ~20 million individuals. Although Sooty Shearwaters are an abundant species, there are persistent signs of a current decline. Between 1969-1971, Northeast Island of the Snare Island group in New Zealand had an estimated 3,200,000 Sooty Shearwater burrows. Between 1996-2000, the number of burrows was estimated at 2,061,000 (a decrease of ~37%



Distribution of Sooty Shearwaters in Alaska as determined from boat-based surveys conducted between 1975-1993. Seabird distribution maps created from data provided by the North Pacific Pelagic Seabird Database (NPPSD) Version 1.0, 2005. USGS Alaska Science Center & U.S. Fish and Wildlife Service, Anchorage, AK http://www.absc.usgs.gov/research/NPPSD

over 27 years). Burrow occupancy also may have declined. Sooty Shearwater numbers have also declined on the New Zealand mainland and some smaller mainland colonies have become extinct. Presence of burrows on the mainland Otago coastline was compared with historical records in 1997-1998. The number of colonies was found to have declined by at least 54% in the past 50 years. Possible reasons for these declines include fisheries bycatch, predation, climate change, and over-harvest.

During the California summer (austral winter), the Sooty Shearwater is the most abundant species of the California Current System (CCS). An estimated five million birds occupied the CCS in the late 1970s. Pelagic surveys conducted between 1987-1994, in the CCS, suggest a 90% decline in Sooty Shearwater abundance. This decline is negatively correlated with a concurrent rise in sea-surface temperatures; Sooty Shearwaters have declined while sea temperatures have risen. Because of the geographic scale of this study the decline is not considered to be a local phenomenon or a response to a short-term distributional shift.

Conservation Concerns and Actions

Sooty Shearwaters wander immense distances from their breeding grounds south of the equator, throughout the Pacific and Atlantic Oceans. This makes the species potentially vulnerable to incidental bycatch in fisheries over a huge area. They may encounter large fishing fleets from Japan, Taiwan, the Soviet Union, Canada, the U.S., and other countries. This species, like most seabirds, is long-lived, slow to reproduce, and late to mature, which could cause the population to decline if mortality from bycatch exceeded the rate of reproduction. Prior to its closure, the North Pacific high seas driftnet fisheries killed ~350,000 Sooty Shearwaters per year. The effects on shearwaters and the magnitude of the bycatch from ongoing fisheries are largely unknown.

In Alaska, the extent of the seabird bycatch is examined for Sooty Shearwaters and Short-tailed Shearwaters together. Between 1993-2003, an estimated 445 shearwaters were taken annually in the Bering Sea/Aleutian Islands demersal groundfish longline fisheries. In contrast, in the Gulf of Alaska, an estimated 21 shearwaters were taken as bycatch annually. Trawl fisheries in Alaska comprise a large portion of the total shearwater bycatch. Between 1998-2003, an estimated <100-1,169 shearwaters were taken annually as bycatch. The distribution of trawl fisheries effort suggests that shearwaters could overlap in both the Bering Sea and the Gulf of Alaska with that fishery.

In New Zealand, Sooty Shearwaters are harvested and sold commercially. Indigenous people from southern New Zealand, the Rakiura Mäori, harvest ~250,000 chicks annually. The birds are primarily harvested for food and are known as "tïtï" or mutton birds. Soap and oil products are also made from the fat chicks and may be sold along with their feathers. The Palawa peoples of Tasmania likewise consider Sooty Shearwaters a food staple, and continue to harvest them today. Harvests are regulated and the effects of the harvests are being studied.

Predation by mammals at breeding sites is another known source of mortality for Sooty Shearwaters. During the 1993-1996 breeding seasons on South Island, New Zealand, ~97% of 118 deaths were caused by predation. Ermine (*Mustela erminea*) were the principal predators, but feral house cats and ferrets (*Mustela furo*) were responsible for a proportion of the deaths.

Recommended Management Actions

- Monitor population trends and distribution of Sooty Shearwaters in Alaskan waters.
- Work with state and federal agencies and fisheries councils to better understand and minimize the impacts of fisheries interactions.
- Support continued research and development of mitigation measures to prevent fisheries bycatch.

Regional Contact

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Telephone (907) 768-3444

References

Armstrong 1995; Birdlife International 2005; IUCN Internet Website (2005); Jones 2000; Kushlan *et al.* 2002; Marchant and Higgins 1990; NOAA Internet Website (2005); NPFMC 2003; Uhlmann 2003; U.S. Fish and Wildlife Service 2002; Veit *et al.* 1997.

Full credit for the information in this document is given to the above references.

SHORT-TAILED SHEARWATER *Puffinus tenuirostris*

Conservation Status

ALASKA: Not At Risk **N. AMERICAN: Not Currently At Risk** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
Nov-Apr	1	52-55 d	88-108 d	burrow	surface dive, pursuit plunge	crustaceans, fish, squid,

Life History and Distribution

Short-tailed Shearwaters (*Puffinus tenuirostris)* are one of the most abundant birds in the pelagic waters of Alaska during the northern summer. During the Alaskan winter, they are found on their breeding grounds in the Southern Hemisphere, making them a trans-equatorial migrant. These birds have been known to make the one-way trip (about 9,000 miles) in as little as six weeks. Shearwaters earned their name by their ability to skim the ocean surface with seemingly little effort. Their long, narrow wings enable them to dynamically soar and travel tremendous distances.

This species is the most abundant Australian seabird. It is an important part of Aboriginal culture in Tasmania and one of the few Australian birds that is commercially harvested. Chicks are taken for food, feathers, and oil. Approximately 200,000 chicks are harvested and sold annually.

Short-tailed Shearwaters have completely dark brown plumage on their upper body and head. The breast and underwings are pale gray and contrast with the darker "hood." Occasionally, the underwing has traces of white in the center. The tail is rounded and the dark grey feet trail behind when in flight. This species may be confused with the slightly larger Sooty Shearwater (*Puffinus griseus)*, which has a somewhat longer bill and more pronounced white under the wings.

The diet of the Short-tailed Shearwater consists primarily of crustaceans, but they also eat fish and squid. To catch their food, they plunge into the water or dive from the surface. The wings are used to propel the birds through the water. Shearwaters convert their food to oil which has a lower weight than the ingested prey. The oil is energy rich and is more easily carried long distances back to the chick.

Nesting occurs in densely packed colonies on coastal islands and on mainland promontories overlooking the sea. Colonies range in size from several hundred pairs to a single colony in excess of a million pairs. Burrows, up to six feet long, are dug for nesting. Occasionally, the birds nest in tunnels made in dense vegetation without burrowing. When nesting, shearwaters are nocturnal and return to the colonies in the dark after feeding at sea during the day. This behavior may reduce the risk from predators.

Breeding occurs only in Australia off the southern and southeastern coasts, around Tasmania, and on islands in Bass Strait. They are a regular nonbreeding summer visitor to Antarctica.

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During the southern winter (northern summer), most birds head for the North Pacific Ocean; the rest travel to the northeastern Indian Ocean. Birds that arrive in Alaskan waters reside there, roughly between May and September. The heaviest concentrations are over the continental shelf in the southern Bering Sea, and along the western Gulf of Alaska. Fewer birds are found in the Chukchi and Beaufort Seas and the central and eastern Gulf of Alaska. Some nonbreeders may remain in Alaska throughout the northern winter.

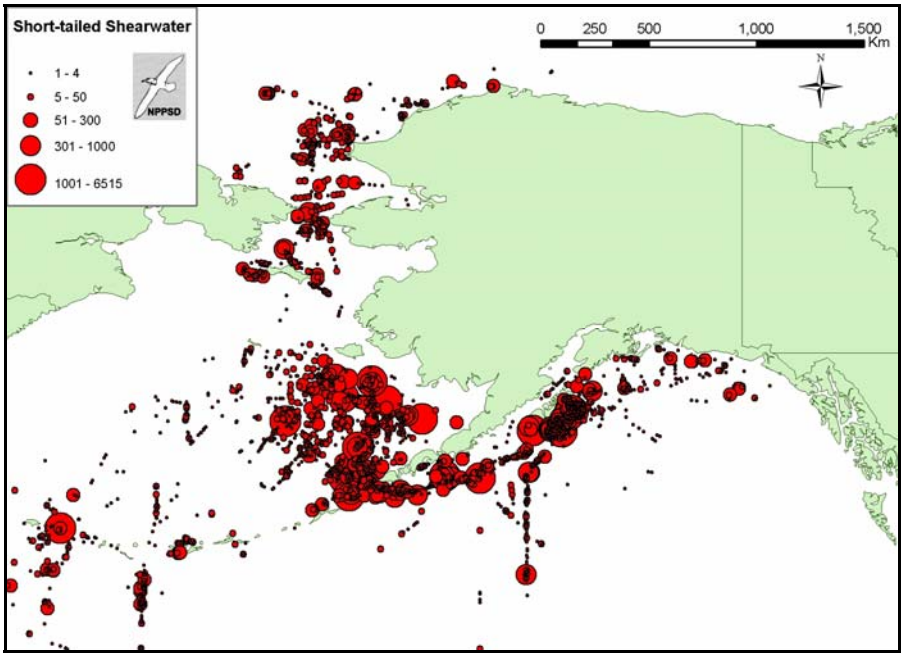
Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern	R	R	R	-
Southcoastal	U	C	U	+
Southwestern	C	C	C	+
Central	-	-	+	-
Western	C	C	C	-
Northern	-	U	U	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. © **Armstrong 1995.**

Population Estimates and Trends

Approximately 23 million Short-tailed Shearwaters breed at about 285 colonies in southeastern Australia. The largest colony is on Babel Island (off the northeast



Distribution of Short-tailed Shearwaters in Alaska as determined from boat-based surveys conducted between 1975-1989. Seabird distribution maps created from data provided by the North Pacific Pelagic Seabird Database (NPPSD) Version 1.0, 2005. USGS Alaska Science Center & U.S. Fish and Wildlife Service, Anchorage, Alaska. http://www.absc.usgs.gov/research/NPPSD

coast of Tasmania), which has about three million burrows. No global trend information is available.

Conservation Concerns and Actions

Although Short-tailed Shearwaters are a numerous species, they could still be vulnerable to over-harvesting, fisheries bycatch, predation, and habitat destruction. Because of the shearwater's international migratory habitats, it may be exposed to threats over a vast area.

In Tasmania, harvest limits are in place to prevent over-harvesting. Chicks are taken under strict controls and the season is limited.

For wide-ranging species, such as the Short-tailed Shearwater, the total magnitude of incidental fisheries bycatch is difficult to assess. In Alaska, the extent of the bycatch is examined for Short-tailed Shearwaters and Sooty Shearwaters together. Between 1993-2003, an estimated 445 shearwaters were taken annually in the Bering Sea/Aleutian Islands demersal groundfish longline fisheries. In the Gulf of Alaska, shearwaters are not taken in large numbers by the longline fishery. An estimated 21 shearwaters were taken annually between 1993-2003. Trawl fisheries in Alaska comprise a large portion of the total shearwater bycatch. Between 1998-2003, annual bycatch estimates in trawl fisheries ranged from <100 to 1,169.

Other potential threats to the species are: trampling of burrows by humans, pigs, cattle, and sheep; predation by feral cats and rats; erosion caused by recreational vehicles; and ingestion of plastics while feeding.

Recommended Management Actions

- Monitor population trends and distribution in Alaskan waters.
- Work with state and federal agencies and fisheries councils to better understand and minimize the negative impacts of fisheries interactions.
- Support continued research and development of mitigation measures to prevent fisheries bycatch.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; IUCN Internet Website (2005); Kushlan *et al.* 2002; Marchant and Higgins 1990; NOAA Internet Website (2005); NPFMC 2003; Parks & Wildlife Service, Tasmania, Internet Website (2005); U.S. Fish and Wildlife Service 2002.

Full credit for the information in this document is given to the above references.

NORTHERN FULMAR *Fulmarus glacialis*

Conservation Status

ALASKA: Moderate **N. AMERICAN: Moderate Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Sept	1	46-51 d	49-58 d	cliff shelf, ground scrape	plunge dive, surface dip	fish, squid, crustaceans, fish waste

Life History and Distribution

The Northern Fulmar *(Fulmarus glacialis)* looks like a gull, but is actually a tubenose bird related to petrels, shearwaters, albatrosses, and storm-petrels. They can be distinguished from gulls by a thick-necked appearance and their flight pattern. Flying low over the water, wings are held stiffly and alternate between rapid wingbeats and long glides. A truly pelagic species, the fulmar spends most of its life at sea and comes to land only to breed.

Two color phases are common: pale gray on the back and wings, with white elsewhere, or uniformly dark gray. Every gradation between the extremes and nearly all-white birds also occur. There is no generally accepted explanation for the variation in color. Fulmars from the North Pacific have relatively slender bills and greater extremes of color variation than occur anywhere in the Atlantic. Bering Sea colonies have few dark colored birds (0-0.2%), Aleutian Island birds are mostly dark (99%), and the Gulf of Alaska colonies are 75-85% dark. Three subspecies are recognized and all fulmars from the North Pacific are in the subspecies, *Fulmarus glacialis rodgersii.* There is also a close relationship between the Northern Fulmar and the Southern, or Antarctic Fulmar (*Fulmarus glacialoides).*

Northern Fulmars are abundant in Alaska, but are rarely seen because they breed in a few remote breeding locations. Usually, they breed on cliff shelves, laying a single white egg in a depression or scrape. The egg is laid on bare rock and loose pebbles. To repel unwanted visitors, both chicks and adults can eject foul smelling stomach oil up to six feet. The oil will matt the plumage of avian predators and can lead to death of the predator.

Reproduction of Northern Fulmars is slow. Generally, they do not breed until they are 8-10 years old and breeding can continue over a period of 40 years or more. They have a mean life expectancy of over 40 years.

Breeding in North America occurs in Alaska, British Columbia, and in arctic and eastern Canada. Half of the colony sites identified are in Alaska. Ninety-nine percent of the Alaskan population breeds at only four sites: the Semidi Islands in the Gulf of Alaska, Chagulak Island in the Aleutian Islands, the Pribilof Islands, and on St. Matthew and Hall islands in the Bering Sea. Breeding is also common in Europe and Asia.

Alaskan populations are common in winter to the

USGS Scott Hatch

northern limits of open water in the Bering Sea. They are also scattered over the North Pacific Ocean, but are common only north of 35-40°N. Birds from the Canadian Arctic are commonly found to 43°N along the western Atlantic Coast.

Alaska Seasonal Distribution

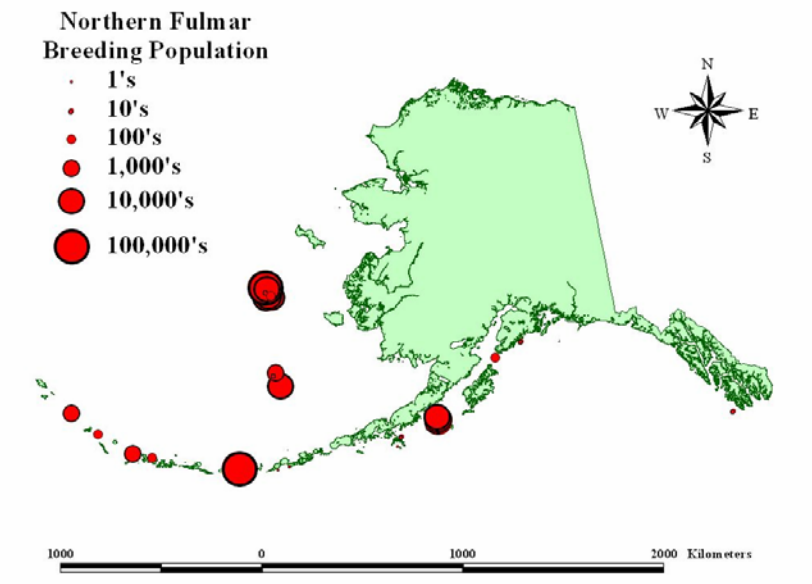
AK Region	Sp	S	F	W
Southeastern	U	U	U	U
Southcoastal	C	C	C	U
Southwestern *	C	C	C	U
Central	-	-	-	-
Western *	U	C	U	R
Northern	-	R	R	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

The estimated worldwide population (including estimates for prebreeders at sea) is 10-12 million individuals. The North American breeding population is estimated at 2.1 million individuals. About 70% or 1.4 million of those birds are found in Alaska at 38 colonies.

In the boreal zone of the Atlantic Ocean there has been an increase in population numbers and distribution of fulmars. It has been suggested that the increase in fulmar populations was a result of food provided by an expanding fishing industry. Fulmars are known to feed extensively on fish waste. However, the possible causes are much



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

debated and probably more complex oceanographic factors also played a part. In Alaska, at least four small colonies established since about 1970 are thought to be growing, but the proportion of the total population remains negligible. Trends are uncertain at other colonies, including aggregations in the Semidi and Pribilof islands.

Conservation Concerns and Actions

There is no immediate threat to the conservation status of Northern Fulmars. However, high local densities of breeding populations may make the species vulnerable to catastrophic changes in food supplies, other environmental conditions, and several human activities.

The attraction of Northern Fulmars to fishing vessels that discard fish waste at sea results in birds being entangled or drowned in fishing gear. In Alaska, the Northern Fulmar is the most frequently taken species in the groundfish fisheries in both the Bering Sea/Aleutian Islands and the Gulf of Alaska. Between 1993-2003, fulmars comprised 59% of the total bycatch in the longline fisheries in the Bering Sea/Aleutian Islands (7,431 individuals per year) and 46% of the total seabird bycatch in the Gulf of Alaska. In the Alaskan trawl fisheries, fulmars comprised >53% of the total bycatch between 1998 and 2003 and the number of birds could range from ~1,000-12,000. Since 2000, increased use of mitigation measures by longline fishermen has greatly reduced seabird bycatch. Nonetheless, the effects of bycatch and food provisioning as a result of fisheries require further research.

Predators such as arctic foxes *(Alopex lagopus)*, red foxes *(Vulpes vulpes)*, and ground squirrels *(Spermophilus spp.)* were introduced to Alaska in the late 1800s and early 1900s. Undoubtedly, they reduced or eliminated some former colonies. Three noted examples of decimated colonies were in the Aleutian Islands on Gareloi, Unalga, and Agattu islands. In 1986, on northeast Baffin Island, Canada, three pairs of arctic foxes with dens above fulmar nesting cliffs fed adult fulmars to their young, almost exclusively.

Recommended Management Actions

- Expand surveys of populations at key index colonies and establish a monitoring program.
- Continue to work with state and federal agencies and fisheries councils to better understand and minimize the impacts of fisheries interactions.
    - Identify the colony of origin of birds taken in longline fisheries in Alaska.
    - Identify geographic, seasonal, and age specific patterns of exploitation of fish waste for Alaskan fulmars.
- Continue efforts to reduce introduced predators such as foxes on Alaskan islands.

Regional Contact

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Telephone (907) 768-3444

References

Armstrong 1995; Dragoo *et al*. In Press; Hatch and Nettleship 1998; IUCN Internet Website (2005); Kushlan *et al.* 2002; NOAA Internet Website (2005); Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006, 2002.
Full credit for the information in this document is given to the above references.

FORK-TAILED STORM-PETREL *Oceanodroma furcata*

Conservation Status

ALASKA: Low **N. AMERICAN: Not Currently At Risk** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Sept	1	46-51 d	51-61 d	burrow, crevice	hover, surface dip	crustaceans, fish, oil

Life History and Distribution

These medium-sized storm-petrels are members of the tubenose order of seabirds. Some other seabirds included in this group are albatrosses, shearwaters, fulmars, and petrels. All members of this group have nostrils, which are enclosed in one or two tubes on their straight, hook-tipped bills. The tubes are used to excrete salt from the seawater they drink. Their wings are long and narrow, the feet are webbed, and the hind toe is not well developed or non-existent.

Fork-tailed Storm-Petrels *(Oceanodroma furcata)* are found only in the North Pacific Ocean and are most abundant in Alaska. Like other tubenoses, they are highly pelagic and spend about eight months a year at sea. In late spring, the birds return to their breeding colonies. They excavate burrows in soil or use natural rock crevices for nesting.

Several adaptations of Fork-tailed Storm-Petrels make them fascinating subjects for ecological and physiological research. They lay a single egg, which is approximately 20% of the female's body weight, one of the largest eggs relative to body size of all birds. Both eggs and chicks can withstand long absences by the parent bird. In bad weather, adults may not feed the chick for several days. The chick reduces its body temperature and goes into a state of torpor in which growth nearly ceases. When the adults return and brood the chick, its body temperature rises and it starts to grow again. These are probably adaptations for survival since the adults also spend a lot of time away from the nest looking for food.

Plumage of this species is mostly silver or bluish-gray with a dark ear patch and dark and light gray patterns on the wings. The bill is dark and the tail is, of course, forked.

The diet consists of fish, crustaceans, and floating animal oils. They skim oily fat from the surface of the water and sometimes eat carrion or other floating refuse. Oil is stored in the adult's stomach and used to feed chicks.

Two subspecies are recognized. The northerly subspecies *Oceanodroma furcata furcata* is lighter in coloration and slightly larger. It occurs in eastern Russia and across the Aleutian Islands in Alaska to Sanak Island. There are also significant breeding colonies in the northern Gulf of Alaska, which are probably this subspecies, but they have not been assigned to one or the other subspecies.

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The more southerly subspecies *Oceanodroma furcata plumbea* breeds from islands off Southeast Alaska to northern California.

Fork-tailed Storm-Petrels winter near their breeding areas with the northern limit being set by the edge of the pack ice in the Bering Sea.

Alaska Seasonal Distribution

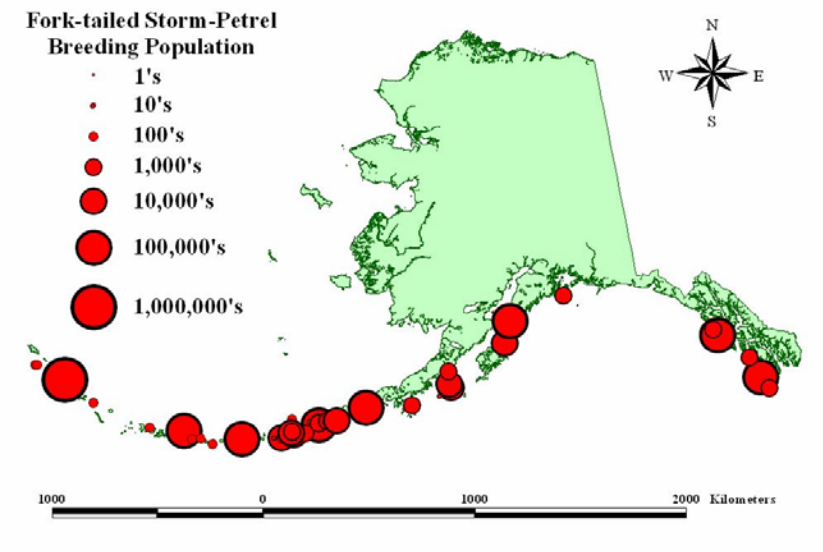
AK Region	Sp	S	F	W
Southeastern *	C	C	C	R
Southcoastal *	C	C	C	R
Southwestern *	C	C	C	R
Central	-	-	+	-
Western	-	U	U	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

The global abundance is estimated at 4 million individuals. The Alaskan breeding population includes 112 colonies with approximately 3.2 million individuals.

Global trends have been stable or increasing since the mid-1970s. In Alaska, Fork-tailed and Leach's Storm-Petrel burrows were combined at most sites for population monitoring purposes. Storm-Petrel populations increased (+3.9% per annum) on Buldir Island in the Aleutian Islands between 1974 and 2003, (+9.3% per annum) on



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

Aiktak Island in the Aleutian Islands between 1990 and 2002, and (+7.4% per annum) on St. Lazaria Island in Southeast Alaska between 1993 and 2001. No other Alaskan colonies exhibited significant trends.

Conservation Concerns and Actions

Fork-tailed Storm-Petrels are so widely distributed and abundant that their populations do not seem to be in jeopardy. However, decreases in breeding populations could go unnoticed because of the difficulty in censusing populations. The nocturnal, burrow-nesting habits of this storm-petrel make it difficult to be seen and counted.

The introduction of predators is the most imminent threat to the survival of Fork-tailed Storm-Petrels on the breeding grounds. Of 18 islands in Alaska with suitable nesting habitat for Fork-tailed Storm-Petrels, the species was present only on the nine islands where foxes *(Vulpes vulpes, Alopex lagopus)* were absent. Rats *(Rattus spp.)* and other predators were introduced on Whaler Island in California and a colony of 20,000 Fork-tailed and Leach's Storm-Petrels was decimated.

Increased soil erosion and the collapse of nesting burrows by humans or large mammals such as bears *(Ursus spp.)* is also a conservation concern. Introduced hooved animals on some islands have also caused soil compaction and have removed vegetation, thereby increasing erosion as well. The species is particularly sensitive to human disturbance at nesting burrows and may abandon their nests if handled by humans.

Fork-tailed Storm-Petrels could be a useful indicator of ocean health since they feed over a wide area and on the surface layer where pollutants accumulate (e.g. oil, plastics). Their habit of following ships to take advantage of discarded food makes them additionally susceptible to ingesting plastic discarded by the vessels. Plastics are commonly ingested, but may not be a serious problem because they can be expelled when birds regurgitate. Because the Fork-tailed Storm-Petrel diet contains large amounts of fats that are similar to oil, this species could be less vulnerable to toxicity from ingesting oil pollution. However, long-term effects on survival and reproductive success from plastic and oil ingestion are unknown.

Lights from ocean going vessels are a great attraction and another potential danger to Fork-tailed Storm-Petrels. Birds often collide with ships and become momentarily dazed and incapable of flying away.

Recommended Management Actions

- Restore Fork-tailed Storm-Petrel populations and distribution to pre-mammal introduction conditions.
    - Continue efforts to reduce introduced predators such as foxes and rats.
    - Re-establish populations on islands after introduced mammals are removed.
- Maintain Alaska-wide populations of at least year 2000 levels.
- Maintain a monitoring program.
- Survey populations at index locations.
- Complete a nesting inventory.
- Determine wintering locations.
- Assess and regulate human presence at nesting sites to avoid soil erosion and burrow collapse.
- Educate ship crews about light pollution and care and release of birds that come aboard.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 786-3444

References

Armstrong 1995; Boersma 2001; Dragoo *et al*. In Press; IUCN Internet Website (2005); Kushlan *et al.* 2002; Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006, 2002.

Full credit for the information in this document is given to the above references.

LEACH'S STORM-PETREL *Oceanodroma leucorhoa*

Conservation Status

ALASKA: Moderate **N. AMERICAN: Low Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Oct	1	38-46 d	63-70 d	burrow, crevice	hover, surface dip	zooplankton, fish

Life History and Distribution

The Leach's Storm-Petrel *(Oceanodroma leucorhoa)* is a truly oceanic species, only returning to remote island breeding colonies under hours of darkness. It is strictly nocturnal at nesting sites to avoid predation and spends the rest of the year on the open ocean. Not a gregarious species, the Leach's Storm-Petrel does not follow ships like many other seabirds. The secretive nature of this species leaves many aspects of its life a mystery.

It is a medium-sized storm-petrel with mostly darkish-brown plumage (upperparts being slightly more gray). The tail is noticeably forked and it has a white patch on the rump. Wings are long and angled back at the "elbow" joint.

Construction of the wings and tail enable the Leach's Storm-Petrel to hover close to the water skimming food from the surface. Food varies seasonally and geographically and includes fish, squid, octopus, crustaceans, and jellyfish.

Nests are generally in underground burrows. The bill and feet are used to dig and shovel out soil. At some sites, nesting also occurs in talus crevices.

Breeding occurs on coasts and offshore islands from the Aleutian Islands in Alaska, south to Baja California. Nesting also occurs in the western Pacific Ocean and in the North Atlantic Ocean from Labrador south to Maine and Massachusetts.

In Alaska, the Leach's Storm-Petrel breeds on the Aleutian, Semidi, and Shumagin islands, in the Sandman Reefs, south of the Alaska Peninsula, and on St. Lazaria and Forrester islands in Southeast Alaska.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	U	C	C	-
Southcoastal *	R	R	R	-
Southwestern *	U	C	C	-
Central	-	-	-	-
Western	-	+	-	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

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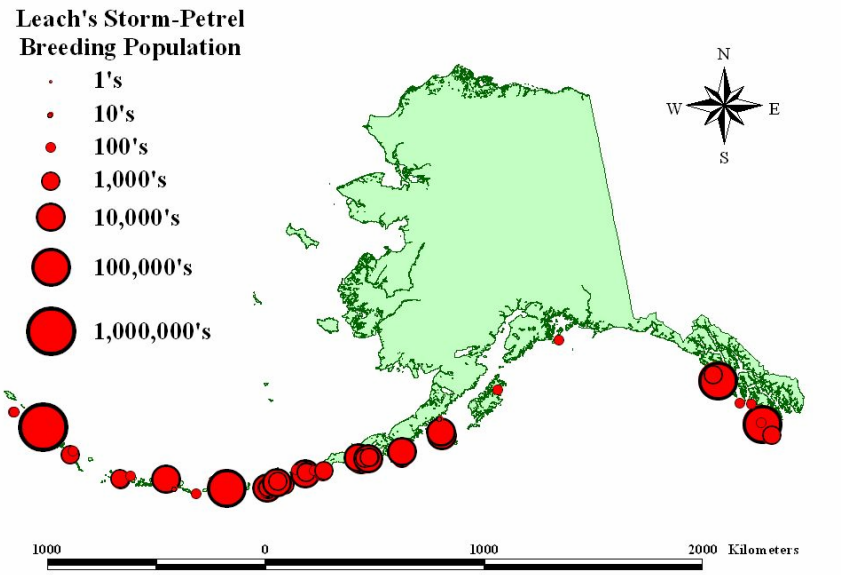
Four subspecies are recognized. *(Oceanodroma leucorhoa leucorhoa)* is found in the North Pacific and Atlantic Oceans, including Alaska, and is the largest of the subspecies. The smaller, dark-rumped Swinhoe's Storm-Petrel *(Oceanodroma monorhis)* which nests off Japan, Korea, China, and Russia, is so similar that it has been considered a race of Leach's Storm-Petrel; the two are considered a superspecies.

Leach's Storm-Petrels winter mostly in tropical waters. Alaskan breeding birds winter mostly in the central and eastern Pacific tropical waters, but some are seen year-round in the Gulf of Alaska. Others may be found as far south as the Galapagos Islands. Several smaller high-density wintering areas occur in Hawaii.

Population Estimates and Trends

Obtaining world estimates of breeding numbers has been extremely difficult. The Leach's Storm-Petrel is the most wide spread tubenose bird breeding in the Northern Hemisphere. However, the nocturnal and subterranean breeding habits of this species make seeing and counting the birds challenging. Furthermore, access to remote colonies during the hours of darkness is difficult and dangerous. Population estimates made between 1977 and 1992 indicated that the global abundance was more than eight million pairs. Millions more nonbreeders remain at sea or on the wintering grounds during the breeding season, although some of them do visit colonies during the



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

nesting season. In Alaska, there are 94 colonies with a breeding population of approximately 3.5 million pairs.

Leach's and Fork-tailed Storm-Petrel burrows were combined at most sites in Alaska for population monitoring purposes. Storm-Petrel populations increased (+3.9% per annum) on Buldir Island in the Aleutian Islands between 1974 and 2003, (+9.3% per annum) on Aiktak Island in the Aleutian Islands between 1990 and 2002, and (+7.4% per annum) on St. Lazaria Island in Southeast Alaska between 1993 and 2001. No other Alaskan colonies exhibited significant trends.

There were declines on the Atlantic coast prior to 1900, but the species has apparently stabilized there during the 20th century.

Conservation Concerns and Actions

Predation at breeding colonies is probably the main cause of mortality. Historically, Leach's Storm-Petrels were extirpated from many islands by introduced predators. Most petrels escape predatory mammals, which can dig up or enter burrows, by nesting on offshore islands. Intentionally or accidentally introduced predators, such as the red *(Vulpes vulpes)* or arctic fox (*Alopex lagopus)*, Norway rat (*Rattus norvegicus)*, and domestic dogs, cats, pigs, and cattle can have devastating effects on populations. Even the house mouse *(Mus musculus)* preys on newly hatched chicks and probably eggs. River otters (*Lutra canadensis*), bears *(Ursus spp.)*, and mink *(Mustela vison)* are also known predators. Alaskan populations on Rat and Kiska islands in the Aleutian Islands are believed to have been decimated by introduced foxes.

With a population of >8 million breeding pairs, the species seems healthy. However, because it is an inconspicuous bird both at sea and on the breeding grounds, and since monitoring is difficult, catastrophic declines could go unnoticed for decades.

Recommended Management Actions

- Maintain an Alaska-wide population of at least year 2000 levels.
- Maintain a monitoring program.
- Survey populations at index locations.
- Complete a nesting inventory.
- Restore Leach's Storm-Petrel populations and distribution to pre-mammal introduction conditions.
    - Continue efforts to reduce introduced predators such as foxes and rats.
    - Re-establish populations on islands after introduced mammals are removed.
- Determine wintering locations.
- Assess and regulate human presence at nesting sites to avoid soil erosion and burrow collapse.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 786-3444

References

Armstrong 1995; Dragoo *et al*. In Press; Huntington *et al.* 1996; IUCN Internet Website (2005); Kushlan *et al.* 2002; Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006, 2002.

Full credit for the information in this document is given to the above references.

DOUBLE-CRESTED CORMORANT *Phalacrocorax auritus*

Conservation Status

ALASKA: Not At Risk N. AMERICAN: Not Currently At Risk GLOBAL: Least Concern

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Aug	2-7	25-29 d	35-42 d	ground, trees	surface dip	fish, other aquatic animals

Life History and Distribution

Double-crested Cormorants *(Phalacrocorax auritus)* are iridescent, greenish-black waterbirds with orange-yellow skin on the face and throat and aqua-blue eyes. They nest in colonies along coasts and inland near rivers and lakes.

Fish is their primary food. Powerful swimmers, they chase their prey underwater while keeping their long, hooked-tipped bill tilted up at an angle. Small prey are swallowed underwater and larger fish are brought to the surface, flipped in the air, and swallowed head-first.

The outer portion of their feathers adsorbs water. This feature is thought to help them dive and is not just a result of inadequate oil glands as is commonly believed. A conspicuous activity often observed in Double-crested Cormorants is wing-spreading. It is generally thought that this behavior is for wing drying which may be important in reducing heat loss. Other proposed functions include balancing, signaling, or as an aid to swallowing prey.

Two small tufts of feathers on either side of the head are responsible for the common name of this bird, but the double crest is only present early in the breeding season. There is also considerable variation in the color and size of crests and body size across their range. Alaskan birds are the largest, with long, straight crests that are mostly white; eastern populations are smaller, with short, all-dark, curled crests. Based on body size and crests, five subspecies are recognized with *Phalacrocorax auritus cincinatus* occurring solely in Alaska.

Double-crested Cormorants are widely distributed in North America. The five breeding zones are Alaska, the Pacific Coast from southern British Columbia to northern Mexico, the Canadian and U.S. interior, the Atlantic Coast from Newfoundland to New York, and Florida and the western Caribbean. In Alaska, breeding occurs on Nunivak Island, in the southeastern Bering Sea, and from the Aleutian Islands to Southeast Alaska, including Kodiak Island. Inland breeding occurs as far north as Lake Louise.

The Alaskan population generally winters near breeding areas although it is a fairly common winter bird in Southeast Alaska and there is some dispersal as far south as British Columbia. Inland birds migrate to coastal areas.

USFWS Rodney Krey

Mark Rauzon

Alaska Seasonal Distribution

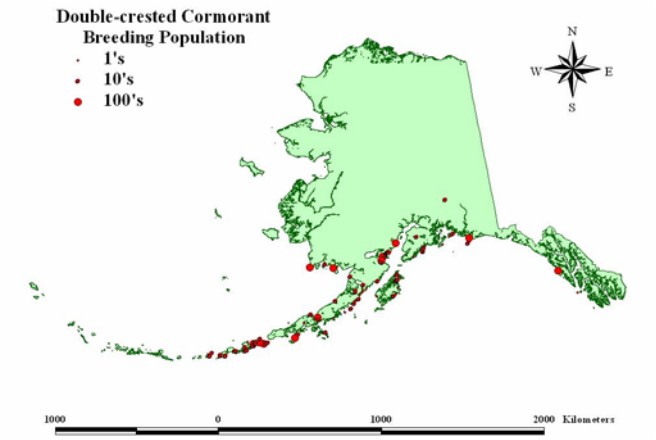
AK Region	Sp	S	F	W
Southeastern *	U	U	U	U
Southcoastal *	C	C	C	U
Southwestern *	C	C	C	U
Central	-	+	-	-
Western *	-	+	+	-
Northern	-	-	-	-

C=Common, U=Uncommon, R=Rare, + =Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp=Mar-May, S=June and July, F=Aug-Nov, W=Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

The 1990 world population estimate was 1-2 million individuals. However, systematic censusing covers only a portion of the population and some of the largest populations are the least well counted (e.g. Manitoba and Mexico). The U.S. Fish and Wildlife Service Beringian Seabird Colony Catalog lists 106 Double-crested Cormorant colonies in Alaska with approximately 6,068 individuals.

Some Double-crested Cormorant populations have undergone dramatic changes over the last three decades. The species almost vanished in some areas due to the effects of the pesticide DDT. Through legislative controls, levels of this compound declined. In response to declining levels of contaminants and human-induced changes in fish stocks, Double-crested Cormorants had an amazing return. Population increases were the most explosive in the Great Plains, Great Lakes, and on the Atlantic Coast. Numbers of breeding birds on the west coast also grew, but did not reach pre-DDT levels in southern California. In Alaska,



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U.S. Fish and Wildlife Service, Anchorage, Alaska.

most colonies have been censused only once, or not since the 1970s. Therefore, population trends are not available. However, numbers are thought to have declined since historical times, especially after the introduction of predators.

Conservation Concerns and Actions

The dramatic come-back of Double-crested Cormorants in some regions created conflict between the birds and humans. Their ability to consume large quantities of fish was perceived as competition by sport and commercial fishermen, and aquaculturists. Their tendency to roost in large flocks and deposit large amounts of excrement in a single location also caused concern about their effects on vegetation. While studies have indicated that some of these concerns were not well founded, others required further research. The U S. Fish and Wildlife Service conducted an Environmental Assessment and finalized an Environmental Impact Statement (EIS) in 2003. As a result of the EIS decision, the Double-crested Cormorant Public Resource Depredation Order (PRDO) was enacted. This Order authorized the U.S. Department of Agriculture's Wildlife Services, state fish and wildlife agencies, and federally-recognized tribes to control cormorants, without a federal permit, in 24 states (not including Alaska). Discussions continue on the impacts of cormorants to fisheries resources, but recent work has shown that measuring their impact is difficult and interpretation is highly disputed.

Due to the remote nature of Alaska and low numbers of Double-crested Cormorants, conflict between people and the cormorants has not been an issue. Concern in Alaska is in maintaining a viable population and several issues are considered as possible threats to the population.

This species is very susceptible to disturbance at colonies by predators and humans. Hasty departures by adults may lead to eggs being tossed from the nest or unattended chicks dying from exposure to cold or predators. Double-crested Cormorants are particularly vulnerable to disturbance at colonies where other species of birds such as gulls *(Larus spp.)* are also nesting. Departures of adults provide predatory birds with the opportunity to eat the cormorants' eggs and newly hatched young. Other predators include red *(Vulpes vulpes)* and arctic *(Alopex lagopus)* foxes and possibly Norway rats *(Rattus norvegicus)*. Numbers of cormorants were probably reduced on some Aleutian Islands by the introduction of foxes in the 1800s. Many islands were rid of the foxes by the U.S. Fish and Wildlife Service and cormorant populations increased at these sites. Some islands still have introduced fox populations.

Mortality has also been recorded in gillnet and trawl fisheries. However, no species specific data are available for the inshore waters where most individuals are found and additional mortality may be occurring.

Recent data for subsistence hunting and egging by Alaskan Natives are not available specifically for Double-crested Cormorants. However, cormorants and their eggs are still harvested and data are available for cormorants in general. Between 1995-2000, approximately 1,753 adult cormorants and 22 eggs were collected annually. In areas where Double-crested Cormorants are found they may be included in the take.

Recommended Management Actions

- Determine Alaskan Double-crested Cormorant breeding population numbers.
- Establish a regional monitoring program.
- Complete a nesting inventory.
- Measure productivity.
- Determine wintering areas.
- Protect colonies and important roosting sites from human disturbance and mammalian predators.
- Investigate mortality related to fishing and fishing gear.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor and regulate subsistence use of Double-crested Cormorants.
- Support efforts to minimize the incidence of fuel spills near breeding and roosting areas and measure contaminants in Double-crested Cormorant eggs.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; Hatch and Weseloh 1999; IUCN Internet Website (2005); Kushlan *et al.* 2002; Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005); Wires *et al.* 2001.

Full credit for the information in this document is given to the above references.

PELAGIC CORMORANT *Phalacrocorax pelagicus*

Conservation Status

ALASKA: High **N. AMERICAN: High Risk** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Sept	3-7	26-31 d	47-49 d	cliff, ground, sticks	surface dive	fish, marine invertebrates

Life History and Distribution

The Pelagic Cormorant *(Phalacrocorax pelagicus)* is noticeably smaller and slimmer than the three other species of cormorants breeding in Alaska. Pelagic and Red-faced *(Phalacrocorax urile)* Cormorants are similar in their appearance. During the winter, they look nearly identical except the Red-faced Cormorant is slightly larger. However, in the spring the birds begin to dress-up for the breeding season and the two species can be more easily separated by their appearance. Pelagic Cormorants develop a patch of dark red skin around their eyes and base of the bill, a conspicuous white patch on each flank, and purplish and greenish highlights. They often develop long white plumes on their necks. Red-faced Cormorants develop a patch of reddish-orange skin around their eyes that extends up onto their foreheads and the base of their bill turns light blue. Both species have two crests on their heads but these are much more obvious on Red-faced Cormorants.

Pelagic Cormorants are among the least gregarious or social of the cormorants. They nest in small dispersed colonies on cliffs of rocky islands and headlands, but also in sea caves, on driftwood logs, pilings, and man-made structures. Typically, they place their nests on narrow ledges and in shallow hollows on the steepest and tallest rock faces available, often in areas with other species of cormorants. The nests are constructed of sticks, marine algae, grass, moss, and debris which they cement together and onto the precarious ledge with their excrement. Nests are reused from year to year.

The name Pelagic Cormorant is misleading as the species prefers nearshore areas year-round, where it feeds primarily on solitary fish and invertebrates on the bottom.

Breeding occurs from the arctic waters of the Chukchi and Bering Seas, south along the North American Coast to Baja California. It also breeds along the Asian coast to southern China.

In Alaska, the northernmost breeding colony is at Cape Lisburne in the northern Chukchi Sea. There are colony sites scattered throughout the Bering Strait, including Little Diomede Island, and south to St. Lawrence and St. Matthew islands in the Bering Sea. Colonies are also found along the Alaskan coast at Kodiak Island, Homer, Kachemak Bay, Cook Inlet, and south throughout the Alexander Archipelago in Southeast Alaska.

Winter migration occurs primarily in the northern populations, probably as a response to pack ice. Alaskan breeding birds are found regularly from the Pribilof Islands south and throughout the Aleutian Islands. Small numbers are reported in winter north to St. Matthew, St. Lawrence, and Little Diomede Island and some birds reside year-round throughout the Gulf of Alaska. This species may be found in winter south along the Pacific Coast to Baja California.

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Alaska Seasonal Distribution

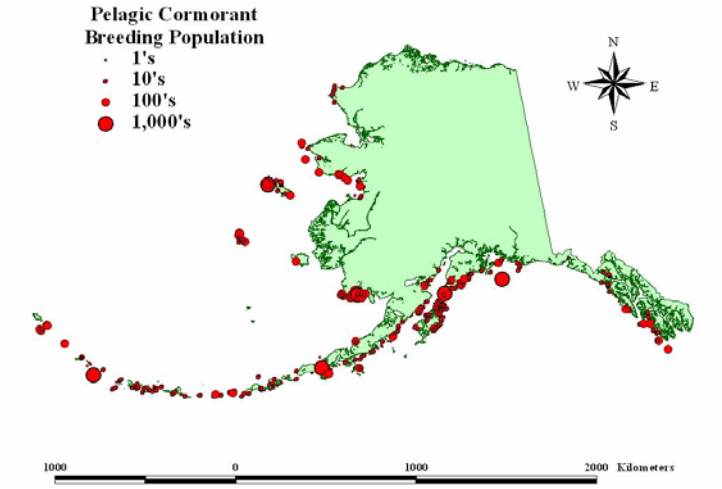
AK Region	Sp	S	F	W
Southeastern *	C	U	C	C
Southcoastal *	C	C	C	C
Southwestern *	C	C	C	C
Central	-	-	-	-
Western *	C	C	C	+
Northern	-	R	+	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. © **Armstrong 1995.**

Population Estimates and Trends

The estimated world breeding population is 400,000 birds, with about one third occurring in North America. However, numbers are roughly known. The U.S. Fish and Wildlife Service Beringian Seabird Colony Catalog lists ~ 43,700 individuals at 420 colonies in Alaska.

Cormorants are known to shift nesting locations between years, so it is difficult to confidently interpret changes in counts. In Alaska, the numbers of Pelagic Cormorants or nests (the index used at some sites) have remained relatively stable at most monitored sites.



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

However, at Chiniak Bay off of Kodiak Island, there was a significant negative trend (-5.5% per annum) between 1975 and 2003 and St. Lazaria Island in Southeast Alaska showed an increase (+38.6% per annum) between 1994-2002. At some colonies in Alaska, cormorant species are combined for counts. Most sites where cormorant species are combined showed no trends, but Shemya Island in the Aleutian Islands declined (-12.9% per annum) between 1988 and 2001and Kasatochi Island, also in the Aleutians, exhibited a positive trend of +4.2% per annum between 1980 and 2003.

Conservation Concerns and Actions

Like most cormorants, this species is vulnerable to oil pollution and other contaminants. Pelagic Cormorants likely suffered high mortality relative to the size of local populations from the *Exxon Valdez* oil spill in Prince William Sound, Alaska in 1989. Additionally, of 19 species studied in Alaska from 1973-1976, Pelagic Cormorants had the highest frequency of organochlorine residues (pesticides).

Another effect of human activity is hunting. Recent data for Native subsistence hunting and egging are not available specifically for Pelagic Cormorants. However, subsistence harvest data are available for cormorants in general. In Alaska, 1,753 adult cormorants and 22 eggs were collected annually from 1995-2000. In areas where Pelagic Cormorants are found, they may be included in the take.

Pelagic Cormorants may drown in gillnets where fisheries overlap with feeding areas. Little is known about fisheries occurring in Pelagic Cormorant habitat or the extent of the impact. The interaction of nearshore fisheries with cormorants could be significant. Data are few, but some incidental mortality was recorded from the set gillnet fishery for Kodiak Island for 2002. The total bycatch estimate for Pelagic Cormorants was 14 individuals. Although Pelagic Cormorants and Red-faced Cormorants comprised only 1% of all colonial birds on Kodiak Island, they comprised 9% of the total bycatch.

The species is sensitive to disturbance at nesting sites. Adults may flush from nests, exposing eggs or chicks to predators and the elements. This issue is important in areas that are experiencing increased recreational activity.

Recommended Management Actions

- Continue monitoring Pelagic Cormorants in Alaska at geographically-dispersed breeding sites.
- Protect colonies and important roosting sites from human disturbance.
- Continue to work with state and federal agencies and fisheries councils to better understand and minimize the negative impacts of fisheries interactions
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor and regulate subsistence use of Pelagic Cormorants.
- Support efforts to minimize the incidence of fuel spills near breeding and roosting areas and measure contaminants in Pelagic Cormorant eggs.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; Dragoo *et al*. In Press; Hobson 1997; IUCN Internet Website (2005); Kushlan *et al.* 2002; Manly *et al.* 2003; Piatt *et al.* 1990; Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005).

Full credit for the information in this document is given to the above references.

USFWS

RED-FACED CORMORANT *Phalacrocorax urile*

Conservation Status

ALASKA: High **N. AMERICAN: High Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Aug	2-4	27-34 d	40-60 d	cliff ledge	surface dive	bottom fish, crab, shrimp

Life History and Distribution

Red-faced Cormorants *(Phalacrocorax urile)* are one of the least studied birds in the North Pacific, possibly because they are shy and nest in small, widely dispersed colonies on steep, inaccessible cliff faces. Never venturing far from the sea, they come to land only to breed or roost.

They are a medium-sized cormorant with blackish plumage. During the breeding season, adults have a double crest on the head and neck, white hair-like feathers on the neck and shoulder area, a white patch on the side of the body, and bright red facial skin. The inside of the mouth is sky blue and the fleshy area around the mouth is a paler blue. Males and females are similar in appearance. A very similar species is the Pelagic Cormorant *(Phalacrocorax pelagicus)* and in areas where the two are found together, they are often confused. The Red-Faced Cormorant can be identified by a lack of feathers on the forehead (feathered in Pelagic), brighter and more extensive red facial skin and a light brown to dark-yellow bill (blackish or dark gray in Pelagic). It is also larger and 20-25% heavier than the Pelagic Cormorant.

The preferred diet of the Red-faced Cormorant is solitary fish or invertebrates found near the bottom. They feed by pursuing their prey underwater using their feet for propulsion.

Nest material is mostly grass and seaweed cemented together with guano; moss, feathers and some sticks may also be used. Offering of nest material to the incubating adult is a part of the pair maintenance and nests continue to grow during the breeding season.

Breeding occurs in a narrow band from the Gulf of Alaska to the central and western Aleutian Islands, through the southern Bering Sea to Russian, and on to the northern Sea of Japan. In Alaska, there are also nesting sites on the Pribilof Islands and in Norton Sound.

The species is not migratory, but the postbreeding distribution is not well known. A few winter observations indicate that adults and immature birds disperse and feed near breeding areas.

USFWS Donna Dewhurst

Alaska Seasonal Distribution

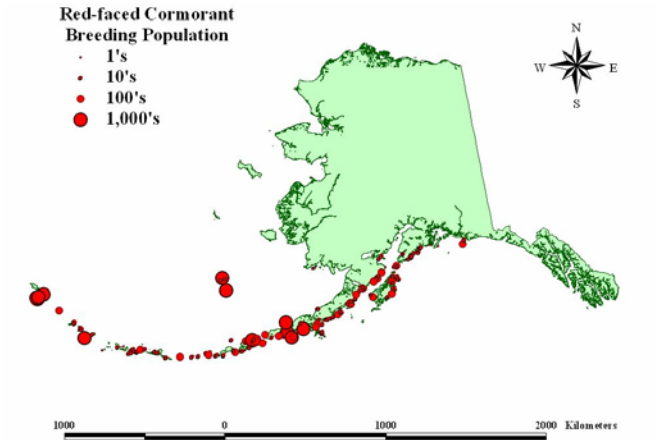
AK Region	Sp	S	F	W
Southeastern	-	-	-	+
Southcoastal *	C	C	C	C
Southwestern *	C	C	C	C
Central	-	-	-	-
Western	-	+	-	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

The size of the world breeding population is roughly known, but is estimated at 155,000 individuals. In North America, the largest colonies are in the western Aleutian Islands. Recent Alaskan estimates are approximately 20,000 birds.

Movement of colony locations may result in high annual variation in numbers between years. Incomplete census data and problems with determining numbers make identification of trends problematic. Generally, Alaskan populations are thought to have decreased in the western and central Aleutian Islands and increased in the Gulf of Alaska. For population monitoring purposes, Red-faced Cormorants were differentiated from other cormorant



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

species at only two colonies: the Semidi Islands, southwest of Kodiak Island and Chiniak Bay, off northeastern Kodiak Island). The Semidi Island colony showed a significant annual decline of -4.2% and the Chiniak Bay colony showed a -12.8% per annum decline.

No trend information is available for Russian or Japanese populations.

Conservation Concerns and Actions

This species is a conservation concern because the cause for population declines and the issues preventing population recovery are unknown. Several issues are considered as possible threats to the population.

Little is known about fisheries occurring in Red-faced Cormorant habitat and the extent of the impact. However, the interaction of nearshore fisheries with cormorants may be significant. Data are few, but some bycatch mortality was recorded from the set gillnet fishery for Kodiak Island for 2002. The total bycatch estimate for Red-faced Cormorants was 28 individuals.

Cormorants are known to be extremely sensitive to local environmental conditions and disturbance at nesting and roosting sites. They may change sites, even undertake mass colony moves, when local conditions change significantly. Some causes of disruption might be changes in food availability, oil pollution or contaminants, human disturbance, and predators.

In early times, cormorants were considered as a winter food by native Aleut peoples. Some hunting and egging still occur today. Recent data for subsistence hunting and egging are not available specifically for Red-faced Cormorants. However, subsistence harvest data are available for cormorants in general. In Alaska, 1,753 adult cormorants and 22 eggs were collected annually from 1995-2000. In areas where Red-faced Cormorants are found they may be included in the take.

A major source for mortality at various colonies is considered to be predation by both natural and introduced predators, including gulls *(Larus spp.)*, foxes *(Vulpes vulpes* and *Alopex lagopus)*, and possibly Norway rats *(*Rattus norvegicus*)*. Numbers of cormorants were probably reduced on some Aleutian Islands by the introduction of foxes in the 1800s. The U.S. Fish and Wildlife Service rid many islands of foxes and cormorant populations have increased at these sites. Some islands still have introduced fox populations.

Cormorants were shown to be vulnerable to oiling following the 1989 *Exxon Valdez* oil spill in Prince William Sound, Alaska. Carcasses of 161 Red-faced Cormorants were collected and counts of all cormorant species in the oil spill area were lower after the spill.

All cormorants investigated have been shown to be sensitive to the effects of DDT (organic pesticide) and its derivatives, but contaminant levels in Alaskan cormorants are unknown.

Recommended Management Actions

- Restore Red-faced Cormorant populations in Alaska to 50,000 individuals.
- Establish a monitoring program.
- Survey populations at key index locations.
- Measure shifts in nesting colonies, adult mortality, reproductive success, and other vital rates.
- Evaluate disease as a factor in population declines cycle.
- Evaluate prey abundance variability.
- Reduce mortality related to fishing and fishing gear.
    - Learn more about fisheries occurring in Red-faced Cormorants habitat and the extent of the interaction.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor and regulate subsistence use of Red-faced Cormorants.
- Assess other human disturbance at key colonies.
- Evaluate and control predation, particularly, by foxes and rats.
- Support efforts to minimize the incidence of fuel spills near breeding and roosting areas and measure contaminants in Red-faced Cormorant eggs.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; Causey 2002; Dragoo *et al.* In Press; IUCN Internet Website (2005); Kushlan *et al.* 2002; Manly *et al.* 2003; U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005).

Full credit for the information in this document is given to the above references.

BRANDT'S CORMORANT *Phalacrocorax penicillatus*

Conservation Status

Alaska: None **N. AMERICAN: High Risk** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Aug	3-6	~ 30 d	~ 35 d	ground, cliff ledge	surface dive	fish, squid, other invertebrates

Life History and Distribution

The name *penicillatus* is Latin for a painter's brush (pencil of hairs), in reference to white plumes found on the head, neck, and back of the Brandt's Cormorant *(Phalacrocorax penicillatus)* during the early breeding season. The common name honors the Russian naturalist Johann Friedrich von Brandt who described the species from specimens collected on expeditions to the Pacific during the early 1800's.

It is a solidly built cormorant with a thick neck, large head, and solid brownish-black plumage with a green luster. Breeding birds have a purple luster on the head and neck and a bright cobalt-blue throat pouch bordered with yellow. No other species of cormorant has a blue gular region with a yellowish border. Young birds are duller and buff colored on the breast. Birds of all ages and phases have light-colored cheek patches. Double-crested Cormorants *(Phalacrocorax auritus)* are similar, but fly with more of a crook in the neck and have a conspicuous orange throat pouch. The Pelagic Cormorant *(Phalacrocorax pelagicus)* is smaller and more slender, with a smaller head; the adult has white flank patches.

Brandt's Cormorant is endemic to marine and brackish environments along the west coast of North America. It breeds from Southeast Alaska to Mexico with the highest concentrations closely tied to the California Current System. Along the Pacific Coast of North America, it occurs regularly from Vancouver Island, British Columbia, south to Island Margarita on the Pacific Coast of Baja California and Island San Pedro Mártir in the Gulf of California.

In Alaska, the species is found extra-limitally and is a very local, intermittent breeder. Records include nests on Seal Rocks in Prince William Sound, and Hazy and St. Lazaria islands in Southeast Alaska.

Generally, Brandt's Cormorants nest in colonies on rocky islets. Nests are built on the ground on flat or sloping areas or on cliffs with flat ledges. The nest is large and disorderly and made of plants or seaweed.

This species is gregarious year-round. They often gather in flocks of several hundred and fly to feeding grounds in long straggling lines. Foraging areas are generally within fifteen miles of their island or mainland colonies. Brandt's and Pelagic Cormorants frequently nest on the same cliffs, with Brandt's forming colonies on the level ground at the top of the cliff and the Pelagic choosing inaccessible ledges.

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There is an extensive, regular postbreeding redistribution, but the winter range is much the same as the breeding range. Movements are apparently directed by shifts in food availability. The winter range extends north to Prince William Sound, south to the tip of Baja California, and throughout much of the Gulf of California.

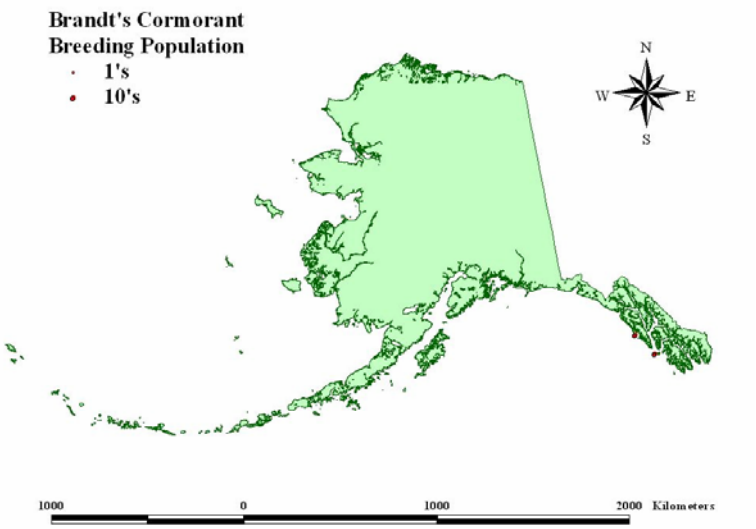
Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	+	R	+	+
Southcoastal *	-	R	-	-
Southwestern	-	-	-	-
Central	-	-	-	-
Western	-	-	-	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

The most recent surveys indicate a total breeding population of < 100,000 individuals, with approximately



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. , Anchorage, Alaska.

75% breeding in California and Oregon. A complete census of breeding colonies in California, Oregon, and Washington was conducted in 2001-2003 and approximately 37,000 nests were counted (USFWS unpubl. data). This represents 10% and 25% declines compared to censuses conducted during 1975-1981 and 1989-1991, respectively. There has also been a regional shift in abundance from the Farallon Islands in California to colonies along the central Californian coast and the Channel Islands. Individual colony size and productivity vary interannually in response to changing oceanographic conditions such as the El Niño Southern Oscillation (ENSO).

The first breeding colony in Alaska was at Seal Rocks in Prince William Sound. The area was made habitable by uplift resulting from the 1964 earthquake. Four nests were occupied at least until 1978, but are now abandoned. St. Lazaria Island in Southeast Alaska had 20 nests in 1984, but has been abandoned since 1994 or possibly before (USFWS unpubl. data). The only known colony remaining in Alaska is on Hazy Island in Southeast Alaska where 40 nests were counted in 2000 (USFWS unpubl. data). Only 23 nests were counted on Hazy Island in 1982.

Since colonies vary from year to year in size and location, interpretation of numbers is difficult.

Conservation Concerns and Actions

Today, although common, Brandt's Cormorants remain at risk from disturbance at nesting and roosting sites, pollutants, commercial fisheries, and from the recreational use of the West Coast marine environment

The most serious conservation concern for Brandt's cormorants is human disturbance at dense breeding colonies. Brandt's Cormorants are especially vulnerable to disturbance during incubation. The adults flush from the nest when approached by humans, boats, low-flying aircraft, and dogs, resulting in increased predation by gulls and ravens and nest abandonment. Repeated disturbance can cause permanent desertion of the colony.

Mortality from coastal gillnet fisheries has been recorded from California and Baja California. Since other species of cormorants are taken in gillnets in Alaska, it is possible that the Brandt's Cormorant is at risk for incidental take where they overlap with gillnet fisheries.

Brandt's Cormorants are also killed as a result of oil contamination though the impacts of these events on populations are not well-studied.

Recommended Management Actions

- Continue to monitor the colony on Hazy Island in Southeast Alaska.
- Protect breeding colonies and roosting sites from human disturbance.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; IUCN Internet Website (2005); Kushlan *et al.* 2002; U.S. Fish and Wildlife Service 2006, 2005, 2002; U.S. Fish and Wildlife Service Internet Website (2005); Wallace and Wallace 1998.

Full credit for the information in this document is given to the above references.

POMARINE JAEGER *Stercorarius pomarinus*

Conservation Status

ALASKA: Low **N. AMERICAN: Low Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Aug	2	23-25 d	31-32 d	ground depression	piracy, hover, swoop	lemmings, voles, fish, birds

Life History and Distribution

Pomarine Jaegers *(Stercorarius pomarinus)* are the largest of the three species of jaegers, but they are still capable of amazing aerial maneuvers such as backward somersaults. Adults in breeding plumage are a spectacular sight with their long, spoon-shaped central tail feathers that are twisted 90 degrees. Both adults and juveniles have light and dark morphs or variation in plumage colors, but 90% of the adults are light. The light morph has a blackish cap and dark brown upperparts, white underparts and collar, a yellow wash on the sides of neck, and a bold brown band across the breast. The dark morph is similar except the underparts, sides of the neck, and collar are entirely dark brown. Juveniles are brown with a uniform head and neck and strongly barred coverts on the tail and underwing. After the breeding season, adults lose the long tail feathers and closely resemble immature birds. Identification of the three jaeger species in their winter plumage can be difficult.

The name "pomarine" is based on the scientific name which has Greek roots meaning "lid-nosed." It refers to a pale, saddle-like sheath covering the base of the upper bill giving it a bi-colored appearance. This feature is found in all three species of jaegers.

A highly specialized reproductive ecology makes the Pomarine Jaeger especially interesting. Successful reproduction is dependent on a single species of prey, the brown lemming *(Lemmus trimucronatus)*. This rodent is the most abundant resident, small vertebrate in the arctic. Populations of lemmings grow and shrink cyclically, peaking every three to five years. Pomarine Jaeger reproduction occurs successfully only during the peaks of the lemming cycle. Nesting habitat is usually near the arctic coast in low-lying wet tundra in areas with high biomass, periodic irruptions of lemmings. In years when lemmings are in low abundance, most Pomarine Jaegers leave the arctic almost immediately.

This jaeger is the only avian predator that digs for lemmings. They will dig vigorously into the burrows, using the bill to pull away vegetation. When lemmings become scarce, later in the season, groups of as many as 20 jaegers may walk over the tundra digging into lemming burrows searching for nests with females and young.

Breeding jaegers rely almost exclusively on lemmings for food, but in August, when lemmings are less available, they also eat shorebirds (mostly chicks), ducklings, and

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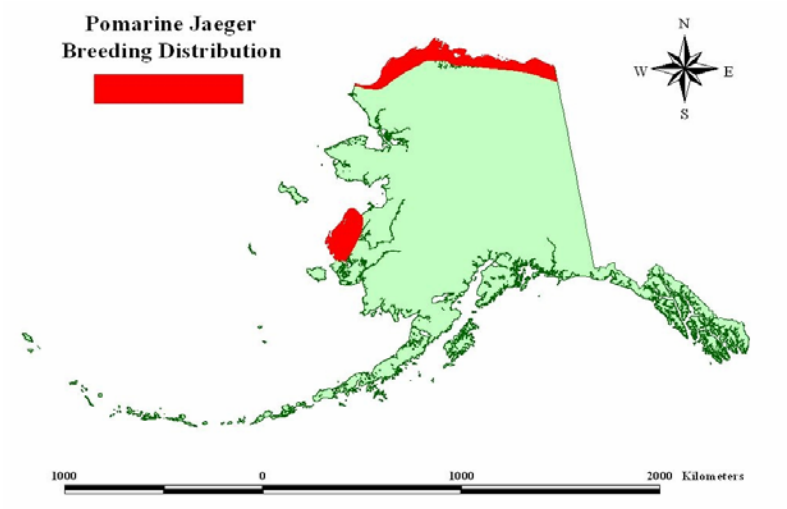
passerines. Nonbreeders take a greater variety of food during summer, including rodents, birds, eggs, insects, marine invertebrates, and carrion. Even though Pomarine Jaegers do not prey much on other birds, they do appear to have a major impact on their populations. During years with high densities of lemmings, breeding of shorebirds and passerines is disrupted by the presence and activity of numerous jaegers, snowy owls *(Nyctea scandiaca)*, and arctic foxes *(Alopex lagopus)*.

In northern Alaska, small numbers of Pomarine Jaegers also breed in localized areas with the presence of other small rodents such as tundra voles (*Microtus oeconomus)*. When they are not breeding, Pomarine Jaegers spend their time at sea. They feed primarily by scavenging, predation on small seabirds, and stealing food from other birds.

Breeding distribution of this species is nearly circumpolar. They are only absent from eastern Greenland where *Lemmus* species do not occur and in northern Europe, west of the White Sea.

In Alaska, they are often present in summer from the Yukon Delta northward along the coast and on St. Lawrence Island in the Bering Sea. Breeding occurs along the arctic coast and on the Yukon Delta. They are found sporadically at any one site, but may be found sometimes in large numbers, especially near Barrow on the Beaufort Sea and in the outer Yukon Delta. Birds may wander widely in the arctic in summer, and presence of birds does not necessarily indicate breeding.



Seabird breeding distribution maps created from data *in* Birds of North America, Wiley and Lee 2000.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern	R	R	U	-
Southcoastal	C	R	C	-
Southwestern	C	U	C	-
Central	-	+	-	-
Western *	C	R	C	-
Northern *	C	U	C	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Wintering occurs in productive regions of tropical and subtropical oceans and concentrations form over upwellings and boundaries of currents. North American breeding birds winter in the Caribbean, in smaller numbers off Florida and probably southern Texas, and from California to Peru.

Birds that breed outside North America winter near the coast of northwest Africa and are common near fishing fleets in coastal waters off southwestern Africa. They are also regular in winter in the Persian Gulf, the Gulf of Oman and the Gulf of Aden in the Middle East. These jaegers are common in the tropical Pacific and are the most numerous jaeger wintering off the coast of southeastern Australia.

Recent evidence shows the Pomarine Jaeger more closely related to the large skuas (*Catharacta spp.)* than to the other two jaegers.

Population Estimates and Trends

More often than not, ornithologists miss by chance, the peaks of lemming abundance in the arctic, thus missing the highest densities of breeding Pomarine Jaegers. This makes assessing population numbers and trends extremely difficult. The area near Barrow, Alaska is the only area where there is information about Pomarine Jaeger populations throughout an entire lemming cycle. No other neararctic area is known to support such high numbers of this species. Data are not available regarding population estimates or trends.

Conservation Concerns and Actions

Pomarine Jaegers may be the most vulnerable of the three species of jaegers to human disturbance because of their reliance on sporadic populations of lemmings for successful reproduction. Because of this unique reproductive strategy, they are also one of the least studied birds of the arctic. Most of the young produced in the arctic probably come from occasional large colonies coinciding with outbreaks of brown lemmings. However, it is not clear in how many areas of the arctic (besides Barrow) or when this occurs.

Survival in wintering areas may regulate populations in the long term, yet very little is also known of the distribution and biology of this species away from the breeding grounds.

The unpredictable occurrence of the species' nesting continues to make them a challenge for study and management.

Recommended Management Actions

- Develop standardized methods for censusing Alaskan breeding populations of Pomarine Jaegers.
- Establish a monitoring program.
- Measure productivity.
- Determine wintering areas and migration routes.
- Investigate links between lemming populations, Pomarine Jaegers, shorebirds, and Steller's Eiders *(Polysticta stelleri)* on the North Slope.
- Measure contaminants in Pomarine Jaeger eggs.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; IUCN Internet Website (2005); Kushlan *et al.* 2002; U.S. Fish and Wildlife Service 2002; Wiley and Lee 2000.

Full credit for the information in this document is given to the above references.

PARASITIC JAEGER *Stercorarius parasiticus*

Conservation Status

ALASKA: Low-Moderate **N. AMERICAN: Low Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Aug	2	25-28 d	25-30 d	ground depression	piracy, kleptoparasitism, hover and strike	mammals, birds, eggs, fish

Life History and Distribution

The Parasitic Jaeger is appropriately named for the two main strategies it uses to acquire food. The first half of the name refers to the species' habit of stealing food from other birds (kleptoparasitism). The second word comes from the German word for hunter and alludes to the predatory nature of this aggressive, aerial champion.

In the northeastern Atlantic and possibly in the Aleutian Islands, kleptoparasitism is the feeding strategy of choice. These birds specialize in harassing colonial seabirds, relentlessly chasing them until they drop their food. Once dropped, this swift and efficient jaeger swoops down to catch the food before it strikes the water or the ground.

Throughout the tundra regions of the arctic, Parasitic Jaegers prefer to hunt and capture their own prey during the breeding season. They defend large territories within which they hunt mainly small birds and eggs, but also small mammals, insects, and fish. After the breeding season, they return to stealing food from other birds. Unlike other jaegers, this species plays a small role as a predator on brown lemmings (*Lemmus trimucronatus).* In some areas of the arctic, however, it plays a major role as a predator on passerines, small shorebirds, and their eggs. Pairs often cooperate in hunting.

Parasitic Jaegers are the mid-size member of the jaeger family. Adult breeding birds have pointed central tail feathers that extend up to four inches beyond the rest of the tail. These long tail feathers are lost after the breeding season. They have different color varieties, or "morphs." There is a light morph and a dark morph, as well as intermediate types. Light morphs have white underparts from throat to belly, often with a partial or complete brown band across the breast. They are brown across the back and tail with a blackish cap, white collar, and yellowish sides of the neck. Dark morphs are similar except the white areas on the head and underparts are replaced with brown. This color variation has been the subject of extensive research. Much of this work has focused on figuring out why the color variations exist, persist in such stable proportions, and why the percentage of dark to light morphs varies according to latitude. The percentage of dark morphs increases from north to south throughout the breeding range. To date, the reason for the color variation remains unsolved.

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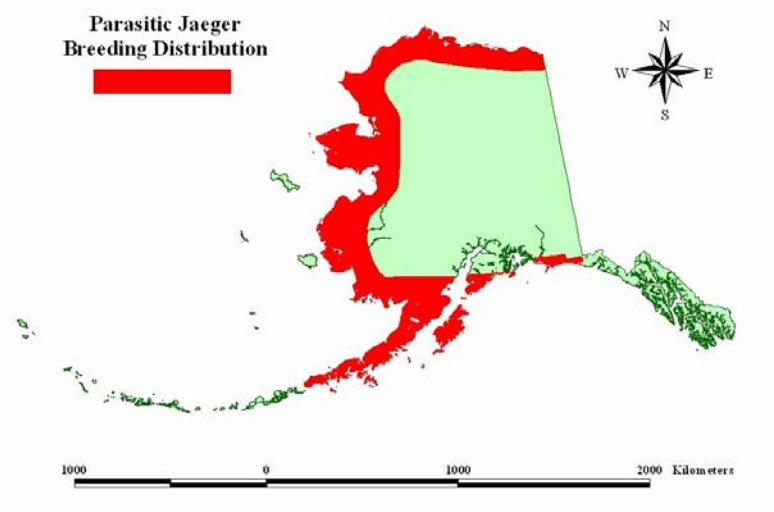
Jaegers spend the majority of their lives at sea, coming to land only to breed. Young birds will spend the entire first two years of their life over the open ocean, before returning to the arctic to nest. While at sea, the birds lead a mostly solitary life.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	U	U	U	-
Southcoastal *	U	C	C	-
Southwestern *	C	C	C	-
Central *	-	R	-	-
Western *	C	C	C	-
Northern *	C	C	C	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

During the summer months in the Northern Hemisphere, Parasitic Jaegers breed across the arctic Polar Regions; they are found further south than either the Pomarine *(Stercorarius pomarinus)* or Long-tailed Jaegers *(Stercorarius longicaudus)*. Usually, they are the least numerous jaeger in the arctic. In the Americas, they nest in Alaska and across the tundra of northern Canada. In Alaska, they breed along the entire arctic and west coasts, the Alaska Peninsula, and throughout the Aleutians.



Seabird breeding distribution maps created from data *in* Birds of North America, Wiley and Lee 1997.

Breeding records are scarce on the south coast, but they have nested on Kodiak Island and possibly as far east as Glacier Bay. Parasitic Jaegers breed inland throughout the Yukon-Kuskokwim Delta and along the arctic coastal plain as far south as the foothills of the Brooks Range. They also nest in northern Europe and Asia.

Wintering areas are not well defined because of the difficulty in distinguishing the three species of jaegers in nonbreeding plumage. It is thought that Parasitic Jaegers most commonly winter off both coasts of South America. They have also been observed repeatedly in the Sargasso Sea (northeast of the W. Indies) and there are occasional reports from the Gulf of Mexico, eastern Florida, and throughout the Caribbean.

Population Estimates and Trends

No estimates of total numbers are available for any area in the neararctic. Trends are available only for Scotland where the total number of Parasitic Jaegers increased between 1969 and 1986.

Conservation Concerns and Actions

Color polymorphism and its relationship to effective kleptoparasitism have been extensively studied in the northeast Atlantic. However, in the arctic, despite its role as a primary predator on small birds and eggs, relatively nothing is known about the biology of the species. It is the scarcest and least studied of the three jaegers there.

Additionally, almost nothing is known of its life during the winter in the southern hemisphere.

Recommended Management Actions

- Develop standardized methods for censusing Alaskan breeding populations of Parasitic Jaegers.
- Establish a monitoring program.
- Initiate biological studies of Parasitic Jaegers on the breeding grounds.
- Measure productivity.
- Determine wintering areas and migration routes.
- Investigate predator/prey relationships on the breeding grounds.
- Measure contaminants in Parasitic Jaeger eggs.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; IUCN Internet Website (2005); Kushlan *et al.* 2002; U.S. Fish and Wildlife Service 2002; Wiley and Lee 1999.

Full credit for the information in this document is given to the above references.

LONG-TAILED JAEGER *Stercorarius longicaudus*

Conservation Status

ALASKA: Not At Risk **N. AMERICAN: Low Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Aug	1-2	23-25 d	22-28 d	tundra, depression	hover and pounce, piracy	rodents, birds, fish, insects, berries

Life History and Distribution

The Long-tailed Jaeger *(Stercorarius longicaudus)* is rarely seen outside of the arctic breeding grounds because it spends over three-fourths of its life at sea. It is the smallest of the three jaegers, the most abundant and widely distributed in the arctic, and it breeds the furthest north.

Identifying the three Jaegers can be quite difficult. Adult Long-tailed Jaegers are similar to the light-phase of the Parasitic Jaeger *(Stercorarius parasiticus)* but are smaller, more graceful, and have very long central tail feathers (up to 8"). The tail feathers are narrow and tapered, instead of broad and twisted as in the Pomarine Jaeger *(Stercorarius pomarinus).* They also project well beyond the tail, instead of only a little way as in the Parasitic Jaeger. The upperparts of the Long-tailed Jaeger are grayish and paler than in the other jaegers, and their blackish cap is smaller and more sharply defined. Identifying the three jaeger species in immature and nonbreeding plumage is even more challenging.

Like the other jaegers, Long-tailed Jaegers occasionally harry terns and gulls to steal their food, but usually they feed by catching their own fish, taking flying insects in the air, and sometimes preying on the eggs and the young of other birds. On the breeding grounds, lemmings *(Lemmus trimucronatus)* and voles *(Microtus oeconomus)* are their staple food. Lemmings undergo regular cycles of abundance and scarcity. In years of scarcity, jaegers often do not breed at all and in other years, their numbers fluctuate with the abundance of lemmings. Unlike other avian predators in the arctic, this species does not experience high mortality or sudden mass migrations in years with scarce prey.

Long-tailed Jaegers breed in the high arctic of Eurasia and North America, with major populations in Alaska, Canada and Russia, and smaller populations around the rest of the arctic. It nests on dry tundra among moss or shrubs. Eggs are laid in a shallow depression on the ground with no nest materials.

In northern Alaska, they breed in the Brooks Range, western Alaska southward through the Yukon River Delta, the Trinity Island group at the south end of the Kodiak Archipelago, and probably at the south end of Kodiak Island itself. They also breed in small numbers in the mountains of central Alaska and the southwest Yukon.

This species is a transequatorial migrant that takes

USFWS Tim Bowman

advantage of regions with high productivity and extended day lengths throughout the year. It spends winters over the open ocean and is very rarely found inland. Large numbers of all ages are found off the southeast coast of South America and southwestern Africa. Occasionally this species is reported in coastal waters in the South Atlantic. Smaller numbers are found regularly off the southeast coast of Australia, in Indonesian seas, and off the coast of Chile.

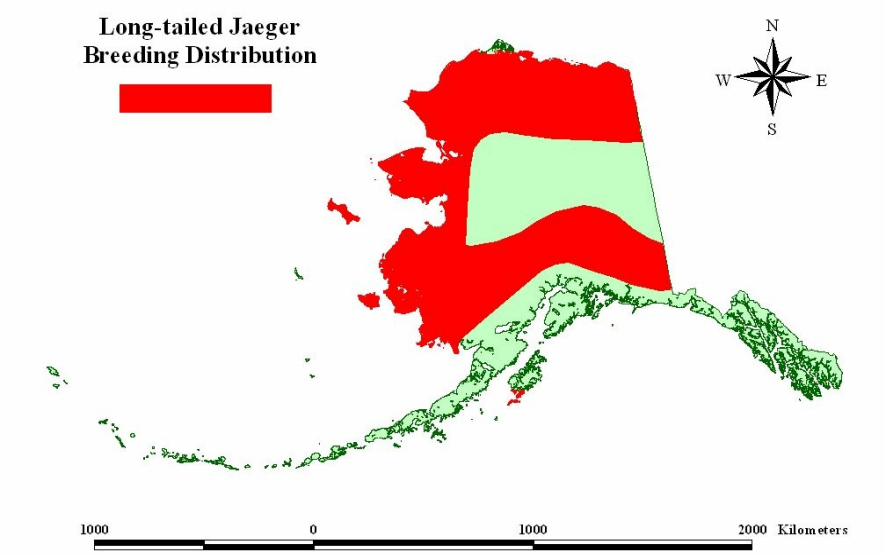
Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern	R	R	R	-
Southcoastal *	R	R	R	+
Southwestern *	U	U	U	-
Central *	C	C	C	-
Western *	C	C	C	-
Northern *	C	C	C	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. © **Armstrong 1995.**

Population Estimates and Trends

There are no detailed estimates of total numbers or trends for the Long-tailed Jaeger. The North American Waterbird Conservation Plan (2002) tentatively estimates the global population at >150,000 individuals.



Seabird breeding distribution maps created from data *in* Birds of North America, Wiley and Lee 1998.

Conservation Concerns and Actions

Because Long-tailed Jaegers are primarily pelagic, most of the information about them comes from observations on the breeding grounds. Fluctuations in densities of lemmings have no clear influence on total numbers and survival after fledging depends on conditions at sea. Yet, wintering areas and migration routes remain poorly documented (particularly in the Pacific), nothing is known about possible contamination by oceanic pollution, and molting also takes place primarily at sea so even the progression of immature plumages is speculative.

The majority of the published information about this jaeger focuses on identification and unusual sitings. The species could be used for monitoring the health of arctic ecosystems because it breeds as far north as any bird and is abundant and conspicuous in the arctic, but much more study is needed before we could have any understanding of the long-term regulation of Long-tailed Jaeger populations.

Recommended Management Actions

- Develop standardized methods for monitoring populations.
- Implement a regional monitoring program.
- Determine Alaskan Long-tailed Jaeger breeding population numbers.
- Complete a nesting inventory.
- Measure productivity.
- Determine wintering areas and migration routes.
- Measure contaminants in Long-tailed Jaeger eggs.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; IUCN Internet Website (2005); Kushlan *et al.* 2002; U.S. Fish and Wildlife Service 2002; Wiley and Lee 1998.

Full credit for the information in this document is given to the above references.

USFWS Tim Bowman

BONAPARTE'S GULL *Larus philadelphia*

Conservation Status

ALASKA: Not at Risk **N. AMERICAN: Moderate Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Aug	2-4	22-25 d	unknown	coniferous trees	dip, dive, glean	insects, fish, crustaceans, worms

Life History and Distribution

This elegant gull is named after a nephew of Napoleon, Charles Lucien Bonaparte, who was a leading ornithologist in the 1800s in America and Europe. It is a small, delicate gull, silvery gray above with white, wedge-shaped patches on the leading edge of the outer wing. Bright orange-red legs and feet accent the plumage and the bill is small and black. The head is hooded in black with narrow white eye crescents in breeding adults, and is white in winter with a dark spot behind the eye. At the beginning of the breeding season, the breast may show a rosy-pink tinge.

The species has a light, buoyant, tern-like flight which helps them to capture insects in mid-air and to gather them from the surface of lakes or ponds. During the breeding season, their diet consists primarily of insects, but throughout the rest of the year they also feed on small fish, crustaceans, snails, and marine worms.

Bonaparte's Gulls *(Larus philadelphia)* are abundant on ocean bays, islands, lakes, rivers, and marshlands. However, it is one of the least known gulls with respect to breeding. It winters in large flocks in coastal areas close to human activity, but it breeds solitarily or in very loose colonies, mostly in habitats remote from humans. This is the only gull that almost always nests in trees. The combination of high latitude, widely dispersed nesting and a nest hidden among coniferous branches, makes it difficult to study the breeding habits of this species. A solitary Bonaparte's Gull may be the only sign that you are near a nest or small colony. Intruders are greeted at a distance of 300 feet or more by gulls flying overhead, calling loudly, and sometimes dive-bombing the intruder, while the nesting birds remain well-hidden.

Most of North America is home to this beautiful gull during some part of the year. In Alaska, they breed from western Alaska (Kobuk and Kuskokwim deltas), southwest to the base of the Alaska peninsula, central and south-coastal Alaska (including Anchorage, the Kenai Peninsula and Prince William Sound), and rarely in Southeast Alaska. Breeding continues east in Canada to James Bay and south to south-central British Columbia, central Alberta, Saskatchewan, and central Ontario.

At high latitudes, the breeding season is short. Flocks of hundreds and eventually thousands form as they move along major river valleys to the Pacific Coast, the Gulf of Mexico, the Mississippi Flyway, and the Atlantic Coast. Some migrate as far south as Panama.

USFWS Donna Dewhurst

Alaska Seasonal Distribution

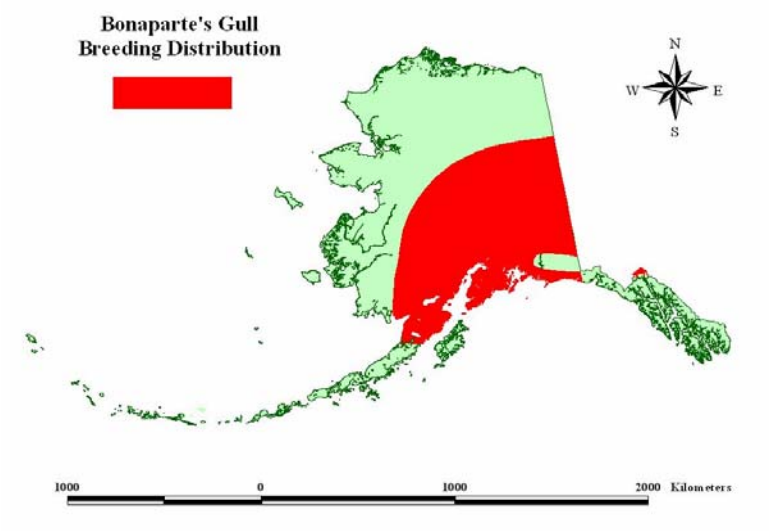
AK Region	Sp	S	F	W
Southeastern *	C	U	C	+
Southcoastal *	C	C	C	+
Southwestern *	U	U	U	-
Central *	U	U	U	-
Western *	U	U	U	-
Northern	-	+	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

The global population of Bonaparte's Gulls is between 85,000-175,000 breeding pairs. However, observations on Christmas Bird Counts of 100,000+ individuals at a single location suggest that this figure may be conservative. The Alaskan population is estimated at several tens of thousands.

This species does not appear to be globally threatened. However, there are no data on trends.



Seabird breeding distribution maps created from data *in* Birds of North America, Burger and Gochfeld 2002.

Conservation Concerns and Actions

Bonaparte's Gulls remain among the least studied of any gulls regularly nesting in North America. Data are completely lacking regarding most aspects of breeding (e.g. mating systems and sex ratios, pair bonds, fledging, age of first breeding). There is also no quantitative information about annual and lifetime reproductive success, life span and survivorship, causes of death, or population regulation.

This gull requires large lakes, bogs, and muskegs which are not disturbed by people for nesting. Such marshes are vulnerable to natural drought and draining, but degradation of the nesting habitat may also occur when development projects increase the contact between Bonaparte's Gulls and humans.

There are no continent-wide programs for management of this species other than protection provided by the Migratory Bird Convention between the U.S. and Canada. Additionally, there are no national or province-wide breeding surveys. In many regions it is difficult to obtain accurate population estimates of this bird because of its dispersed nesting pattern. Yet, such estimates are necessary for determining trends and possible human effects on numbers.

A great deal of further study is needed to understand and manage this species.

Recommended Management Actions

- Determine Alaskan Bonaparte's Gull breeding population numbers.
- Develop standardized methods for monitoring populations.
- Implement a regional monitoring program.
- Complete a nesting inventory.
- Measure productivity.
- Determine wintering areas and migration routes.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; Burger and Gochfeld 2002; IUCN Internet Website (2005); Kushlan *et al.* 2002. U.S. Fish and Wildlife Service 2002.

Full credit for the information in this document is given to the above references.

MEW GULL *Larus canus*

Conservation Status

ALASKA: Not At Risk N. AMERICAN: Not Currently At Risk GLOBAL: Least Concern

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Aug	2-3	24-26 d	30-32 d	ground, shrub, floating vegetation	surface dip, piracy	insects, worms, fish, mollusks, rodents

Life History and Distribution

Mew Gulls *(Larus canus)* are the smallest of the white-headed gulls in North America and are named for the "mewing" sounds of their breeding calls. Formerly they were known as the Short-billed Gull.

Across the extensive breeding range of the Mew Gull three distinct forms are recognized and sometimes considered different species. The American Ornithologists' Union (1998) recognized these forms as subspecies. The three groups include the North American birds (*Larus canus brachyrhynchus)*, the European and central Asian breeders (*Larus canus canus)*, and the northeast Asian breeders *(Larus canus kamtschatschensis)*. The North American birds are the smallest of the races, and have a relatively thinner bill.

North American breeding birds are solid white above and below, with white tails, and light gray wings and backs. Although solid white in summer, their heads and the back of the neck are washed with brown in winter. The eyes are large, dark, and rimmed in red. Thin and solid yellow, their unmarked bills distinguish Mew Gulls from all other Alaskan gulls (except Kittiwakes, which have a red dot on their lower bill). Their legs are a dull yellow and the wings have black tips with prominent white spots, which may appear as a white band. Adults of both sexes appear similar. Many stages of juvenile plumage precede attainment of adult plumage in the third year.

These noisy, social birds are primarily scavengers. They are also known to hunt insects, earthworms, mollusks, crustaceans, and occasionally young birds and mice. To break open hard shells, they drop prey, such as sea urchins, onto the beach. Grain, garbage, and fish are also included in the diet. Large groups sometimes congregate at garbage dumps, sewage treatment plants, and fish docks to scavenge and pirate food from each other.

Mew Gulls build nests in conifers, on islands in marshes (in vegetation), and on the ground. Adults aggressively defend their nests, often diving and swooping upon intruders.

The breeding range extends in North America from Kotzebue Sound in northwest Alaska, east through the Yukon River valley (south of the Brooks Range) to the Yukon and Northwest Territories of Canada. South of these localities, it breeds throughout most of Alaska, south to the Alaska Peninsula (from Vicar River west to Isabel Bay, Morzhovoi Bay, and Dolgoi Island). It also occurs in coastal Southeast Alaska, east in Canada to central Mackenzie, south to northern Saskatchewan, and along the coast to southern British Columbia.

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Wintering occurs along the Pacific Coast from Southeast Alaska south to Baja California. In Alaska, the Mew Gull also winters around Kodiak Island, on the Kenai Peninsula, west (very locally) to Bristol Bay, and north to the Tanana River.

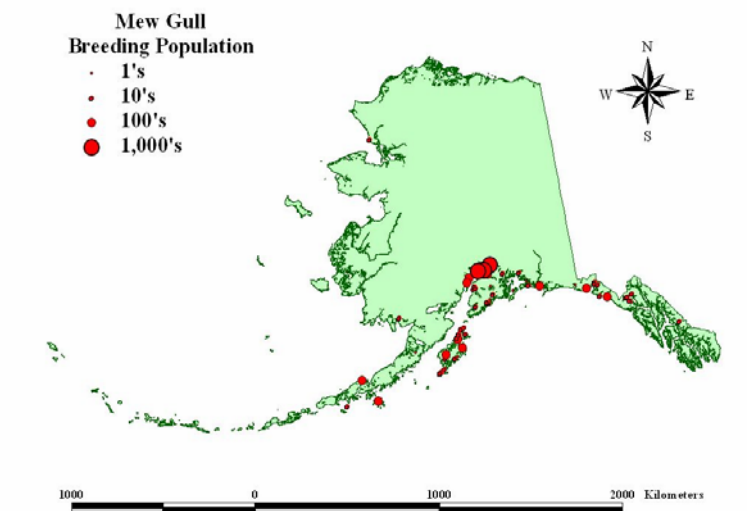
Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	C	C	C	C
Southcoastal *	C	C	C	C
Southwestern *	C	C	C	C
Central *	C	C	C	-
Western *	C	C	C	-
Northern *	R	R	R	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

No precise data exist for total numbers of Mew Gulls. The global population estimates range from 585,000 to one million pairs. The U.S. Fish and Wildlife Service



Seabird breeding population maps created from data (coastal only) provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

Beringian Seabird Colony lists 69 colonies with approximately 14,400 individuals. This includes colonies only on coastal lands and islands in the eastern Bering Sea and Gulf of Alaska. North American Breeding Bird Surveys conducted in Alaska and Canada report high numbers on a regular basis. The greatest abundance has been recorded on the Christmas Bird Counts (CBC) where the annual count total for all CBCs is about 50,000 individuals. There are no systematic data for trends from North America.

Conservation Concerns and Actions

This species does not appear to be threatened in any part of its range. There are no confirmed data, but the influences on population numbers are probably adequate food resources, nesting habitat, harsh weather, and human disturbance.

When threatened by predators, especially introduced species, reproductive success suffers. Mew Gulls' choices of nesting sites reflect predation pressures. Introduced predators include domestic dogs, cats, and red *(Vulpes vulpes)* and arctic *(Alopex lagopus)* foxes.

Mew Gulls are vulnerable to oil pollution and were negatively impacted by the 1989 *Exxon Valdez* oil spill in Prince William Sound, Alaska.

In Alaska, adult Mew Gulls and their eggs are still taken by Native subsistence hunters. Between the early 1990s and 2000, about 145 adult Mew Gulls and almost 6,689 eggs were taken annually. Effects on the populations are not directly known, but current harvests are not thought to cause severe impacts.

Mew Gulls often congregate on airfields to feed on soil invertebrates and to nest in grassy areas around runways. This interaction has had negative impacts on both gulls and human safety. Lake Hood Airport in Anchorage, Alaska has had problems with Mew Gulls and has instituted several measures to control gull populations in and around the airport. Control measures included introducing taller, thicker grass to deter nesting; the use of loud noises to scare off gulls; intentional human disturbance to thwart nesting efforts; the relocation of nesting pairs; and placing monofilament line over areas to deter gulls from landing.

Where fed on a regular basis, Mew Gulls may become tame. However, if threatened around nesting areas, birds will retaliate with aerial attacks creating another potential urban problem.

Recommended Management Actions

- Establish a monitoring program.
- Determine wintering areas and migration routes.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Mew Gull eggs.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use of Mew Gulls.
- Continue efforts to minimize negative human/gull interactions.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

American Ornithologists' Union 1998; Armstrong 1995; IUCN Internet Website (2005); Kushlan *et al.* 2002; Moskoff and Bevier 2002; Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005).

Full credit for the information in this document is given to the above references.

USFWS Donna Dewhurst

HERRING GULL *Larus argentatus*

Conservation Status

Alaska: Low **N. AMERICAN: Low Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Aug	1-4	24-28 d	~ 35 d	ground scrape, trees, buildings	surface dip, shallow dive	fish, insects, birds, eggs, chicks, carrion, refuse

Life History and Distribution

Herring Gulls *(Larus argentatus)* are very social, noisy birds that prefer to nest in colonies. These large, white-headed gulls inhabit a wide variety of environments including offshore islands, coastlines, lakes, and large rivers. Successful nesting requires a site near water and safe from terrestrial predators. Frequently, the nests are on flat ground, but nests are also built on cliffs, possibly to avoid predatory mammals. In some places, where food from human activities is abundant, these gulls have begun to nest on roofs and window ledges of buildings.

They are very adaptable, and eat almost anything. Populations breeding on offshore islands, or in remote parts of the Arctic, exist on a natural diet of fish, marine invertebrates, and insects. Some birds forage on breeding colonies by taking eggs and young of other Herring Gulls and other species of seabirds. In urban areas, they can survive on fish waste from fish processing plants and from human refuse. Gulls drink fresh water when it is available; if none is around, they will drink seawater. Special glands located over the eyes allow gulls to excrete salt. The salty excretion can be seen dripping out of the nostrils and off the end of the bill.

The head, body, and tail of this species are white, the bill is yellow with a red spot on the lower tip, the legs are pink or flesh-colored, and the eyes are golden with a yellow or orange orbital ring around them. Backs and upper wing surfaces of adults are gray, and the tips of their outermost flight feathers are black with white spots. In winter, the heads of the adults are streaked with brown. Immature birds are mottled brown and have about three plumage stages before full adult plumage is developed.

This species has a circumboreal breeding range. It extends from southern Alaska, inland across Canada to Hudson Bay, and south to the North Carolina coast. Breeding also occurs in Iceland, Europe, and Russia. In North America, it is a year-round resident on the Aleutian Islands, Alaska Peninsula, Kodiak Island, throughout Southeast Alaska, south through British Columbia, on the Great Lakes, and on the east coast from Newfoundland to North Carolina.

In winter, birds are usually found near open fresh or salt water. Only nonbreeding birds appear migratory; most adults remain near breeding grounds throughout the year. First-year birds winter in the southern portions of the range, with second- and third-year birds moving intermediate distances. Herring Gulls that nest in North America, winter throughout their breeding range and south into tropical waters, primarily along coastlines in the southern United States, Baja California, and the Gulf of Mexico.

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At least nine subspecies have been recognized. The only subspecies that breeds in North America is *Larus argentatus smithsonianus*. In Alaska, Herring Gulls hybridize with Glaucous-winged Gulls *(Larus glaucescens)* on the Kenai Peninsula and in Southeast Alaska and with Glaucous Gulls *(Larus hyperboreus)* in northern Alaska. *"American Birds"* records suggest that the Asian race (*L. a. vegae)* is a regular visitor to western Alaska.

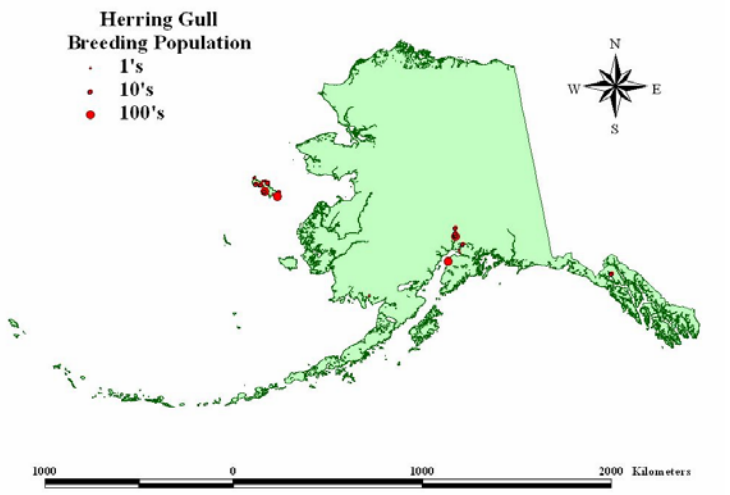
Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	C	C	C	C
Southcoastal *	C	U	C	U
Southwestern	R	R	R	R
Central *	U	U	U	-
Western *	U	U	U	-
Northern *	-	R	U	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

There are few data available for Herring Gulls



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U.S. Fish and Wildlife Service, Anchorage, Alaska.

breeding in Alaska, especially those that may be nesting on inland lakes and rivers. The U.S. Fish and Wildlife Service Beringian Seabird Colony Catalog lists 1,567 individuals at 36 colonies in Alaska. Approximately 55% of the 1,567 individuals are on St. Lawrence Island in the Bering Sea. Other colonies or sites are located on Grassy Island near Dillingham, in the Anchorage area at the Port and at Potter Marsh, Duck Flats near Palmer, on the Kenai Peninsula at Shadura Lake, at various sites around the river systems between Anchorage and Talkeetna, and in Adams Inlet in Southeast Alaska. No trend information is available for Herring Gull populations in Alaska.

The total North American breeding population according to Pierotti and Good (1994) is approximately 250,000 individuals. Herring Gulls were nearly extirpated in North America during the nineteenth century by feather hunters and egg collectors. Partly due to protection by the 1916 Migratory Bird Convention between Canada and the United States, they recovered and may have exceeded historical numbers by the 1960s. The recovery may have been facilitated by plentiful food derived from human sources. In recent years, increases have come mostly from range expansion southward. The species has expanded south into Maryland, Virginia, and North Carolina.

Conservation Concerns and Actions

The attraction of gulls to fish waste discarded by fishing vessels can result in birds being entangled or drowned in nets. In Alaska, gulls (Herring Gulls, Glaucous Gulls, Glaucous-winged Gulls) are the second most frequently taken species group as bycatch in the Bering Sea/Aleutian Islands demersal groundfish longline fisheries and the third most frequently taken species group in the Gulf of Alaska. Between 1993-2003, gulls comprised 20% of the total bycatch in the longline fisheries in the Bering Sea/Aleutian Islands (2,571 individuals per year) and 12% (106 individuals per year) of the total bycatch in the Gulf of Alaska. In 1999, gulls were taken as bycatch in the Upper Cook Inlet salmon setnet and driftnet fisheries. Additionally, small numbers of gulls have been taken as bycatch in the Alaskan trawl fisheries.

High levels of chlorinated hydrocarbons (pesticides) have been recorded in Herring Gulls in recent decades, and were especially acute in the Great Lakes during the 1960s and 1970s. Many eggs failed to hatch and chicks showed growth retardation and deformities. The problem was alleviated during the 1980s as contaminant levels declined. Herring Gulls probably take in contaminants (e.g. chlorinated hydrocarbons) while feeding, but the lethal or sublethal effects on the population are unknown.

Other effects of human activity include hunting. In Alaska, Herring Gulls and their eggs are taken by Native subsistence hunters. Between 1995 and 2000, an average of 62 adult Herring Gulls and 2,453 eggs were taken annually. An additional 16,992 gull eggs were harvested, but not identified to species. Herring Gull eggs could also be included in this number. Effects on the populations are not directly known, but current harvests are not thought to cause severe impacts.

Recommended Management Actions

- Determine Alaskan Herring Gull breeding population numbers and establish a regional monitoring program.
- Continue to work with state and federal agencies and fisheries councils to measure and minimize the negative impacts of fisheries interactions.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use of Herring Gulls.
- Measure contaminant levels in Herring Gull eggs.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; IUCN Internet Website (2005); Kushlan *et al.* 2002; Manly 2004: NOAA Internet Website (2005); Pierotti and Good 1994; U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005).

Full credit for the information in this document is given to the above references.

SLATY-BACKED GULL *Larus schistasagus*

Conservation Status

ALASKA: None **N. AMERICAN: Insufficient Information** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Aug	3-4	25-28 d	40-50 d	rock ledge, tops of rocks	surface dip, shallow dive, scavenging	fish, marine invertebrates, chicks and eggs, garbage

Life History and Distribution

Slaty-backed Gulls *(Larus schistasagus)* are very large, barrel-bodied gulls with powerful heads, and relatively short, yellow bills. A distinct pattern on the wings makes it easiest to identify them in flight. The back and upper side of the wings are deep slate-gray with a broad, conspicuous, white trailing edge and black in the outer primary feathers. The underwing shows a "string-of-pearls" pattern, considered to be the most characteristic identification feature of this species. Sandwiched between a wide arc of pure white wing linings and the white trailing edge of the wing is a wide row of dark gray formed by the bases of the primary and outermost secondary feathers. A row of black primaries, tipped white and an extra line of translucent spots (the "string of pearls") crosses the gray. Remaining physical traits of these stout gulls include; pale eyes ringed with pinkish-red; short, dark pink legs; and white tails, bellies, and heads. In winter, adults also acquire gray-brown streaking on the back of the neck.

This species most commonly chooses inaccessible breeding locations along rugged seacoasts and on rocky islets in northeast Asia. Nests are composed of loose vegetation placed on rock ledges and on the tops of rocks. Colonies range in size from a few pairs to over a thousand pairs and are usually located near or among other seabird species.

Fish, marine invertebrates, chicks of other seabird species, and garbage are some of the food items of Slaty-backed Gulls. Diets vary annually and seasonally. Small mammals and berries may also be taken.

Breeding occurs in the Russian Far East along most of the mainland coast, from the Koryak Highlands in the north to the southern boundary of Russia with China. Colonies are common on the Kamchatka Peninsula, but are almost absent on the Komandorskiye Islands. Nesting continues south through the Kuril Islands, Sea of Okhotsk, to Hokkaido and northern Honshu, Japan.

In Alaska, this species is a rare spring migrant and summer and fall visitor along the Bering and Chukchi seas. The first confirmed breeding record for Alaska and North America was from Aniktun Island in July 1996. Aniktun is a low, sandy, barrier island located about two miles south-southwest of Cape Romanzof in the Bering Sea. This area is part of the Yukon Delta National Wildlife Refuge. The nest contained a single egg, and was located among primarily, Glaucous Gull *(Larus hyperboreus)*

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nests, some Glaucous-winged Gull *(Larus glaucescens)* nests, and a few Glaucous-winged/Glaucous Gull hybrid nests. Two adults and an immature Slaty-backed Gull were also observed in the area. In 1997, a pair of Slaty-backed Gulls was again recorded nesting on Aniktun Island. That nest contained three eggs and was located within a group of about ten Glaucous Gull nests.

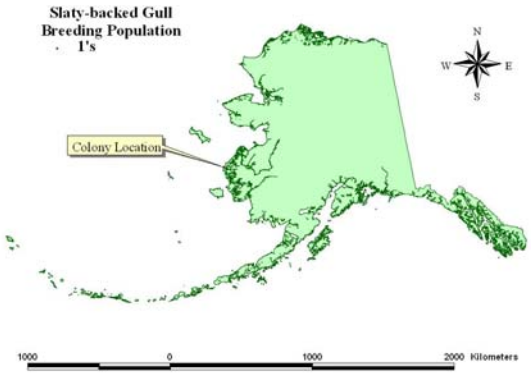
Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern	-	-	+	+
Southcoastal	+	+	+	+
Southwestern	R	R	R	U
Central	-	-	-	-
Western *	R	R	R	U
Northern	R	R	R	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Wintering of Slaty-backed Gulls occurs along the coasts of northeast Asia from the Kurile Islands south to China. This species frequently wanders east to the Alaskan mainland, Aleutian, and Pribilof islands.

Slaty-backed Gulls are most similar in appearance to the Siberian or Vega form of the Herring Gull *(Larus argentatus vegae)* and the Western Gull *(Larus occidentalis)*. Both of these species may be found in western Alaska. The Slaty-backed Gull can usually be distinguished by the very dark mantle color and the



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U.S. Fish and Wildlife Service, Anchorage, Alaska.

wingtip pattern. First-year birds can be quite difficult to identify. Structurally, the Slaty-backed Gull is slightly thinner billed than the Western Gull and stockier and broader-winged than the Vega form of the Herring Gull.

Population Estimates and Trends

The total world breeding population is estimated at 131,300 pairs (Larisa Zelenskaya, unpubl. data). The Russian population comprises the majority of birds with only 10,000 pairs nesting in Japan.

Shelikan Island in the northern Sea of Okhotsk hosts one of the largest colonies of Slaty-backed Gulls known in the Russian Far East. In 1986, the population was estimated at 2,000 pairs and increased to 5,500 pairs in 2005. Some colonies in the Russian Far East appear to be increasing dramatically. Verkhoturova Island in the Bering Sea, northeast of the Kamchatka Peninsula had 150 pairs in 1975, but by 1994, numbers had reached 4,800 individuals.

Conservation Concerns and Actions

In general, Slaty-backed Gull populations in the northern Sea of Okhotsk and Kamchatka are not currently considered threatened. However, human impacts, both direct and indirect still influence Slaty-backed Gull populations.

There is a large Japanese driftnet fishery operating in the Russian Economic Zone. Observers were placed onboard these vessels to monitor seabird bycatch. Slaty-backed Gulls were among the 25 species of birds that were observed drowned in fish nets. An estimated 42 Slaty-backed Gulls were taken as bycatch in the Japanese driftnet salmon fishery between 1993-1997. These large white-headed gulls have also been recorded as bycatch in the Russian demersal long-line fisheries. In the waters of Eastern Kamchatka, 57 Slaty-backed gulls were caught in 2003 and 38 were taken in 2004.

Harvest of eggs and birds on seabird colonies in the northern Sea of Okhotsk dates back about 3000 years. Today, illegal egg collecting is a common activity of people from nearby villages and crews from visiting vessels. On Umara Island, there were no chicks of Slaty-backed Gulls in 1995 as a result of excessive egg collection. Declining resources for environmental and game inspections in the Russian Far East have allowed an increase in these illegal activities.

In recent years, there has been indiscriminant disposal of garbage, fur farm waste, and fish waste in the northern Sea of Okhotsk. This has provided an additional food source for Slaty-backed Gulls during periods of poor foraging in autumn and winter. As a result, more gulls have survived and populations of this species have increased in the region. During the breeding season, Slaty-backed Gulls prey on chicks of other seabirds. Predictably, an increase in gulls resulted in an increase in predatory activity in seabird colonies in the region. Thus, indirectly, human activity may have caused an increase in Slaty-backed Gulls, which is having negative impacts on other bird species.

Recommended Management Actions

- Determine the Alaskan breeding population of Slaty-backed Gulls.
    - Reconfirm nesting at Aniktun Island in the Bering Sea.
    - Create a Slaty-Backed Gull "WATCH" enlisting the public, state, other federal agencies, and USFWS biologists involved in monitoring and surveying of other species to report sightings of Slaty-backed Gulls, especially nesting birds, in Alaska.

Regional Contact

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Telephone (907) 768-3444

References

Armstrong 1995; Artyukhin and Burkanov 2000; Artyukin *et al.* 2006; Bent 1921; Brazil 1991; Enticott and Tipling 1997; Hasegawa 1984; Hashimoto 1977; IUCN Internet Website (2005); Kessel and Gibson 1978; Kondratyev 1991; Kondratyev *et al*. 2000a; Kondratyev *et al.* 2000b; Kushlan *et al.* 2002; Shuntov 2000; Sibley 2000; U.S. Fish and Wildlife Service 2006; Zelenskaya 2006 unpubl. data.
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GLAUCOUS-WINGED GULL *Larus glaucesens*

Conservation Status

ALASKA: Not At Risk **N. AMERICAN: Not Currently At Risk** **GLOBAL Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Aug	1-3	27-29 d	35-54 d	cliff, ground	surface dip	fish, marine invertebrates, birds, fish waste, garbage

Life History and Distribution

The Glaucous-winged Gull *(Larus glaucesens)* is abundant in bays, harbors, estuaries, and rivers during all seasons in northwestern North America. Its fearless nature and opportunistic eating habits make it a well known gull in coastal cities and towns. Due to environmental changes, availability of fish waste from fish processing, and garbage at landfills, this gull has increased in numbers. It nests primarily in colonies on rocky islets offshore, but in response to pressure on the breeding colonies, some birds are now nesting on the roofs of waterfront buildings. Other man-influenced habitats used along the coast include garbage dumps, city parks, athletic fields, school yards, airports, and agricultural fields.

This large, bulky gull is mostly white with a pearly gray mantle. Its wing tips are somewhat darker gray, with white spots. The bill is bright yellow with a red spot, the legs are pink, and the eyes are brownish. In winter, the red spot on the bill becomes a diffuse black and the head and neck look dusky. Glaucous-winged Gulls hybridize with Herring Gulls (*Larus occidentalis)* and Glaucous Gulls *(Larus hyperboreus)* in Alaska. The resulting hybrids are often difficult to identify.

Glaucous-winged Gulls breed from Cape Romanzof, Alaska in the southern Bering Sea, south along the Pacific coast to northwestern Oregon. They nest casually near freshwater in British Columbia, Washington, and Oregon. In Alaska, nesting also occurs on inland lakes on the southwest mainland, the entire Alaska Peninsula, throughout the Aleutian Islands, and casually on St. Lawrence Island and Cape Denbigh in Norton Sound.

Outside of North America, breeding occurs on the Commander Islands and on the Kamchatka Peninsula in Russia.

In winter, the species is generally found further away from shore than in summer. It is found throughout the breeding range south along the coast to southern Baja California and on the Pacific coast of Asia south to Japan.

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Alaska Seasonal Distribution

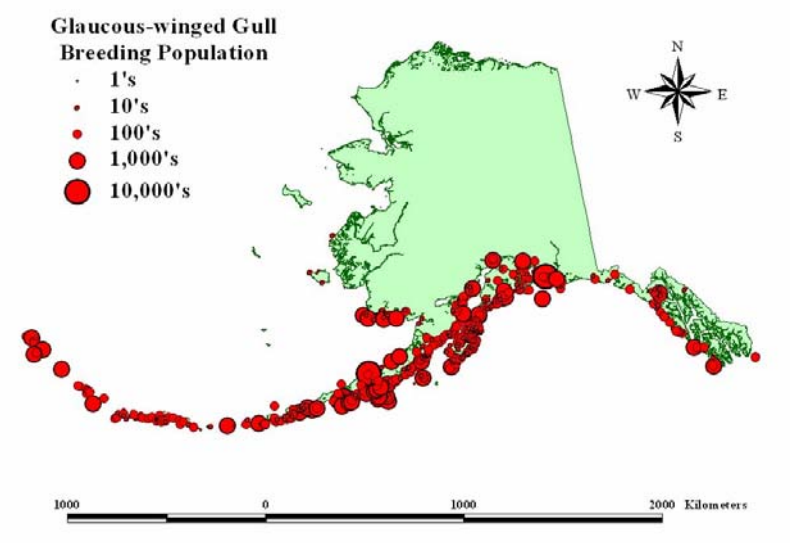
AK Region	Sp	S	F	W
Southeastern *	C	C	C	C
Southcoastal *	C	C	C	C
Southwestern *	C	C	C	C
Central	-	R	R	-
Western *	C	C	C	-
Northern	-	-	+	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

The total breeding population along the coast of North America is estimated at 400,000 birds. Based on colony counts in Alaska, there are approximately 252,000 Glaucous-winged Gulls at 825 colonies. The largest colony in Alaska is on Middleton Island, in the Gulf of Alaska with about 12,500 birds.

Glaucous-winged Gulls on Middleton Island increased (+13.6% per annum) from the mid-1980s to the mid-1990s, but currently they are declining there. This species has decreased on Buldir Island in the Aleutian Island chain (a significant negative trend of -21.3% per annum) since 1992. No trends are evident at other monitored colonies in Alaska.



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

Conservation Concerns and Actions

The attraction of Glaucous-winged Gulls to fish waste discarded by fishing vessels can result in birds being entangled or drowned in nets. In Alaska, gulls (Glaucous-winged Gulls, Glaucous Gulls, Herring Gulls) are the second most frequently taken species group as bycatch in the Bering Sea/Aleutian Islands demersal groundfish longline fisheries and the third most frequently caught species group in the Gulf of Alaska. Between 1993-2003, gulls comprised 20% of the total bycatch in the longline fisheries in the Bering Sea/Aleutian Islands (2,571 individuals per year) and 12% (106 individuals per year) of the total bycatch in the Gulf of Alaska. In 1999, gulls were taken as bycatch in the Upper Cook Inlet salmon setnet and driftnet fisheries. Additionally, low numbers of gulls have been taken as bycatch in the Alaskan trawl fisheries.

Other effects of human activity include hunting. In Alaska, Glaucous-winged Gulls and their eggs are taken by Native subsistence hunters. Between 1995 and 2000, an average of 71 adult Glaucous-winged Gulls and 5,286 eggs were taken annually. An additional 16,992 gull eggs were harvested, but not identified to species. Glaucous-winged Gull eggs may be included in this number. Effects on the populations are not directly known, but current harvests are not thought to cause severe impacts.

This species is not presently a management concern. If Glaucous-winged Gulls increased in numbers in mixed colonies to the point where they had deleterious effects on other species (e.g. kittiwakes, murrelets), management might become necessary. For example, the presence of large numbers of gulls could cause interference with the foraging success of small diving birds such as murrelets.

Control measures are sometimes necessary if gulls roost at airports, create problems at garbage dumps, or create public health hazards nesting on buildings.

Recommended Management Actions

- Continue monitoring Glaucous-winged Gulls in Alaska at geographically-dispersed breeding sites.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use of Glaucous-winged Gulls.
- Continue to work with state and federal agencies and fisheries councils to measure and minimize the negative impacts of fisheries interactions.
- Measure contaminant levels in Glaucous-winged Gull eggs.

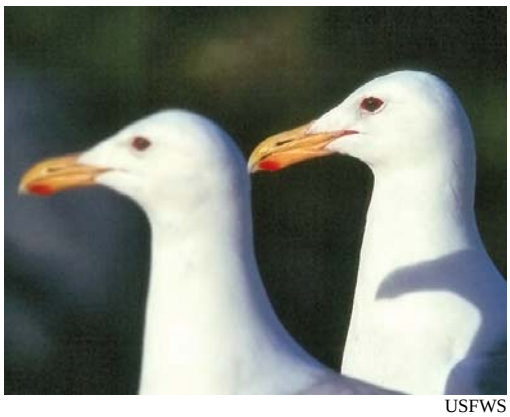
Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; Dragoo *et al*. In Press; Hatch, S.A. *et al.* unpublished data; IUCN Internet Website (2005); Kuletz 2005; Kushlan *et al.* 2002; Maniscalco *et al.* 1998*;* Manly 2004; NOAA Ostrand 1999; Internet Website (2005); U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005); Verbeek 1993.

Full credit for the information in this document is given to the above references.



USFWS

GLAUCOUS GULL *Larus hyperboreus*

Conservation Status

ALASKA: Not At Risk N. AMERICAN: Not Currently At Risk GLOBAL: Least Concern

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Aug	2-4	27-28 d	45-50 d	ground, vegetation mound	active predation, piracy, scavenging	fish, marine invertebrates, carrion, berries, eggs, birds

Life History and Distribution

The Glaucous Gull *(Larus hyperboreus)* is a large, pale gull that has a circumpolar distribution. It is the only large gull commonly found in the far north. This is one of the most predatory of gulls, capturing and eating adult birds, eggs and chicks, small mammals, and fish. Marine invertebrates, berries, garbage, and dead animal matter are also part of the diet and the Glaucous Gull is known to pirate food items from other birds.

This species is heavy-bodied with a long, powerful, yellow bill with a red spot, pink legs, and yellow eyes. Its head, neck, breast, belly, and tail are white. The edges and tips of the wings are also white; the back and upperwings are gray. In winter, it is brushed with brown streaking and spotting on the head and nape. The Glaucous Gull hybridizes with Glaucous-winged Gulls *(Larus glaucesens)* and Herring Gulls *(Larus argentatus)* in North America and the hybrids may display intermediate plumage characteristics.

Nesting occurs in a variety of habitats including; sea cliffs, barrier islands, ice edges, open tundra, freshwater lakes and ponds, and islets on river deltas. It often nests in sizeable groups in colonies of mixed species, but may also be found nesting as solitary pairs on the tundra.

In North America, the Glaucous Gull breeds along the west and north coasts of Alaska and throughout most of low and high arctic Canada. The center of abundance of this species in Alaska is the Yukon-Kuskokwim Delta and the east side of the Bering Strait.

It winters primarily in coastal waters and distribution is dependent on access to open water. The Alaskan breeding population commonly winters on the Aleutian and Pribilof islands and is found in decreasing numbers along the coast to Oregon and rarely as far south as California. In the Atlantic, the species winters from Labrador, south to Virginia and N. Carolina, and rarely to Florida. The majority winters in the Atlantic provinces of Canada. It also occurs regularly, in small numbers, in the Gulf of St. Lawrence and on the Great Lakes.

Breeding also occurs in Greenland, Iceland, northern Europe and along the islands and coast of Russia.

Four subspecies are recognized with three known to occur in North America. Subspeciation is based on slight differences in size and darkness of the mantle. The subspecies *Larus hyperboreus barrovianus* is found in Alaska and the Yukon Territory.

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Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern	R	R	R	R
Southcoastal	R	R	R	R
Southwestern *	U	U	U	U
Central	R	R	R	-
Western *	C	C	C	+
Northern *	C	C	C	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

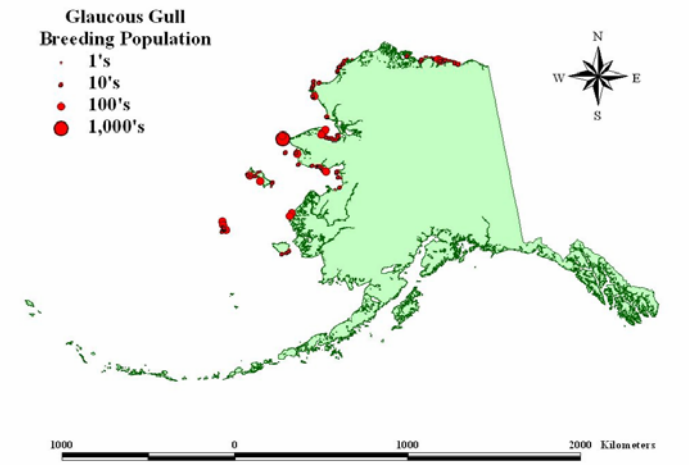
Population Estimates and Trends

Populations are difficult to census because many breed as separate pairs (rather than in colonies) on widely dispersed river flats. Therefore, population numbers are poorly known. An adjusted estimate for Alaska, to include Glaucous Gulls nesting inland, is approximately 100,000 individuals. A minimum estimate of breeding Glaucous Gulls in Canada is 69,000 individuals at 1,031+ colonies.

Trends for Glaucous Gulls are also poorly known. Few changes in population size or distribution have been reported in North America or globally. Breeding populations remain stable in Alaska and in northeastern Canada, but they have declined on Belcher Island off western Quebec, Canada.

Conservation Concerns and Actions

The Glaucous Gull is less thoroughly studied than most other gull species in North America, owing partly to its remote breeding locations.



Seabird breeding population maps created from data (coastal only) provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

High levels of chlorinated hydrocarbons (pesticides) have been recorded in Glaucous Gulls in recent decades, often at levels comparable to other top predators such as the polar bear *(Ursus maritimus)*. The most extensive studies have occurred in polar regions outside North America. Lethal effects to seabirds can occur when high concentrations of PCBs (synthetic, chlorinated, organic compounds) stored in fat are released in the body, such as during starvation events. However, lethal and sublethal effects on Glaucous Gulls are unknown.

The attraction of Glaucous Gulls to fish waste discarded by fishing vessels can result in birds being entangled or drowned in nets. In Alaska, gulls (Glaucous Gulls, Glaucous-winged Gulls, Herring Gulls) are the second most frequently taken species group of birds as bycatch in the Bering Sea/Aleutian Islands demersal groundfish longline fisheries and the third most frequently taken species group in the Gulf of Alaska. Between 1993-2003, gulls comprised 20% of the total bycatch in the longline fisheries in the Bering Sea/Aleutian Islands (2,571 individuals per year) and 12% (106 individuals per year) of the total bycatch in the Gulf of Alaska. Small numbers of gulls are also taken in the Alaskan trawl fisheries as bycatch.

Access to waste from fishing activities and to human refuse could increase breeding numbers of Glaucous Gulls locally around communities, and could also increase overwinter survival of young gulls. This does not commonly occur among Glaucous Gull populations due to the remote nature of their breeding areas. An exception to this is the Prudhoe Bay area in Alaska, where garbage dumps and other human development are prevalent. This area supports greater numbers of both breeding and nonbreeding Glaucous Gulls than are found in more pristine areas of the region.

Other effects of human activity include hunting. In Alaska, Glaucous Gulls and their eggs are taken by Native subsistence hunters. Between 1995 and 2000, about 706 adult Glaucous Gulls and almost 17,732 eggs were taken annually, with the majority of eggs taken in the Bristol Bay area. An additional 16,992 gull eggs were harvested, but not identified to species. Glaucous Gull eggs may also be included in this number. Effects on the populations are not directly known, but current harvests are not thought to cause severe impacts.

Human or predator disturbance at nests may increase predation on chicks or eggs by other Glaucous Gulls. Adults will attack predators and humans at nest areas by aerial dives and strikes with their feet. Chicks may scramble away from the nest, and try to hide, making them more susceptible to predation. Capturing adults on nests may result in nest abandonment.

Glaucous Gulls are known to prey on juvenile waterfowl and chicks of other seabirds. On the Yukon-Kuskokwim Delta in Alaska, this species took large numbers of goslings *(Chen canagica, Anser albifrons, Branta canadensis mimima)*, but it is not clear whether gull predation was limiting the growth of geese populations. In Russia and Greenland, Glaucous Gulls were formerly culled to enhance reproduction of murres and eiders. It is not known if culling of gulls for management purposes necessarily lowers Glaucous Gull breeding populations over time. In addition, culling remains controversial.

Recommended Management Actions

- Determine Alaskan Glaucous Gull breeding population numbers and trends.
- Determine annual reproduction.
- Establish a regional monitoring program.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use of Glaucous Gull eggs.
- Continue to work with state and federal agencies and fisheries councils to measure and minimize the negative impacts of fisheries interactions.
- Measure contaminant levels in Glaucous Gull eggs.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; Bowman *et al.*2004; Gilchrist 2001; IUCN Internet Website (2005); Kushlan *et al.* 2002; NOAA Internet Website (2005); U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005).

Full credit for the information in this document is given to the above references.

SABINE'S GULL *Xema sabini*

Conservation Status

ALASKA: Low **N. AMERICAN: Low Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incub	Fledge	Nest	Feeding Behavior	Diet
June-Aug	1-3	20-25 d	~ 20 d	ground, depression in vegetation	surface seizing, dipping	aquatic insects, zooplankton, crustaceans, fish

Life History and Distribution

Sir Edward Sabine, an explorer and astronomer, discovered a new, small gull species while on an arctic expedition in 1818. He sent a specimen to his brother Joseph, a naturalist, who named the gull Sabine's Gull (*Xema sabini*) in honor of his brother.

These eye-catching, graceful birds are not typical gulls. Behaviorally and physically, they are unique and the only gull in the genus *Xema.* In many respects, they act more like shorebirds or terns than gulls. Their flight is light and buoyant like that of a tern and the sounds they emit are also quite tern-like. At the nest, Sabine's Gulls react to mammalian predators with a variety of distraction displays similar to those used by shorebirds (e.g. choking, leading predators away from the nest); no other gull uses such displays. Additional, atypical features of these gulls are feeding of whole prey to females during courtship (rather than regurgitating it, as in other gulls) and development of flight in chicks before they are fully feathered, similar to the pattern of terns.

One of only two gull species with a yellow-tipped, black bill and notched tail, Sabine's Gulls are quite distinctive. Long, narrow, pointed wings with a conspicuous triangular pattern on the upper surface characterize the species even further. The black, white, and gray triangular pattern on the wing makes identification of Sabine's Gulls straightforward. During the breeding season, adults have charcoal-gray hoods that are ringed with a thin, black line at the base. After the breeding season, the head becomes white with dark smudges. The tail is white, legs and feet are dark, and the eyes are dark with a red orbital ring. Males and females look alike, but males average slightly larger. Juvenile birds have a similar tri-colored wing pattern, but the gray triangular area is brown and the tail is edged with a black band.

Widely dispersed nesting occurs in small colonies (up to 20± pairs) or as single pairs in arctic and subarctic areas. One to three eggs are laid in a depression on the moist ground (e.g. swampy, low-lying tundra, tidal marshes, low-lying sea coasts), usually near fresh water. Frequently, nests are placed near or within Arctic Tern (*Sterna paradisaea*) colonies.

Throughout the summer, Sabine's Gulls generally feed singly or in pairs, in fresh water or on land, and occasionally in brackish water. Aquatic insects are the primary diet. They also take eggs from the nests of other birds and steal food from Arctic Terns. When not breeding, these gulls are truly marine. They migrate to tropical and subtropical waters, where they feed over the open ocean in groups of hundreds, including mixed-species flocks. This species is also known to follow fishing vessels to feed on fish waste.

USFWS Meg Laws

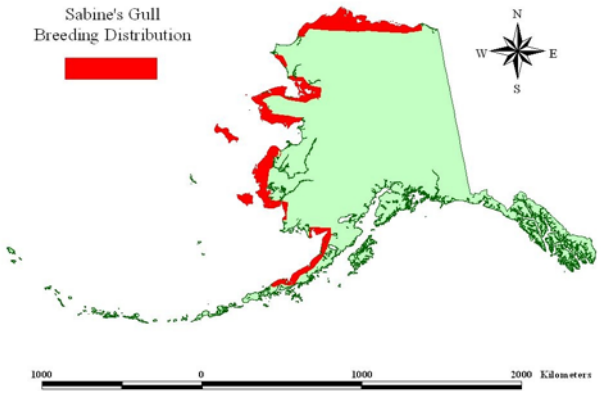
Breeding occurs in coastal areas within Alaska and east across arctic Canada to northern Hudson's Bay and Greenland. Nesting also happens on the islands of Spitsbergen (islands north of Norway) and northern Russia (Taimyr Peninsula) to Siberia.

In Alaska, breeding takes place along the northern coast of the Alaska Peninsula, on the Yukon-Kuskokwim Delta, Nunivak Island, and St. Lawrence Island. Based on availability of similar habitat nesting may also occur on much of the northwest coast to the vicinity of Point Hope. In northern Alaska, nesting occurs from the vicinity of Cape Sabine (northern portion of Cape Lisburne Peninsula) east to Demarcation Bay (Alaska-Canadian border).

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern	R	+	R	-
Southcoastal	U	R	U	-
Southwestern *	U	U	U	-
Central	-	+	-	-
Western *	C	C	C	-
Northern *	C	C	C	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. © **Armstrong 1995**.



Seabird breeding distribution maps created from data *in* Birds of North America, Day *et al.* 2001.

Cool water upwellings of the Humboldt Current off Peru are thought to be the primary wintering zone for birds breeding in Alaska, central, eastern, and probably western Russia, and western Canada. The main wintering area for breeding birds from eastern Canada, Greenland, Spitsbergen, and possibly western Russia is considered to be in the upwellings zones of the Benguela Current off the southwestern coast of Africa. The boundary between these two wintering populations on the breeding grounds in North America is not definitively known, but occurs somewhere in the Canadian Arctic.

Population Estimates and Trends

The estimated population for Sabines's Gulls in Alaska is probably several tens of thousands of individuals. Aerial surveys conducted in 2005 in western Alaska (Yukon-Kuskokwim Delta coastal zone) indicated a population size of 25,061 Sabine's Gulls. This estimate was 40% above the long-term average for 1992-2005. North-Slope aerial surveys conducted June 2004 suggested a population index of 10,345 Sabine's Gulls. Data from this survey for 1992-2004 indicated a non-significant growth rate for this species in northern Alaska. In contrast, Sabine's Gull counts were erratic, though level in the long term, on another aerial survey also conducted along the north coast. The latter survey was flown earlier in June (10-19). It is likely that this difference between the two surveys relates to survey timing since the Sabine's Gull is a relatively late, long-distance migrant. Hence, the survey conducted later in June is probably better for tracking this species.

There are no mechanisms in place to monitor Sabine's Gulls in Canada. Hence, there is insufficient information to speculate about population trends. Approximately 200 pairs nest in Greenland, but an unknown number also nests in low densities scattered along the coastline. Very few Sabine's Gulls nest on Spitsbergen, and only in scattered pairs. In Russia, this species nests inland and the population is unknown.

Shuntov (1998) estimated the Pacific wintering population size at ≤100,000 individuals. Most one-year old subadults remain on the wintering grounds for their first (northern) summer and do not return to the breeding grounds.

Conservation Concerns and Actions

The propensity of Sabine's Gulls to follow fishing vessels on the wintering grounds has the potential for interactions with commercial fisheries. This interaction is poorly understood and needs further investigation. If the Sabine's diet is supplemented by waste discarded by fisheries, interacting could be positive. However, if feeding birds are caught in fishing gear, the result could be detrimental.

Hunting and egging of Sabine's Gulls continues today in Alaska. Subsistence harvest was estimated at approximately 58 adults and 3,305 eggs per year between the mid-1990s and 2000. Impacts on the population are not known.

Few data are available on disturbance at nest sites. However, in northeastern Greenland, productivity was strongly, negatively affected by human disturbance. Results were abandonment of nests or prevention from breeding.

Relationships between Sabine's Gulls and Arctic Terns on the nesting grounds are not well understood. Further research could lend insight into the nature of this association (e.g. protection by a more aggressive species, mutual defense, shared habitat requirements).

Recommended Management Actions

- Monitor Sabine's Gulls in Alaska.
- Complete a nesting inventory and measure productivity.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use.
- Evaluate disturbance at nesting sites.
- Investigate the nesting relationship between Sabine's Gulls and Arctic Terns.
- Determine the extent of overlap and interactions with commercial fisheries.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503 Telephone
(907) 768-3444

References

Armstrong 1995; Day *et al.* 2001; Environment Canada Website (2005); IUCN Internet Website; Kushlan *et al.* 2002; Larned *et al.* 2005; Platte and Stehn 2005; Shuntov 1998; U.S. Fish and Wildlife Service Internet Website(2005).

Full credit for the information in this document is given to the above references.

USFWS

BLACK-LEGGED KITTIWAKE *Rissa tridactyla*

Conservation Status

ALASKA: Moderate **N. AMERICAN: Not Currently At Risk** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Sept	1-3	25-27 d	34-58 d	cliff ledge	dip, surface-seize, plunge dive	fish, marine invertebrates

Life History and Distribution

This small gull usually has just three functional toes, hence its Latin name *tridactyla*. The common name, kittiwake, comes from the sound of its call. While the name "black-legged," is quite apt, in a few rare individuals, the legs are orange or red.

Adult Black-legged Kittiwakes *(Rissa tridactyla)* have a white head, body, and tail. The upperwings and back are pearl gray and the wingtips, feet and legs look like they have been dipped in jet-black ink. The plumage is offset with a bright, greenish-yellow bill and orange inside the mouth. In breeding condition, adults also develop a reddish-orange ring around the eye which accents the dark iris. Outside the breeding season, adults have a dark gray smudge across the back of the neck and an even darker spot over the ear area. Males and females look alike.

The genus *Rissa* includes the Red-legged Kittiwake (*Rissa brevirostris)* which shares the solid black wingtips and greenish-yellow bill. It is distinguished from the more abundant Black-legged Kittiwake by a darker mantle, shorter bill, and darker color under the primary feathers.

Black-legged Kittiwakes nest on narrow cliff ledges on offshore islands or inaccessible areas of coastal mainlands. Often, the ledges are barely wide enough to fit a nest and birds; the adult and chicks must sit on the nest facing the cliff with their tails hanging off the edge. Nests are composed of seaweed, grass, feathers, and mud to cement them together. Kittiwakes are colonial nesters and colonies may vary from a few nests to many thousands. Frequently, nests are so close together that they are literally touching.

Two subspecies of the Black-legged Kittiwake are recognized: the Pacific subspecies *(Rissa tridactyla pollicaris)* breeds along the coasts of northeastern Siberia, Kamchatka, the Sea of Okhotsk, the Kurile Islands, and throughout the Bering Sea as far as mainland Alaska. The Atlantic subspecies (*Rissa tridactyla tridactyla*) breeds along the coasts of northern and central arctic Canada, Greenland, Iceland, western and northern Europe, and the Russian Arctic. It is difficult to distinguish between the two subspecies because of overlap in range and morphology.

In Alaska, Black-legged Kittiwakes nest from Point Hope on the northwest coast; south on islands and the mainland coast to the southern Bering Sea; throughout the Aleutian Islands to the westernmost end; and east throughout southcoastal Alaska, Prince William Sound, the Gulf of Alaska, and into Southeast Alaska.

USFWS Max Kauffman

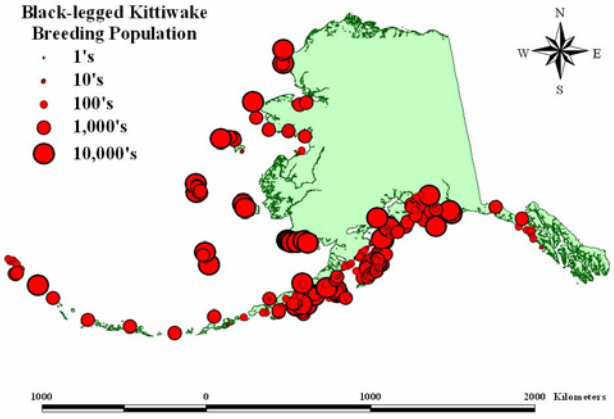
Even in winter, Black-legged Kittiwakes are rarely seen very far inland. After the breeding season, they prefer outer ocean shelves and deep water habitats. This species can be found throughout the ice-free areas of their summer range and as far south as southern California and Mexico.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	U	U	U	U
Southcoastal *	C	C	C	U
Southwestern *	C	C	C	U
Central	-	-	+	-
Western *	C	C	C	-
Northern	R	C	C	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. © **Armstrong 1995.**

Reproductive success and population numbers of Black-legged Kittiwakes appear to be strongly influenced by food supply. Summer diets vary depending on the location of the breeding colony. In Alaska, the diet is mostly fish including Pacific herring (*Clupea harengus)*, sandlance (*Ammodytes hexapteus)*, capelin *(Mallotus villosus)*, and walleye pollock (*Theragra chalcogramma)*. In the Aleutian Islands and Bering and Chukchi Seas, the diet also includes greenling *(Hexagrammidae* family*)* and zooplankton. Food is obtained by dipping or seizing the prey from the sea surface or sometimes plunge diving. Black-legged Kittiwakes are important in mixed-species



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U.S. Fish and Wildlife Service, Anchorage, Alaska.

feeding flocks and often feed with murres, puffins, terns, and cormorants. Feeding occurs primarily during the day, but birds sometimes forage at night. During the breeding season, Black-legged Kittiwakes stay near the coast to feed. Generally, they do not fly as far in search of food as Red-legged Kittiwakes, but may travel up to 60 miles from the breeding colony.

Population Estimates and Trends

The Pacific subspecies of the Black-legged Kittiwake has a breeding population of about 2.6 million individuals at colonies in the North Pacific and adjacent seas. In Alaska, more than 371 colony sites have been identified with a population of ~ 1,322,000 individuals. Most colonies have fewer than 5,000 birds, but a few larger colonies support > 30,000 individuals. The larger colonies in Alaska are: St. Matthew, Hall, Little Diomede, and St. George islands, Delarof Harbor in the Shumagin Islands, and Cape Newenham in Bristol Bay. Middleton Island, in the northern Gulf of Alaska, formerly supported about 160,000 individuals, but has declined to fewer than 20,000 since 1980 (-7.5% per annum).

There is evidence of population declines in some additional colonies in Alaska, while other monitored colonies appear to be increasing or stable. Since the 1970s, significant negative population trends have occurred at St. Paul Island (-4.0% per annum) and Chowiet Island in the Semidi islands (-1.9%). Black-legged Kittiwakes at Cape Peirce in Bristol Bay have also declined (-6.4%) since the 1990s. Some colonies have had significant increases since the 1970s. The Buldir Island colony in the Aleutian Islands increased by +6.6% per annum, and colonies in Prince William Sound have increased by +1.6%. The other 13 monitored colonies in Alaska exhibited no significant population changes.

Conservation Concerns and Actions

Black-legged Kittiwake colonies are abundant in Alaska and relatively easy to observe, so they have been studied more than other seabird species. However, causes for persistent breeding failure at some colonies remain ambiguous.

There is some evidence that suggests that kittiwake productivity is limited primarily by insufficient food availability at the surface during the breeding season. Scarcity of food may be exacerbated by additional predation. Nests are more likely to be unattended and more vulnerable to predators as adults spend more time in search of food. Gulls *(Larus spp.)*, raptors, ravens *(Corvus corax)*, and crows *(Corvus brachyrhynchos)* prey heavily on Black-legged Kittiwake eggs and chicks at some Alaskan colonies.

Because Black-legged Kittiwakes are surface feeders, they do not seem to be as directly impacted by oil pollution as some other seabirds. However, large spills such as the 1989 *Exxon Valdez* oil spill in Prince William Sound may cause substantial mortality. Thousands of Black-legged Kittiwakes were killed in that spill. The species may serve as a potential indicator of indirect effects of oil spills such as changes in the marine food chain.

An additional human activity which directly involves kittiwakes is subsistence hunting and egging. Some hunting and egging continue today by Alaskan indigenous peoples. Between 1995 and 2000, approximately 423 adult Black-legged Kittiwakes and 39 eggs were taken annually. Effects on the populations are not directly known, but current harvests are not thought to cause severe impacts.

Recommended Management Actions

- Maintain 2004 population levels of Black-legged Kittiwakes in Alaska.
- Continue current levels or increase monitoring at index locations on the current schedule of once every one to five years.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Black-legged Kittiwake eggs
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use of Black-legged Kittiwakes.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; Baird 1994; Dragoo *et al.* In Press; Hatch *et al.* 1993; IUCN Internet Website (2005); Kushlan *et al.* 2002; Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005).

Full credit for the information in this document is given to the above references.

RED-LEGGED KITTIWAKE *Rissa brevirostris*

Conservation Status

ALASKA: Highly Imperiled **N. AMERICAN: High Concern** **GLOBAL: Vulnerable**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Sep	1-3	23-32 d	38-48 d	cliff ledge	pursuit plunge, surface dip	fish, invertebrates, zooplankton

Life History and Distribution

The Red-legged Kittiwake *(Rissa brevirostris)* is a small gull that breeds at only five to six locations in the world, all in the Bering Sea. They nest on ledges of vertical sea cliffs up to 900 feet high with other species of seabirds, including their more common relative, the Black-legged Kittiwake (*Rissa tridactyla).*

Adult Red-legged Kittiwakes are mostly white, but the upper surface of the wings and back are dark gray. Wings are tipped with black, the legs and feet are fire engine-red, and the bill is yellow. This species can be distinguished from Black-legged Kittiwakes by the leg color, a shorter and more curved bill, and darker back and upper wing color. Also, the forehead is steeper giving them a round-shaped head and distinctive profile. Both males and females look alike.

Small fish found in surface waters are the primary diet of Red-legged Kittiwakes. Sometimes they form large feeding groups called "melees" with Black-legged Kittiwakes. Prey are captured by plunging into the water or dipping on the surface. Both species feed day or night, but the Red-legged Kittiwake has a larger eye, making it better adapted to night feeding. Parents also trade nest duties, mostly at night.

In Alaska, they nest on St. George, St. Paul, and the Otter islands in the Pribilof Islands, and on Bogoslof and Buldir islands in the Aleutian Island chain. The St. George colony in Alaska contains over 80% of the world's population. The second largest breeding colony is in Russia on the Commander Islands.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern	-	-	-	-
Southcoastal	-	+	+	R
Southwestern *	U	C	U	U
Central	-	+	-	-
Western	-	R	+	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

USFWS

During the breeding season this species is usually found over deep water from 600 to 6,000 feet deep. Very little is known about the migration of Red-legged Kittiwakes away from breeding areas. The winter range is thought to be the North Pacific Ocean where it is believed they feed in even deeper water.

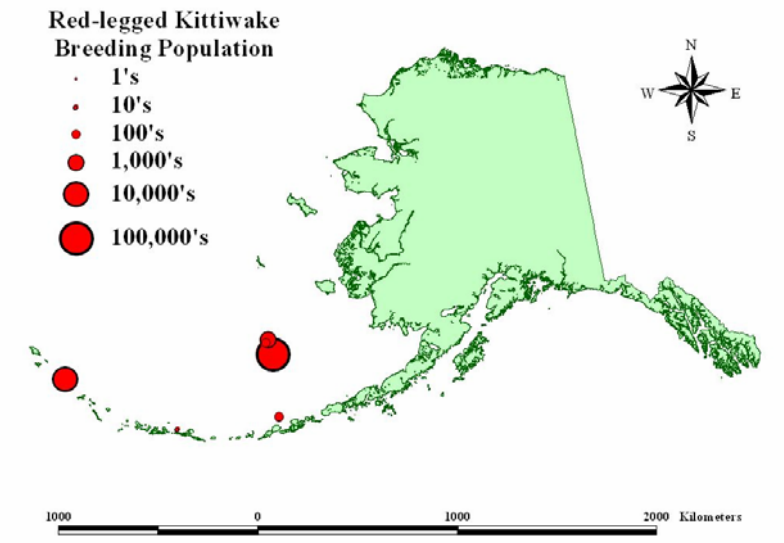
Population Estimates and Trends

The Alaskan breeding population is estimated at 209,000 birds. In the Pribilof Islands, Red-legged Kittiwakes declined significantly on St. Paul Island (-2.6% per annum) between 1976-2002, but exhibited no trend on St. George Island. In 1996, a new Red-legged Kittiwake colony was established on Koniuji Island in the Shumagin Islands, but declined -15.6% per annum and was almost completely abandoned in 2003. This species exhibited a positive trend (+3.2% per annum) on Buldir Island between 1974 and 2003.

The Russian breeding population is estimated at 4,000-5,000 birds and numbers may also be increasing there.

Conservation Concerns and Activities

Reasons for large population fluctuations in the Pribilof Islands are not well understood. Possibly, fluctuations are due to irregular food supplies near



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

colonies, but the causes of the food variability are unknown.

Little is known about the species away from breeding sites, so other unknown factors may also have influenced its population trends.

Oil pollution from spills and chronic oiling from ship bilge dumping are other ongoing concerns for the species. An oil spill near St. George could have a tremendous impact on the majority of the world's breeding population.

The potential introduction of rats *(Rattus spp.)* from ships could also pose a serious threat to Red-legged Kittiwakes.

Native subsistence hunting and egging do occur on the Pribilof Islands, but effects on the population are unknown.

Recommended Management Actions

- Maintain an Alaska-wide population of at least 200,000 individuals.
- Maintain a population monitoring program.
- Develop and utilize an index of abundance at key locations.
- Measure irregularity in the food supply.
- Determine wintering locations.
- Evaluate disturbance at key colonies.
- Work with state and federal agencies and fisheries councils to minimize the negative impacts of fisheries interactions.
    - Review plans for emerging fisheries to identify potential problems and solutions.
- Reduce disturbance around colonies through the use of buffer zones.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Red-legged Kittiwake eggs.
- Continue a rat prevention program in the Pribilof Islands using outreach and education.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use of Red-legged Kittiwakes.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 786-3444

References

Armstrong 1995; Barton and Lindquist 2003; Byrd and Williams 1993a; Byrd *et al.* 1997; Dragoo *et al.* In Press; Dragoo *et al.*2001; IUCN Internet Website (2005); Kushlan *et al.* 2002; Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005); Williams and Byrd 2001.

Full credit for the information in this document is given to the above references.

CASPIAN TERN *Hydroprogne caspia*

Conservation Status

ALASKA: None **N. AMERICAN: Low Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Aug	1-4	~ 27 d	~ 35 d	ground, surface scrape	plunge dive, piracy	fish

Life History and Distribution

Caspian Terns *(Hydroprogne caspia)* are the largest terns in the world with a wing span of nearly four and a half feet. A long, stout, red bill with a trace of black on the tip and a black cap with a slight crest at the back are characteristic of this robust tern. The face, neck, breast, and belly are white; the back and upper surface of the wings are pale gray; and the underside of the wings are light colored and tipped with smoky-gray. Black feet and legs and a short, white, notched tail add the finishing touches to the impressive appearance. Males and females look alike.

In 2006, the American Ornithologists' Union reclassified this species based on genetic sequence comparisons. Previously, it was in the genus *Sterna;* now it is the only tern in the genus *Hydroprogne*.

Nesting usually occurs on flat, natural and artificial islands with sand and shell substrate and very little vegetation. Colony size varies widely, but generally ranges from tens to hundreds of pairs. Nest sites often adjoin those of other birds, especially gulls and other tern species. Numerous habitat types are used for nesting; coastal estuaries, saltwater marshes, barrier islands, and freshwater beaches and islands. One to four eggs are laid in a depression (scrape) on the ground which may be lined with grasses, seaweed, or mosses. Fish comprise the bulk of the diet and are captured by plunge diving.

Colonies of Caspian Terns are found throughout the world on every continent except South America and Antarctica. The North American breeding population consists of wide-spread locations in six regions; the Pacific and Atlantic coasts, central Canada, west-central interior of the U.S., Great Lakes, and the Gulf Coast.

In Alaska, Caspian Terns are rare. They were first detected in 1981 near Ketchikan and Sitka in Southeast Alaska. The first nesting record for Alaska was in 1996 on Neragon Island, north of Cape Romanzof in the Bering Sea. Three nests were discovered among a dispersed colony of Glaucous Gulls *(Larus hyperboreus)*. Three Caspian Tern nests were again found on Neragon Island in 1997. The first documented breeding record for Southeast Alaska occurred in 2000. A breeding colony of approximately 16 adults and at least four nests with eggs were located on a rocky island at Twin Glacier Lake, Taku Inlet. In July 2005, four to five pairs of Caspian Terns attempted to nest near the mouth of the Kashunuk River

USFWS Lee Karney

(central Yukon-Kuskokwim Delta, ~ 60 miles south of Neragon Island). At least one bird fledged from these efforts (Bob Gill, USGS, unpubl. data).

In 2006, two new nesting areas were recorded for Caspian Terns in Alaska. Twenty-five pairs were observed nesting at Icy Bay in Southeast Alaska (Michelle Kissling, USFWS, pers. comm.) and ~ 116 pairs were found nesting on the Kokinhenik Bar at the mouth of the Copper River Delta, east of Prince William Sound (Tyee, Teal, and Trae Lohse and Aaron Lang, Cordova, AK, pers. comm.).

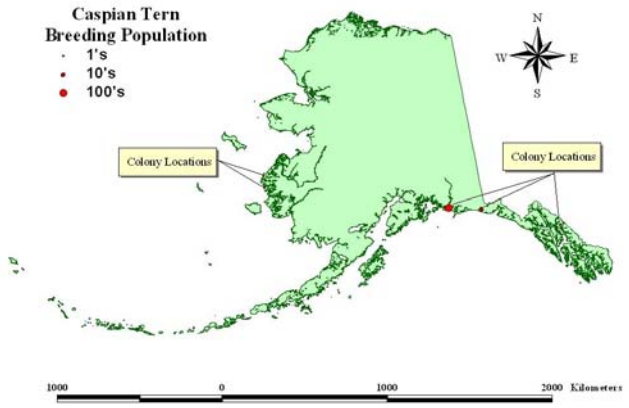
Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	R	R	R	-
Southcoastal *	R	R	R	-
Southwestern	-	-	-	-
Central	-	+	-	-
Western *	+	+	-	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. © **Armstrong 1995.**

North American breeding birds winter along the Pacific Coast from southern California to Costa Rica; along the Atlantic and Gulf Coasts from southernmost North Carolina; south around the Florida Peninsula; west to southern Texas; and south along the coast of Mexico to at least northern Honduras. Numbers of birds wintering in North America are unknown. Wintering also occurs locally (rare) in the West Indies, Panama, and northern South America.

Breeding also occurs in Eurasia, the southwest Pacific,



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

northwestern and southern Africa, and interior Africa at Lake Rudolf in Kenya. Wintering of these populations occurs in Africa, the Mediterranean, Persian Gulf, and Indian Ocean.

Population Estimates and Trends

The North American breeding population is the largest of the continental populations and is estimated at 33,000-35,000 pairs. Since the 1980s, the Pacific Coast population has more than doubled to about 12,900 pairs in 2000. Nesting in the Columbia River estuary was first documented in 1984 and the population increased rapidly between 1986 and 1991. The estuary now holds the largest breeding colony in North America and in the world at East Sand Island, Oregon (9,200 pairs in 2006). A concentration of this magnitude at one location (~65% of the U.S. Pacific Coast population) is very unusual.

Distribution of breeding Caspian Terns among Pacific coastal areas has changed considerably over the last two decades. In the early 1980s, the largest breeding concentrations were along the coast of Washington State and in San Francisco Bay. By 2006, approximately 65% of breeders were nesting in Oregon versus 4% during the late 1970s. During the last 25 years, the proportion of this population nesting at inland sites versus coastal sites has remained constant (18% and 82% respectively), but before 1980 many terns shifted from nesting in small inland colonies at natural sites to large coastal colonies at man-made sites. Although it is too early to know if it represents a consistent trend, the breeding range of the Pacific Coast population has recently expanded northward into Alaska and farther south into Mexico.

Dramatic changes in distribution of the Pacific Coast population may have been facilitated by its tendency to exhibit low philopatry (propensity of a migrating bird to return to a specific location in order to breed or feed) relative to other seabirds. Caspian Terns often nest in habitats that could be susceptible to flooding and erosion, invasion by early seral stage plants, or degradation of nearby shallow-water foraging areas. The increase in the Columbia River estuary population is probably the result of a unique abundance of stable nesting and foraging resources. Development of dredge material islands offered stable nesting sites and the man-made islands were located close to abundant supplies of hatchery reared salmon smolts.

Population numbers outside of North America are: Finland, Sweden, and Estonia (1,850-1,950 pairs, 1984); Afro-tropical region, mostly West Africa (a few thousand pairs, 1992); southern Africa (~500 pairs, 1992); New Zealand (3,500-5,000 pairs, 1985); and Australia (many thousands, 1996).

Conservation Concerns and Actions

Dramatic increases in the number of Caspian Terns nesting in the Columbia River estuary has led to concerns about their potential impact on fish stocks of conservation concern (juvenile salmonids of the *Oncorhynchus* species). A federal Environmental Impact Statement (2005) was prepared to explore possible management of Caspian Terns to reduce predation on juvenile salmonids in the estuary.

The unprecedented concentration of terns nesting at one site in the Columbia River estuary could negatively impact the entire Pacific Coast population should a major natural or anthropogenic catastrophe (e.g. oil spill, introduced predators, disease) occur at this one location.

Additional conservation concerns for this species are habitat loss and degradation of nesting sites, and disturbance at nesting colonies.

Recommended Management Actions

- Determine the Alaskan breeding population and the trend in population size.
    - Reconfirm nesting at all five previously verified locations in the State of Alaska.
    - Create a Caspian Tern "WATCH" enlisting the public, state, other federal agencies, and USFWS biologists involved in monitoring and surveying of other species to report sightings of Caspian Terns, especially nesting birds, in Alaska.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 786-3444

References

American Ornithologists' Union 2006; Armstrong 1995; Cairns 1992; Cuthbert 1988; Cuthbert 1981; Cuthbert and Wires 1999; Gill and Mewaldt 1983; Isleib and Kessel 1973; IUCN Internet Website (2005); Johnson 2003; McCaffery *et al.* 1997; Monaghan 1996; Roby *et al.* 2002; Shuford and Craig 2002; Suryan *et al.* 2004; U.S. Fish and Wildlife Service 2006, 2005b; 2005c; Wires and Cuthbert 2000.

Full credit for the information in this document is given to the above references

ARCTIC TERN *Sterna paradisaea*

Conservation Status

ALASKA: High **N. AMERICAN: High Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Aug	1-3	21-23 d	21-24 d	ground scrape	pursuit plunge, dip	fish, crustaceans, insects

Life History and Distribution

The Arctic Tern *(Sterna paradisaea)* is an Arctic to Antarctic traveler with annual migrations of up to 24,000 miles round trip. On its wintering grounds, this Olympic flyer benefits from a "second summer" giving it more hours of daylight than any other bird.

In addition to excellent flying abilities, this slender tern is also known for its elegant breeding plumage. The bill, feet, and legs are blood-red. The upper wings and back are light gray, contrasting with a jet-black cap. The tail is long and deeply forked. Arctic Terns often mix on coastal breeding grounds with Aleutian Terns (*Sterna aleutica)*. They are similar in appearance and both have a black cap, but the Aleutian Tern has a white forehead, black bill, feet and legs, and the wings are a darker gray.

Nests of the Arctic Tern are commonly made near fresh or salt water in open, usually treeless environments. The nest is very difficult to spot unless it contains eggs; it is little more than a shallow depression scraped in the ground. Intruders in nesting areas are often met with aggressive dives and pecks on the back or head.

Diet varies from place to place, but fish is the primary food given to chicks. Prey is captured by plunge-diving or dipping. Occasionally insects are taken on the wing.

The breeding range is circumpolar, from the shores of the Arctic Ocean to the northern tip of Greenland and as far south as Cape Cod, Massachusetts. It also breeds in Europe and Asia. In the far north, the species nests widely inland.

In Alaska, in addition to its' wide breeding distribution on the arctic coastal plain of the Beaufort Sea, it nests along the coasts of the Chukchi and Bering Seas and on St. Lawrence Island. There are also breeding sites in the western Aleutian Islands and many sites throughout the Gulf of Alaska, some as far south as Southeast Alaska.

It is not known specifically where Arctic Terns from North America spend the winter, but birds from the entire northern hemisphere are thought to intermingle around Antarctica. Some birds also winter in southern Africa, southern Australia, and New Zealand.

USGS Bob Gill

Alaska Seasonal Distribution

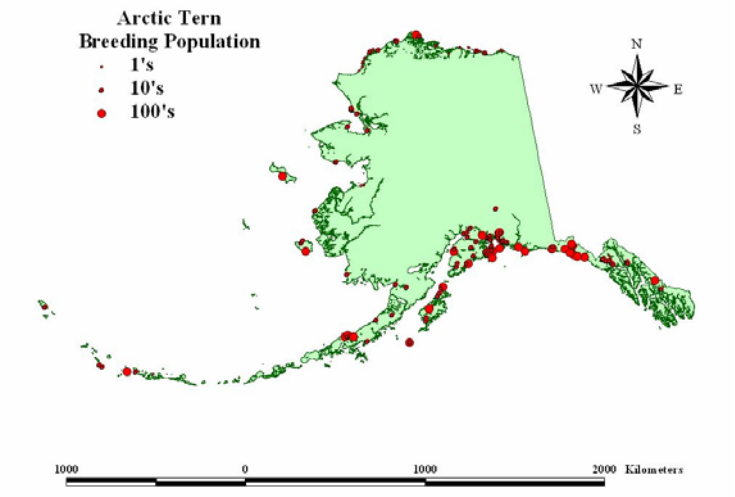
AK Region	Sp	S	F	W
Southeastern *	C	C	C	-
Southcoastal *	C	C	C	-
Southwestern *	C	U	C	-
Central *	U	U	U	-
Western *	C	C	C	-
Northern *	U	U	U	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. © **Armstrong 1995.**

Population Estimates and Trends

No population estimates are available for most of the species' range, but worldwide numbers of Arctic Terns may be 1-2 million breeding pairs. In Alaska, there may be several hundred thousand, most nesting inland. However, inland nesting is widespread and poorly documented. The U.S. Fish and Wildlife Service Beringian Seabird Colony Catalog lists 218 Alaskan coastal colonies with a breeding population of approximately 11,000 birds.

There are no data for general population trends in Canada, Alaska, or on the Atlantic Coast, but declines have been reported within each of these areas. In the Gulf of Alaska, both coastal colony counts on Kodiak Island and surveys at sea in Prince William Sound indicated declines of more than 90%. Except for the effects of the



Seabird breeding population maps created from data (coastal only) provided by the Beringian Seabird Colony Catalog Database. U.S. Fish and Wildlife Service, Anchorage, Alaska.

1964 earthquake in Alaska, factors causing the population decline and preventing population recovery are unknown.

Conservation Concerns and Activities

Since Arctic Terns are long-lived, far-traveling, and spend part of their year at each pole, they may contribute valuable insights into numerous scientific questions about birds (e.g. daylight exposure and migration, accumulated environmental impacts, and abstention from breeding and movement as responses to changes in food supplies). However, the Alaskan population is not monitored and there is a lack of knowledge about most aspects of their population. Very little is known about nonbreeders in the Antarctic and most of the mortality occurs during this part of the yearly cycle. Therefore, we need to begin with a better understanding of the species distribution, numbers, and trends throughout its range.

Several factors could contribute to population declines of Arctic Terns. This species has been documented to be especially sensitive to reductions in food availability sometimes causing complete breeding failure and possibly decreases in adult survival. Causes for food variability and shortages and the implications for Arctic Terns have not been critically examined.

Arctic Terns are also known to be susceptible to human disturbance at nesting and roosting sites, especially if dogs accompany the humans. The disturbance can prevent occupation of sites, promote desertions, and cause loss of eggs or chicks. In Alaska, reindeer herding caused abandonment of sites and a helicopter landing within a colony caused complete abandonment.

Shooting, egging, and trapping occur in numerous areas across the terns' breeding range and may occur on the migration route on the west coast of Africa. In Alaska, subsistence harvest was estimated at approximately 80 adults and 2,500 eggs per year between the early 1990s and 2000. These are minimal estimates and the full extent of the harvest and the impacts on the population are not known.

Arctic Terns are also vulnerable to predation, which can limit colony sites and strongly affect nest dispersion. Over much of the Arctic Terns' range the main mammalian predator is the arctic fox (*Alopex lagopus).* Norway rats *(Rattus norvegicus)* are also known to eat and cache surplus eggs. Gulls *(Larus spp.)* and birds of prey also eat both chicks and eggs and are a concern at Alaskan colonies.

Since Arctic Terns are surface feeders, they would likely be less vulnerable to oil spills than diving birds, but there is no information on response to oil slicks.

Recommended Management Actions

- Restore and maintain Alaskan Arctic Tern coastal populations of at least 30,000 individuals.
- Establish a monitoring program.
- Develop and utilize an index of abundance at key locations.
- Complete a nesting inventory.
- Measure productivity.
- Determine wintering locations and foraging habits.
- Evaluate human disturbance at key colonies.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use of Arctic Terns.
- Reduce predation of Arctic Terns with continued fox removal and rat prevention programs.
- Determine the extent of predation by gulls and the effect on populations.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Arctic Tern eggs.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; Hatch 2002; IUCN Internet Website (2005); Kushlan *et al.* 2002; U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005).

Full credit for the information in this document is given to the above references.

ALEUTIAN TERN *Onychoprion aleutica*

Conservation Status

ALASKA: Moderate **N. AMERICAN: High Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Aug	1-3	20-29 d	25-31 d	depression in vegetation	pursuit high dive	fish, invertebrates, insects

Life History and Distribution

The Aleutian Tern *(Onychoprion) aleutica* breeds only in Alaska and eastern Siberia. It nests in coastal colonies that are distributed over a wide range. In Alaska, it frequently associates with Arctic Terns *(Sterna paradisaea)* on the breeding grounds. The two species are very similar in appearance and may be difficult to differentiate. Both have a black cap, but the Aleutian has a white forehead. During the breeding season, the Arctic Tern has a bright red bill, feet and legs while the Aleutian's are black.

Until recently, the Aleutian Tern was placed in the large genus *Sterna* which included most terns. In 2006, the American Ornithologists' Union reclassified this species based on genetic sequence comparisons. It is now in the genus *Onychoprion* which includes three other "brown-backed" tern species.

Nesting occurs in a variety of habitats (e.g. islands, shrub-tundra, grass or sedge meadows, and freshwater and coastal marshes). The nest is generally a depression in short or matted vegetation and nests are widely scattered in the colony.

The primary diet consists of small fish which are caught in a variety of ways. The tern may search for fish from the air and swoop down to pick them from the surface, hover and dive to shallow depths, or sit on the surface and dip. They are skilled fliers and can take insects out of the air while flying.

In Alaska, Aleutian Tern colonies are located along the coast of the Chukchi Sea as far north as Kasegaluk Lagoon, on the Seward Peninsula, the Yukon-Kuskokwim River delta, and along the Alaska Peninsula. They are also found in widely scattered locations in the Aleutian Islands, Kodiak Archipelago, Kenai Peninsula, Copper River delta, and along the Gulf of Alaska as far east as Dry Bay. Colonies often shift from year to year and nesting sites in the northern Bering and Chukchi Seas are not occupied every year.

Breeding colonies located in Siberia are on Sakhalin Island, the Kamchatka Peninsula, in the Sea of Okhotsk, and in the Bering Sea at Olyutorskiy Bay and Karagin Island.

The winter range of the Aleutian Tern is mostly unknown. However, observations of this species in the coastal waters around Hong Kong in spring and fall, and Singapore and the Indonesian islands of Karimun and Bintan between October and April, indicate that at least part of the population migrates through and winters in these areas. Observations during December 1997 suggest that the coastal waters of Java, Bali, and Sulawesi may also be part of the winter range.

USGS Bob Gill

Alaska Seasonal Distribution

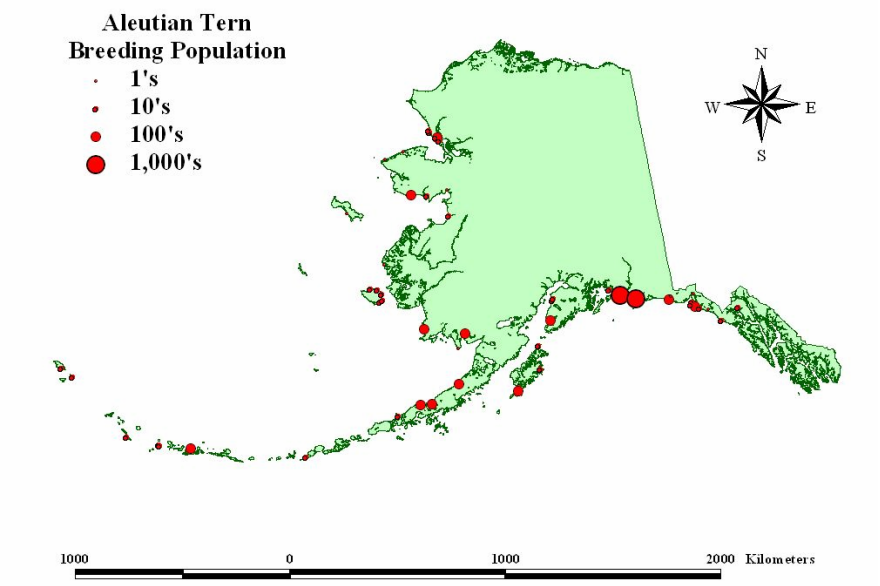
AK Region	Sp	S	F	W
Southeastern	+	+	-	-
Southcoastal *	U	U	U	-
Southwestern *	U	U	U	-
Central	-	-	-	-
Western *	U	U	U	-
Northern *	-	+	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

The world population is between 17,000-20,000 individuals. The breeding population estimate for Alaska is 9,500 birds.

On the south and east side of Kodiak Island, Alaska, Aleutian Terns have declined from 1,559 individuals in the late 1970s to two birds in 2002. Because terns are known to shift nesting locations between years, trends are difficult to evaluate. Some colonies could have relocated and birds may be nesting inland. An extensive survey must be conducted to confidently interpret a true decline. Nonetheless, the data are consistent with surveys of tern colonies in Prince William Sound, where population



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U.S. Fish and Wildlife Service, Anchorage, Alaska.

declines have also been documented based on historical data.

Neither the Alaskan nor Siberian populations are well monitored. However, both populations are thought to be declining.

Conservation Concerns and Actions

Primary causes of mortality and factors which regulate populations are predation, inclement weather during chick rearing, and human disturbance at nesting sites.

Eggs and chicks are reportedly preyed on by introduced species such as arctic *(Alopex lagopus)* and red *(Vulpes vulpes)* foxes, Norway rats *(Rattus norvegicus)*, and domestic dogs. Natural predators include mink *(Mustela vison)*, bears *(Ursus spp.)*, and a wide variety of other bird species. Some chicks may also be killed by Arctic Terns.

There is limited information regarding response to predation, but Aleutian Terns are not as aggressive as Arctic Terns and are very sensitive to disturbance at colonies. Individuals frequently hover high over the colony if disturbed by humans. They will dive at avian predators, but often rely on the more aggressive Arctic Terns to chase intruders away.

Recommended Management Actions

- Maintain an Alaska-wide population of at least 10,000 individuals.
- Establish a monitoring program.
- Survey populations at key index locations (e.g. Port Moller Spit, Yakutat Bay, Icy Bay, Safety Lagoon, and Amchitka).
- Determine wintering locations.
- Complete a nesting inventory.
- Measure productivity.
- Determine the extent of predation and the effect on populations.
    - Continue efforts to reduce introduced predators such as foxes and rats.
    - Control domestic and feral dogs and cats near nesting colonies.
    - Determine the extent of predation by Arctic Terns, gull species, and birds of prey (especially Bald Eagles (*Haliaeetus leucocephalus)* and Peregrine Falcons *(Falco peregrinus pealei*).
- Assess and regulate human presence at nesting sites.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Aleutian Tern eggs.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 786-3444

References

Agler and Kendall 1997; American Ornithologists' Union 2006; Armstrong 1995; Hill and Bishop 1999; IUCN Internet Website (2005); Kushlan *et al.* 2002; North 1997; Stephensen and Irons 2003; Stephensen *et al.* 2002; U.S. Fish and Wildlife Service 2006, 2002.

Full credit for the information in this document is given to the above references.

DOVEKIE *Alle alle*

Conservation Status

ALASKA: None **N. AMERICAN: Moderate Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incub	Fledge	Nest	Feeding Behavior	Diet
June-Aug	1	28-31 d	26-30 d	crevice	surface dive	crustaceans, fish

Distribution

This little bird, often called the Sea Dove or Little Auk, is the smallest and most abundant alcid in the North Atlantic Ocean. It breeds in high-arctic regions, particularly Greenland, but there are also a few small breeding colonies in Alaska and northeastern Canada.

Dovekies *(Alle alle)* are the only completely planktivorous alcid in the Atlantic and have several adaptations for plankton feeding. They have a small, stubby bill that is wide at the base; a soft, agile tongue; tooth-like projections on the roof of their mouths; and a throat pouch for transport of food to their young. To gather the plankton, the Dovekie dives from the surface of the water and propels itself as deep as possible. As the Dovekie moves back towards the surface, it gulps in as much water as can be held, taking plankton in with it. The throat is expandable which allows the bird to take in large amounts of food. The plankton concentrates in cold, surface waters in moderate to heavy offshore pack ice, over banks at sea, and at upwellings and oceanographic fronts.

In summer, the Dovekie has a jet-black head, neck, breast and upper parts, and white underparts. In winter, its breast, neck and the area behind its face change to white. The body shape is stout and sometimes the birds appear neckless. They fly with rapid, insect-like wingbeats.

Dovekies are social birds and tend to nest and fly in large groups, bunched tightly together. Females lay one pale, bluish egg in a rock crevice, among cliff rubble, or occasionally in a burrow.

This species breeds throughout the far north Atlantic, as far east as Siberia, with the majority of their huge breeding colonies located on western Greenland. Small numbers possibly breed on Little Diomede and St. Lawrence islands in the Bering Strait; they have also been seen near and possibly breeding on King Island in the Bering Strait, and St. Matthew Island and the Pribilof Islands in the Bering Sea. The only known breeding colony in the Canadian Arctic is in Home Bay on east Baffin Island (<1,000 pairs). Breeding may also occur on Ellesmere Island, Canada.

In the Atlantic, they winter in the Labrador Sea, Grand Banks, and off the coast of Newfoundland. They can reach as far south as the Scotian Shelf, the Gulf of Maine, and the northern and eastern edges of Georges Bank. A few venture south to Long Island and as far south as coastal Virginia.

USFWS Mark Rauzon

They are found casually in winter off the coast of Alaska and western Canada. Periodically, large groups or "wrecks" appear along the coast of the northeastern United States and occasionally at inland locations. The "wrecks" may be due to changes in Dovekie food supply, strong, easterly winter winds, or changes in overall sizes of Dovekie populations.

Two subspecies are recognized based on size. To date, only one is known to occur in North America. It is *Alle alle alle.* It is smaller in all measurements and lighter in mass than the other subspecies.

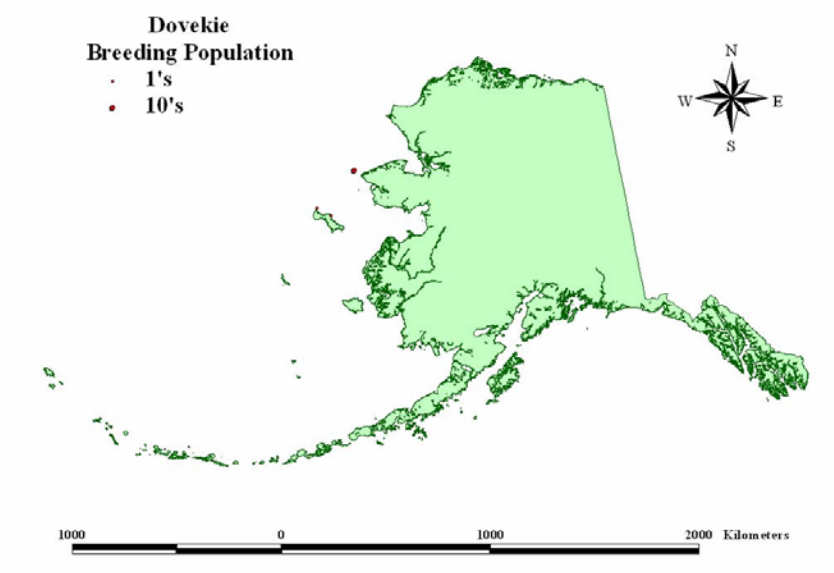
Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern	-	-	-	-
Southcoastal	-	-	-	-
Southwestern	+	+	+	+
Central	-	-	-	-
Western *	R	R	R	-
Northern	-	+	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. © **Armstrong 1995.**

Population Estimates and Trends

World population estimates range from >30 million to 80-100 million individuals. The breeding population of Thule, northwest Greenland, is among the largest and densest breeding aggregations of all auks in the world.



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

Traditionally, this population has been estimated at about 30 million birds. Fewer than 1,000 pairs are estimated to breed in North America with the majority breeding at Home Bay on Baffin Island, Canada. Probable breeders in Alaska are estimated at about 60 individuals.

Like many crevice nesting species, Dovekies are extremely difficult to census. Therefore, there are no reliable data on trends.

Conservation Concerns and Actions

The Dovekie is a dominant part of the marine birdlife of the northwestern Atlantic Ocean. Because of its abundance, passive nature, accessibility at nesting colonies, and predominance in inshore waters and along ice-edges, it has been easy for humans to exploit the species. Traditionally, it has played an important role in the food economies of the Inuit people in the Thule district in northwestern Greenland and of Newfoundlanders. Inuits also traditionally used the skins of Dovekies to make clothing. Today, it is no longer hunted in Newfoundland or Labrador, but is still hunted at large colonies in northwestern and eastern Greenland, where there is no closed season and no apparent bag limits for the species. In winter, it is also hunted extensively in southwestern Greenland and less so in northwestern Greenland. A limited commercial harvest also takes place in northwestern Greenland.

Dovekies are highly vulnerable to oiling and a significant source of mortality is oiling at sea. In eastern Canada, it is the second most common species found oiled on beaches. Systematic beached-bird surveys estimate that 60,000-80,000 Dovekies may be killed by oiling at sea each year.

The Dovekies' association with arctic waters, arctic prey, and sea ice could make them susceptible to changes in ocean temperatures and nutrient-rich currents due to global warming. This species could be a potentially useful indicator of some of the ecological effects of climate change. However, before that would be possible more studies are needed of demography, population biology, winter at-sea distributions, and the impacts of natural and human caused disturbance.

Recommended Management Actions

- Implement a systematic census of the Alaskan population.
- Determine Alaskan Dovekie breeding population numbers.
- Establish a regional monitoring program.
- Complete a nesting inventory.
- Measure productivity.
- Determine wintering locations.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; IUCN Internet Website (2005); Kushlan *et al.* 2002; Montevecchi and Stenhouse 2002; U.S. Fish and Wildlife Service 2006, 2002.

Full credit for the information in this document is given to the above references.

COMMON MURRE *Uria aalge*

Conservation Status

ALASKA: Low **N. AMERICAN: Moderate Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Aug	1	30-35 d	19-21 d	cliff ledge, bare rock	surface dive	fish, crustaceans, mollusks

Life History and Distribution

The Common Murre *(Uria aalge)* is one of the most numerous and most studied marine birds in the Northern Hemisphere. It is a large black and white seabird, with smallish wings which propel it during underwater dives in search of prey (mostly fish).

It is a highly social species and nests shoulder to shoulder, primarily on cliff ledges and slopes. Eggs are laid on bare rock. In addition to high nesting density, its unique breeding strategy includes; a high degree of egg laying synchrony, group colony departures, and simultaneous departure of chicks at just 3-4 weeks of age. The chicks are still unable to fly when they depart the colony and their remaining development takes place at sea in the company of their male parent.

In most of Alaska, Common Murres breed in mixed colonies with similar-looking Thick-billed Murres *(Uria lomvia)*. They can be distinguished by a longer, thinner bill which tapers to the tip and is always black (the bill of the Thick-billed Murre has a white stripe along the bottom edge of the upper bill). Both species have white breasts and brownish throats, but the white breast of the Common Murre meets the brown throat in a straight line, not a "V" like in the Thick-billed Murre.

In Alaska, Common Murres breed in Southeast Alaska, the Gulf of Alaska, on the Aleutian Islands and north to Pt. Hope. Areas of particular significance are St. George Island, Bird Rock, Shaiak Island, North Twin, Round and Hall islands, and Cape Lisburne.

In winter Common Murres are found at sea, south of the ice edge, and on little islands in the Pacific. They often form large rafts of up to 250,000 birds.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	C	C	C	C
Southcoastal *	C	C	C	C
Southwestern *	C	C	C	C
Central	-	-	-	+
Western *	C	C	C	C
Northern	-	+	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. © **Armstrong 1995.**

USFWS Lisa Sheffield

Population Estimates and Trends

The estimated world breeding population is 13-20.7 million birds. In Alaska, where the breeding range overlaps extensively with that of Thick-billed Murres, it is difficult to identify and assign every individual to a species. As a result, population estimates in Alaska include a percentage of unidentified murres at all colonies censused. The Alaskan Common Murre population is approximately 2.8 million breeding birds at 230 colonies.

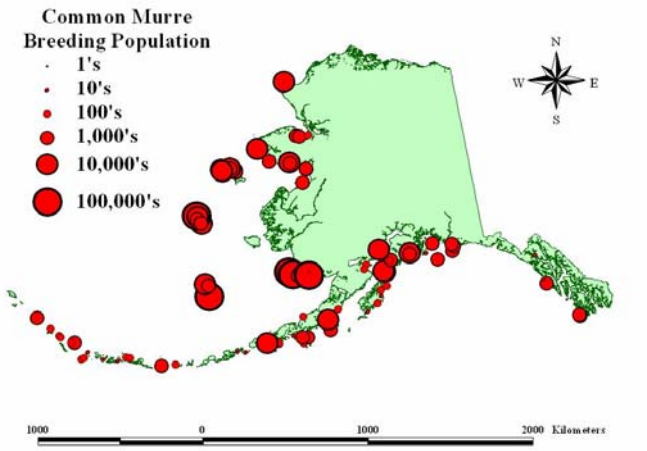
At sites where counts of murres are made from the water, it is especially difficult to differentiate the species. Common and Thick-billed Murres are often combined at these sites for population trend analysis. For sites where murres are not combined, significant negative trends were found for Common Murres on St. Paul Island in the Pribilof Islands (-3.6% per annum 1976-2002), Chisik/Duck islands in Cook Inlet (-9.0% per annum 1986-1999), and Cape Peirce in Bristol Bay (-4.5% per annum 1990-2003). Common Murres showed a significant positive trend (+7.1% per annum 1986-2000) on Gull Island in Kachemak Bay

Changes in sea surface temperatures seem to be associated with changes in murre population levels and oscillating patterns are typical of many, but not all Bering Sea and Aleutian Island colonies.

Conservation Concerns and Actions

Local murre populations can be significantly impacted by climate changes (changes in food availability) and numerous human activities.

Murres have high energetic (and thus, food) requirements which can put them in direct competition with commercial fisheries. An adult murre eats 10-30% of



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

its body mass daily and they continue to feed chicks for 1-2 months after they leave the nesting area. A principal food for Common Murres is pollock *(Theragra chalcogramma)*. This creates potential for conflict in the Bering Sea in Alaska where there is a huge pollock fishery. However, murres eat only juvenile Pollock; therefore, there is no direct conflict. In fact, too many adult pollock can result in high cannibalism of juveniles, so if more adult pollock are taken in the fisheries, it could result in more juvenile pollock available for murres.

In addition to direct competition, fisheries might affect seabird colonies in other ways such as boat disturbance, alteration of predator-prey relations among fish species, habitat disturbance, and fisheries bycatch and net entanglement. In Alaska, bycatch is monitored and recorded by the National Marine Fisheries Service, Alaska Marine Mammal Observer Program. Incidental mortality of Common Murres has been recorded in various types of commercial fisheries. Some murres are taken in trawl fisheries in Alaska, but the main source of incidental take is in gillnet fisheries. Over 70,000 Common and Thick-billed Murres nest within 60 miles of Kodiak Island. In 2002, the bycatch of Common Murres from the set gillnet fishery for Kodiak Island was estimated at 185 individuals. While these species comprised <1% of all colonial birds on Kodiak Island; they comprised 34% of the total bycatch. Other areas with recorded bycatch of Common Murres include; 183 Common Murres in 1999 in the Upper Cook Inlet salmon driftnet fishery, and 433 birds found dead or seriously injured in Prince William Sound salmon driftnets in 1991. These figures are extrapolated estimates from actual numbers of birds recovered in nets.

Other effects of human activities include hunting. In Alaska, murres and eggs are taken by Native subsistence hunters. Between the early 1990s and 2000, about 9,195 adult murres and almost 37,000 murre eggs were taken annually, with the majority of adult murres taken on St. Lawrence Island. The murres are not identified to species in the subsistence surveys and comprise both Common and Thick-billed Murres. Effects on the populations are not directly known, but current harvests are not thought to cause severe impacts.

Predation by introduced mammals, such as foxes, can also cause major reductions in colonies, delays in breeding, and impacts on reproductive success. During 1976, the presence of two red foxes (*Vulpes vulpes)* on Shaiak Island, in Bristol Bay, caused the loss of almost all eggs of 25,000 pairs of Common Murres.

Murres are very vulnerable to oiling at sea because they have a low reproductive rate, large populations, dense concentrations in coastal habitats, and form "rafts" (flocks) on the water. No North American coast where murres occur has been exempt from major kills due to oil spills during the past 50 years. The *Exxon Valdez* oil spill in 1989 in Prince William Sound, Alaska, was the largest murre kill yet, with an estimated mortality of 185,000 murres. Long-term beached bird surveys also indicate chronic oiling, often without a known source. This susceptibility to oiling is what drives much of the research on the species

Recommended Management Actions

- Continue the current level or increase monitoring of Common Murre populations in Alaska.
- Initiate additional introduced predator removal programs, continue the rat introduction prevention program, and begin a rat response program.
- Work with state and federal agencies and fisheries councils to better understand and minimize the negative impacts of fisheries interactions.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Common Murre eggs.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use of Common Murres.
- Reduce human disturbance at colonies.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 786-3444

References

Ainley 2002; Armstrong 1995; Dragoo *et al*. In Press; IUCN Internet Website (2005); Kushlan *et al.*2002; Manly 2004; Manly *et al.* 2003; Piatt and Ford 1996; Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006, U.S. Fish and Wildlife Service Internet Website (2005); Wynne *et al.* 1992, 1991.

Full credit for the information in this document is given to the above references.

THICK-BILLED MURRE *Uria lomvia*

Conservation Status

ALASKA: Not at Risk **N. AMERICAN: Moderate Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Aug	1	30-35 d	16-30 d	cliff ledge, bare rock	surface dive	fish, marine invertebrates

Life History and Distribution

Thick-billed murres *(Uria lomvia)* nest on narrow ledges on precipitous cliff faces. Breeding colonies are extremely dense and can number up to a million birds. Birds nest shoulder to shoulder, laying one egg on bare rock, with densities reaching 10–30 eggs per square yard. Eggs are round at one end and pointed at the other. The unique shape helps them to roll around in a circle if they are bumped, instead of falling off the cliff. Egg color and mottling vary greatly from green to pinkish and may assist the parents in recognizing their own egg. One parent incubates and guards the egg while the other goes to sea to feed. Foraging trips may be up to 100 miles from the colony and can take up to two days.

Murres are tough and hearty. Only three weeks after hatching, flightless chicks jump off high cliff ledges and plunge into frigid ocean water below. The first day after leaving the nest they begin an incredible migration southward, remaining with the male parent who feeds them for another month. First, they swim up to 600 miles, then once their flight feathers have developed, they fly further south to their wintering grounds

The breeding range is circumpolar, including arctic and subarctic regions in the Atlantic, Arctic, and Pacific Oceans. In North America, they nest in Atlantic and arctic Canada, Alaska, and a few pairs in British Columbia. In Alaska, they breed from Cape Lisburne in the northwest, along the coast of western Alaska (Kotzebue Sound, Diomede, Nunivak, St. Lawrence, St. Mathew, and the Pribilof islands) to the Alaska Peninsula, and throughout the Aleutian Islands. They also breed along the southern coast of Alaska off Kodiak, the Barren, and Middleton islands, and at Cape St. Elias and St. Lazaria Island in Southeast Alaska.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	R	R	R	R
Southcoastal *	R	R	R	R
Southwestern *	C	C	C	C
Central	-	-	-	-
Western *	C	C	C	C
Northern	R	R	R	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

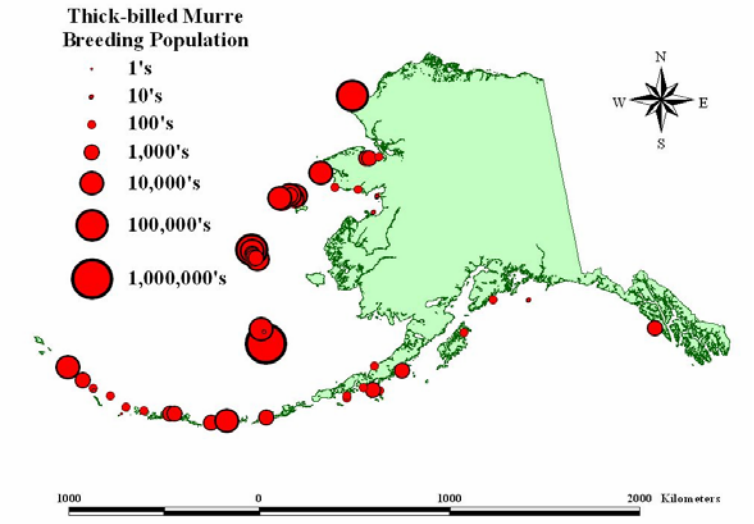
USFWS Chris Dau

In most of Alaska, Thick-billed Murres breed in mixed colonies with the similar-looking Common Murre *(Uria aalge)*. The latter predominates in the Gulf of Alaska and on the Alaska Peninsula and Bering Sea coast. Thick-billed Murres are more common in the western Aleutian Islands and the Chukchi Sea. In breeding plumage, Thick-billed Murres differ from Common Murres in having blacker, or less brownish, upperparts (except face and sides of neck), a shorter, thicker bill with a white line on the cutting edge, a pattern of white on the breast which tapers into a point on the throat, and generally cleaner and whiter flanks. Hybridization between the two species may be regular at some colonies in Alaska.

Alaskan breeding birds winter wherever there is open water; in the Bering Sea, Aleutian Islands, Gulf of Alaska, and northern British Columbia. Thick-billed Murres from the eastern Canadian Arctic winter mainly off eastern Newfoundland and Labrador. Some also winter off western Greenland and as far south as the northeastern United States.

Thick-billed Murres also breed in eastern Greenland, Iceland, Norway, on the Siberian coast, the Chukotski Peninsula, Kamchatka, the Sea of Okhotsk, and south to Sakhalin and the southern Kuril Islands. These birds winter in the Barents and Norwegian Seas, waters off Iceland and Denmark Strait, southwestern Greenland, the Kuril Islands, Sea of Okhotsk, and south to the Sea of Japan.

Four subspecies are recognized with only two occurring in North America (one in the Pacific and one in



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

the Atlantic). The Pacific subspecies is *Uria lomvia arra.*

Population Estimates and Trends

The total world population is estimated at 15-20 million individuals. In Alaska, where the breeding range overlaps extensively with that of Common Murres, it is difficult to identify and assign every individual to a species. As a result, population estimates in Alaska include a percentage of unidentified murres at all colonies censused. The Alaskan Thick-billed Murre population is approximately 2.2 million birds at 174 colonies.

At sites where counts of murres are made from the water, it is especially difficult to differentiate the species. Thick-billed and Common Murres are often combined at these sites for population trend analysis. For sites where murres are not combined, significant negative trends were found for Thick-billed Murres on Hall Island in the Bering Sea (-2.4% per annum 1983-1997) and on St. Paul Island in the Pribilof Islands (-1.7% per annum 1976-2002). On Buldir Island in the Aleutian Islands, Thick-billed Murres showed a significant positive trend of +7.7% per annum between 1974-2003.

Conservation Concerns and Actions

Cliff life presents many hazards to murres. Storms, cold weather, and disturbance by humans can cause both chicks and eggs to be blown or knocked off their narrow ledges, killed by exposure, or left undefended to be snatched by predators. Murres at breeding colonies are especially sensitive to helicopters, gunshots, and disturbance from above the. Few predators prey on adult Thick-billed Murres, but some introduced species such as the arctic (*Alopex lagopus)* and red *(Vulpes vulpes)* fox are known to do so.

Effects of human activity include hunting. In Alaska, adult murres and eggs are taken by Native subsistence hunters. Between the early 1990s and 2000, about 9,195 adult murres and almost 37,000 murre eggs were taken, with the majority of adult murres taken on St. Lawrence Island. The murres were not identified to species in subsistence surveys and comprised both Common and Thick-billed Murres in census figures. Effects on the populations are not directly known, but current harvests are not thought to cause severe impacts. Eggs are also harvested by two Native communities in the eastern Canadian Arctic, where population effects are also thought to be unlikely. Winter subsistence hunts in Newfoundland and Labrador currently take about 200,000 Thick-billed Murres per year. Heavy hunting also occurred at breeding colonies in western Greenland where hunting was probably the major cause of population declines in this century.

Thick-billed Murres are vulnerable to the effects of oil pollution because they have a low reproductive rate, large populations, and dense concentrations in coastal habitats. The *Exxon Valdez* oil spill in 1989 in Prince William Sound, Alaska, is the largest murre kill yet, with an estimated mortality of 185,000 murres (most were Common Murres).

Drowning in fishing nets is also a cause of mortality and has been reported for much of the species range.

Recommended Management Actions

- Continue the current level or increase monitoring of Thick-billed Murre populations in Alaska.
- Initiate additional introduced predator removal programs, continue the rat introduction prevention program, and begin a rat response program.
- Work with state and federal agencies and fisheries councils to better understand and minimize the negative impacts of fisheries interactions.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Thick-billed Murre eggs.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use of Thick-billed Murres.
- Reduce human disturbance at colonies.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; Dragoo *et al*. In Press; Gaston and Hipfner 2000; IUCN Internet Website (2005); Kushlan *et al.* 2002; NOAA Intenet Website (2005); Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005).

Full credit for the information in this document is given to the above references.

BLACK GUILLEMOT *Cepphus grylle*

Conservation Status

ALASKA: Moderate **N. AMERICAN: Not currently at risk** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Aug	1-2	23-29 d	30-40 d	crevice, hole	surface dive	fish, marine invertebrates

Life History and Distribution

The Black Guillemot (*Cepphus grylle)* is a striking bird with almost entirely black breeding plumage, a bright, white patch on the upper wing and spotless, white underwings. Its plumage is set off with bright red legs and feet, a slender black bill, and a coral red mouth-lining. The most similar North American species is the Pigeon Guillemot *(Cepphus colomba)* and the two species may be seen together in the northern Bering Sea. In any plumage, the Pigeon Guillemot may be distinguished by dusky-gray underwings and a broad, black wedge in the white wing patch.

The breeding distribution of Black Guillemots is circumpolar. They nest from the Gulf of Maine northward throughout eastern Canada, over most of the Canadian Arctic Archipelago, north to Greenland, and across Eurasia. There are also isolated colonies in northern Alaska and the Yukon Territory in Canada.

In the western Arctic and adjacent Pacific Oceans, Black Guillemots breed on coastlines and islands of the eastern Siberian, western Chukchi, and Beaufort Seas. In northern Alaska, they are an uncommon, local breeder from Seahorse Island and Point Barrow east to Igalik Island and a rare breeder farther east to Barter Island. In western Alaska, they are an uncommon breeder at Cape Thompson and a regular summer visitor to St. Lawrence Island (no confirmed breeding).

In winter, this species spends most of its time on the open ocean in the vicinity of its breeding areas. However, in areas where open water is limited by sea ice, the birds retreat until reaching ice-free coastal areas or mobile pack ice with open water and accessible foraging habitat.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern	-	-	-	-
Southcoastal	-	-	-	-
Southwestern	R	-	-	R
Central	-	-	+	+
Western *	U	U	U	U
Northern *	U	U	U	U

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

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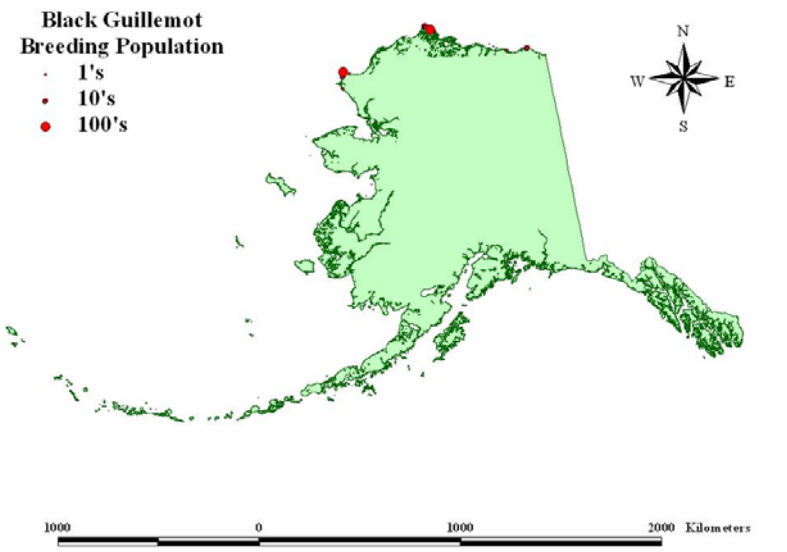
Black Guillemots are an ice-dependent (pagophilic) species. Their survival is inextricably tied to the arctic pack ice. Satellite observations indicate a decrease in the extent of ice cover of nearly three percent per decade since the late 1970s, with the rate of loss accelerating this decade. Changes in Black Guillemot colonization and populations in the western arctic are already among the first documented biological effects of climate change.

Typically, the species nests in crevices on rocky sea cliffs or in cavities found on rocky shorelines or headlands. In northern Alaska, however, the low coastal tundra bluffs and gravel beaches lack any fissures or spaces suitable for breeding and the birds nest in driftwood piles and increasingly in manmade structures. They require a minimum of 80 snow-free days for laying eggs, hatching their young, and for the fledglings to leave the nest.

Population Estimates and Trends

A recent estimate of the global population is 250,000-500,000 pairs, but small colony size and crevice nesting make accurate censusing of Black Guillemots difficult. The U. S. Fish and Wildlife Service Beringian Seabird Colony Catalog estimates 693 individuals at 15 colonies.

The only trend data available is for the Cooper Island population. This colony is located 25 miles east of Point Barrow and is the furthest north point in Alaska. During the 1970s and 1980s, the colony experienced rapid growth, with a maximum number of breeding pairs of around 200. By the mid-1990s, the breeding population had declined by almost 100 to 115 pairs. During 2002, the breeding population again increased with 150 breeding pairs present in the colony. Researchers continue to investigate possible causes for changes in the population.



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

Conservation Concerns and Actions

The ability of Black Guillemots to exploit arctic habitats throughout the year makes them an ideal monitor of arctic marine ecosystems. Variations in Black Guillemot demographics, breeding biology and composition of their tissues could reflect conditions in the arctic. This species' close association with snow and ice habitats also makes it a sensitive indicator to atmospheric warming. However, continued investigation is needed in numerous areas. The development of reliable and accurate census methods is essential to tracking long-term population trends.

Warming trends may also be responsible for subarctic seabirds, such as the Horned Puffin *(Fratercula corniculata)*, expanding breeding to the far north colonies. The incursion of Horned Puffins may have also reduced Black Guillemot breeding success because they are predators and nest competitors of the Black Guillemot. The link between immigration of new predators/competitors and changes in the northern environment warrants further study.

Continued investigation is also needed to determine the validity of applying subspecies distinctions to various populations in North America and Europe. Recent treatments list five subspecies of Black Guillemots which may be grouped into arctic breeders and all others. Of the five subspecies, only two occur in North America (*Cepphus grylle mandtii* and *Cepphus grylle arcticus).* It is the subspecies *Cepphus grylle mandtii* that is found in northern Alaska. However, the status of proposed subspecies remains unresolved.

Effects of crude-oil spills on Black Guillemot populations have been clearly demonstrated in a number of incidents where counts of mortality were possible. Chronic impacts of oil exposure are not well understood and there is no published information on impacts of oil pollution in the nearshore waters of the Black Guillemot foraging habitat.

Recommended Management Actions

- Develop reliable census methods for Black Guillemot populations in Alaska.
    - Implement a systematic census of the Black Guillemot population.
- Determine Black Guillemot breeding population numbers in Alaska.
- Establish a monitoring program.
- Complete a nesting inventory.
- Measure productivity and dietary needs.
- Determine wintering locations.

Regional Contact

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References

Armstrong 1995; Butler and Buckley 2002; Friends of Cooper Island Internet Website (2005); IUCN Internet Website (2005); Kushlan *et al.* 2002; U.S. Fish and Wildlife Service 2006, 2002.

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PIGEON GUILLEMOT *Cepphus columba*

Conservation Status

ALASKA: Moderate **N. AMERICAN: Moderate Concern:** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Sept	1-2	25-33 d	29-54 d	crevice, burrow	surface dive	fish, squid, crustaceans

Life History and Distribution

Pigeon Guillemots (*Cepphus columba)* are medium-sized seabirds that are close cousins to auklets, murres, murrelets, and puffins. Eye-catching breeding plumage and the delightful antics of their courtship rituals make them engaging. Compared to other alcids, guillemots have the widest array of vocal calls and behaviors to affect pair bonding and establish dominance hierarchies. Lively duet flights and "water games" begin the courtship. Spectacular chases at, or just below, the water surface, leap-frog competitions, and whistles and trills are typical behavior at the colony. These antics usually occur during a high tide "social hour" on the rocks below nest sites.

Adults of breeding age are a sleek black, with white wing patches and brilliant red feet that match the vermillion lining of the mouth. Breeding plumage is a startling change from the winter plumage of a mostly white head and belly and dark gray back. Younger birds have faint white streaking mixed with brownish-black feathers and gray-orange legs.

This species nests along rocky coastlines from California to Alaska and along the eastern shores of Siberia. Pigeon Guillemots are flexible in their nest site selection and will use remote offshore islands or onshore sites. Nesting occurs as isolated pairs or as small colonies scattered along the coastline. In a few locations there are colonies of more than 1000 pairs. One or two eggs are laid in natural cavities, rock crevices in talus boulders, on cliff faces, or in tree root systems. If natural cavities are not available some birds will dig a burrow, while others choose to nest in artificial structures.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	C	C	C	C
Southcoastal *	C	C	C	C
Southwestern *	C	C	C	C
Central	-	-	-	-
Western *	C	C	C	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

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Little is known about the winter range, but it is slightly more restricted than the breeding range. Exposed coastlines appear to be deserted in favor of more sheltered inshore waters and birds from the Bering Sea colonies likely withdraw south to just beyond the ice-edge.

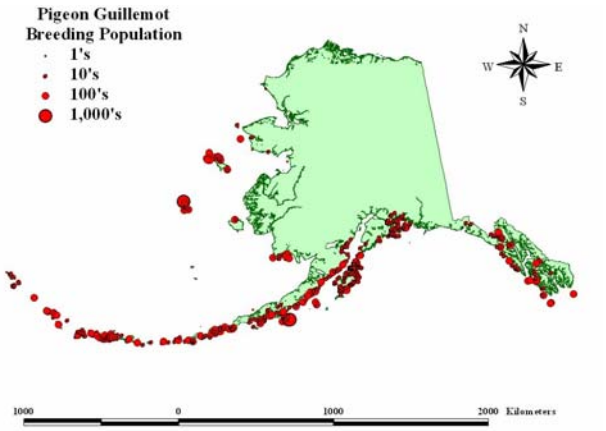
Five distinct subspecies are recognized; three occur in Alaska and all but one occur in North America. C*epphus columba columba* breeds from Kamchatka to the Bering Strait, *C. c. kaiurka* is found on the west-central Aleutian and Commander Islands, and *C. c. adianta* breeds from the central Aleutian Islands to Washington State.

The Pigeon Guillemot closely resembles the related Black Guillemot *(Cepphus grylle).* Occasionally, Black Guillemots summer in Pigeon Guillemot colonies in the Bering Sea. Black Guillemots are slightly smaller, have whitish underwings, and an unmarked white wing patch (except juvenile). Pigeon Guillemots and Black Guillemots are currently recognized as a superspecies by the American Ornithologists' Union (1983).

Population Estimates and Trends

The estimated world population of Pigeon Guillemots is about 235,000 and at least 50% breed in Alaska. Use of unsystematic census techniques permits detection of only dramatic changes and little trend information is available.

The U.S. Fish and Wildlife Service Beringian Seabird Colony Catalog lists approximately 49,000 birds in Alaska. Summer surveys conducted in Alaska by the U.S. Fish and Wildlife Service since 1992 estimate the population of Pigeon Guillemots at 2,233 in Prince William Sound (2004); 9,000 in lower Cook Inlet (1993); 19,000 in Southeast Alaska (1994); and 2,000 on Kodiak Island (2001).



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

The Prince William Sound guillemot population showed a significant negative trend (-6.7% per annum) 1972-2004. The decline is confirmed by detailed counts at study colonies. The 1989 *Exxon Valdez* oil spill exacerbated the decline, but there is also evidence that the population in the Sound was in decline prior to the 1989 spill. The reason for the magnitude of the decline is not well understood. Pigeon Guillemot populations at Aiktak Island in the Aleutian Islands also showed a significant negative trend (-5.8% per annum between 1980-2004). However, populations monitored at other sites showed no significant trends (e.g., Buldir and Kasatochi islands in the Aleutian Islands and St. Lazaria Island in Southeast Alaska).

Conservation Concerns

Local threats to Pigeon Guillemots include gillnet bycatch mortality, oil pollution, and predation. Additionally, changes in marine ecosystems could affect food availability and thus, regional population trends.

In the late 1970s, there was a major regime shift in the marine ecosystem of the Gulf of Alaska. Crustaceans and forage fish were replaced by predatory bottom fish which are less available and less energy-rich prey for seabirds. This ecosystem shift may account for the observed long-term decline in populations of Pigeon Guillemots in Prince William Sound. Also, important prey such as juvenile herring *(Clupea pallas)* may have been compromised by the 1989 *Exxon Valdez* oil spill and overfishing.

Guillemots are highly vulnerable to mortality from oil spills. More than 600 Pigeon Guillemot carcasses were recovered from the 1989 *Exxon Valdez* oil spill, including 135 from Prince William Sound. Based on carcass recovery rates, immediate mortality could have been as high as 6000 guillemots. Pigeon Guillemots are subtidal and nearshore foraging birds that often use intertidal rocks. As a result, they are highly susceptible to oil long after the immediate mortality. The guillemot population decline in Prince William Sound was still apparent in 1998, nine years after the spill.

Predation on eggs and chicks can sometimes be heavy. Foxes *(Vulpes vulpes* and *Alopex lagopus)* introduced to two of the Shumagin Islands in Alaska (Simeonof and Chernabura) are thought to be responsible for very low densities of Pigeon Guillemots on those islands. River otters *(Lutra canadensis)* and mink *(Mustela vison)* also prey on adults, eggs, and chicks in Alaska. Ravens *(Corvus corax)*, crows *(Corvus brachyrhynchos)*, and magpies *(Pica hudsonia)* also take unattended eggs or chicks. Bald eagles *(Haliaeetus leucocephalus)* prey on adults on the water. Unusual observations include predation of adults by killer whales *(Orcinus orca)* and octopus *(Enteroctopus dofleini)*.

Some subsistence hunting by Native people continues today in Alaska. Between 1995 and 2000, approximately six adult guillemots and 118 guillemot eggs were taken annually by subsistence hunters. Guillemots are not identified to species during subsistence surveys and the effects of subsistence hunting and egging are unknown.

Inshore gillnet fisheries can cause local mortality particularly because Pigeon Guillemots tend to forage near their colonies. About 2,000 Pigeon Guillemots nest around Kodiak Island. In 2002, the bycatch of guillemots in the set gillnet fishery for Kodiak Island was estimated at 76 individuals. While these species comprise <1% of all colonial birds on Kodiak Island; they comprised 14% of the total seabird bycatch.

Recommended Management Actions

- Implement standardized survey protocols to assess population size and trends.
- Continue monitoring Pigeon Guillemots.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Pigeon Guillemot eggs.
- Work with state and federal agencies and fisheries councils to minimize impacts of gillnet fishing.
- Evaluate and minimize disturbance at colonies.

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References

American Ornithologists' Union 1983; Armstrong 1995; Dragoo *et al.* In Press; Ewins 1993; Irons *et al.* 2000; IUCN Internet Website (2005); Kuletz 1983; Kushlan *et al.* 2002; Manly *et al.* 2003; Oakley and Kuletz 1996; Sanger and Cody 1993; Sullivan *et al.* 2005; U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005).

Full credit for the information in this document is given to the above references.

MARBLED MURRELET *Brachyramphus marmoratus*

Conservation Status

ALASKA: High **N. AMERICAN: High Concern** **GLOBAL: Endangered**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Aug	1	28-30 d	27-40 d	trees, ground, crevice	surface dive	fish, aquatic invertebrates

Life History and Distribution

The mysterious Marbled Murrelet *(Brachyramphus marmoratus)* perplexed ornithologists for 100 years because their nests could not be found. The first verified nest discovery was in a tree, in 1974. That discovery and subsequent records, confirmed the unique nesting habits of this small auk. Unlike most seabirds, they do not nest in colonies.

Nesting generally occurs in trees in forested areas or on the ground on islands and along coasts. They breed along the coast from the Aleutian Islands in Alaska, south to central California. Spring and summer records also exist in Alaska for Bristol Bay, the northern Bering Sea, and St. Lawrence Island.

During winter in Alaska, many birds move to protected waters, offshore areas, or unknown locations; some individuals remain near breeding areas. The winter range is not well documented, but known winter concentrations occur in Southeast Alaska, the Kodiak Archipelago, Cook Inlet, Prince William Sound, and some areas of the Gulf of Alaska.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	C	C	C	C
Southcoastal *	C	C	C	C
Southwestern *	U	U	U	U
Central	-	-	+	-
Western *	+	+	+	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Most nest sites consist of a mossy platform on a thick limb or broad trunk deformity in old-growth trees. All nests found from British Columbia to California have been in trees, but some ground nests have been located in Alaska. Today, approximately 260 nests have been found in North America, and thirty-three nests have been confirmed in Alaska (14 ground nests and 19 tree nests). Evidence of additional nesting has been recorded for Alaska, but nests were not found.

In its breeding plumage, the top of the head, back and wings are dark brown, while the throat, chest and abdomen are brown flecked with white and cinnamon, giving a "marbled" appearance. Males and females have similar coloring. The winter plumage is blackish-brown above with largely white shoulders (scapulars) and white underparts.

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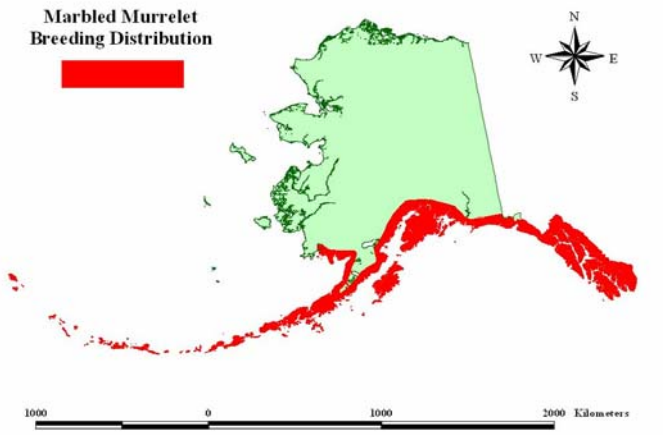
Kittlitz's Murrelets *(Brachyramphus brevirostris)* are closely related, similar in appearance, and overlap in some areas with the Marbled Murrelet. The bill of the Kittlitz's Murrelet is shorter and when flushed the tail shows white in the outer feathers. The Kittlitz's breeding plumage is more tawny or gray and mottled with more white.

Marbled Murrelets normally feed in nearshore marine waters, including shallow bays, fjords, and inlets. Fish and aquatic invertebrates are caught by underwater pursuit and feeding occurs day and night. Although large foraging groups may be attracted to sites where fish are concentrated, typically, they forage individually or in pairs. Their ability to locate small schools of fish may be why they are often the catalysts for formation of forage flocks.

A dramatic decline in the Marbled Murrelet population caused concern throughout its range and the Washington-Oregon-California population was federally listed as Threatened under the Endangered Species Act in 1992. The Canadian population in British Columbia, was assigned Threatened status in 1990. In Alaska, the Marbled Murrelet is considered a Bird of Conservation Concern by the U.S. Fish and Wildlife Service.

Population Estimates and Trends

Because of the difficulty in locating and following individual nests, Marbled Murrelets are monitored by surveys at sea. Monitoring the population in Alaska is further complicated because of the difficulty in distinguishing them from the Kittlitz's Murrelet. Many historical surveys did not distinguish between these two



Seabird breeding distribution maps created from data *in* Birds of North America, Nelson 1997.

Brachyramphus species. However, Marbled Murrelets typically comprised 90-99% of the *Brachyramphus* murrelets in Alaska.

The best available and most recent population estimate for Marbled Murrelets in North America is ~944,000 individuals. However, important areas lack recent data. Approximately 91% of the North American population breeds in Alaska. Southeast Alaska may support >70% of the North American population and ~79% of the Alaskan population. Most of the population estimates for Alaska were derived from surveys previous to 2000, and often from the 1970s-1990s. California, Washington, and Oregon comprise 2% of the total population, and British Columbia the remaining 7% of the North American population.

The most complete trend data for Alaska are from Prince William Sound, where the population declined 89% between 1972 and 2004. Trends in other regions of Alaska also showed declines. *Brachyramphus* Murrelet densities declined in Glacier Bay by 74% (1991-2000), along the Malaspina Forelands by 44% (1992-2002), and in Kachemak Bay by 52% (1988-2004). In the Kenai Fjords, murrelets declined 62% between 1976 and 1986, but then increased 10% per year from 1986-2002. No trend data are available for Southeast Alaska, which was last surveyed comprehensively in 1994.

Conservation Concerns and Actions

The loss of old-growth nesting habitat is believed to be a key factor in the decline of Marbled Murrelets in some areas. It is unknown if loss of nesting habitat is as important in Alaska as it is further south, because timber harvest has not been intensive in Alaskan areas where murrelet declines have been documented. Other factors may be contributing to the declines in Alaska. Documented sources of mortality include bycatch in gillnet fisheries and oil spills. Additionally, changes in oceanic conditions since the 1970s in the Gulf of Alaska, may have negatively affected the availability of forage fish for Marbled Murrelets. To raise chicks, they require energy-rich fish like juvenile herring *(Clupea pallasi)* and adult sandlance (*Ammodytes hexapterus).* In Prince William Sound, the crash of herring stocks in the early 1990s may have exacerbated the decline of Marbled Murrelets.

A 1990-1991 study of gillnet fisheries in Prince William Sound, estimated that between 450-1,470 *Brachyramphus* murrelets were killed annually as accidental bycatch. Estimates of gillnet mortality for other areas include (37 birds, Cook Inlet 2000) and (56 birds, Kodiak Island 2002). Gillnet fisheries occur widely in Alaska and Carter *et al.* (1995) suggested that many thousands of Marbled Murrelets may be killed annually in Alaskan fishing nets.

The 1989 *Exxon Valdez* oil spill, in Prince William Sound, Alaska, caused direct mortality of an estimated 8,400 *Brachyramphus* murrelets; most were Marbled Murrelets. This number represents the minimum mortality. Murrelets were difficult to find on the rocky shorelines and many of the unidentified small alcids were probably Marbled Murrelets. Throughout Alaska, they have also been killed by small oil spills.

Recommended Management Actions

- Establish an at sea monitoring program at select sites.
- Re-survey the entire Southeast Alaska sub-region using protocol similar to that used in 1994.
- Complete further compilation, synthesis, and analysis of data on population sizes and trends.
- Continue investigation of distribution and abundance of prey species and effects of oceanographic changes on availability.
- Work with state and federal agencies and fisheries councils to better understand and minimize negative impacts of fisheries throughout the species' range.
- Support efforts to minimize the incidence of fuel spills and chronic oiling.
- Investigate potential disturbance impacts from vessel traffic and tour boats.

Regional Contact

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References

Agler *et al.* 1998; Anderson and Piatt 1999; Armstrong 1995; Burger 2002; Carter and Kuletz 1995; Carter *et al.* 1995; DeGange 1996; IUCN Internet Website (2005); Kuletz 2005; Kushlan *et al.* 2002; Manly 2004; McShane *et al.* 2004; Mendenhall 1992; Nelson 1997; U.S. Fish and Wildlife Service 2006, 2002; 1992; Van Pelt and Piatt 2003; Wynne *et al.* 1992, 1991.

Full credit for the information in this document is given to the above references.

KITTLITZ'S MURRELET *Brachyramphus brevirostris*

Conservation Status

ALASKA: High **N. AMERICAN: High Risk** **GLOBAL: Critically Endangered**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Aug	1	unknown	24 d	bare ground, scrape	surface dive	fish, invertebrates, macroplankton

Life History and Distribution

A small diving bird related to puffins and murres, the Kittlitz's Murrelet *(Brachyramphus brevirostris)* is one of the rarest and least known seabirds in North America. In most of its range, the Kittlitz's Murrelet seems to nest in rugged mountains near glaciers or in previously glaciated areas, sometimes up to 45 miles inland. During summer, it usually feeds near tidewater glaciers, among icebergs, and outflows of glacial streams. The bird's association with such ancient ice flows has earned it the nickname, "Glacier Murrelet."

Kittlitz's Murrelets differ from 98% of all other seabirds in that they don't nest colonially. They are solitary nesters that rely on camouflage and secretive behavior to avoid predation. They nest on the ground, generally on unvegetated scree fields and occasionally on cliff faces. A single egg is laid in a small scrape, usually on the downhill side of a large rock. Finding nests has proven to be extremely difficult. Only 25 nests have been found, and only one of those was observed throughout a complete season. What is known about the species' breeding distribution has largely been extrapolated from their presence at sea. To further complicate censusing this unique alcid is the difficulty in identifying it correctly. Kittlitz's Murrelets closely resemble Marbled Murrelets (*Brachyramphus marmoratus)* which are common in Alaskan coastal waters and are found in virtually all areas frequented by the former. The Kittlitz's Murrelet shows white in the tail when flushed, which is helpful in field identification.

All of the North American and most of the world population of Kittlitz's Murrelets breed, molt, and winter in Alaska. They inhabit coastal waters discontinuously from Point Lay on the northwest coast of Alaska, south to northern portions of Southeast Alaska. Part of the world population also breeds in the Russian Far East from the Okhotsk Sea to the Chukchi Sea. There are no good estimates of the Siberian population, but it is thought to be much less than the Alaskan population. During the breeding season, Kittlitz's Murrelets are found in several core population centers in Alaska. The centers are the south side of the Alaska Peninsula, Prince William Sound, Lower Cook Inlet and Kenai Fjords, Icy Bay, Yakutat Bay and the Malaspina Forelands, and Glacier Bay.

The winter range is not well known. However,

NPS Mason Reid

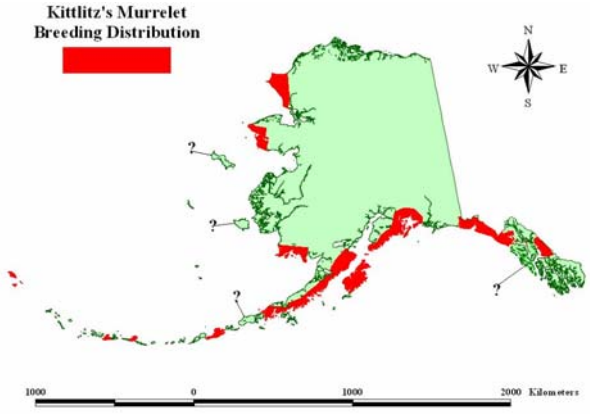
sightings have occurred in Southeast and western Alaska, and in a few locations in southcoastal Alaska. Lower densities of birds also occur in the mid-shelf regions of the northern Gulf of Alaska.

The Kittlitz's Murrelet has undergone steep population declines in several of its core population areas. Reasons for the population declines have not been conclusively determined. Because the species may warrant listing as threatened or endangered under the Endangered Species Act, the U.S. Fish and Wildlife Service named the murrelet as a candidate for protection under the Act in 2004. Candidate species are not subject to the regulatory protections of the Endangered Species Act, and human activities that may affect candidate species are not restricted. Rather, the listing encourages the formation of partnerships among federal agencies, researchers, and others, to carry out research and conservation activities, that may preclude the need to list a species as threatened or endangered.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	U	U	U	U
Southcoastal *	C	C	C	U
Southwestern *	U	U	U	R
Central	-	-	-	-
Western *	U	U	U	-
Northern	R	R	R	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. © **Armstrong 1995.**



Seabird breeding distribution maps created from data *in* Birds of North America, Day *et al.* 1999.

Population Estimates and Trends

Estimates of the Alaskan population range from 9,000 to 25,000 birds. Interpretation of Kittlitz's Murrelet population status and trend data is complicated.

The best U.S. Fish and Wildlife Service information indicates that Kittlitz's Murrelets in Prince William Sound have declined by 84% since 1989, and could disappear from that sub-region by ~2010. Recent declines in the Glacier Bay population center would, if continued, eliminate that population of birds by ~2045. Data from the Malaspina Forelands suggests that its local population of Kittlitz's Murrelets declined by at least 38%, and perhaps by as much as 75%, between 1992 and 2002. In the Kenai Fjords area, the murrelet population has declined by as much as 83% since 1976.

Conservation Concerns and Actions

All the hypotheses about reasons for the decline of Kittlitz's Murrelets are untested. Basic information is still needed about the Kittlitz's Murrelets' habitat, foraging behavior, and food requirements to increase our understanding of these birds and improve our ability to determine the reasons for their decline.

At least two sources of human-caused mortality for Kittlitz's Murrelets have been identified, gillnet fisheries and oil spills. Being small-bodied, nearshore divers, these birds sometimes get caught in gillnets and drown. Adult and juvenile mortality have been documented in gillnet fisheries in southcoastal Alaska. In Prince William Sound, Kittlitz's Murrelets represented 5-30% of the total murrelet bycatch in salmon gillnets during 1990 and 1991. The same traits make them susceptible to oil spills. Relative to their population, high numbers of Kittlitz's Murrelets were killed by the 1989 *Exxon Valdez* oil spill. Seventy-two Kittlitz's murrelets were positively identified among the bird carcasses recovered after the oil spill. Nearly 450 more *Brachyramphus* murrelets were not identified to the species level, and it is reasonable to assume that some of those were Kittlitz's Murrelets. In addition, many more murrelets probably were killed by oil than were actually recovered. It is likely that about 500 individuals died as an acute effect of the oil spill, which would represent a substantial fraction of the world population. Additionally, in 1999, a tour boat went aground in a bay adjacent to Glacier Bay, and, in 2001, two commercial fishing vessels sank and released fuel in northern Prince William Sound. Both events occurred near areas used by Kittlitz's Murrelets. As vessel traffic increases in Alaska's nearshore waters, such events, while not individually catastrophic for the species, could have cumulative impacts on local murrelet populations.

Factors that are strongly suspected to have negative effects on Kittlitz's Murrelet populations include cyclical changes in the oceanic environment and glacial retreat, both of which may alter their prey or foraging habitat. Glacial retreat may be a consequence of global warming.

Other factors that are suspected to cause Kittlitz's Murrelet mortality include natural predation, chronic oil pollution, disturbance by commercial and recreational boaters, and flightseeing operations. The primary breeding areas for Kittlitz's Murrelets are all experiencing increases in tour operations.

Recommended Management Actions

- Complete surveys of Kittliz's Murrelet range and monitor population trends at key sites (Glacier Bay, Prince William Sound, Cook Inlet, Icy Bay, Kenai Fjords, Kachemak Bay, and Yakutat).
- Obtain population estimates at sites with little or no data (Cape Lisburne, Aleutian Islands, and Cape Suckling south to Cape Spencer).
- Develop a productivity index to monitor juvenile birds on the water at key sites.
- Continue studies at key sites on habitat use, chronology, productivity, and foraging biology.
- Work with state and federal agencies and fisheries councils to minimize the negative impacts of fisheries interactions.
- Support efforts to minimize the incidence of fuel spills and chronic oiling near breeding and wintering areas.
- Assess effects on murrelets of large vessel traffic and large tour boat traffic in fjords.

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References

Armstrong 1995; Day *et al.* 1999, IUCN Internet Website (2005); Kendall and Agler 1998; Kushlan *et al.* 2002; Manly and Nations 2002; U.S. Fish and Wildlife Service 2002; Wynne *et al.* 1992, 1991.

Full credit for the information in this document is given to the above references

ANCIENT MURRELET *Synthliboramphus antiquus*

Conservation Status

ALASKA: Highly Imperiled **N. AMERICAN: High Risk** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Aug	1-2	33-36+ d	1-4 d	burrow	surface dive	crustaceans, fish

Life History and Distribution

The Ancient Murrelet *(Synthliboramphus antiquus)* is unique among seabirds in rearing its chicks entirely at sea. Successful mating leads to two comparatively enormous eggs, each weighing approximately one-quarter of the female's weight. Only 2-4 days after hatching, without ever having been fed, the downy youngsters leave the nest and follow the adult birds to the sea. The chicks remain with their parents for at least one month after leaving the colony. This behavior and their nocturnal habits appear to be adaptations to reduce predation on adults. Ancient Murrelets have a relatively low adult annual mortality rate.

These murrelets normally breed in colonies on forested islands or those covered in grass or dense forbs. Nests are usually burrows dug in soft soil, but cavities under tree roots and shallow holes under grass tussocks are also used. Crevices in rocks or among boulders are less frequently occupied.

Ancient Murrelets are pigeon-sized birds with a black cap, gray back, cream-colored bill, and pale blue legs and feet. During the breeding season, they have a white stripe over the eye and a black throat patch. In winter, they lose the white stripe over the eye and the sides of the neck are white. Nonbreeding plumage is not maintained for long and many birds are in breeding plumage by December.

The Ancient Murrelet is the most widespread and abundant member of the genus *Synthliboramphus.* It is found around the northern Pacific Rim from China to British Columbia and is most numerous in the eastern part of its range. In Alaska, they are moderately common and widespread in the Aleutian Islands (at least 50 sites) and the Gulf of Alaska (Sandman Reefs, Shumagin and Semidi islands, and smaller islands in the vicinity of the Alaska Peninsula, Kodiak Island, and Shelikof Strait). They are also seen occasionally off the Pribilof Islands. In Southeast Alaska, they are abundant on St. Lazaria and Forrester islands.

In winter, there is a general southward dispersal of North American breeders as far as California. Some birds remain within their breeding range throughout the year, except for a postbreeding dispersal. Asian birds winter off Japan and Korea and are common in the Sea of Okhotsk, on the Kuril Islands, and off the Kamchatka Peninsula.

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Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	U	U	U	U
Southcoastal *	U	U	U	U
Southwestern *	C	C	C	C
Central	-	-	-	-
Western	+	R	R	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. © **Armstrong 1995.**

Population Estimates and Trends

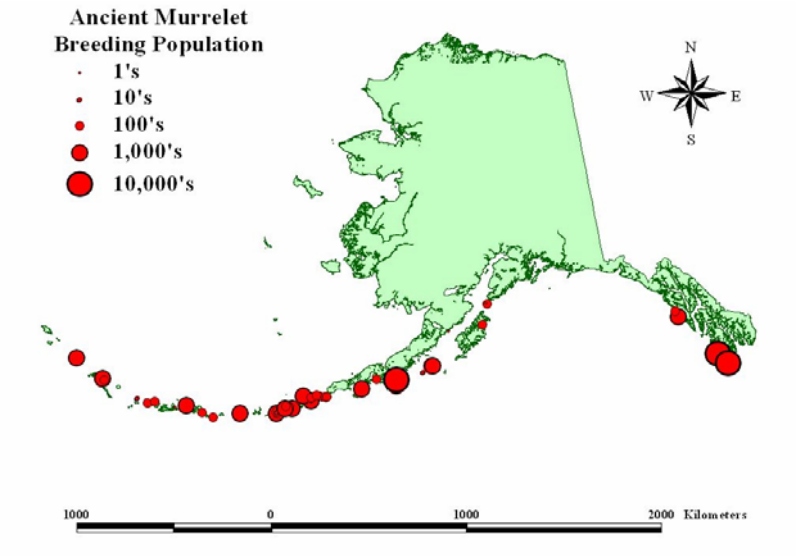
The world population is estimated at 1-2 million birds. Population numbers are poor for this species, except in British Columbia, where about 500,000 birds breed. In Alaska, there are approximately 90 colonies with ~300,000 individuals. Asia has several tens of thousands of birds.

Populations throughout the species' range have been significantly diminished by the introduction of mammalian predators.

Conservation Concerns and Actions

The species is protected under the Migratory Bird Convention between the U.S. and Canada. It was also classified as a Designated Special Concern in Canada in 1993. The status of the species was re-examined and confirmed as Vulnerable in November 2004.

The main limiting factor for Ancient Murrelets has been the introduction of exotic predators. The Langara Island colony in the Queen Charlotte Islands, Canada probably numbered as many as 400,000 birds prior to the



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U.S. Fish and Wildlife Service, Anchorage, Alaska.

1960s. A sharp decrease seems to have coincided with the arrival of rats *(Rattus rattus, R. norvegicus)* on the island. By 1993, there were only about 30,000 birds remaining. The introduction of raccoons *(Procyon lotor)* to the Queen Charlotte Islands has also had severe impacts on murrelets. On Limestone Island, it was demonstrated that raccoons can cause as much as 80% of the predator-caused mortalities to adult Ancient Murrelets**.** Programs are underway in Alaska and British Columbia to remove foxes *(Alopex lagopus, Vulpes vulpes)*, rats, and raccoons from colony islands. In the Queen Charlotte Islands, a cooperative effort was begun to remove raccoons. To date, the strategy appears to be working. In Alaska, where foxes have been removed, populations have recovered quickly.

Breeding birds are sometimes attracted to lighted fishing boats close to colonies**.** The presence and activities of a salmon-fishing fleet in the 1950s and 1960s may also be linked to the decline of the Ancient Murrelet population on Langara Island. This fishery is known to have caused heavy mortality through fatal light attraction and drowning in gillnets.

An oil spill could also have devastating effects if it occurred near a staging area during the breeding season or when chicks fledge and are flightless. In the Sea of Japan, Ancient Murrelets are one of the most common birds killed in oil spills.

Another concern for the species is their sensitivity to disturbance during incubation. Any intrusion into the burrow during this time usually leads to desertion by the incubating adult.

Recommended Management Actions

- Restore Ancient Murrelet populations and distribution to pre-fox, pre-rat introduction conditions.
- Survey populations at key index locations and maintain a monitoring program in Alaska.
- Continue fox removal and rat prevention programs.
- Work with state and federal agencies and fisheries councils to minimize negative impacts such as light pollution, net entanglement, and bycatch.
    - Review plans for emerging fisheries, to identify potential problems and solutions.
    - Educate ship crews about light pollution.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Ancient Murrelet eggs.
- Evaluate human disturbance at key colonies.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; Bertram 1995; Gaston 1994; IUCN Internet Website (2005); Kushlan *et al.* 2002; Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006, 2002.
Full credit for the information in this document is given to the above references.

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CASSIN'S AUKLET *Ptychoramphus aleuticus*

Conservation Status

ALASKA: High **N. AMERICAN: Moderate Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Aug	1	37-42 d	41-50 d	burrow, crevice	surface dive	zooplankton, squid, fish

Life History and Distribution

Like many of its relatives, this chubby little seabird nests on offshore islands that are far removed from the activities of humans and predatory mammals. It spends its life on the open sea and only comes ashore during the breeding season. Even then, it spends the daylight hours resting and feeding on the open ocean and arrives on the colony well after dark. Unless it is incubating eggs or brooding small chicks, it returns to the sea before dawn. Like many nocturnal birds that need to find their mates and young at night, the Cassin's Auklet *(Ptychoramphus aleuticus)* is vocal on the colony. In the wee hours of the morning, there is a chorus reminiscent of swarming frogs.

In keeping with their secretive character, both males and females have mostly dull, grey-brown feathers all year round; the belly is white. The only decorations on this nondescript plumage are small, white crescents above and below the eye, which are too small to be seen at any distance. The featherless parts of the bird are more colorful. The feet are bright blue, and there is a pale pink patch on the lower half of the bill. The eyes, which are brown in the young, become a striking metallic grey in the adult.

Cassin's Auklets are opportunistic in their nest site selection. Sometimes they nest in natural cavities such as rock crevices, under debris or driftwood, or in artificial nest boxes. Usually, they nest in burrows that they dig with their sharp toe nails. The burrows can be distinguished from those of other seabirds by pinkish-purple spatters among the droppings at the mouth of the burrow. These spatters are remnants of a "soup" of small oil-rich crustaceans, or hard-shelled animals, that they carry in a special "gular" pouch to their chicks. This pouch develops prior to the breeding season and shrinks before fall migration. In spring and early summer, the auklets may feed on larval or juvenile fish, which are also oil-rich.

There are breeding colonies of Cassin's Auklets along the west coast of North America, from the Aleutian Islands to Baja California. The largest colonies in Alaska are located on Chagulak Island in the Aleutian Islands, the Nigrud Island group, Hunter and Umga islands in the Sandman Reefs, Castle Rock in the Shumagin Islands, Suklik Island in the Semidi Islands, and Petrel and Lowrie islands in Southeast Alaska.

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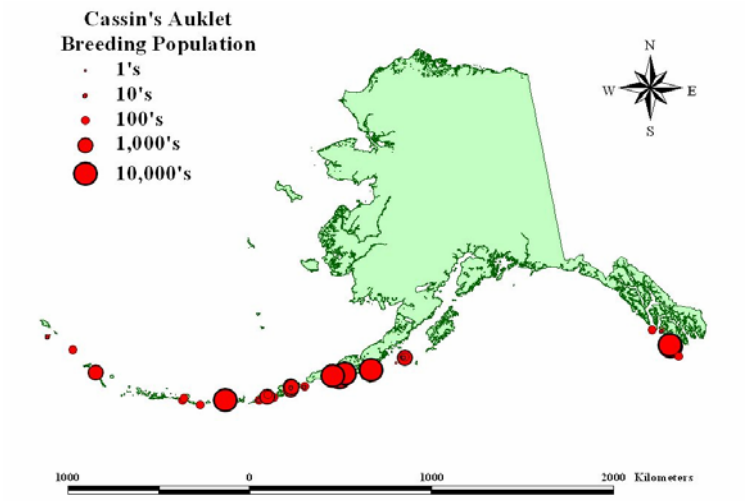
The winter range is poorly known. Southern populations are mostly resident and northern populations (Alaska and British Columbia) migrate further south after the breeding season. A greater number of Cassin's Auklets are seen in California waters in the fall and winter than nest in California, Oregon, and Washington combined. No other information is available on timing or routes of migration.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	U	U	U	U
Southcoastal	R	R	R	-
Southwestern *	C	C	C	C
Central	-	-	-	-
Western	-	-	-	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Two subspecies are recognized. The northern form, *Ptychoramphus aleuticus aleuticus* is found from Alaska south to Guadalupe Island off the coast of northern Baja California. The northern form is larger and heavier. The southern form, *P.a. australe*, breeds off the west coast of Baja California from the San Benito Islands, south to Asuncion and San Roque Islands.



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

Population Estimates and Trends

The total estimated population is at least 3.6 million individuals. The core of the population is in British Columbia, Canada (>2.7 million). Triangle Island, B.C. has the largest colony in the world with approximately 1.1 million breeding birds, although this colony is presently declining.

The U.S. Fish and Wildlife Service Beringian Seabird Colony Catalog estimates 473,000 Cassin's Auklets at 53 colonies in Alaska.

Populations of Cassin's Auklets appear to be declining at several locations throughout the species' range. Some historic colonies have disappeared, mainly due to introduced predators. No recent trend information is available for Alaska.

Conservation Concerns and Actions

Major concerns for Cassin's Auklets in Alaska include introduced predators, oil spills, and mortality from fisheries interactions. Historically, the Alaskan population was probably much larger, but fur farmers and other settlers introduced foxes, rats, and other mammals, which extirpated vast numbers of this species. The arctic fox (*Alopex lagopus)* extirpated large breeding colonies of Cassin's Auklets in the Sanak Islands, off the tip of the Alaska Peninsula. Cassin's Auklets also disappeared from the Aleutian Islands of Adugak, Keegaloo, the Ilak Islands, and from small islands off Amlia Island. Common Ravens (*Corvus corax)*, and river otters (*Lutra canadensis)* are also known to prey on this seabird in Alaska.

Cassin's Auklets may be less vulnerable to oil spills during the breeding season than other closely related species. They do not "raft" or float in huge numbers near breeding colonies daily. Instead of carrying out their social activities near nesting areas (e.g. pairing, mating, and displaying to each other), like some species, they perform these behaviors while scattered on the open ocean. Mortality from oil spills depends on the season and location. In December 1988, Cassin's Auklets made up about 32% of the birds that were killed along Vancouver Island and 0.8% of the birds found dead along the Washington coast from the *Nestucca* oil spill.

Mortality also occurs from drowning in high-seas and coastal gillnets. Currently, the magnitude of the interaction with commercial fisheries is unknown.

Recommended Management Actions

- Continue efforts to derive reliable monitoring techniques.
- Determine breeding population numbers of Cassin's Auklets in Alaska.
- Develop standardized methods for monitoring populations.
- Implement a regional monitoring program.
- Complete a nesting inventory.
- Measure productivity.
- Determine wintering areas and migration routes.
- Reduce predation of Cassin's Auklets with continued fox removal and rat prevention programs.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Cassin's Auklet eggs.
- Work with state and federal agencies and fisheries councils to minimize negative impacts of commercial fisheries.
- Evaluate human disturbance and minimize disturbance at colonies.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; Bailey 1993; IUCN Internet Website (2005); Kushlan *et al.* 2002; Manuwal and Thoresen 1993; U.S. Fish and Wildlife Service 2006, 2005, 2002.

Full credit for the information in this document is given to the above references.

PARAKEET AUKLET *Aethia psittacula*

Conservation Status

ALASKA: Low **N. AMERICAN: Low Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Aug	1	35-36 d	35 d	crevice, among boulders, burrow	surface dives	crustaceans, fish, jellyfish

Life History and Distribution

The unusually shaped bill of this chunky little auklet gives it an appealing look. The bright red bill is roundish with the lower mandible curved upward. This shape enables them to feed on their favorite foods of jellyfish and the tiny marine crustaceans found among the tentacles of the jellyfish. White plumes ornament the auklets' face and extend back and downward from each of its yellow eyes. It has a distinct, pot-bellied shape, shows more extensive white in its underparts, and is larger than Least *(Aethia pusilla)* and Cassin's Auklets *(Ptychoramphus aleuticus)*.

This auklet does not form large colonies, but mainly nests scattered among puffins *(Fratercula spp.)* and other auklet species. Its preferred breeding sites are in crevices on steep rocky cliffs, but it also nests in burrows on talus slopes, and among loose boulders on rocky beaches or grassy slopes. It is less gregarious and in most areas less numerous than the Least and Crested Auklets *(Aethia cristatella)*.

It is a highly vocal species. Whinneying displays are normally performed by males standing on a rock near the entrance to the nesting crevice. Duets are also executed by males and females and may serve in pair formation.

Formerly the Parakeet Auklet *(Aethia psittacula)* was placed alone in the genus *Cyclorrhynchus*, which refers to the nearly circular profile of the bill. Now it is merged under the *Aethia* genus.

Parakeet Auklets are widely distributed from Southeast Alaska, across the Gulf of Alaska, in most of the Bering Sea, and in the Sea of Okhotsk in Siberia.

They are locally distributed in Southeast Alaska (small numbers south to St. Lazaria, Hazy and Forrester islands) and on the Kenai Peninsula. In the Gulf of Alaska, they are found on the Shumagin and Semidi islands and on Chirikof Island near Kodiak. Areas of concentrations are the Aleutian Islands west to Buldir and Agattu, and in the Bering Sea (Little Diomede, St. Lawrence, King, St. Matthew, Pribilof, and Nunivak islands).

Winter distribution is poorly known, but it occurs offshore and moves further south and into the central South Pacific Ocean.

USFWS

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern	R	+	-	+
Southcoastal *	U	U	U	+
Southwestern *	C	C	C	U
Central	-	-	-	-
Western *	C	C	C	-
Northern	-	-	+	-

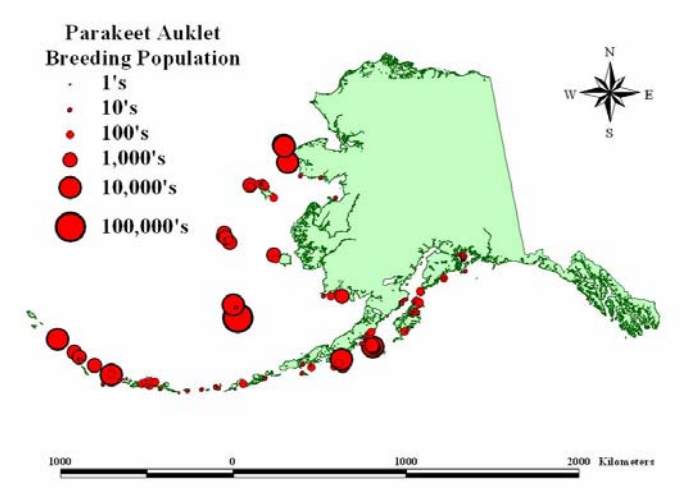
C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

The Alaskan population is estimated at 1,000,000 individuals at 195 colony sites. The total number of birds may be considerably higher for several reasons: the dispersed nature of breeding, lack of intensive surveys, difficulty of censusing crevice nesting species, and because the population is dispersed at sea for much of the year. St. George Island in the Pribilof Islands has the largest concentration of Parakeet Auklets in Alaska (approximately 250,000 breeding pairs).

In Asia, the population is unknown due to lack of censusing throughout most of the breeding range, but may total 300,000-400,000 pairs.

Trends are unknown. Numbers in the Aleutians may possibly be lower than before arctic fox *(Alopex lagopus)* and Norway rat *(Rattus norvegicus)* introductions,



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

although Parakeet Auklets were not one of the species considered to have been heavily preyed upon by foxes.

Conservation Concerns and Actions

While the large population size and dispersed nature of Parakeet Auklets suggest no immediate conservation concern, further work needs to be done to ensure healthy populations. This species should be considered vulnerable to predation by introduced predators and expanding gull populations, ingestion of plastic particles, entanglement and mortality in fishing nets, and oil pollution.

At Buldir Island in the Aleutian Islands, Glaucous-winged Gulls *(Larus glaucescens)* are abundant and predation on Parakeet Auklets has been intense. The auklets may be susceptible in cases of increasing gull populations because they do not exhibit a mass flight, anti-predator response of some other auklet species. Mammalian predators include introduced arctic and red foxes *(Vulpes vulpes)* and probably Norway rats.

For unknown reasons, a high percentage of Parakeet Auklets ingest plastic particles when feeding at sea. This species ranked first among 24 North Pacific seabird species sampled. Since 1969 this trend seems to be increasing, but the effects on the auklets health are unknown.

Parakeet Auklets have been shown to be vulnerable as bycatch in gillnets set in offshore waters. In one salmon driftnet fishery in the northwest Pacific, they accounted for 4.7% of seabirds caught with an estimated 7,079 birds killed in 1977 and 1,966 in 1987. In the eastern Bering Sea between 1993-1999, Parakeet Auklets made up 0.38% of seabirds drowned in Japanese salmon driftnet fisheries.

Oiled beach-cast Parakeet Auklets were found at Ushagat Island (in the Barren Islands) after the *Exxon Valdez* oil spill in 1989, and at Buldir Island in 1994. Large numbers may continue to be killed by oil spilled or dumped at sea, but little quantitative information is available.

Native subsistence hunting and egging still take place in Alaska. No good data are available on numbers of Parakeet Auklets killed or effects on the population because auklets were not identified to species in subsistence surveys.

Recommended Management Actions

- Maintain an Alaskan population of at least 1,000,000 individuals.
- Improve population monitoring techniques.
- Survey populations at index locations and implement a monitoring program in Alaska.
- Investigate the status of the small populations in Southeast Alaska.
- Determine wintering areas.
- Continue fox removal and rat prevention programs.
- Investigate impacts of increasing gull populations.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Parakeet Auklet eggs.
- Measure incidence and impacts of plastic ingestion.
- Work with state and federal agencies and fisheries councils to minimize negative fisheries impacts.
    - Review plans for emerging fisheries to identify potential problems and solutions.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC). to monitor subsistence use of Parakeet Auklets.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 786-3444

References

Armstrong 1995; Dragoo *et al*. In Press; IUCN Internet Website (2005); Jones *et al.* 2001; Kushlan *et al.* 2002; U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005).

Full credit for the information in this document is given to the above references.

LEAST AUKLET *Aethia pusilla*

Conservation Status

ALASKA: Moderate **N. AMERICAN: Moderate Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Aug	1	28-36 d	26-31 d	crevice	surface dive	zooplankton

Life History and Distribution

This five-inch-tall alcid is the most abundant seabird in North America. Though small, they have a large appetite. Least Auklets *(Aethia pusilla)* eat almost 90% of their weight per day in microscopic marine crustaceans and other small zooplankton. Their food is often concentrated far from shore, in areas where strong vertical mixing carries it to the surface. To catch the prey, they dive beneath the surface and forage while in wing-propelled, underwater "flight".

During the breeding season, both sexes are bedecked with three kinds of facial ornaments: a colorful red bill with a lighter tip, a dark, horny knob projecting vertically from the upper bill, and white facial plumes. There is a single line of plumes behind each eye and various plumes on the front of the face. Breeding plumage is dark gray above with variable white patches on the shoulder. Underparts are markedly variable and range from unmarked white, through spotted intermediates, to completely blackish gray. The intermediate coloration is the most common. In winter, the bill becomes blackish, they lose the bill knob and white facial plumes, and the plumage of the underparts is unmarked white.

Least Auklets breed on remote islands, on rocky beaches, sea-facing talus slopes, cliffs, boulder fields, and lava flows which provide rock crevices for nesting. Nest concentrations are usually most dense on unvegetated talus. One egg is laid on bare rock on a flat surface inside the crevice. They are a highly colonial species and generally nest in association with crested auklets.

In Alaska, breeding occurs on the Aleutian Islands, Shumagin and Semidi islands, and on isolated islands in the Bering Sea. Virtually all colonies are on volcanic islands adjacent to deep water or where deep oceanic water, filled with energy-rich crustaceans, is transported past the colonies. The single exception to this is St. Matthew Island, in the southern Bering Sea, where the auklets feed on lower quality, ocean shelf crustaceans.

Outside of North America, Least Auklets breed on the Chukotski peninsula of eastern Siberia, west coast of the Kamchatka peninsula, Commander Islands, central Kurile Islands, and on islands in the Sea of Okhotsk.

Autumn and winter are spent exclusively at sea. They remain near breeding areas year-round where waters remain ice-free.

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Alaska Seasonal Distribution

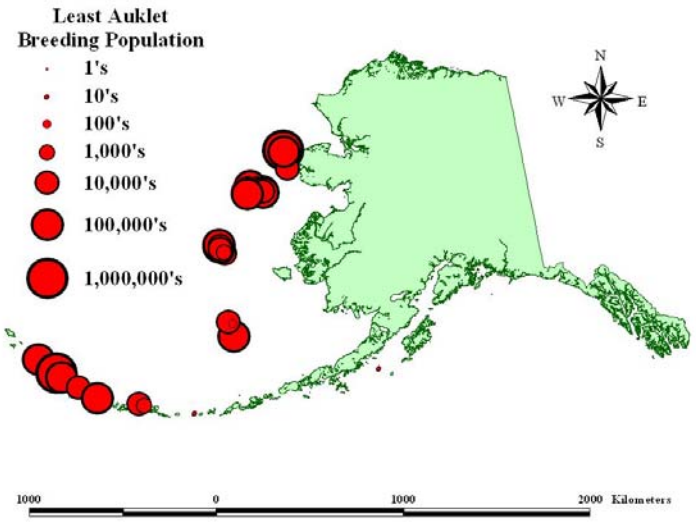
AK Region	Sp	S	F	W
Southeastern	-	-	-	-
Southcoastal	+	+	+	+
Southwestern *	C	C	C	C
Central	-	-	-	-
Western *	C	C	C	-
Northern	-	+	+	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

No effective censusing method has been devised and population estimates for Least Auklet colonies have been difficult to interpret. Nests are hidden under rocks, colonies are large, and colony attendance is highly variable. Monitoring of populations has primarily been done by counting birds loitering on the surface of the colony. This is a small and variable percentage of the population. Colony attendance varies greatly both daily and seasonally. Auklet land attendance relates to changing weather and food conditions which also vary from year to year. This may result in large changes in surface counts of birds between years with no overall population changes.

Estimates of the total North American population range from 5.5 million to 9 million individuals at a total of 37 colony sites. The largest colonies are located on Kiska,



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

Segula, and Gareloi islands in the Aleutian Islands; St. Matthew and Hall islands; Singikpo Cape; St. Lawrence Island; and Diomede Island.

Little trend information is available. Least Auklet populations were monitored by the Alaska Maritime National Wildlife Refuge only at Kasatochi Island in the Aleutian Islands, where a significant negative trend was found (-5.2% per annum 1991-2003). There is no evidence on population trends in North America.

Conservation Concerns and Actions

Some large auklet colonies were extirpated from several Aleutian Islands and reduced on many other islands when arctic foxes *(Alopex lagopus)* were introduced for fur farming. A predator that is far more difficult to control is the introduced Norway rat (*Rattus norvegicus*). There is evidence of frequent predation on auklets by rats on Kiska Island. A cache of 28 auklets, killed by bites to the back of the neck, was discovered by G.V. Byrd (pers. comm., Alaska Maritime National Wildlife Refuge). Rats escaping from fishing vessels and boat harbors are a continuing and serious threat to the species.

Alaska indigenous peoples traditionally hunted auklets for food on Diomede, St. Lawrence, and the Pribilof islands. Some hunting continues today, but auklets are hunted much less than formerly. Between 1995 and 2000, approximately 9,200 auklets were taken annually for subsistence hunting in Alaska, with over 50% being taken on St. Lawrence Island. Auklets were not identified to species in subsistence surveys, but it is probable that Least Auklets were among the take. The effects of subsistence hunting and egging on the species are unknown.

Auklets are occasionally reported to be caught and drowned in commercial fishing nets. In 2002, the bycatch of Least Auklets from the set gillnet fishery for Kodiak Island, Alaska was estimated at 18 individuals.

Colony-wide effects of human disturbance on Least Auklet breeding success are unknown, but this species is sometimes sensitive to disturbance at colonies. Flocks may repeatedly circle and fail to alight on the breeding grounds or enter nesting crevices until the disturbance passes. The Least Auklet may also be vulnerable to oil spills because of a high ratio of body surface area to mass.

Recommended Management Actions

- Continue efforts to develop reliable monitoring techniques.
- Continue monitoring Least Auklets at geographically-dispersed breeding sites.
- Reduce predation of Least Auklets with continued fox removal and rat prevention programs.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Least Auklet eggs.
- Work with state and federal agencies and fisheries councils to minimize the negative impacts.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use of Least Auklets.
- Evaluate human disturbance and minimize disturbance at colonies.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 768-3444

References

Armstrong 1995; Dragoo *et al*. In Press; IUCN Internet Website (2005); Jones 1993b; Kushlan *et al.* 2002; Manly *et al.* 2003; Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006, 2002, 1988; U.S. Fish and Wildlife Service Internet Website (2005).

Full credit for the information in this document is given to the above references.

USFWS

WHISKERED AUKLET *Aethia pygmaea*

Conservation Status

ALASKA: Moderate **N. AMERICAN: Moderate Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Aug	1	35-36 d	35-46 d	crevice	surface dive	zooplankton

Life History and Distribution

Whiskered Auklets *(Aethia pygmaea)* are small alcids that are endemic to a group of volcanic islands from the Aleutian Islands in Alaska to the Commander and Kuril Islands of Russia. Alcids are a group of seabirds that includes murres, murrelets, guillemots, puffins, and Dovekies *(Alle alle)*. They are built for marine life. Characteristics which they share include: a stout bill, heavy, streamlined body, short tail and wings, feet set far back on the body, and strong, powerful chest muscles that move them swiftly through both the air and water. Wing-propelled, underwater "flight" enables them to swim to great depths in search of food. Whiskered Auklets feed in nearshore marine waters, mostly associated with areas of mixed water in "passes" between islands. These areas are formed by the convergence and upwelling of currents, and concentrate zooplankton, the auklet's primary food.

This enigmatic seabird is exotically ornamented with a long black forehead crest, three white facial plumes, and a scarlet bill with a white tip. Behavior at the breeding colony is secretive and strictly nocturnal.

Unlike the more abundant Least *(Aethia pusilla)* and Crested Auklets *(Aethia cristatella)*, Whiskered Auklets generally breed at low densities over a wider range of habitat types. The female lays one egg in a small crevice on a cliff face, talus slope, grassy slope with rocky outcrops, or on a cobble-boulder beach. It is thought that this dispersed breeding may have evolved in relation to competition with other alcids for nest sites.

In Alaska, this species is a locally common breeder throughout the Aleutian Islands, primarily west of Unimak Island. Particular areas of concentrations are the Krenitzen Island group, Islands of Four Mountains, Atka Pass to east Sitkin Sound, and Buldir Island.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern	-	-	-	-
Southcoastal	-	-	-	-
Southwestern *	U	U	U	U
Central	-	-	-	-
Western	-	+	-	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

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In winter, they are probably a year-round resident near breeding areas. Generally, birds remain in the nearshore waters of the Aleutian, Commander and Kuril Islands, but some observations have been made as far south as Honshu and Shikoku, Japan.

Population Estimates and Trends

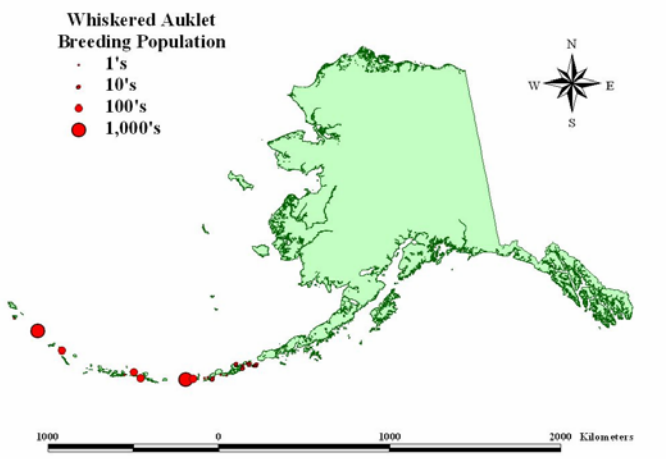
Recent estimates indicate there are about 116,000 Whiskered Auklets throughout the Aleutian Islands. These estimates are based on the largest counts of birds observed at sea during the breeding season, when many individuals were possibly attending nest sites, and should be considered as minimum estimates. Whiskered Auklets are increasing in the Aleutian Islands.

Estimates from the 1990s for the Commander Islands are about 5,000 individuals. No estimates are available for the Kuril Islands.

Conservation Concerns and Actions

Whiskered Auklets are of conservation concern because of their limited range and introduction of mammalian predators such as arctic foxes (*Alopex lagopus*) and Norway rats (*Rattus norvegicus*) to many of their breeding islands. In addition, Whiskered Auklets may be vulnerable to oil spills, entanglement in fishing nets, fatal attraction to ships' lights, and physical and human caused factors that disrupt their food base.

When Whiskered Auklets breed in dense mixed-species colonies, they are subject to disturbance by other auklet species and also by Horned Puffins *(Fratercula corniculata)*. Killing of Whiskered Auklet chicks by other auklet species has been observed at some study sites. On



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U.S. Fish and Wildlife Service, Anchorage, Alaska.

the other hand, low density breeding exposes these small auks to predation by gulls *(Larus spp.)*, a threat that the diurnal Least and Crested auklets overcome by nesting in dense colonies. At low densities, Whiskered Auklets appear to avoid the predation risk by their almost exclusively nocturnal trips between the sea and their breeding sites.

Naturally occurring tundra voles (*Microtus oeconomus*) and red-backed voles *(Clethrionomys rutilus*), and introduced Norway rats, arctic foxes and red foxes *(Vulpes vulpes)* have all been recorded depredating auklets on islands in the Bering Sea. On Iona Island, in the Okhotsk Sea, there are no mammalian or avian predators and Whiskered Auklets are reported to have a diurnal pattern of activity. Further research is needed to establish whether nocturnality is a trait that responds to predation.

Seabird species that nest in rock crevices were expected to be less susceptible to fox predation than those that nest on the ground or in earthen burrows. However, that was not the case with Whiskered Auklets due to some unique characteristics. Many young and some adults return to breeding colonies after the breeding season to sleep on boulders on the shore making them particularly vulnerable to foxes patrolling beaches at night. They also have year-round residency near breeding areas rather than dispersing to the open seas like other *Aethia* species. This makes them available to foxes year-round. Proximity to year-round foraging areas may be the reason they remain close to the breeding areas.

The Aleutian Islands have no native terrestrial mammals west of Umnak Island. The introduction of arctic foxes had a dramatic, controlling effect on the distribution and abundance of Whiskered Auklets. Historical evidence suggests that this species was abundant prior to fox introduction, experienced large declines at the peak of fur farming, and is now recovering to former levels after an active fox removal program by the U.S. Fish and Wildlife Service. One impediment to further population increases and range expansion could be predation by Norway Rats which have been accidentally introduced to at least 16 islands.

Nocturnal fishing activities near breeding colonies pose a potentially serious threat to Whiskered Auklets. Birds come and go from breeding colonies at night and can be attracted to lighted vessels, resulting in collisions with ships and entanglement in nets. Over 1,000 birds were killed when they flew into lights aboard a fishing vessel in the eastern Aleutian Islands.

Oil spills could also cause significant damage since Whiskered Auklets seem to occur in large flocks at relatively few places.

Recommended Management Actions

- Restore Whiskered Auklet populations and distribution to pre-fox, pre-rat introduction conditions and maintain an Alaska-wide population of at least year 2003 levels.
- Survey populations at index locations and maintain a monitoring program in Alaska.
- Complete a nesting inventory.
- Continue fox removal and rat prevention programs.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Whiskered Auklet eggs.
- Work with state and federal agencies and fisheries councils to minimize the negative impacts.
    - Review plans for emerging fisheries, to identify potential problems and solutions.
    - Educate ship crews about light pollution and care and release of birds that come aboard.

Regional Contact

Branch Chief, Nongame Migratory Birds, Migratory Bird Management, USFWS, 1011 E. Tudor Rd., Anchorage, Alaska 99503
Telephone (907) 786-3444

References

Armstrong 1995; Byrd and Williams 1993b; Dragoo *et al.* In Press; Hunter *et al.*2002; IUCN Internet Website (2005); Kushlan *et al.* 2002; North 1997; U.S. Fish and Wildlife Service 2006, 2002; Williams *et al.* 2003.
Full credit for the information in this document is given to the above references.

CRESTED AUKLET *Aethia cristatella*

Conservation Status

ALASKA: Moderate **N. AMERICAN: Moderate Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Aug	1	34-41 d	35 d	crevice	surface dive	mostly zooplankton

Life History and Distribution

The Crested Auklet (*Aethia cristatella)* is a small, peculiar-looking seabird with a bright orange bill (during breeding season) and an eye-catching crest ornament, which is present in both sexes. Males and females prefer mates with large crests and have a distinctive tangerine odor to their plumage.

During the breeding season, this bird is found only in the Bering Sea and adjacent North Pacific Ocean, and nests in colonies on remote coastlines and islands. They are an extremely social species and nest in mixed colonies with Least Auklets (*Aethia pusilla)* ranging in size from a few hundred to possibly more than a million pairs. Nests are located deep in rock crevices on sea-facing talus slopes, cliffs, boulder fields, and lava flows making it difficult to census them.

Summer foods include marine invertebrates and less frequently fish and squid. Crested Auklets often forage in large flocks. To capture their food, birds dive from the surface and pursue the prey in underwater "flight".

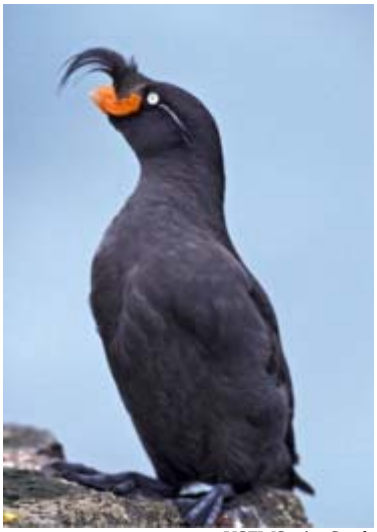
In Alaska, Crested Auklets are found in the Bering Sea, on the Aleutian Islands, and on the Shumagin Islands. A total of 43 colony sites are known with notable centers of breeding abundance in the northern Bering Sea and the western Aleutian Islands. Virtually all colonies are on volcanic islands adjacent to deep water or where deep oceanic water, filled with energy-rich crustaceans, is transported past the colonies. The single exception to this is St. Matthew Island where the auklets feed on lower quality (less nutrient-rich), ocean shelf crustaceans.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern	-	-	-	-
Southcoastal	-	+	+	U
Southwestern *	C	C	C	C
Central	-	-	+	-
Western *	C	C	C	-
Northern	-	R	R	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

They also breed in Russia on the central Kurile Islands, the Chukotski peninsula, and on islands in the Okhotsk Sea. The winter range is poorly documented, but Crested Auklets are usually present near breeding areas where the waters remain ice-free. In Alaska, there is some southeastward movement in winter to the Gulf of Alaska.



USFWS Art Sowls

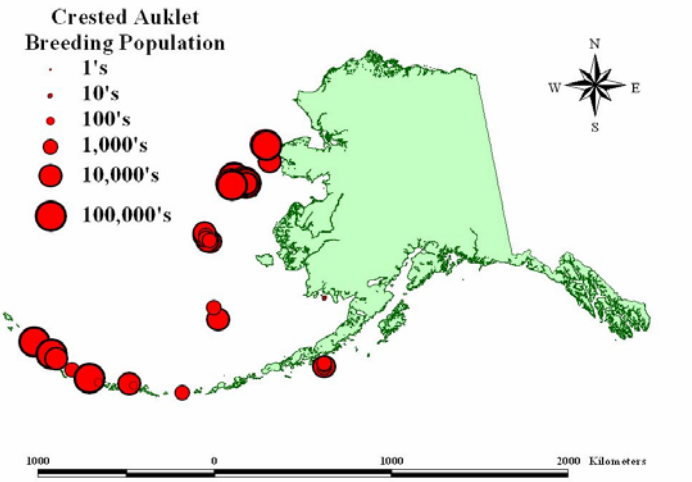
Population Estimates and Trends

Numbers of birds on the surface at a colony and the nearby sea represent only a small, variable, and poorly understood proportion of the total population. Colony sizes are estimated from numbers of adults visible on the surface of a colony site. The total North American population is estimated at about 2.9 million birds. The largest breeding colonies are at Sirius Pt. on Kiska Island in the central Aleutian Islands and at Kongkok Bay, on St. Lawrence Island. The global population is estimated at approximately 6 million individuals.

Little information is available on global trends. There is no evidence for an overall population trend in North America, although some information is available on local population changes. Crested Auklet populations were monitored by the Alaska Maritime National Wildlife Refuge only at Kasatochi Island in the Aleutian Islands, where a significant positive trend was found (+7.0% per annum 1991-2003).

Conservation Concerns and Actions

Crested Auklets face several threats including



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

disturbance at colonies, predation from introduced predators, oil spills, collisions with fishing vessels due to attraction to light, and entanglement in driftnets.

If disturbed, birds will continue to circle the colony and not alight or enter the nesting crevice until the disturbance has passed. They are particularly sensitive to disturbance at nesting crevices. Handling of incubating adults could result in nest abandonment.

This species was extirpated from several Aleutian Islands and reduced on many other islands when arctic foxes (*Alopex lagopus)* were introduced for fur farming. Red foxes *(Vulpes vulpes)* also killed an estimated 800 Crested Auklets in a three month period at Big Koniugi Island in the Shumagin Islands. A far more difficult predator to control is the introduced Norway rat (*Rattus norvegicus)*. There is evidence of frequent predation on auklets by rats on Kiska Island. Rats escaping from fishing vessels and boat harbors are a continuing and potentially serious threat to the species.

Crested Auklets are highly vulnerable to oil spills because of large local concentrations at breeding and favored wintering areas. Beached, oil-soaked corpses have been found on Buldir Island in the western Aleutian Islands.

Human activities where bright lights are employed at sea, particularly during bad weather (e.g. oil and gas development, fishing vessels, oil tankers) also represent a potential danger to the species. Birds may be killed by collisions with the light source. In one incident near Kodiak Island, 6,000 Crested Auklets came aboard a brightly-lit crab fishing vessel resulting in high mortality.

Auklets are occasionally reported to be caught and drowned in monofilament driftnets. Other indirect impacts of commercial fishing such as those related to food availability are difficult to ascertain and further study is required.

Alaska indigenous peoples traditionally hunted auklets for food on Diomede, St. Lawrence, and the Pribilof islands. Some hunting continues today. Between 1995 and 2000, approximately 9,200 auklets were taken annually for subsistence hunting in Alaska with over 50% being taken on St. Lawrence Island. Auklets were not identified to species in subsistence surveys, but it is probable that Crested Auklets were among the take. The effects of subsistence hunting and egging on the species are unknown.

Recommended Management Actions

- Restore Crested Auklet populations and distribution to pre-fox, pre-rat introduction conditions.
- Maintain an Alaska-wide population of at least year 2000 levels.
- Continue study of effective monitoring techniques.
- Implement a systematic census of the Alaskan population.
- Survey populations at index locations and maintain a monitoring program in Alaska.
- Complete a nesting inventory.
- Determine wintering locations.
- Reduce predation of Crested Auklets with continued fox removal and rat prevention programs.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Crested Auklet eggs.
- Work with state and federal agencies and fisheries councils to minimize the negative impacts of fisheries interactions.
    - Educate ship crews about light pollution and care and release of birds that come aboard.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use of Crested Auklets.
- Evaluate human disturbance and minimize disturbance at index colonies.

Regional Contact

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Telephone (907) 786-3444

References

Armstrong 1995; Dragoo *et al.* In Press; IUCN Internet Website (2005); Jones 1993a; Kushlan *et al.* 2002; Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006; U.S. Fish and Wildlife Service 2002; U.S. Fish and Wildlife Internet Website (2005).

Full credit for the information in this document is given to the above references.

RHINOCEROS AUKLET *Cerorhinca monocerata*

Conservation Status

ALASKA: Low **N. AMERICAN: Low Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
June-Sept	1	39-52 d	48-55 d	burrow, crevice	surface dive	fish, marine invertebrates

Life History and Distribution

The Rhinoceros Auklet *(Cerorhinca monocerata)* is an unusual member of the Alcidae family. "Auklet" is a misnomer, since this bird is not a close relative of the small, plankton-feeding alcids called auklets, but is actually related to the more brightly colored, parrot-billed puffins *(Fratercula spp.)*. It is similar to puffins in many aspects of its biology, but its outward appearance differs noticeably. This bird is pigeon-sized with drab, mostly gray plumage that is darker on the back, lighter gray on the throat and breast, and white on the underparts. The eyes are yellow and it has a thick, orange bill with a brown tip. During the breeding season, the head is rather ornate with two white plumes on either side of the head and a pale yellow, rhinoceros-like "horn" projecting above its upper bill. Both sexes have the same size horn. The function of this prominent feature is unknown.

Nesting occurs on offshore islands throughout the temperate waters of the North Pacific. Males and females dig burrows with their bills and long, sharp claws. The burrows are usually dug in deep soil on grassy slopes or beneath forests. If soil is lacking, they will nest in crevices or natural cavities.

Unlike other puffins, the Rhinoceros Auklet is mainly a nocturnal visitor to its colonies. This may be an adaptation in response to kleptoparasitism (stealing of food by other birds) and predation by gulls *(Larus spp.)* and raptors. During the day, this species tends to stay on the open sea to feed. The adult waits for nightfall before venturing ashore to feed its young and remains hidden in the burrow until about two hours before sunrise. This is the only nocturnal auk that carries fish externally (crosswise in their bills) to hungry chicks back at the colony. All of the other nocturnal auks bring food in a gular pouch in the throat.

This species breeds from Japan in the west, to the Gulf of Alaska in the east, and south to southern California. In Alaska, it breeds on Chowiet Island in the Semidi Islands, Middleton Island and the Chiswell Islands in the Gulf of Alaska, and St Lazaria and Forrester islands in Southeast Alaska. It is also a probable breeder on Buldir Island in the Aleutian Islands in very small numbers (~30 birds) (J. Williams pers. comm., Alaska Maritime National Wildlife Refuge). The breeding colony previously recorded on Sud Island in the Barren Islands was not found in 1994, but Rhinoceros Auklets are still seen in summer around the Barren Islands and are probably still breeders in the area (A. Kettle pers. comm., Alaska Maritime National Wildlife Refuge).

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The North American breeding population winters in Pacific waters, from Southeast Alaska to southern Baja California. The bulk of the breeding population appears to winter off California.

Birds that breed outside North America do not move far outside the breeding range, but occur as far south as Tokyo, and occasionally Kyushu and northeastern China.

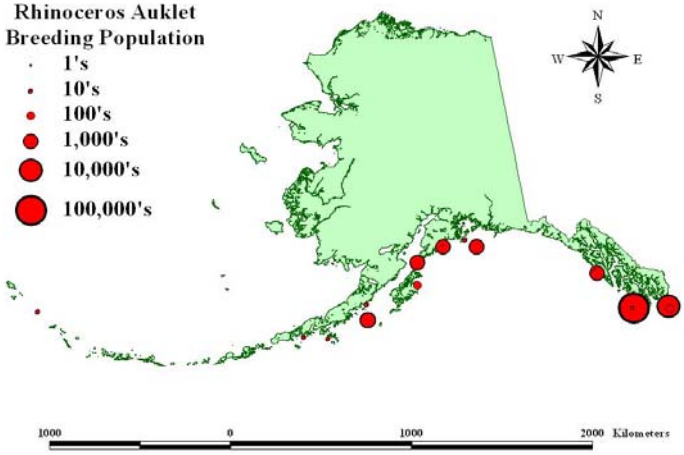
Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	U	U	U	+
Southcoastal *	R	R	R	-
Southwestern *	R	R	R	R
Central	-	-	-	-
Western	-	-	-	-
Northern	-	-	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

Population estimates are generally unreliable because of the difficulty in counting nesting birds. Burrows are long and sometimes branched making nest chambers hard to access. World population estimates are extremely rough. The total population is estimated at 2-3 million individuals including nonbreeders. The breeding



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

population is estimated at 1.5 million birds. In North America, >95% of the population breeds in British Columbia (73%), Washington (13%), and in Southeast Alaska (12%) where most of the birds are found at eight large colonies. Breeding also occurs in Oregon and California.

Rhinoceros Auklets increased by 4.6% per annum at both Middleton Island and the Semidi Islands between the mid-1970s and 2003. There is no trend information available for other breeding sites in Alaska. Populations appear to have increased in British Columbia and perhaps Washington.

Conservation Concerns

Populations of this secretive and poorly known species are potentially threatened by introduced mammalian predators, oil pollution, and bycatch in fishing nets.

Disturbance and trampling of burrows by humans, mammals, and surface nesting or roosting birds can cause nest loss and lowered reproductive success. Populations have been reduced at some sites by the introduction of mammalian predators such as the arctic fox (*Alopex lagopus)* in Alaska, and raccoons *(Procyon lotor)* and rats (*Rattus spp.)* in British Columbia. At Helgesen Island, B.C., raccoons reduced the population from 13,000 to 2,000 pairs between 1986 and 1993.

A large proportion of Rhinoceros Auklets breed at just a few large colonies in North America and winter in continental-shelf waters off California. This makes them potentially vulnerable to the effects of major oil spills. The Rhinoceros Auklet was the second most common species killed in the *Apex Houston* oil spill off central California.

High mortalities have also been documented in the California and Washington gillnet fisheries.

Abundant dead birds on California beaches during the 1983 El Niño event suggest that major changes in oceanographic conditions can lead to heavy mortality.

Recommended Management Actions

- Assess population size and document trends at colonies throughout Alaska.
- Continue monitoring Rhinoceros Auklets at geographically-dispersed breeding sites.
- Reduce predation with continued introduced predator removal and prevention programs.
- Continue to work with state and federal agencies and fisheries councils to minimize the negative impacts of fisheries interactions.
- Support efforts to minimize the incidence of fuel spills near breeding and roosting areas and measure contaminants in Rhinoceros Auklet eggs.
- Minimize human disturbance at nesting sites.

Regional Contact

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References

Armstrong 1995; Dragoo *et al*. In Press; Gaston and Dechesne 1996; IUCN Internet Website (2005); Kushlan *et al.* 2002;
U.S. Fish and Wildlife Service 2006, 2002.
Full credit for the information in this document is given to the above references.

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HORNED PUFFIN *Fratercula corniculata*

Conservation Status

ALASKA: Moderate **N. AMERICAN: Moderate Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Sept	1	40-42 d	38-45 d	crevice, burrow	surface dive	fish, squid, other invertebrates

Life History and Distribution

The Horned Puffin *(Fratercula corniculata)* is one of the most sought after seabirds in Alaska by tourists and photographers. It is a smallish, picturesque bird with a large, triangular orange and red bill, and bright orange legs and feet. Because of its coloration, the Horned Puffin was named "sea parrot" and "clown of the sea" by early sailors. In summer, it has a small, fleshy, dark "horn" above each eye from which it takes its name. Outer layers of the bright bill are shed in late summer, leaving a smaller, drab-colored bill. The legs and feet fade to a pale fleshy color.

Puffins feed their chicks fish and are known to carry bills full of dangling fish, all neatly lined up crosswise. They are able to catch and secure more than one fish by using spines on their tongues and roofs of their mouths.

The species is widespread in the North Pacific Ocean. It nests on coastlines and offshore islands from British Columbia (where they are rare) to Alaska, and southwest to the Sea of Okhotsk and the Kuril Islands.

In Alaska, the largest colonies are concentrated in the northwest Gulf of Alaska and along the Alaska Peninsula in the Semidi, Shumagin, and Sanak islands. Nesting also occurs on the Aleutian Islands, a few islands in the Bering and Chukchi Seas (e.g. Pribilof, St. Matthew, St. Lawrence, Diomede, and Chamisso islands), and a few coastal and island sites along the Alaskan mainland. The most northerly well-established colony is at Cape Lisburne in the Chukchi Sea. Small numbers also breed as far east as Cooper Island, which is east of Point Barrow in the Beaufort Sea.

Alaska Seasonal Distribution

AK Region	Sp	S	F	W
Southeastern *	R	R	R	R
Southcoastal *	U	U	U	R
Southwestern *	C	C	C	U
Central	-	-	-	-
Western *	C	C	C	-
Northern *	-	R	+	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

In winter, they disperse over a broad area of the central North Pacific Ocean, generally over deep water.

USFWS Art Sowls

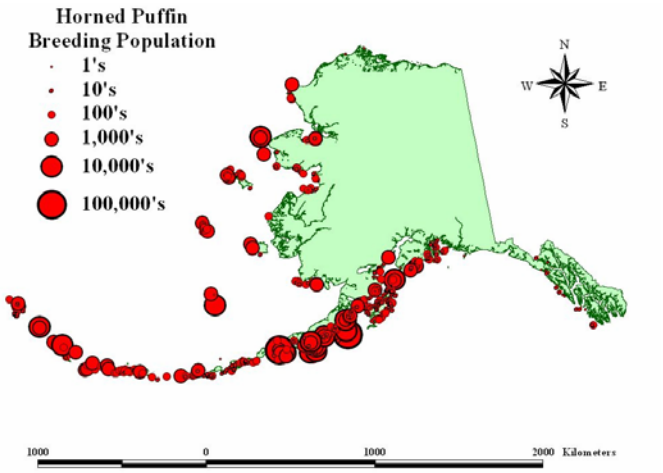
Population Estimates and Trends

The total world population estimate is 1,088,500 individuals, of which > 85% nest in North America. In Alaska, there are 608 breeding colonies with an estimated population of 921,000 individuals. The population estimates are unreliable due to the difficulty of censusing birds in rock crevices and burrows. Most estimates are based on observations of birds attending colonies, but no standardized census techniques have been developed, and the ratio of birds attending colonies at any given time to local populations is unknown.

Boat based surveys of seabirds at sea in Prince William Sound, Alaska, suggest an overall 79% decline of Horned Puffins from 1972-1998. This paralleled a similar rate of decline for other fish-eating seabirds in Prince William Sound and for murres *(Uria spp.)* in the Gulf of Alaska. Major changes in the food base, apparently the result of a changing marine climate, have been correlated to the decline of murres and may have played a role in the declines of Horned Puffins as well. Other information about trends for Horned Puffins is extremely limited.

Conservation Concerns and Actions

Puffins, like many other species of seabirds, need predator-free nesting areas and abundant food supplies to successfully reproduce. Considering the large-scale changes in marine food chains and climate which have been observed over the last decade, prey availability is the most likely source of population regulation. However,



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U.S. Fish and Wildlife Service, Anchorage, Alaska.

there are almost no data on which to base population trends and monitoring is an essential priority. Moreover, many basic studies are needed to improve our understanding of the biology and ecology of this species in order to assess the causes of population changes that might be occurring.

Some causes of adult mortality are starvation, predation, oil pollution, fishing net mortality, and harvest.

Introduced predators such as the arctic fox (*Alopex lagopus)*, red fox *(Vulpes vulpes)*, and the Norway rat *(Rattus norvegicus)* prey on Horned Puffins. In general, they likely have been less affected than some other species of seabirds because they usually nest in less accessible crevices.

Horned Puffins are vulnerable to oil pollution, but no major oil-mortality events other than the *Exxon Valdez* spill in 1989 have been reported. In that spill, 162 Horned Puffins were retrieved dead.

Bycatch of Horned Puffins in gillnets in the North Pacific Ocean has been widespread. From the 1950s to the 1990s, tens of thousands of Horned Puffins were killed in offshore salmon and squid driftnet fisheries. By 1990, the bycatch had declined to less than 1000 individuals because the high-seas driftnet fisheries were largely eliminated.

Coastal gillnet fisheries continue to catch birds in Alaska. The bycatch is monitored and recorded by the National Marine Fisheries Service, Alaska Marine Mammal Observer Program. Bycatch of Horned Puffins has been recorded in various gillnet fisheries, but the magnitude is minimal compared to the high-seas. For example, in 2002, the bycatch of Horned Puffins from the set gillnet fishery for Kodiak Island was estimated at 14 individuals.

Historically, puffins were used for food and clothing by Alaskan Natives. Aleut Natives made parkas of puffin skins, which were very tough and worn feather side in. Today adult Horned Puffins and their eggs are still harvested for subsistence use in some areas of Alaska, particularly in the Bering Strait region. The harvest is minimal, localized, and estimated at 226 adults and 146 eggs taken annually between the early 1990s and 2000. The figures include both Horned and Tufted Puffins *(Fratercula cirrhata*) since puffins were not identified to the species level in subsistence harvest surveys.

Recommended Management Actions

- Develop standardized methods for monitoring populations.
- Implement a regional monitoring program.
- Survey populations at key index colonies such as the few large colonies that account for most of the total population.
- Complete a nesting inventory.
- Measure productivity.
- Determine wintering areas.
- Evaluate prey abundance variability and impacts on Horned Puffin populations.
- Reduce predation with continued fox removal and rat prevention programs.
- Support efforts to minimize the incidence of fuel spills near breeding and wintering areas and measure contaminants in Horned Puffin eggs
- Continue to work with state and federal agencies and fisheries councils to minimize the negative impacts of fisheries interactions.
- Evaluate human disturbance at key colonies and educate the public to avoid disturbance of Horned Puffins.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use of Horned Puffins.

Regional Contact

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Telephone (907) 786-3444

References

Armstrong 1995; Dragoo *et al*. In Press; IUCN Internet Website (2005); Kushlan *et al.* 2002; Manly *et al.* 2003; Piatt and Kitasky 2002a; Piatt *et al.*1990; Stephensen and Irons 2003; U.S. Fish and Wildlife Service 2006, 2002; U.S. Fish and Wildlife Service Internet Website (2005).

Full credit for the information in this document is given to the above references.

TUFTED PUFFIN *Fratercula cirrhata*

Conservation Status

ALASKA: Not At Risk **N. AMERICAN: Moderate Concern** **GLOBAL: Least Concern**

Breed	Eggs	Incubation	Fledge	Nest	Feeding Behavior	Diet
May-Sept	1	40-53 d	45-55 d	burrow, crevice	surface dive	fish, squid, other invertebrates

Life History and Distribution

Tufted puffins *(Fratercula cirrhata)* are highly decorative seabirds. Breeding adults have huge orange bills, legs, and feet, white faces, and long golden feather tufts that curl back from each side of the head. In late summer, they lose their tufts and the bright colors of the bill turn to a dull reddish-brown.

Diet is one of the fascinating details of Tufted Puffin biology. Chicks are fed almost entirely tiny fish which the parents catch underwater and collect, lined up head to tail, across their bills. They routinely hold 5-20 fish in their mouths while returning to the nest. Puffins use their tongues to hold the fish against the spiny palate in their mouths while opening their bill to catch more fish.

This species prefers high, steep areas for nesting. Although they are about the size of a crow, they are twice as heavy with short, stubby wings. The wings are used for "flying" underwater in pursuit of food; this same feature makes them poor aerial flyers. Tall cliffs make for easy take-offs and give newly fledged puffins assistance in getting up enough airspeed for their first flight. The toes of their webbed feet have sharp claws that are used to dig burrows in the steep hillsides of their nesting areas. At rockier sites where soil is scarce or nonexistent, they nest in crevices.

Tufted puffins are widespread in the North Pacific Ocean and nest on coastlines and offshore islands from lower California to Alaska and across the ocean from Japan to the shores of northeastern Asia.

In Alaska, Tufted Puffins nest from Southeast Alaska (St. Lazaria, Forrester islands), along the Alaska Peninsula (Amagat, Castle Rock, Suklik, Barren, and Triplet islands), to the eastern Aleutian Islands where the largest colonies are concentrated on Egg, Kaligagan, Aiktak, Vsevidov, and Chagulak islands. The population is dispersed among other Aleutian Islands, notably on Buldir and Koniuji. They are also found on islands in the Bering and Chukchi Seas (Pribilof, St. Matthew, St. Lawrence, and Diomede islands), and at a few coastal and island sites along the Alaskan mainland. The most northerly well-established colony is at Cape Lisburne in the Chukchi Sea.

Alaskan breeding birds are pushed south by advancing ice in winter. They disperse throughout the North Central Pacific Ocean. A few remain as year-round residents among islands from Kodiak to Attu.

USFWS Donna Dewhurst

Alaska Seasonal Distribution

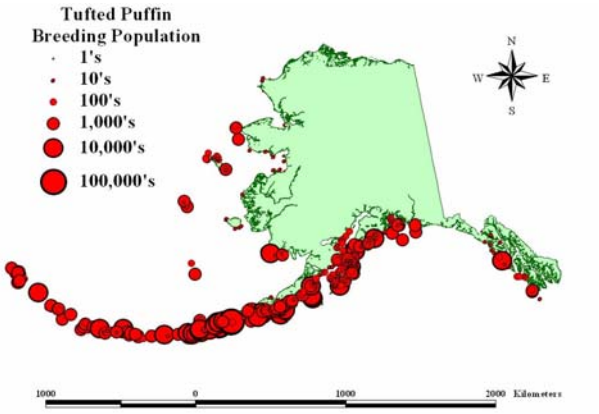
AK Region	Sp	S	F	W
Southeastern *	U	U	U	R
Southcoastal *	C	C	C	R
Southwestern *	C	C	C	U
Central	-	-	-	-
Western *	C	C	C	-
Northern	-	+	-	-

C= Common, U= Uncommon, R= Rare, + = Casual or accidental, - = Not known to occur, * = Known or probable breeder, Sp= Mar-May, S= June and July, F= Aug-Nov, W= Dec-Feb. **© Armstrong 1995.**

Population Estimates and Trends

The total world population estimate is 2,970,000 individuals, of which > 80% nest in North America. In Alaska, there are 693 breeding colonies with an estimated population of 2,280,000 individuals. The population estimates are unreliable due to the difficulty of censusing birds in nesting burrows. Most estimates are based on observations of birds attending colonies, but the ratio of birds attending colonies at any given time to local populations is unknown.

Owing to variability among census counts or to low numbers of counts, or both, calculated trends are marginal or insignificant in half of the studies. However, results suggest that populations are increasing in the Gulf of Alaska and westward and declining throughout Southeast Alaska, British Columbia, Washington, Oregon, and California. Tufted Puffin populations showed significant positive trends at Nizki (+8.7% per annum 1976-1998), Adak (+18.3% per annum 1988-1995), Bogoslof (+3.3%



Seabird breeding population maps created from data provided by the Beringian Seabird Colony Catalog Database. U. S. Fish and Wildlife Service, Anchorage, Alaska.

per annum 1973-2001), and Aiktak (+2.5% per annum 1989-2002) islands in the Aleutian Islands. No trends were evident at any other monitored sites in Alaska. Population trends in Russia are poorly known. There have been dramatic declines in Japan; only 30 birds remain and extirpation appears likely soon.

Conservation Concerns and Actions

Puffins, like many other species of seabirds, need predator-free nesting areas and abundant food supplies to successfully reproduce. Considering the large-scale changes in marine food chains and climate, which have been observed over the last decade, changes in prey availability are the most likely source of population regulation. However, data are limited and need to be updated at many sites.

Some causes of adult mortality that could be investigated further are starvation, predation, oil pollution, fishing net mortality, and harvest.

Because Tufted Puffins nest in accessible dirt burrows, they have been historically affected by the intentional or accidental introduction of predators such as the arctic fox (*Alopex logopus)*, red fox *(Vulpes vulpes),* and the Norway rat *(Rattus norvegicus).* Removal of foxes and rats from some islands showed dramatic results with recovery of populations beginning immediately following removal of the predators. Eggs and young are also taken in their burrows by river otters *(Lutra canadensis)* and mink *(Mustela vison)*, and adults are taken by Bald Eagles *(Haliaeetus leucocephalus)*, presumably on the water.

Puffins are also vulnerable to oil spills. About 570 Tufted Puffins were retrieved after the *Exxon Valdez* oil spill in Alaska in 1989. Based on recovery rates, the number killed could have been as high as 13,000.

Bycatch of Tufted Puffins in gillnets in the North Pacific Ocean has been widespread. From the 1950s to the 1990s, tens of thousands were killed in offshore salmon and squid driftnet fisheries. By 1990, the bycatch had declined to <500 individuals because the high-seas driftnet fisheries were largely eliminated. However, Japanese driftnet fishing for salmon continued in the Russian economic zone (Bering Sea, Kurils, Sea of Okhotsk), and 15,000-30,000 Tufted Puffins per year continued to be killed throughout the 1990s.

Coastal gillnet fisheries continue to catch birds in Alaska. The bycatch is monitored and recorded by the National Marine Fisheries Service. In 2002, the bycatch of Tufted Puffins from the set gillnet fishery for Kodiak Island was estimated at 110 individuals. Small numbers of puffins were also recorded in the bycatch for the Prince William Sound gillnet fishery. Additionally, a few Tufted Puffins may be taken in the Alaskan trawl fisheries.

Historically, puffins were used for food and clothing by Alaskan Natives. Parkas were made from puffin skins and bills were commonly used to make ceremonial rattles or hoops. Today, adult Tufted Puffins and their eggs are still harvested for subsistence use in some areas of Alaska, particularly in the Bering Strait region. The harvest is minimal and localized. Between the early 1990s and 2000 an estimated 226 adult puffins and 146 puffin eggs were taken per year. Horned Puffins *(Fratercula corniculata)* and Tufted Puffins were not identified to species in census surveys so the figures represent both species.

Recommended Management Actions

- Continue monitoring populations of Tufted Puffins at key index colonies and implement monitoring at as many additional locations as possible.
    - Collect survival data at monitoring sites.
- Determining wintering areas.
- Evaluate prey abundance variability and impacts on Tufted Puffin populations.
- Continue fox removal and rat prevention programs.
- Support efforts to minimize the incidence of fuel spills and measure contaminants in Tufted Puffin eggs.
- Continue to work with state and federal agencies and fisheries councils to minimize the negative impacts of fisheries interactions.
- Work with the Alaska Migratory Bird Co-Management Council (AMBCC) to monitor subsistence use of Tufted Puffins.
- Evaluate human disturbance at key colonies.

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