

Shorebirds – Introduction

Alaska provides breeding habitat for more shorebirds than any other state in the United States. Seventy-three species of shorebirds have been recorded in Alaska, representing fully one-third of the world's shorebird species. Of these, 46 species have been documented breeding; 37 are regular breeders and 9 are irregular breeders or breed in small numbers (Gill et al. 1994, Gill and Senner 1996). This incredible diversity is the result of Alaska's proximity to the major flyways of the world and the unique characteristics of the region's landscape, geomorphology, and vegetation (Kessel and Gibson 1978). Most of these species migrate south of the U.S.-Mexico border and a third migrate to South America, Asia, or Oceania. Only a few species remain in Alaska throughout the year.

The list of shorebird taxa restricted wholly or in large part to Alaska is impressive. For example, most of the world's breeding populations of 3 species (Bristle-thighed Curlew, Black Turnstone and Western Sandpiper) and 5 subspecies (Dunlin *C. a. pacifica* and *C. a. arctica*; Rock Sandpiper *C. p. ptilocnemis* and *C. p. couesi*; and Short-billed Dowitcher *L. g. caurinus*) occur entirely within Alaska. As much as 75% of the world's breeding populations of Surf-bird and a subspecies of the Rock Sandpiper (*C. p. tschuktschorum*) occur in the state. A large proportion of North American populations of several other taxa also occur in Alaska, including Black Oystercatcher, Pacific Golden-Plover, Wandering Tattler, Whimbrel (*N. p. rufiventris*), Bar-tailed Godwit (*L. l. baueri*), and Red Knot (*C. c. roselaari*).

Recent evidence suggests many shorebird species throughout the world are declining (International Wader Study Group 2003). Such declines are also occurring in North America. Indeed, of the 72 species and subspecies of shorebirds addressed in the U.S. and Canada National Shorebird Plans, almost half (49%) have experienced apparent population declines since 1970. For many species, the relative status is poorly known and basic monitoring is needed. Outright loss of habitat is the cause of the population decline of many species; for others, it is less clear what factors are responsible for the observed declines.

To better ascertain the reasons for these declines and to gather baseline data on species occurring in Alaska, the shorebird group selected 7 species to highlight in the CWCS. They include the Black Oystercatcher, Bristle-thighed Curlew, Buff-breasted Sandpiper, Marbled Godwit, Rock Sandpiper, Lesser Yellowlegs, and Solitary Sandpiper. Detailed conservation action plans for these species are presented separately. These 7 species exhibit a variety of life history patterns, have population sizes that range from a few thousand to hundreds of thousands, and have population trends that range from stable to possibly increasing to dramatically decreasing. We also relied on a species prioritization process developed as part of the U.S. Shorebird Conservation Plan (Brown et al. 2001). That process is based upon factors such as: 1) population trend and population trend uncertainty, 2) relative abundance, 3) threats during breeding season, 4) threats during nonbreeding season, 5) breeding distribution, and 6) nonbreeding distribution. The result of this process is an Alaskan conservation priority list that includes 2 taxa ranked as

highly imperiled and 17 ranked as of high concern. These species are covered in more detail in the Alaska Shorebird Conservation Plan (Alaska Shorebird Group 2000).

Beyond studying individual species, there are many conservation needs that transcend a single species and are common to particular shorebird groups or to all shorebirds. Several of these areas are outlined here.

Alaska Shorebird Information and Data

The first step in conserving wildlife is to understand what information is currently available on a given species or subject. There is a need to develop an information clearinghouse, which would synthesize current information on the geographic distribution, abundance, and dynamics of shorebird populations inhabiting the different regions of Alaska. This relational database would include information on where, when, and how studies were conducted, which species were present, counts or estimates of abundance, and other demographic information (e.g., nest initiation, success). The goal is to provide easily accessible web-based information on Alaska's 73 species of shorebirds to a variety of interested parties. It also could be used to identify information gaps and guide development of monitoring and research programs.

Clearinghouse information could be shared directly with the AKNHP, which is Alaska's statewide clearinghouse for information on plant and animal species of conservation concern, natural communities of conservation concern, and invasive nonnative plant species. AKNHP collects, validates, and distributes this information, and assists natural resource managers and others in applying it effectively. The AKNHP is part of NatureServe, and its data are linked to similar programs in all 50 states, most Canadian provinces, and many Latin American countries.

Monitoring and Assessment of Shorebird Populations

Traditional methods of monitoring have been problematic for shorebirds, especially species that occupy remote breeding areas, occur at very low densities, exhibit cryptic behavior near the nest, or frequently forage well outside their nesting territory. For many of these species, an analysis of vital demographic rates may be a more practical approach to determine (1) which rates have the greatest effect on population size, (2) how populations might change with changes in vital rates, and (3) whether the status of these populations can be easily monitored through the most sensitive vital rates. For a few species, basic information on adult survival, age of reproduction, productivity, and annual recruitment is available or can be estimated from a sister taxon. For other species, this basic information needs to be collected by conducting field studies.

Due to the large ranges and migratory nature of many of these species, the ability to identify and assess changes in shorebird populations requires well-coordinated state, national, and international efforts. Within Alaska, state, federal, and private organizations must work cooperatively to obtain objectives that transcend jurisdictional boundaries. Improved and coordinated monitoring of shorebirds would allow suspected population

trends to be confirmed and provide better estimates of the rates of change. This information, in turn, could be used to inform many important management decisions, including 1) detecting species at risk, 2) identifying causes of population changes, 3) evaluating conservation and restoration programs, and 4) setting priorities for conservation of species and habitats. Responding to this need, the U.S. and Canadian Shorebird Council's Monitoring Committee established the Program for Regional and International Shorebird Monitoring (PRISM) in 2001 (Bart et al. 2002). This international program includes monitoring of shorebirds in the Arctic, boreal and montane regions of Alaska, as well as on migration stopover and staging sites throughout the coastal areas of the state. The following projects represent the first steps to fully implementing PRISM.

(1) Arctic and Sub-Arctic Monitoring of Shorebirds

A general approach for the Arctic surveys has been developed during the past 5 years (Bart and Earnst 2002). It uses double sampling and habitat-based models to estimate population size.

(2) Development of Survey Methods for Monitoring Boreal-Nesting Shorebirds

Currently, scientists lack an appropriate survey method(s) for boreal-nesting species. Primary methodologies that warrant evaluation are point count surveys and line transects that use distance estimation, double-sampling, and fixed- and rotary-winged surveys. Several species of shorebirds breed in the boreal region of Alaska, including 3 of known conservation concern and several (> 7) of unknown population status (Gill 1996; Alaska Shorebird Group 2000).

(3) Inventory of Shorebirds Using State Critical Habitat Areas and State Game Refuges on the Alaska Peninsula

Alaska Peninsula estuaries are extremely important staging and stopover sites for autumn-migrant shorebirds that disperse to nonbreeding areas throughout the Americas, Oceania, and Australasia. Much less clear is the spatial and temporal extent to which shorebirds use these estuaries in spring. A study is needed to assess the relative importance of Bristol Bay estuaries and the adjacent terrestrial areas to spring migrant and breeding shorebirds. Such a study would fill critical gaps in life history information for several species of conservation concern, such as the Marbled Godwit, whose nesting appears restricted to the Egegik Bay-Port Heiden portion of the Alaska Peninsula. It also would greatly facilitate efforts to implement species-specific, regional, and/or statewide monitoring programs to establish size and trends of Alaska shorebird populations.

(4) Regional Assessments of Migration Stopover Sites for Shorebirds in Southcentral, Southeastern, and Northern Alaska

The relative importance of intertidal mudflats, estuaries, and wetlands along the Southcentral and Southeastern coast of Alaska as essential wildlife habitat to many animals, particularly migrating shorebirds, is undisputed (Isleib 1979; Senner et al. 1981). Many of these fall under state jurisdiction. Also, research done during the Outer Continental Shelf Environmental Assessment Program in the mid 1970s (Connors et al. 1979, 1984) indicated that shorebirds changed habitat use from upland tundra breeding sites to coastal littoral staging areas as the summer progressed. Virtually nothing is

known on how shorebirds aggregate along the coast and whether congregations in one area represent birds from adjacent tundra or from large areas of the coastal plain. A summary of the existing shorebird information from these regions is needed. This “regional assessment” includes a site description, previous shorebird abundance and diversity information, appropriate survey methods, measurement error and bias concerns associated with counting shorebirds, and need for pilot studies to accurately count birds. This information, along with GIS land coverage of coastlines, could be used to identify other locations where shorebirds may stopover during migration. The completed regional assessment will be an invaluable tool for regional biologists as they prioritize and plan future coastal studies and assess the potential effects of proposed habitat development projects. But most important, this document will provide the needed information, when combined with similar data from Canada and the contiguous United States, to develop a statistically sound sampling plan for estimating shorebird abundance and population trends across the Pacific Flyway.

Conservation Issues Affecting Shorebird Populations

There are a number of natural and anthropogenic factors that represent real and potential threats to Alaskan shorebird populations and require further study. The 2nd edition of the Alaska Shorebird Conservation Plan (Alaska Shorebird Group 2000) describes known and potential effects on shorebird populations from oil and gas development and infrastructure in Prince William Sound, Cook Inlet, Bristol Bay, and the Arctic Coastal Plain; marine transport of diesel fuel to coastal communities; marine-based recreation; mining; subsistence harvest; increased populations of native and introduced predators; and climate change. It also identifies data gaps and information needs.

Natural History of Shorebirds in Alaska

For many species of shorebirds in Alaska, little is known about many aspects of their natural history. Detailed studies are needed to document distribution and abundance, migration and staging patterns, physiology, population discreteness, and general breeding biology. Information on factors limiting the growth of a population is particularly needed given the decline of many species. Natural history projects that also help address conservation issues presented above would be most helpful. In addition, several species of shorebirds reside in Alaska during the winter months, including the Black Oystercatcher, Surfbird, Black Turnstone and Pribilof Rock Sandpiper. These species occupy regions of Cook Inlet, Prince William Sound, Kodiak Island and Southeast Alaska. Virtually nothing is known about the winter ecology of these species, where species winter relative to where they breed, and whether seasonal movements of these birds occur.

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Black Oystercatcher

A. Species description

Common name: Black Oystercatcher

Scientific name: *Haematopus bachmani*

Conservation designation: Classified as species of “high concern” within the United States (Brown et al. 2001), Canadian (Donaldson et al. 2001), and Alaska shorebird conservation plans (Alaska Shorebird Group 2004). Listed as bird of conservation concern within national and regions 1 and 7 lists of the USFWS, and is included in the Alaska Audubon Watchlist.

B. Distribution and abundance (see map page 310, Appendix 4)

Range: (from Andres and Falxa 1995)

Global range comments: Generally resident throughout range that extends from Alaska to Baja California. Common throughout most of Aleutian Islands and coastal Southcentral Alaska, along outer coast of Southeast Alaska, British Columbia, Washington, Oregon, and California, and along Pacific coast of Baja California south to Laguna San Ignacio.

State range comments: In western Alaska common throughout Aleutian Archipelago west to Kiska Island and locally in northern Bristol Bay. Most of population occurs in Southcentral Alaska where common throughout Kodiak Archipelago and east to Kenai Fjords National Park and to eastern Prince William Sound. Also regular along outer coast of Southeast Alaska. Occasionally found on Pribilof Islands in winter.

Abundance:

Global abundance comments: Estimated at 8900 individuals (Brown et al. 2001).

State abundance comments: About 60% of the global population (5300 individuals) thought to reside in Alaska, mostly within Kodiak Archipelago and east throughout Prince William Sound.

Trends:

Global trends: Thought to be stable but data limited.

State trends: Within Prince William Sound, number of pairs have increased or remained constant between 1991 and 1998 (Murphy and Mabee 2000). A large population increase has occurred on Middleton Island since the late 1980s (Gill et al. 2004).

C. Problems, issues, or concerns for species

Oystercatchers are completely dependent upon a narrow coastal area throughout their life cycle, where they are highly susceptible to direct and indirect (through long-term residues remaining in the intertidal areas) exposure to oil spills. Their strong fidelity to breeding territories, easy accessibility, conspicuous behavior, and limited reproductive

potential (at most 3 young raised per pair per year and a delayed maturation) also make them particularly vulnerable to local extirpation through persistent disturbance by predation and humans (Andres 1997, 1998). Subsistence harvest of either breeding adults or eggs is a potential threat to some local populations of this species in Alaska. There is also increasingly disturbance by kayakers, fishermen, and tourists within Prince William Sound and Kenai Fjords National Park.

D. Location and condition of key or important habitat areas

Black Oystercatchers are obligate users of the intertidal zone during their entire annual cycle. Here they obtain the necessary food resources for survival and reproduction. In many parts of their range, individual pairs may set up year-long territories or when migratory, exhibit rather high territory site fidelity among years. These factors make the species especially vulnerable to disturbance from marine industrial pollution (e.g., oil spills, waste discharge), human disturbance from tourism and fishing, and harvest or scientific collection. Long-term damage of intertidal areas may occur when oil residues remain in the sediments for years; this is especially relevant in cases where little washing of the area occurs through natural wave action.

Within most of their range, habitat conditions remain relatively pristine, although increasing human disturbance is occurring. In British Columbia, development of nearshore oyster farms and other aquaculture may hinder oystercatchers from breeding. In Prince William Sound and Kenai Fjords, human tourism may make nesting sites less desirable despite little actual habitat alteration.

E. Concerns associated with key habitats

- Marine pollution along coastal shorelines, which may directly kill adults and indirectly affect breeding pairs for years if oil residue remains in sediments within feeding territories.
- Increasing numbers of boaters, kayakers, fisherman, and campers in previously remote coastal areas of Alaska and British Columbia.
- Local extirpation of breeding pairs through subsistence harvest of adults or eggs, scientific collection, and high predator numbers.
- Increasing numbers of wild and feral predators in nearshore areas, such as cats, dogs, foxes, ravens, gulls, rats, and livestock.

F. Goal: Ensure Black Oystercatcher populations remain sustainable throughout their range within natural population-level variation and historical distribution across Alaska.

G. Conservation objectives and actions

State conservation and management needs:

Objective: Maintain sufficient habitat and population viability.

Target: Maintain territory occupancy and productivity levels at or above those documented in Prince William Sound in the 1990s (these are most comprehensive data sets available). Conduct breeding and nonbreeding studies throughout range to determine vital rates necessary for building population viability models and evaluating effects of human disturbance.

Measure: Assess changes in vital rates and determine population trends in areas previously surveyed, and establish baseline levels in new survey sites.

Issue 1: Marine pollution along coastal shorelines.

Issue 2: Increasing numbers of boaters, kayakers, fishermen, and campers in previously remote coastal areas may reduce nesting propensity and reproductive success.

Issue 3: Local extirpation of breeding pairs through subsistence harvest of adults or eggs, scientific collection, and high predator numbers.

Issue 4: Increasing numbers of wild and feral predators in nearshore areas, such as cats, dogs, foxes, ravens, gulls, rats, and livestock.

Conservation actions:

- a) Determine vital parameters and sensitivity of each to stochastic and anthropogenic perturbations (e.g., oil spills, human disturbance).
- b) Determine importance of Southeast Alaska, Kodiak, Middleton Island, and Prince William Sound to postbreeding populations.
- c) Determine extent of postbreeding movements between breeding and wintering areas.
- d) Evaluate impacts from subsistence harvest on adults and eggs.
- e) Promote development of outreach and educational information to inform the public (recreational boaters and campers, local hunters, and pet owners) on the effects of disturbance, subsistence harvest, and introduced predators.

Global conservation and management needs:

Objective: Conserve sufficient habitat to ensure population sustainability.

Target: Maintain territory occupancy and productivity levels at or above those documented in British Columbia and coastal western states (these are most comprehensive data sets available).

Measure: Assess changes in vital rates and determine population trends in areas previously surveyed, and establish baseline levels in new survey sites.

Issue 1: Marine pollution along coastal shorelines.

Issue 2: Increasing numbers of boaters, kayakers, fishermen, and campers in previously remote coastal areas may reduce nesting propensity and reproductive success.

Issue 3: Increasing numbers of wild and feral predators in nearshore areas, such as cats, dogs, foxes, ravens, gulls, rats, and livestock.

Issue 4: Increasing levels of coastal development may hinder or enhance habitat.

Conservation actions:

- a) Determine extent of postbreeding movements between breeding and wintering areas.
- b) Determine population size and trends in breeding areas.
- c) Evaluate impact of feral and wild predators on oystercatcher adult survival and productivity.
- d) Determine vital parameters and sensitivity of each to stochastic and anthropogenic perturbations (e.g., oil spills, human disturbance).
- e) Support implementation of the Black Oystercatcher Working Group to promote collaboration on national and international level.
- f) Promote development of outreach and educational information to inform the public on the effects of disturbance and introduced predators.
- g) Promote identification and protection of key areas through collaborations with NGOs and state and federal entities.

H. Plan and time frames for monitoring species and their habitats

Surveys should be conducted at key breeding and nonbreeding sites once every 5 years to evaluate population abundance and status. Given that much of the intertidal area is under state jurisdiction, funding and some logistical and personnel support to conduct surveys should come from the State of Alaska. The USFSW, the Canadian Wildlife Service, the USGS, as well as other state and provincial governments throughout the species range should contribute funds and personnel to conduct surveys.

I. Recommended time frame for reviewing species status and trends

Every 5 years in conjunction with the Alaska Shorebird Group and revision of its Alaska Shorebird Conservation Plan.

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Lesser Yellowlegs

A. Species description

Common name: Lesser Yellowlegs

Scientific name: *Tringa flavipes*

Conservation designation: Considered a “species of moderate concern” in both the U.S. Shorebird Conservation Plan (Brown et al. 2001) and the Alaska Shorebird Conservation Plan (Alaska Shorebird Group 2004). However, significant population declines (4–9% per year) identified recently in NABBS data (Sauer et al. 2003) has generated a higher level of concern for this species.

B. Distribution and abundance (see map page 311, Appendix 4)

Range: (from Tibbitts and Moskoff 1999)

Global range comments: Breeding range extends from western Québec to western Alaska and from southern portions of the Prairie Provinces to northern MacKenzie. Nonbreeding range extends along the Atlantic Coast from southern New Jersey to southern Texas; and the Pacific Coast from San Francisco Bay to southern California and at the Salton Sea. Widespread on the mainland of Mexico down through southern Panama. Also winters in West Indies and throughout South America to Chile and Argentina. Most birds migrate via the Central Flyway in spring and fall and on the Atlantic Coast in fall. Widespread elsewhere in North America during migration but in low numbers.

State range comments: In Alaska, breeds throughout the area bordered by Anaktuvuk Pass in the north, Kobuk River in northwest, Sheenjek Valley in northeast, Situk River Flats in southeast, and Innoko National Wildlife Refuge in west.

Abundance:

Global abundance comments: Cumulative totals of birds at fall staging areas and aerial surveys on nonbreeding areas suggest the population numbers about 500,000 birds (Morrison et al. 2001). However, this species is difficult to census accurately because of its tendency to disperse over large areas.

State abundance comments: Alaska breeding population thought to be about 150,000 birds (Alaska Shorebird Group 2004). To date, no comprehensive effort has been made to quantitatively estimate the size of the Alaska population.

Trends:

Global trends: Steep decline of 9% per year ($P = 0.00$, $N = 28$ routes) between 1980 and 2002 along NABBS routes in Canada (Sauer et al. 2003).

State trends: Similar trend in NABBS data from Alaska, where an estimated annual rate of decline of 4% ($P = 0.06$, $N = 37$ routes) has occurred during this same time period.

C. Problems, issues, or concerns for species

Existing

- Lack of practicable methods to census Lesser Yellowlegs throughout their annual cycle
- Lack of information about regions and specific habitats preferred by this species in the Neotropics
- Lack of information about habitat preferences in Alaska
- Alteration and loss of nesting habitat in boreal region
- Alteration and loss of wetland habitats throughout nonbreeding range

Potential

- Pesticides and other contaminants may be ingested by Lesser Yellowlegs in habitats they commonly use on nonbreeding grounds, including estuaries, flooded agricultural fields, and sewage lagoons
- Habitat change, especially drying of boreal wetlands

D. Location and condition of key or important habitat areas

Breeding: Breeds primarily in boreal forest and forest/tundra transition habitats. Typical nesting area in Alaska contains a combination of shallow wetlands, trees or shrubs, and open areas. Habitat at nesting areas has been described as open or semi-open forest interspersed with marshes, bogs, ponds, lakes, and sedge meadows.

Foraging: During breeding, forage mostly in small boreal forest wetlands nearby nest areas (e.g., ponds, flooded woodlands, creek banks). Birds nesting near the coast forage in salt marsh ponds. Nesting birds will make daily foraging flights between boreal nest sites and nearby wetlands (up to 13 km away). Vegetated intertidal areas appear important to migrants in Alaska.

E. Concerns associated with key habitats

Boreal forest habitats are being altered and lost at increasing rates; effects of climate change uncertain. Wooded wetlands in Central and South America continue to be altered at considerable rates.

Attributes surrounding species success: Dispersed distribution during breeding insulates this species from local disturbance events (e.g., road construction, fire).

F. Goal: Ensure Lesser Yellowlegs populations remain sustainable throughout their range within natural population-level variation and historical distribution across Alaska.

G. Conservation objectives and actions

State conservation and management needs:

Objective: Maintain sufficient habitat and population viability.

Target: Reverse downward trend in population size estimated with the NABBS route data by 2010.

Measure: Document number and geographic coverage of off-road surveys relative to species' breeding distribution. Compare the ability of different survey techniques to accurately estimate breeding pair densities.

Issue 1: Lack of statistically valid and logistically feasible methods to census and evaluate productivity of Lesser Yellowlegs during breeding and staging; measurement of this objective may be difficult.

Issue 2: Alteration and loss of nesting habitat in boreal region from human development.

Issue 3: Habitat change, especially drying of boreal wetlands

Conservation actions:

- a) Verify accuracy of existing trend data in Alaska and implement more intensive off-road surveys.
- b) Identify causes of the apparent decline.
- c) Develop, test, and implement a statistically valid statewide monitoring protocol for boreal forest shorebirds, including Lesser Yellowlegs.
- d) Quantify nesting, adult feeding, and brood-rearing habitat in greater detail to learn what types of habitat or habitat complexes are required for successful reproduction.
- e) Develop feasible options for tracking changes in habitat using remote sensing methods.
- f) Quantify differences in breeding density and breeding success among habitats.
- g) Monitor changes in the extent and primary productivity of boreal forest wetlands.
- h) Advocate for policies and conservation planning that protects Lesser Yellowlegs habitat.

Global conservation and management needs:

Objective: Conserve sufficient habitat and population sustainability.

Target: Assess rate of wetland habitat loss and exposure to contaminants on nonbreeding grounds. Expand off-road BBS routes and implement other techniques for enumerating Lesser Yellowlegs by 2007.

Measure: Determine known rates of habitat loss and levels of contaminant exposure. Estimate population trend using new and improved survey methods.

Issue 1: Lack of statistically valid and logistically feasible methods to survey Lesser Yellowlegs throughout their annual cycle.

Issue 2: Lack of information about regions and specific habitats preferred by this species in the Neotropics.

Issue 3: Alteration and loss of wetland habitats throughout nonbreeding range.

Issue 4: Pesticides and other contaminants may be ingested by Lesser Yellowlegs in habitats they commonly use on nonbreeding grounds, including estuaries, flooded agricultural fields, and sewage lagoons.

Conservation actions:

- a) Assess the accuracy of BBS population trend data by testing and implementing methods.
- b) Identify causes of the apparent decline.
- c) Develop, test, and implement a statistically valid monitoring protocol for Lesser Yellowlegs during nonbreeding season.
- d) Document regions and habitats used by species in the Neotropics.
- e) Evaluate extent and rate of wetland habitat loss in nonbreeding areas.
- f) Evaluate exposure to contaminants on nonbreeding grounds.

H. Plan and time frames for monitoring species and their habitats

Develop and implement statistically valid and logistically feasible survey method(s) by 2008. Monitor changes in the extent and primary productivity of boreal forest wetlands and evaluate effects on Lesser Yellowlegs by 2010. Potential partners include municipalities, ADF&G, DNR, BLM, various Native regional and village corporations, USFWS, and the USGS. Additional support from the State of Alaska to conduct surveys on state lands, which cover most of the suspected breeding range, is especially needed. Fieldwork should be planned with the Boreal Partners in Flight groups who are working extensively in boreal regions of North America.

The difficulty in developing a reliable census technique for this species is significant. Periodic review is needed to determine if monitoring and survey recommendations are unrealistic and in need of revision. Monitoring via a population index, as opposed to estimating actual population, may prove to be a more attainable goal.

By 2010, initiate studies on nonbreeding areas to investigate the distribution and habitat use by yellowlegs and assess the potential for the species to be exposed to contaminants. Continue to evaluate and improve survey methods on nonbreeding grounds. Federal, state, provincial, nongovernmental organizations, and Native villages and regional corporations throughout the species range should contribute funds and personnel to assess these objectives.

I. Recommended time frame for reviewing species status and trends

Every 5 years in conjunction with the Alaska Shorebird Group and revision of its Alaska Shorebird Conservation Plan.

J. Bibliography

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Solitary Sandpiper

A. Species description

Common name: Solitary Sandpiper

Scientific name: *Tringa solitaria* (*T. s. cinnamomea* race breeds in Alaska)

Conservation designation: Alaska-breeding population considered “highly imperiled” (Alaska Shorebird Group 2004) and of “high conservation concern” (Boreal Partners-In-Flight); continental population considered “species of high concern” in U.S. Shorebird Conservation Plan (Brown et al. 2001). The species is also a bird of conservation concern on the national and region 6 lists of the USFWS. All designations are based on the extremely small population estimate, rapid rate of population decline (4.1%) in Alaska Breeding Bird Survey data, and the uncertainty about the accuracy of these estimates.

B. Distribution and abundance (see map page 312, Appendix 4)

Range:

Global range comments: Species breeds across the boreal forests of Alaska and Canada. Nonbreeding range extends from southeast Texas and Sinaloa, Mexico, throughout Central America, and south to Peru, Bolivia, and south-central Argentina. Most birds migrate via the Central Flyway and are broadly dispersed in fall and somewhat more concentrated (in time and space) in spring.

State range comments: Nests from within 25 km of the Bering Sea in western Alaska east to the Alaska/Canada border, and from the northern Alaska Peninsula north to the Brooks Range. Probably migrates across a broad front in small flocks (<10 birds) or singly. Areas of concentration not yet identified for migrants or postbreeders. *T. s. cinnamomea* breeds in boreal forests of Alaska (Moskoff 1995).

Abundance:

Global abundance comments: Species population estimated at about 25,000 birds (Morrison et al. 2001), but quality of estimate poor and may be several times larger.

State abundance comments: *T. s. cinnamomea* population estimated at only 4000 individuals (Brown et al. 2001). If accurate, this estimate indicates that the Alaskan-breeding race is among the rarest shorebirds in North America.

Trends:

Global trends: Very little data, but recent analyses indicate downward trends in all data sets that have sufficient information to investigate such trends (i.e., NABBS in Alaska, NABBS in Canada, and migrant monitoring in Ontario and Quebec). Although not statistically significant, NABBS data from Canada show an annual rate of decline of 10% between 1966 and 1999 ($P = 0.13$, $N = 12$ routes). Point estimates of trend for migrant birds in both Ontario and Quebec between the late 1970s and the late 1990s are also negative, but neither approaches significance (Aubry and Cotter 2001; Ross et al. 2001).

<p><u>State trends:</u> Breeding Bird Survey data from Alaska since 1980 show a significant population decline of 4.1% per year ($P = 0.02$, $N = 20$ routes; Sauer et al. 2003). This suggests that the Alaskan population (<i>T. s. cinnamomea</i>) today is only about a third the size of a quarter century ago.</p>
<p>C. Problems, issues, or concerns for species</p> <p><i>Existing</i></p> <ul style="list-style-type: none"> • Paucity of information about population status and trends • Lack of workable methods to survey Solitary Sandpipers throughout their annual cycle • Lack of information about regions and specific habitats preferred by this species in the Neotropics • Lack of information about habitat preferences in Alaska • Loss of nesting habitats to logging in boreal forests • Loss of nonbreeding habitats to logging in tropical woodlands • Loss of wetland habitats throughout the species distribution • Decline in other species whose nests this species uses <p><i>Potential</i></p> <ul style="list-style-type: none"> • Pesticides and other contaminants • Habitat change, especially drying of boreal forest wetlands
<p>D. Location and condition of key or important habitat areas</p> <p>Breeding: Wooded wetlands in muskeg bogs, spruce forests, and deciduous riparian woodlands (Moskoff 1995), occasionally riparian tall shrub thickets.</p> <p>Postbreeding and staging: Same as breeding but also uses nonwooded wetlands such as margins of large lakes and coastal salt marshes.</p> <p>Nonbreeding: Does not occur in Alaska during this period. Habitats used within suspected nonbreeding range include wooded wetlands, intertidal mudflats, mangrove swamps, flooded ricefields, estuaries, and riverbanks.</p>
<p>E. Concerns associated with key habitats</p> <ul style="list-style-type: none"> • Effects of climate change are uncertain. • Boreal forest habitats are being altered and lost at increasing rates, particularly in Canada. • Wooded wetlands in Central and South America have undergone considerable alteration and loss. <p>Attributes surrounding species success: Dispersed distribution during all phases of annual cycle protects this species from local catastrophic events (e.g., oil spills). Only low levels of human disturbance likely experienced by this species during breeding and postbreeding periods.</p>
<p>F. Goal: Ensure Solitary Sandpiper (<i>T. s. cinnamomea</i>) populations remain sustainable throughout their range within natural population-level variation and historical distribution across Alaska.</p>

G. Conservation objectives and actions (applies only to *T. s. cinnamomea*)

State conservation and management needs:

Objective: Maintain sufficient habitat and population viability.

Target: Reverse downward trend in population size estimated with the BBS route data by 2010.

Measure: Document number and geographic coverage of off-road surveys relative to species' breeding distribution. Compare the ability of different survey techniques to accurately estimate breeding pair densities.

Issue 1: Lack of statistically valid and logistically feasible methods to survey and evaluate productivity of Solitary Sandpipers during breeding and staging; measurement of this objective may be difficult.

Issue 2: Alteration and loss of nesting habitat in boreal region from logging and other human development.

Issue 3: Habitat change, especially drying of boreal wetlands.

Issue 4: Decline in other species (e.g., Rusty Blackbird) whose nests this species uses.

Conservation actions:

- a) Verify accuracy of existing trend data in Alaska and implement more intensive off-road surveys.
- b) Identify causes of the apparent decline.
- c) Develop, test, and implement a statistically valid statewide monitoring protocol for boreal forest shorebirds, including Solitary Sandpipers.
- d) Quantify nesting, adult feeding, and brood-rearing habitat in greater detail to learn what types of habitat or habitat complexes are required for successful reproduction.
- e) Develop feasible options for tracking changes in habitat using remote sensing methods.
- f) Conduct population viability analysis to identify important vital rates regulating population.
- g) Quantify differences in breeding density and breeding success among habitats.
- h) Monitor changes in the extent (i.e., loss of habitat due to logging) and primary productivity of boreal forest wetlands.
- i) Assess relationships with those passerine species that provide the nesting substrates for the Solitary Sandpipers.
- j) Advocate for policies and conservation planning that protects Solitary Sandpiper habitat.

Global conservation and management needs:

Objective: Maintain sufficient habitat and population viability.

Target: Assess rate of wetland habitat loss and exposure to contaminants on nonbreeding grounds. Expand off-road BBS routes and implement other techniques for enumerating Solitary Sandpipers by 2007.

Measure: Determine known rates of habitat loss and levels of contaminant exposure. Estimate population trend using new and improved survey methods.

Issue 1: Lack of statistically valid and logistically feasible methods to census Solitary Sandpipers throughout their annual cycle.

Issue 2: Lack of information about regions and specific habitats preferred by this species in the Neotropics.

Issue 3: Alteration and loss of wetland habitats throughout nonbreeding range.

Issue 4: Solitary Sandpipers may ingest pesticides and other contaminants in habitats they commonly use on nonbreeding grounds including estuaries, flooded agricultural fields, and sewage lagoons.

Conservation actions:

- a) Assess the accuracy of BBS population trend data by testing and implementing survey methods.
- b) Identify causes of the apparent decline.
- c) Develop, test, and implement a statistically valid monitoring protocol for Solitary Sandpipers during the nonbreeding season.
- d) Document regions and habitats used by subspecies in the Neotropics.
- e) Determine extent of postbreeding movements between breeding and nonbreeding areas, using population genetics, stable isotopes, and mark-recapture studies.
- f) Evaluate extent and rate of wetland habitat loss in nonbreeding areas.
- g) Evaluate exposure to contaminants on nonbreeding grounds.

H. Plan and time frames for monitoring species and their habitats

Develop and implement statistically valid and logistically feasible survey method by 2008. Monitor changes in the extent and primary productivity of boreal forest wetlands and evaluate effects on Solitary Sandpipers by 2010. Potential partners include ADF&G, DNR, BLM, various Native regional and village corporations, USFWS, and the USGS. Additional support from the State of Alaska to conduct surveys on state lands, which cover most of the suspected breeding range, is especially needed. Fieldwork should be planned with the Boreal Partners in Flight groups who are working extensively in boreal regions.

The difficulty in developing a reliable census technique for this species is significant. Periodic review is needed to determine if monitoring and survey recommendations are unrealistic and in need of revision. Monitoring via a population index, as opposed to estimating actual population, may prove to be a more attainable goal.

By 2010, initiate studies on nonbreeding areas to investigate the distribution, habitat use, and potential for contaminant exposure to the species. Continue to evaluate and

improve survey methods on nonbreeding grounds. Federal, state, provincial, and nongovernmental organizations, and Native villages and regional corporations throughout the species range should contribute funds and personnel to conduct these objectives.

I. Recommended time frame for reviewing species status and trends

Every 5 years in conjunction with the Alaska Shorebird Group and revision of its Alaska Shorebird Conservation Plan.

J. Bibliography

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Bristle-thighed Curlew

A. Species description

Common name: Bristle-thighed Curlew

Scientific name: *Numenius tahitiensis*

Conservation designation: IUCN “Vulnerable” species (Waterbirds International 2002); on National Audubon Society’s Watch List; a species of high conservation concern within U.S. Shorebird Conservation Plan (Brown et al. 2001); a bird of conservation concern on the national and region 7 lists of the USFWS; and one of top 3 species of concern by Alaska Shorebird Group (Alaska Shorebird Group 2004). All designations based on small population size, limited breeding range, and concern over threats on the nonbreeding grounds (Marks et al. 2002).

B. Distribution and abundance (see map page 313, Appendix 4)

Range: (from Marks et al. 2002)

Global range comments: Restricted range species with nesting confined to 2 relatively small, disjunct regions of western Alaska and recent evidence of genetic separation between birds inhabiting the 2 breeding areas (J. Gust, USGS, unpubl.). Nonbreeding range on other hand possibly largest of any avian species, encompassing south-central Pacific Ocean from the Hawaiian Archipelago south to Pitcairn Island and east to west from the Marquesas Islands to the Marshall Islands. Only migratory shorebird found exclusively on atolls and islands during nonbreeding season. Listed as “Vulnerable” by Wetlands International owing to small and supposedly declining population size and predation by exotic mammals on nonbreeding grounds.

State range comments: Nesting restricted to northern Seward Peninsula and Andreafsky Wilderness of southwest Norton Sound. Postbreeding birds stage on coastal portions of central and southern Yukon-Kuskokwim River Delta. Birds occasionally common in spring on Alaska Peninsula estuaries; rare but annual in north Gulf of Alaska in spring.

Abundance:

Global abundance comments: Population is among smallest of all shorebirds with estimated size (including nonbreeding subadults) at 10,000 individuals (Waterbirds International 2002).

State abundance comments: Comprehensive survey of known breeding range from 1988 to 1989 yielded about 3200 breeding pairs with 60% in Nulato Hills portion of Andreafsky Wilderness and 40% on Seward Peninsula.

Trends:

Global trends: Numerous lines of evidence suggest the population is being negatively affected by anthropogenic factors on the nonbreeding grounds in central Oceania. Average number of birds declined steadily between 1988 and 2000 at a site in the northern portion of the range; however, site is on northern edge of nonbreeding range and used by comparatively few birds.

State trends: Replication of 1988–1989 survey in 1999–2000 resulted in too much variation to assess trend over this decade.

C. Problems, issues, or concerns for species

Existing

- Exotic predators on nonbreeding grounds
- Subsistence hunting throughout range. (Uncertainty about the specific identity of “large shorebirds” harvested in western Alaska raises the possibility that subsistence harvest in Alaska may also be a threat to this species.)
- Small genetically effective population size

Potential

- Road construction and increased human access to Seward Peninsula
- Increase in natural predators (Common Ravens *Corvus corax*) associated with human landfill practices in western Alaska
- Contaminants on nonbreeding grounds

D. Location and condition of key or important habitat areas (from Marks et al. 2002; Alaska Shorebird Group 2004)

Breeding: Rolling hills (50–500 m elevation; slopes 3–10%) covered with upland tundra; lower parts of drainages with medium to tall (1.2–2.4 m) shrubs, and upper elevations (ridges and slopes) with extremely short vegetation and/or bare ground. Northern breeding area occurs on north-central Seward Peninsula from Kougarok River west to Ear Mountain. Most of this region is state-owned or Native-selected land with some federal inholdings managed by the BLM. Entire region site of active mineral (mostly gold) extraction efforts with associated roads, trails, and site-based infrastructures. Southern breeding area largely within Andreafsky Wilderness Area within Yukon-Delta National Wildlife Refuge. Species relatively secure on breeding range because of extremely low nesting density and general inaccessibility of the area to humans during this season.

Postbreeding Staging: Entire breeding population thought to stage on outer Yukon-Kuskokwim Delta from Scammon Lagoon south to Kuskokwim River. Most birds restricted to dwarf-shrub tundra, graminoid meadows, and mosaic of tundra/meadow habitat. Unknown proportion of Seward Peninsula breeding population moves to coast of southern Seward Peninsula before moving on to Yukon-Kuskokwim Delta. Annual variation in standing crop of fruits of black crowberry and ericaceous shrubs appears major determinant of habitat use. Birds rarely found on unvegetated, soft-substrate intertidal habitats. All staging habitats are generally pristine.

Nonbreeding: Uses wide variety of habitats on islands and atolls, including tidal mudflats, marshy areas, edges of mangrove swamps and lagoons, reefs, salt pans, channels among islets, beaches, forb mats, and human-created habitats (airport runways, lawns, *Cocos* “forests,” other open areas). Most birds found at sea level in these habitats but on high volcanic islands also occasionally found in meadows up to 800 m elevation. Condition of habitats varies from very degraded to pristine, with most little altered by humans.

E. Concerns associated with key habitats

Breeding habitats on Seward Peninsula historically the focus of several mining initiatives with current effort largely a function of world market prices. Associated infrastructure, namely roads, has allowed human access to the southern portions of the breeding range. Off-road vehicles and use of tracked vehicles in support of mining operations have in places caused significant degradation of tundra habitats. Proposed new roads and extraction of road materials from within breeding range could affect breeding distribution. No known threats to habitats on southern breeding area or postbreeding staging areas on the Yukon-Kuskokwim Delta. Habitat modification severe in many parts of nonbreeding range, but degradation per se probably not as important to curlews as predation by introduced mammals.

Attributes surrounding species success: Most breeding and staging habitats are either remote, pristine, and/or within conservation units. Relatively few, but critical, nonbreeding sites also designated as conservation units. Natural history traits, especially extent of dispersal during breeding and nonbreeding seasons, likely buffer adverse affects of small-scale habitat degradation.

F. Goal: Ensure Bristle-thighed Curlew populations remain sustainable throughout their range within natural population-level variation and historical distribution across Alaska.

G. Conservation objectives and actions**State conservation and management needs:**

Objective: Maintain sufficient habitat and population sustainability.

Target: Maintain a minimum of 1280 and 1920 breeding pairs on the Seward Peninsula and Nulato Hills, respectively (C. Handel et al. in Marks et al. 2002).

Measure: Improve (i.e. increased number of survey sites) previously established surveys. Conduct surveys on 3 breeding areas every 5 years. Use new satellite imagery and other GIS-based tools to quantify changes in habitat availability.

Issue 1: Financial and logistical constraints for conducting surveys.

Issue 2: The species' complex life history strategies, including extremely low nesting densities and low detection probabilities during breeding, have hampered efforts to achieve above objective.

Issue 3: Road construction and increased human access to Seward Peninsula.

Issue 4: Increase in natural predators (Common Ravens) associated with human landfill practices in western Alaska.

Issue 5: Poor reporting of subsistence harvest during breeding and staging (e.g., poor identification of "large shorebirds" and inadequate survey coverage).

Conservation actions:

- a) Conduct surveys on breeding and staging areas.
- b) Develop demographic models to evaluate which vital rates are most important in regulating population size.

- c) Evaluate habitat damage associated with human access and development, and work with stakeholders to minimize and mitigate effects.
- d) Evaluate effect of artificially enhanced populations of predators on reproductive success and survival of species.
- e) Evaluate extent and impact of subsistence harvest throughout annual cycle.
- f) Implement education initiatives throughout species' range, particularly in relation to human development and subsistence harvest.

Global conservation and management needs:

Objective: Maintain sufficient habitat and population sustainability.

Target: Partition and visit nonbreeding grounds to evaluate species presence and use, habitat alteration and predator effects, and obtain blood samples for population genetic structure.

Measure: Document the location and number of islands/atolls (i.e., percentage of nonbreeding grounds) visited over the next 10 years.

Issue 1: Exotic predators.

Issue 2: Insufficient surveys.

Issue 3: Contaminant exposure.

Issue 4: Lack of information on stopover sites and nonbreeding distribution.

Issue 5: Poor international collaboration throughout Oceania.

Conservation actions:

- a) Determine population structure throughout nonbreeding grounds and link nonbreeding areas to discrete breeding populations.
- b) Evaluate impact and control of exotic predators on nonbreeding grounds.
- c) Evaluate effective and genetic population sizes.
- d) Identify areas throughout nonbreeding range that host large numbers of birds.
- e) Identify migratory stopover sites south of Hawaiian Archipelago.
- f) Assess levels of heavy metal contamination to birds using certain islands in the Northwestern Hawaiian Archipelago.
- g) Implement international efforts to protect and manage key nonbreeding areas, including active removal of exotic animals.
- h) Implement education initiatives to make indigenous people aware of impacts of introducing exotic predators and disturbing natural habitats throughout nonbreeding grounds.

H. Plan and time frames for monitoring species and their habitats

Survey methodologies are in place for obtaining population indices on breeding and staging areas. This work was conducted through a collaborative effort between the USGS and the USFWS. Additional support from the ADF&G to conduct surveys on state lands, which cover a large portion of the Seward Peninsula, is needed. All 3 partners should promote outreach with local communities.

I. Recommended time frame for reviewing species status and trends

Every 5 years in conjunction with the Alaska Shorebird Group and revision of its Alaska Shorebird Conservation Plan.

J. Bibliography

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Marbled Godwit

A. Species description

Common name: Marbled Godwit

Scientific name: *Limosa fedoa* (*L. f. beringiae* subspecies breeds only on the Alaska Peninsula, see below)

Conservation designation: Species of High Conservation Concern in the U.S., Canadian, and Alaska shorebird conservation plans because of declining population trend and threats on breeding grounds (Brown et al. 2001; Donaldson et al. 2001; Alaska Shorebird Group 2004). *L. f. beringiae* represents a geographically and morphologically distinct population. Also a bird of conservation concern on the national and Region 7 lists of the USFWS and is included on the National Audubon Society's Watch List.

B. Distribution and abundance (see map page 314, Appendix 4)

Range: (mostly from Gratto-Trevor 2000)

Global range comments: The species breeds only in North America in 3 disjunct areas: (1) majority in grasslands of northern United States and southern Prairie Provinces of Canada, (2) small population also along coast of southwest James Bay, Ontario, and (3) equally small population on northern Alaska Peninsula, Alaska. During the nonbreeding season, it is found along the Pacific coast from southwest British Columbia (where rare) south to El Salvador with most occurring from Washington to Baja California. Also in this region found inland in interior California (Sacramento-San Joaquin Valley and Salton Sea). Rare, local visitor to Pacific coast of Costa Rica, Panama, Columbia, Ecuador, and Chile. Also rare, local and irregular in nonbreeding season along immediate Atlantic coast from about Massachusetts south to Virginia but regular and more numerous from North Carolina south to Florida, and west along coast of Gulf of Mexico to northern coast of Yucatan Peninsula. Uncommon along Atlantic coast of Venezuela.

State range comments: Nesting confirmed only from the Ugashik Bay area, but suspected of breeding in 100 by 50 km area from just north of Ugashik Bay south to Port Heiden. Common migrant in spring along coast of Southeast Alaska (e.g., Yakutat Forelands), but rare Prince William Sound and Cook Inlet, suggesting spring migrants cross north Gulf of Alaska to Alaska Peninsula. Prior to nesting, fairly common on intertidal habitats of Ugashik Bay and Cinder-Hook Lagoon. Postbreeding birds also common on these estuaries as well as at Egegik Bay and Port Heiden, occasionally south to Nelson and Izembek lagoons. *L. f. beringiae* population thought to spend nonbreeding season along coast of Washington, Oregon, and northern California.

Abundance: (from Gratto-Trevor 2000; Morrison et al. 2001)

Global abundance comments: Species population estimated at between 140,000 and 200,000 birds.

State abundance comments: *L. f. beringiae* population estimated at 3000 individuals and among smallest of all North America shorebird populations. Estimate derived from scattered, non-systematic counts of postbreeding birds on Alaska Peninsula estuaries; extent of breeding range of *L. f. beringiae* population poorly defined, and no population assessment has been made during the breeding season.

Trends:

Global trends: Historically few data, but the species had a larger breeding range and population before 1900 (Page and Gill 1994). Breeding range no longer includes Wisconsin, Iowa, Nebraska, and much of Minnesota. Slight increasing trend in numbers since 1950s in Florida and Carolinas, possibly also Washington coast. Trends from Breeding Bird Survey routes indicate no overall changes in Canada and U.S. prairie populations from 1966 to 1996. Numbers in United States increased slightly but significantly; those in Canada remained the same. Numbers in North Dakota did not change significantly from 1967 to 1992–1993.

State trends: No information.

C. Problems, issues, or concerns for species

Existing

- Subsistence hunting
- Small population size and restricted breeding range makes species vulnerable to local extirpation

Potential

- Pesticides and other contaminants
- Loss of nonbreeding habitat to aquaculture development (Mexico)
- Loss of wetland habitats used during migration
- Sea level rise
- Indirect and direct effects from oil spills in Bristol Bay
- Habitat change, especially intertidal habitats of Alaska Peninsula estuaries altered in conjunction with development of oil and natural gas

D. Location and condition of key or important habitat areas (following for *L. f. beringiae* subspecies only)

Breeding: Lowland areas inland from immediate coast from just north of Pilot Point south to Cinder-Hook Lagoon. “Preferred” areas (additional study needed) composed of marsh/very wet bog and wet bog/wet meadow habitats dominated by moist-bluejoint, moist-sedge meadows, scattered willows 1–2 m tall, and scattered ponds. Apparently not found in shrub-graminoid habitat that predominates in this region. All known and suspected nesting habitats are pristine.

Postbreeding Staging: Entire breeding population thought to move to intertidal habitats of Alaska Peninsula estuaries, primarily Egegik and Ugashik Bays and Cinder-Hook Lagoon with juveniles lingering into late September. Birds also recorded at Seal Islands, Port Heiden, and occasionally Nelson and Izembek Lagoons. Unknown to what extent Kvichak and Nushagak Bays used following nesting. No other Alaska sites known to support this taxon during this period. Migration of both adults and juveniles thought to entail direct flight across Gulf of Alaska to nonbreeding areas. All habitats used during postbreeding period appear in very good to pristine condition.

Nonbreeding: Does not occur in Alaska during this period. Habitats used within suspected nonbreeding range of *L. f. beringiae* include coastal mudflats, adjoining savannas or meadows, estuaries, sandy beaches and sandflats; sometimes roosting at salt ponds. Significant historic degradation or loss of estuarine habitats along Pacific coast. Existing habitats a mixture from pristine to highly degraded, with most having been altered to some extent.

E. Concerns associated with key habitats

Breeding habitats remote and pristine, but extremely small population size and propensity to occur in flocks increases taxon's susceptibility to environmental perturbations. Proposal for road construction along the Alaska Peninsula could directly affect nesting habitat, and may increase illegal harvest. Contamination of benthic foods from oil spills likely, while birds themselves prone to direct oiling of plumage. Sea level rise from global climate change likely to alter food web and structure of nonbreeding foraging habitats.

Attributes surrounding species success: Alaska breeding habitat pristine but only small proportion within conservation units. Known major postbreeding sites are within conservation units, mostly those administered by of the State of Alaska. Little human disturbance during breeding and postbreeding periods.

F. Goal: Ensure Marbled Godwit (*L. f. beringiae*) populations remain sustainable throughout their range within natural population-level variation and historical distribution across Alaska.

G. Conservation objectives and actions (for *L. f. beringiae* only)

State conservation and management needs:

Objective: Conserve sufficient habitat to ensure population sustainability across the natural range of the species.

Target: Define the breeding range and determine the size of the breeding population by 2007.

Measure: Range maps and population estimates generated based on GIS-based habitat model and extensive on-ground sampling.

Issue 1: Breeding is confirmed for only a single localized site, yet observations during nonbreeding periods suggest the breeding range is more extensive.

Issue 2: Very small population that may be vulnerable to local extirpation.

Issue 3: Legal subsistence harvest of Bar-tailed Godwits may result in accidental mortality.

Issue 4: Habitat change, especially intertidal habitats of Alaska Peninsula estuaries altered in conjunction with development of oil and natural gas.

Conservation actions:

- a) Conduct ground surveys in potential breeding range and nearby areas to estimate population size and habitat use.
- b) Assess and refine habitat-bird model developed previously.
- c) Acquire conservation designation for breeding habitat.
- d) Link use of Alaska Peninsula estuaries by nonbreeding birds to specific nesting areas.
- e) Determine extent of area used in Alaska during nonbreeding periods.
- f) Determine extent of illegal harvest, and promote outreach to reduce accidental take.

Global conservation and management needs:

Objective: Conserve sufficient habitat to ensure population sustainability across the natural range of the species.

Target: Establish geo- and habitat-referenced bounds on nonbreeding area(s) of the *L. f. berengiae* population.

Measure: Site use and range will be established using radiotelemetry, resightings of individually marked birds, and genetic analysis.

Issue 1: Birds that breed in Alaska are suspected of spending the nonbreeding season along the coast from Washington to northern California, but this has yet to be confirmed.

Issue 2: Effective conservation requires that all areas and habitats be identified throughout a species' annual cycle.

Issue 3: Potential exposure to pesticides and other contaminants on nonbreeding grounds in Mexico and Canada.

Issue 4: Potential loss of nonbreeding habitat to aquaculture development (Mexico).

Issue 5: Loss of wetland habitats used during migration.

Conservation action:

- a) Identify nonbreeding areas outside Alaska and encourage appropriate conservation designation.
- b) Over portions of nonbreeding range in Mexico and Canada conduct studies to evaluate contaminant exposure and effects of aquaculture development.
- c) Determine southward migration strategy.
- d) Evaluate effective and genetic population sizes.

H. Plan and time frames for monitoring species and their habitats

By 2007, conduct survey of breeding range to assess habitat use and population size. Assess use of Alaska Peninsula estuaries by pre- and postbreeding populations. Potential partners include ADF&G, DNR, BLM, various Native regional and village corporations, USFWS, USGS, and University of Alaska. Additional support from the State of Alaska to conduct surveys on state lands, which cover most of the suspected breeding range, is especially needed.

By 2008, determine extent of nonbreeding range from data collected through techniques involving analyses of stable isotopes, genetics, and marked birds. Federal, state, provincial and nongovernmental organizations, and Native villages and regional corporations throughout the species' range should contribute funds and personnel to accomplish these objectives.

I. Recommended time frame for reviewing species status and trends

Every 5 years in conjunction with the Alaska Shorebird Group and revision of its Alaska Shorebird Conservation Plan.

J. Bibliography

- Alaska Shorebird Group. 2004. A conservation plan for Alaska shorebirds. Unpublished Report, Alaska Shorebird Group. Available through USFWS, Migratory Bird Management, Anchorage, AK.
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Rock Sandpiper

A. Species description

Common name: Rock Sandpiper (Pribilof Sandpiper, Aleutian Sandpiper, Northern Rock Sandpiper)

Scientific name: *Calidris ptilocnemis* (subspecies: *C. p. ptilocnemis*, *C. p. couesi*, *C. p. tschuktschorum*)

Conservation designation: Nominate race considered population of high conservation concern in U.S. Shorebird Conservation Plan (Brown et al. 2001) and Alaska Shorebird Conservation Plan (Alaska Shorebird Group 2004).

B. Distribution and abundance (see map page 315, Appendix 4)

Range: (from Gill et al. 2002)

Global range comments: North Pacific Ocean centered on Bering Sea (from Japan Archipelago north through Commander, Aleutian, and central Bering Sea Islands; mainland from southern Kamchatka Peninsula, coastal Chukotsky Peninsula, coastal Alaska from northern Seward Peninsula south throughout coastal Yukon-Kuskokwim River Delta and Alaska Peninsula; and also among islands of western Gulf of Alaska. In nonbreeding season south of normal limit of sea ice from central Alaska Peninsula, throughout Aleutian Archipelago, Gulf of Alaska (including Cook Inlet), and North Pacific south to northern California and Japan Archipelago.

State range comments: Generally nonmigratory with seasonal movements (some pronounced) regulated by severity of conditions during the nonbreeding season.

Abundance:

Global abundance comments: 150,000 (Morrison et al. 2001), Wetlands International (2002).

State abundance comments: Alaska estimated at <150,000 individuals as of 2003 (*C. p. ptilocnemis* <20,000; *C. p. couesi* 75,000; *C. p. tschuktschorum* 50,000).

Trends:

Global trends: Largely unknown. CBC data from Pacific Northwest suggests decline in nonbreeding season population of *C. p. tschuktschorum* (Buchanan 1999 in Gill et al. 2002).

State trends: Unknown.

C. Problems, issues, or concerns for species

Existing

- Alteration of nesting habitat on Bering Sea Islands from introduced ungulates, mostly reindeer (effects on Rock Sandpiper populations unknown)
- Predation on nesting birds, eggs, and young from exotic animals (foxes, rats) in Aleutian Archipelago

Potential

- Oil spills
- Habitat change, especially intertidal habitats

D. Location and condition of key or important habitat areas

Breeding: Coastal lowland tundra at elevations seldom higher than a few hundred meters above sea level. Most nesting habitat pristine (except on Bering Sea Islands) and within designated conservation lands (National Wildlife Refuges and State of Alaska Critical Habitat areas and Game Refuges).

Roosting: Typical of most intertidal-foraging shorebirds in that species forms roosts at high tide. Roosts invariably formed immediately adjacent to intertidal areas on exposed rocky, cut bank, and sandspit shorelines. Will readily roost on man-made structures such as piers, wharfs, jetties, and riprap.

Foraging: During breeding, forages mostly on tundra, but if nesting in proximity to intertidal habitats will make foraging flights between tundra and intertidal areas; during nonbreeding period forages on various intertidal habitats (rock, gravel, soft-substrate, vegetated). Vegetated intertidal areas appear important in early spring when birds arrive on breeding grounds and nonvegetated intertidal habitats still mostly covered in ice.

E. Concerns associated with key habitats

Contamination of benthic foods from oil spills and to lesser extent from direct oiling of plumage. Areas most likely to be affected include Cook Inlet and Bristol Bay estuaries. Sea level rise from global climate change likely to alter food web and vegetative structure of breeding and foraging habitats (see above).

Attributes surrounding species success: Most of North American breeding habitat pristine and within conservation units. There is general awareness by industry of environmental responsibilities associated with oil and gas development in Cook Inlet and Bering Sea; spill response and efficacy is a key for this and other intertidal species. General lack of human disturbance throughout all phases of annual cycle.

F. Goal: Ensure Rock Sandpiper populations remain sustainable throughout their range within natural population-level variation and historical distribution across Alaska.

G. Conservation objectives and actions

State conservation and management needs:

Objective: Maintain sufficient habitat and population sustainability.

Target: Substantiate and maintain population estimates determined during recent surveys.

Measure: Base-line assessments would be made for each subspecific population and repeated at 5-year intervals. Use remote imagery and ground-truthing to assess habitat change caused by reindeer.

Issue 1: Lack of rigorous assessments of population size for 2 subspecies (Aleutian and Northern).

Issue 2: Impacts of reindeer on habitat use unknown (Pribilof Islands).

Issue 3: Impacts of fox and/or rat predation on distribution and productivity (all subspecies).

Issue 4: Oil and gas development in Cook Inlet.

Conservation actions:

- a) Determine size structure and levels of genetic variation among subspecific populations of Rock Sandpiper.
- b) Maintain genetic viability among all subspecific populations.
- c) Evaluate impacts of fox and/or rat predation on distribution and productivity, and if necessary, promote or conduct removal of predators.
- d) Evaluate potential direct and indirect impacts from oil and gas development, including assessing the background levels of hydrocarbon contaminants in birds and their prey in Cook Inlet.
- e) Elevate awareness and continue protection of critical habitat areas throughout range. (ADF&G is the key land manager in all 7 major estuaries on the Alaska Peninsula, as well as major portions of the nonbreeding sites used in Cook Inlet.)
- f) Continue existing local surveys and conduct periodic rangewide surveys to assess the size, status, and trend of the various populations:
 - Determine vital parameters and sensitivity of each population to natural and anthropogenic perturbations (e.g., oil spills, extreme cold events).
 - Assess impacts to habitat quality from reindeer grazing on Bering Sea Islands.
 - Determine importance of Alaska Peninsula estuaries to postbreeding populations of the nominate subspecies.
 - Determine extent of postbreeding movement among all subspecific populations.

Global conservation and management needs:

Objective: Maintain sufficient habitat and population sustainability of the northern subspecies.

Target: Develop and implement an international management plan.

Measure: Document number of studies being conducted, lands under new protection, and international collaborations.

Issue 1: Lack of information on population size and distribution, including breeding range.

Issue 2: CBC data in British Columbia and Washington have identified a decline in population size, although extent of decline throughout population unknown.

Issue 3: Threats have not been identified in Russia.

Conservation actions:

- a) Determine proportion of population that breeds in Russia.
- b) Identify key breeding areas and promote conservation designation and management.
- c) Encourage population surveys on nonbreeding grounds in coastal Alaska, British Columbia, and Washington.

H. Plan and time frames for monitoring species and their habitats

A breeding population assessment was recently completed for the Pribilof subspecies. This survey should be replicated at 5-year intervals with support from the USGS, USFWS, and Native villages and regional corporations.

New surveys are needed for the Aleutian and Northern subspecies on Alaska Peninsula, Aleutian Archipelago, and western Alaskan. Potential partners for these surveys are USGS, USFWS, ADF&G, NPS, and various Native villages and regional corporations.

Surveys on nonbreeding sites are needed throughout the Aleutians, in Lower Cook Inlet, Prince William Sound, and from the Alaskan Panhandle through British Columbia to Washington state. Potential partners include the USFWS, USFS, NPS, USGS, Canadian Wildlife Service, provincial government of British Columbia, and Native villages and regional corporations. The State of Alaska is the principal land custodian for areas used by these taxa during the nonbreeding season (postbreeding through winter) and thus has a disproportionate responsibility for ensuring these tasks are accomplished.

I. Recommended time frame for reviewing species status and trends

Every 5 years in conjunction with the Alaska Shorebird Group and revision of its Alaska Shorebird Conservation Plan.

J. Bibliography

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Buff-breasted Sandpiper

A. Species description

Common name: Buff-breasted Sandpiper

Scientific name: *Tryngites subruficollis*

Conservation designation: Globally classified as “near threatened” (IUCN 2003). Included in Appendix I (migratory species that are endangered) of the Convention on the Conservation of Migratory Species of Wild Animals (CMS 2005), and classified as “high concern” in both the U.S. (Brown et al. 2001) and Canadian (Donaldson et al. 2001) shorebird conservation plans. Listed as bird of conservation concern on USFWS’s national and Region 7 lists. Also listed as “vulnerable” in Brazil’s Red Data Book and on the list of Official Endangered Species for Rio Grande do Sul State (Fontana et al. 2003; Decreto Estadual 41.672, 11 de junho de 2002 - the endangered species list for the state.).

B. Distribution and abundance (see maps pages 316–318, Appendix 4)

Range: (from Lanctot and Laredo 1994)

Global range comments: High Arctic (66°–76° N) including Alaska, Yukon (Herschel Island, Blow River to Clarence Lagoon), Mackenzie (Anderson River to Horton River, Franklin Bay, Rasmussen Basin Lowlands), Banks Island (south of Bernard River, Sach's Harbor, De Salis Bay), Melville Island (Polynia Lake, Winter Harbor), Bathurst Island (Cape Cockburn, Polar Bear Pass), Devon Island (Truelove Lowland, Cape Sparbo), Victoria Island (Cambridge Bay, Prince Albert Sound, Richard Collinson Inlet), Jenny Lind Island, King William Island, Prince of Wales Island (Crooked Lake), Boothia Peninsula (Wrottesley Valley), and Somerset Island (Creswell River; see references in Lanctot and Laredo 1994; Figure 3.23). Historic information and more contemporary data indicate that the main wintering range of the species is within the coastal sectors of the Rio de La Plata Grasslands, at the eastern portion of the Flooding Pampa of Argentina, and adjacent to large lagoon complexes in the coastal plain of Rio Grande do Sul of Brazil and Uruguay. Incidental sightings during the nonbreeding season were also reported in the remaining portions of the Rio de La Plata Grassland (subregions of the rolling pampa, inland pampa, southern pampa, mesopotamic pampa). Smaller numbers have also been observed in saline lagoons of the Puna Ecoregion of Argentina and Bolivia, and the Central Trough of Rio Grande do Sul, Brazil (see Lanctot et al. 2002, Figure 3.24).

State range comments: Primarily east of Point Barrow along the coastal portion of the Alaska Coastal Plain, but also observed near Cape Woolley, Seward Peninsula in western Alaska (see Gotthardt and Lanctot 2002, Figure 3.25). Much of the potential breeding area has not been adequately surveyed.

Abundance:

Global abundance comments: Estimated at between 15,000 and 25,000 individuals (Brown et al. 2001; Morrison et al. 2001).

State abundance comments: 20–25% of global population or 3000 to 6250 individuals (Alaska Shorebird Conservation Plan 2004).

Trends:

Global trends: Thought to be declining based on declines observed in local areas on breeding, migration, and nonbreeding sites.

State trends: Number of adults seen during surveys on breeding grounds varies dramatically on an annual basis; breeding density (nr./km²) in Alaska varied from 0 to 10 during 1971–1974 (Bergman et al. 1977) and 0.5–14.0 from 1981 to 1989 (average = 5.7; Troy and Wickliffe 1990). Once listed as an abundant species at Point Barrow in the late 1880s and is now rarely seen there.

C. Problems, issues, or concerns for species (from Gotthardt and Lanctot 2002 and references therein)

Habitat loss/Degradation of habitat: Conversion of native grasslands or pastures to agriculture and suburbs along the migration corridor has resulted in an enormous loss of habitat for upland shorebirds. Grassland areas that have been preserved in the United States are frequently managed for species preferring tall grass, and as such do not have historic levels of grazing required to maintain shorter vegetation preferred by Buff-breasted Sandpipers. Pampas grasslands on the nonbreeding grounds also have been lost to agricultural row crops. In addition, the development of mines and forest plantations in Brazil, construction of buildings and roads for tourism in Uruguay, and the subdivision of haciendas (i.e., ranches) in Argentina all threaten to degrade upland habitats that this species prefers. Cattle ranching on the nonbreeding grounds has transformed grassland communities from taller tussock grasses to shorter grasses and dicots, possibly resulting in an expansion of the nonbreeding range of Buff-breasted Sandpipers. On the nonbreeding grounds the majority of the grasslands visited by Buff-breasted Sandpipers are located within privately owned ranches. Few of these sites are legally protected. Land management practices in unprotected areas are subject to change with global and regional economic constraints. The introduction and movement of livestock (e.g., cattle, horses, and sheep) at a local and regional level could have profound effects on the distribution and abundance of this species. Increased protection of these “key” nonbreeding areas is needed, and adequate livestock grazing patterns must be maintained to ensure the conservation of this species. The remaining nonbreeding range is unlikely to be converted to agriculture because of flooding and saline conditions near the coast, although these areas have the potential to be developed as beach resorts, mines, and pine plantations.

Sensitivity to disturbance at nest and roosting sites. The development and extraction of oil and gas resources in northern Alaska and Canada may affect the species. These developments are frequently sited in drier upland habitats to avoid impacting wetlands, but as a result alter habitats typically used by Buff-breasted Sandpipers. The availability of garbage around development sites and Arctic communities may increase predator populations, and be indirectly responsible for higher predation of nests and juveniles by species such as Arctic fox (*Alopex lagopus*), red fox (*Vulpes vulpes*), Glaucous Gull (*Larus hyperboreus*), and Common Raven (*Corvus corax*).

Commercial hunting and trapping: Buff-breasted Sandpiper numbers declined dramatically in the late 1800s and early 1900s due to market hunting. This species was hunted most heavily in the central United States and to a lesser degree on the South American nonbreeding grounds. Since 1918, this species has been protected by the Migratory Bird Treaty Act in the United States and in Canada. Currently, hunting of Buff-breasted Sandpipers is thought to be minimal or nonexistent throughout their range.

Pesticides and other contaminants: Exposure to pesticides and herbicides used on lands frequented by Buff-breasted Sandpipers during migration may pose a threat to the species. Such lands include agricultural fields (e.g., rice and alfalfa), sod and stubble fields, golf courses, airport runways, and cemeteries. Buff-breasted Sandpipers may use these nonconventional, man-altered habitats because the majority of short-grass prairies are destroyed. Native prairies preserved today are frequently managed as tall grass prairies making them unavailable to this species. Buff-breasted Sandpipers may also be exposed to organochlorines in rice fields on the nonbreeding grounds. Furthermore, natural grasslands in the Rio de La Plata Grassland are being increasingly plowed and replaced by sown pastures that are supplemented with imported fertilizers and other agrochemicals. Such chemical exposure may cause individuals to die. Three adult Buff-breasted Sandpipers died from feeding on planted rice seed treated illegally with Furadan 4F in Calhoun County, Texas, in 1983. Death of other sandpipers species (*Calidris mauri* and *C. melanotos*) has been attributed to exposure to Furadan 3G, a rice pesticide closely related to Furadan 4F. Pesticide exposure has been implicated in the decline of other upland species in South America. Sublethal doses of pesticides can reduce survival, growth, and reproduction rates in birds.

D. Location and condition of key or important habitat areas (from Lanctot and Laredo 1994; Lanctot et al. 2002; Gotthardt and Lanctot 2002)

Nesting Habitat: Breeding restricted to tundra ecoregion. Habitat use depends on sex and breeding stage; males display in first snow-free areas, typically along barren ridges, creek banks, and raised, well-drained areas with reticulate-patterned ground and scant vegetation. Leks occur in moist, graminoid meadows with *Carex aquatilis* and *Eriophorum angustifolium* as dominant vegetation types. Display areas tend to be on non-patterned ground with closely spaced tussocks about 20 cm high and 25–50 cm in diameter, often with dwarf willow thickets (*Salix glauca* and *S. lanata*). Nests are on dry slopes with numerous sedge tussocks, on moss-willow-varied grass tundra, and in moist or wet sedge-graminoid meadows on non-patterned or strangmoor (series of aligned tussocks) ground. Females on incubation breaks found primarily along streambanks in non- and reticulate-patterned ground with scant vegetation. Females with broods are seen primarily in moist and emergent vegetation along or in streambeds. Buff-breasted Sandpipers are considered part of the “upland species” guild because of their dependence on drier, sloping areas or tundra with many polygons. This species is also one of the few shorebird species that do not show a pronounced seasonal shift toward lowland, wet (ponded) sites during brood-rearing.

The majority of Arctic-nesting habitat is in pristine condition, although continuing development of natural resources on the Arctic Coastal Plain is leading to habitat degradation.

Nonbreeding Habitat: Buff-breasted Sandpipers are typically found in pasturelands that are being grazed by livestock and are very short (2- to 5-cm tall). The species is found less frequently in agriculture (e.g. rice) and abandoned fields. In Brazil and Uruguay, Buff-breasted Sandpipers were found almost exclusively in heavily grazed grasslands along the margins of salt and freshwater lagoons. Birds detected in Argentina were in very large pastures that were part of large ranches and were not restricted to lagoon margins.

Most of the sites identified as being key nonbreeding areas in this study are privately owned, and few are legally protected. Fortunately, these areas are unlikely to be converted to agriculture because of flooding and saline conditions near the coast. However, these areas are likely to be flooded should global warming lead to higher water levels. Further, large fluctuations in the proportion of land devoted to cropping and animal husbandry in the Rio de la Plata Grassland has occurred during the past 20–30 years. These changes appear to be directly related to the price of beef and grain.

Other forms of development, such as mines and pine plantations in Brazil, construction of roads and buildings for tourism in Brazil and Uruguay, and the subdivision of ranches in Argentina, may also have a negative effect on the species. Development of coastal beaches for tourism in Uruguay is also a threat. The introduction and movement of livestock at a local and regional level may indirectly have strong within- and among-year effects on the distribution and abundance of Buff-breasted Sandpipers. Pastures may never become suitable if livestock are moved too frequently among pastures (i.e., to minimize overgrazing), introduced too late in the austral summer, or removed altogether. Overall nonbreeding habitats appear to be of suitable quantity now, but degradation is occurring slowly throughout their winter range.

Migration Habitat: Buff-breasted Sandpipers frequent short-grass areas such as pastures, burned grasslands, sodfields, golf courses, cemeteries, airports, and lawns. The species is also found along damp margins of freshwater lakes, ponds, and lagoons. Buff-breasted Sandpipers use a variety of agricultural fields, including recently plowed or cut alfalfa fields or fields of newly planted or emerging rice, cotton, and potatoes. In South America, birds are in recently harvested and burned sugar cane fields of Surinam; in open, dry fields with short grasses in Brazil; and on dry sandbars in rivers.

Natural short-grass prairies occur rarely as management tends to favor species that prefer tall grass prairies, and the use of bison and other herbivores to maintain short grass heights is uncommon. Much of the human-altered habitat is under constant change, as farmers manage agricultural lands according to their resources and the regional agricultural economics. Overall, migration habitat appears to be the most degraded and appropriate habitat is not being provided by current management regime.

E. Concerns associated with key habitats (from Lanctot and Laredo 1994; Lanctot et al. 2002; Gotthardt and Lanctot 2002).

Nesting Habitat: Oil and gas development on the Arctic Coastal Plain may decrease the suitability of drier upland habitats and lead to increased predation on nests and young.

Nonbreeding Habitat: The reliance of Buff-breasted Sandpipers on old and new rice fields on their nonbreeding grounds in South America may expose the species to herbicides and pesticides. Natural grasslands in the Rio de La Plata Grassland are being increasingly plowed and replaced by sown pastures supplemented with fertilizers and other agrochemicals. While most pastureland along the coast is unsuitable for conversion to agriculture, other forms of development, such as mines and pine plantations in Brazil, construction of roads and buildings for tourism in Brazil and Uruguay, and the subdivision of ranches in Argentina, may also decrease the suitability of the habitat for the species.

Migration Habitat: Buff-breasted Sandpipers may be also exposed to agrochemicals along their migration route in the United States. Here the species frequents altered habitats such as golf courses, sod fields, airport runways, cemeteries, and newly planted rice fields that are subject to herbicide and pesticide applications.

F. Goal: Ensure Buff-breasted Sandpiper populations remain sustainable throughout their range within natural population-level variation and historical distribution across Alaska.

G. Conservation objectives and actions

State conservation and management needs:

Objective: Conserve sufficient habitat and population sustainability.

Target: Evaluate state trend in population size and increase accuracy of population estimate by developing habitat-based models to identify suitable breeding sites and extrapolating population density estimates.

Measure: Repeat target (see above) on 5-year intervals.

Issue 1: Lack of data on breeding distribution and population size.

Issue 2: Artificially enhanced numbers of predators and increasing development on Arctic Coastal Plain.

Issue 3: Unpredictable and sporadic occurrence in breeding locations.

Conservation actions:

- a) Determine breeding distribution and population size.
- b) Document potential impacts from predators and human development.
- c) Develop habitat-based model to predict distribution on Arctic Coastal Plain.
- d) Educate policy makers on impacts of development on the “upland” birds.
- e) Evaluate contaminant exposure to birds breeding in Alaska.

Global conservation and management needs:

Objective: Conserve sufficient habitat and population sustainability.

Target: Maintain population size at levels recorded in 1999 and 2001 on the nonbreeding grounds.

Measure: Conduct population surveys on nonbreeding grounds at 5-year intervals.

Issue 1: Potential contaminant exposure during migration and on nonbreeding grounds.

(The species frequents altered habitats such as golf courses, sod fields, airport runways, cemeteries, and newly planted rice and other agricultural fields where pesticides and herbicides are commonly applied.)

Issue 2: Habitat loss through agricultural conversion on wintering grounds.

Issue 3: Effect of livestock management regimes on habitat availability.

Issue 4: Inadequate funding in South America to do conservation studies.

Conservation actions:

- a) Capture and test a minimum of Buff-breasted Sandpiper adults for exposure to organophosphorus and carbamate pesticides on migration and nonbreeding sites. These studies are inappropriate in Alaska as birds either die or metabolize chemicals prior to arriving in the state.
- b) Evaluate impacts of livestock management practices on habitat use on nonbreeding grounds.
- c) Evaluate impacts from human development on habitat availability on nonbreeding sites.
- d) Develop international partnerships and manage species on a flyway basis.
- e) Repeat population surveys on nonbreeding grounds every 5 years.

H. Plan and time frames for monitoring species and their habitats

Initial survey of population conducted on nonbreeding range over 2-year period in 1999 and 2001. Such surveys should be conducted once every 5 years to determine population stability. Intensive surveys should be conducted at key nonbreeding habitat sites identified in previous surveys.

The difficulty in developing a reliable census technique for this species is significant. Periodic review is needed to determine if monitoring and survey recommendations are unrealistic and in need of revision. Monitoring via a population index, as opposed to estimating actual population, may prove to be a more attainable goal.

I. Recommended time frame for reviewing species status and trends

Given the small size of the species population, we recommend reviewing and revising the strategy every 5 years, or at more frequent intervals in response to additional information. Plan should be prepared in conjunction with the Alaska Shorebird Group and revision of its Alaska Shorebird Conservation Plan.

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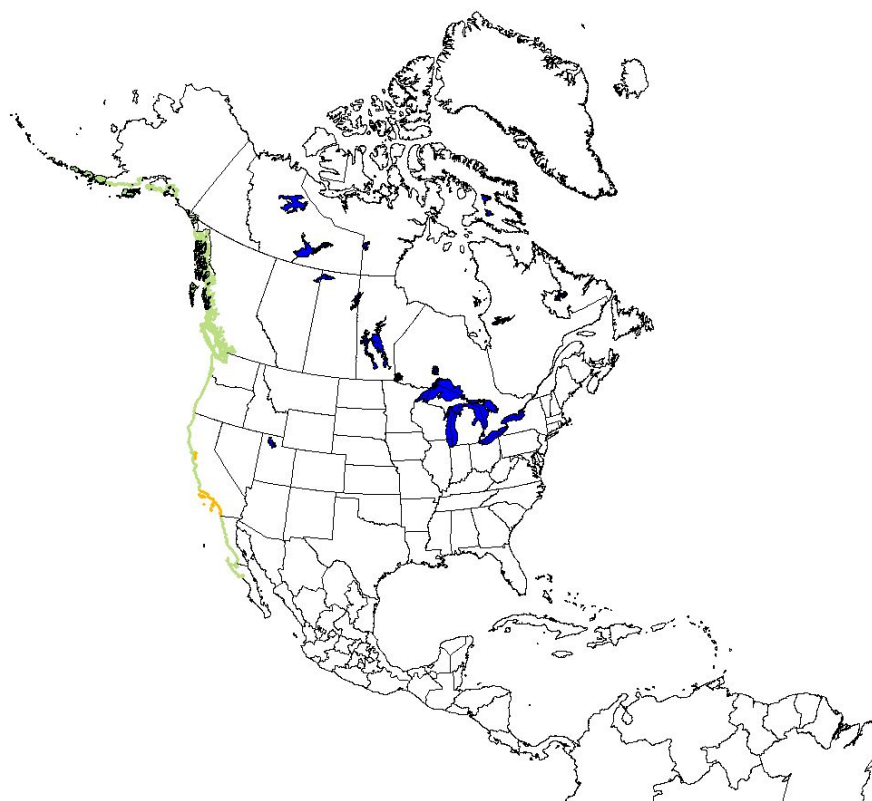


Figure 4.17 Year-round (green) and nonbreeding (yellow) distribution of the Black Oystercatcher

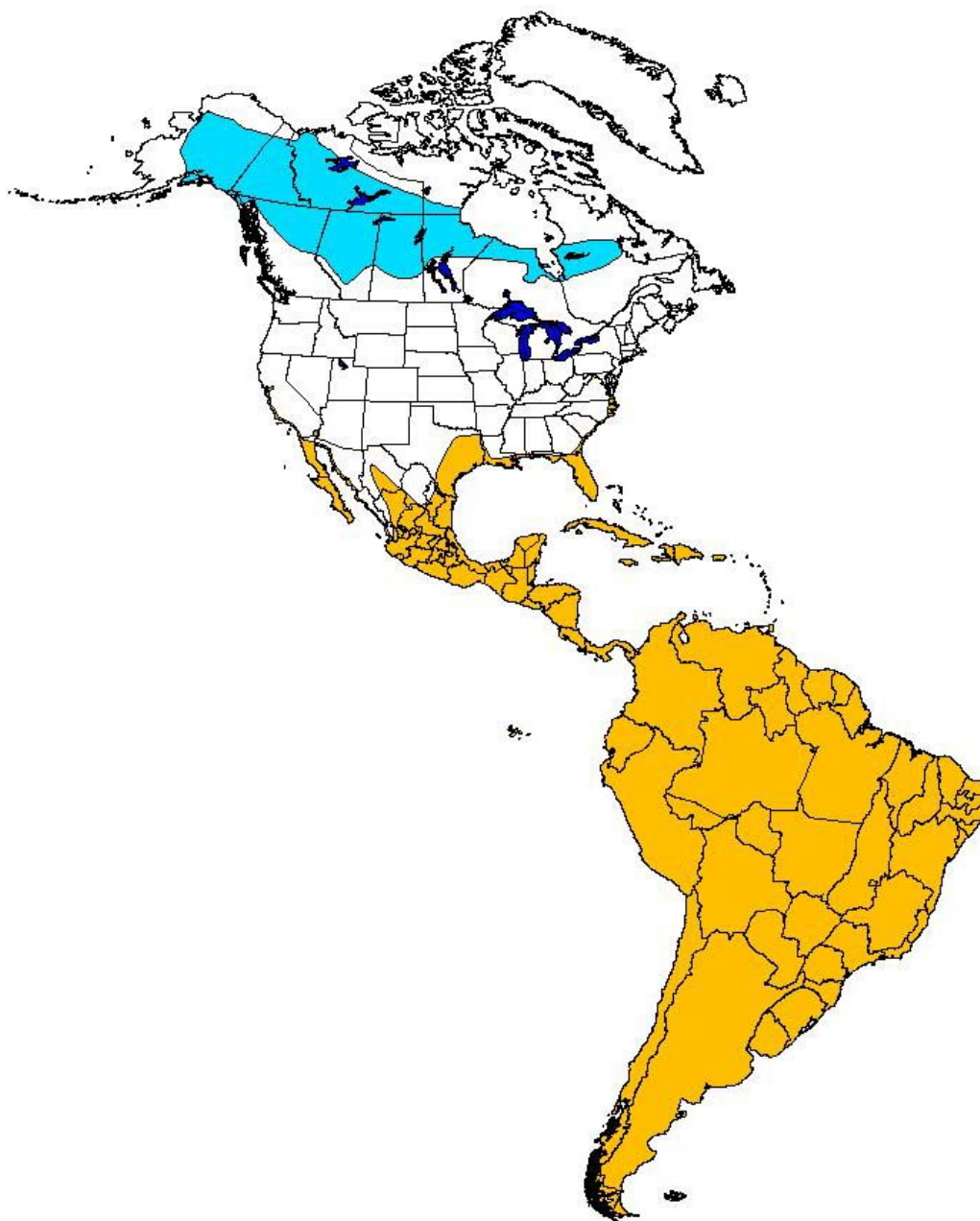


Figure 4.18 Breeding (blue) and nonbreeding (yellow) ranges of the Lesser Yellowlegs (from Tibbitts and Moskoff 1999)

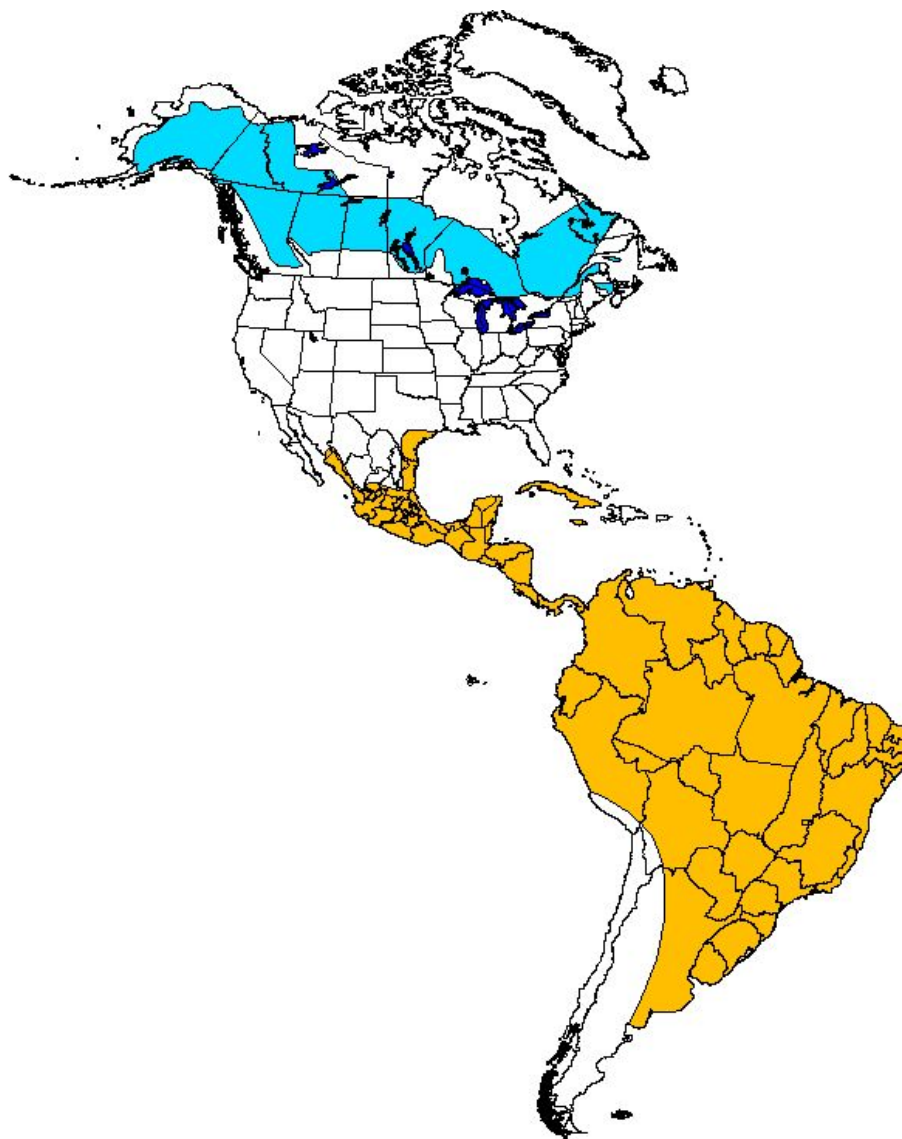


Figure 4.19 Breeding (blue) and nonbreeding (yellow) distribution of the Solitary Sandpiper (includes both subspecies, Moskoff 1995)

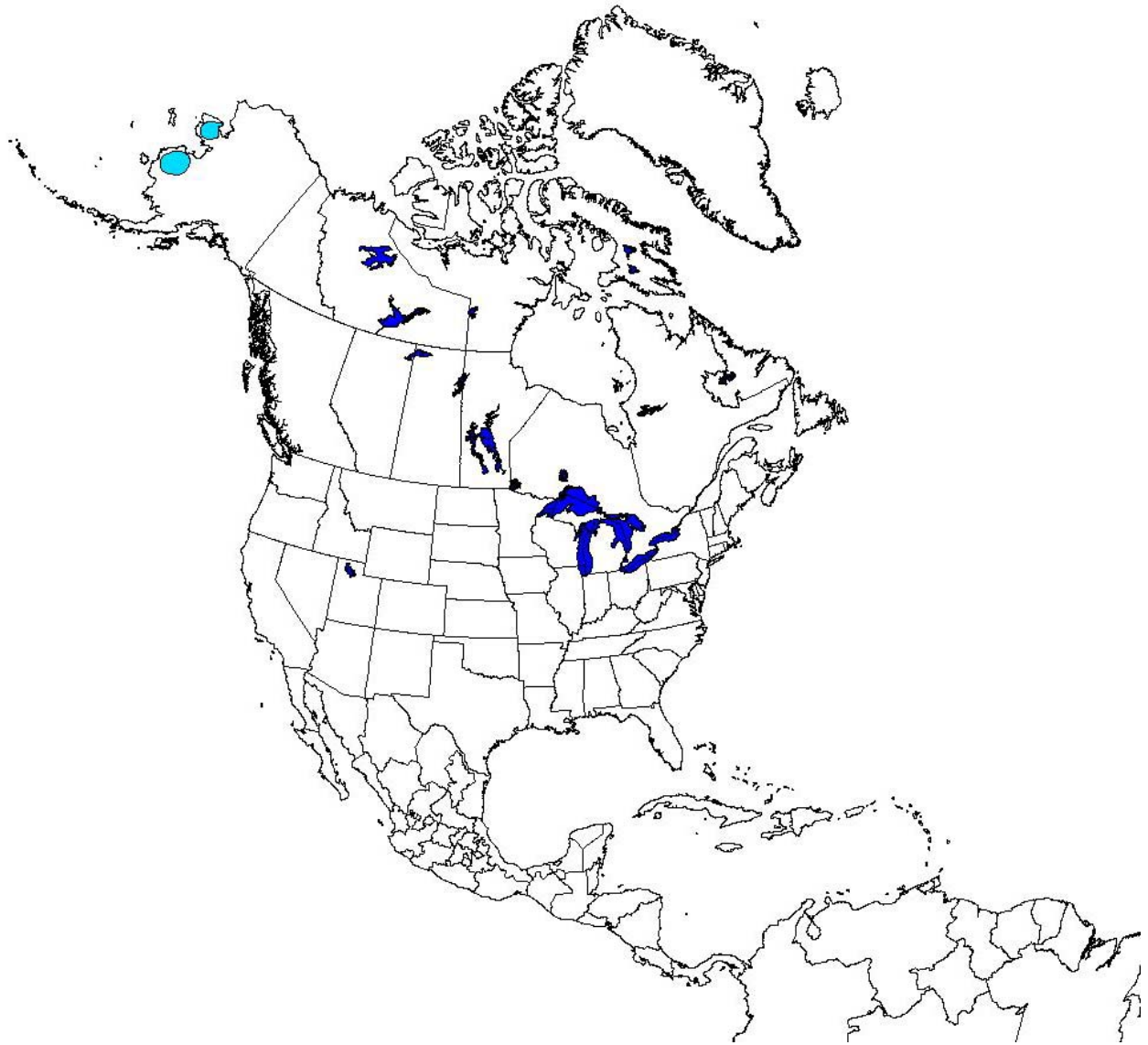


Figure 4.20 The breeding range of the Bristle-thighed Curlew is restricted to two small portions (shown in light blue) of western Alaska (Marks et al. 2002).

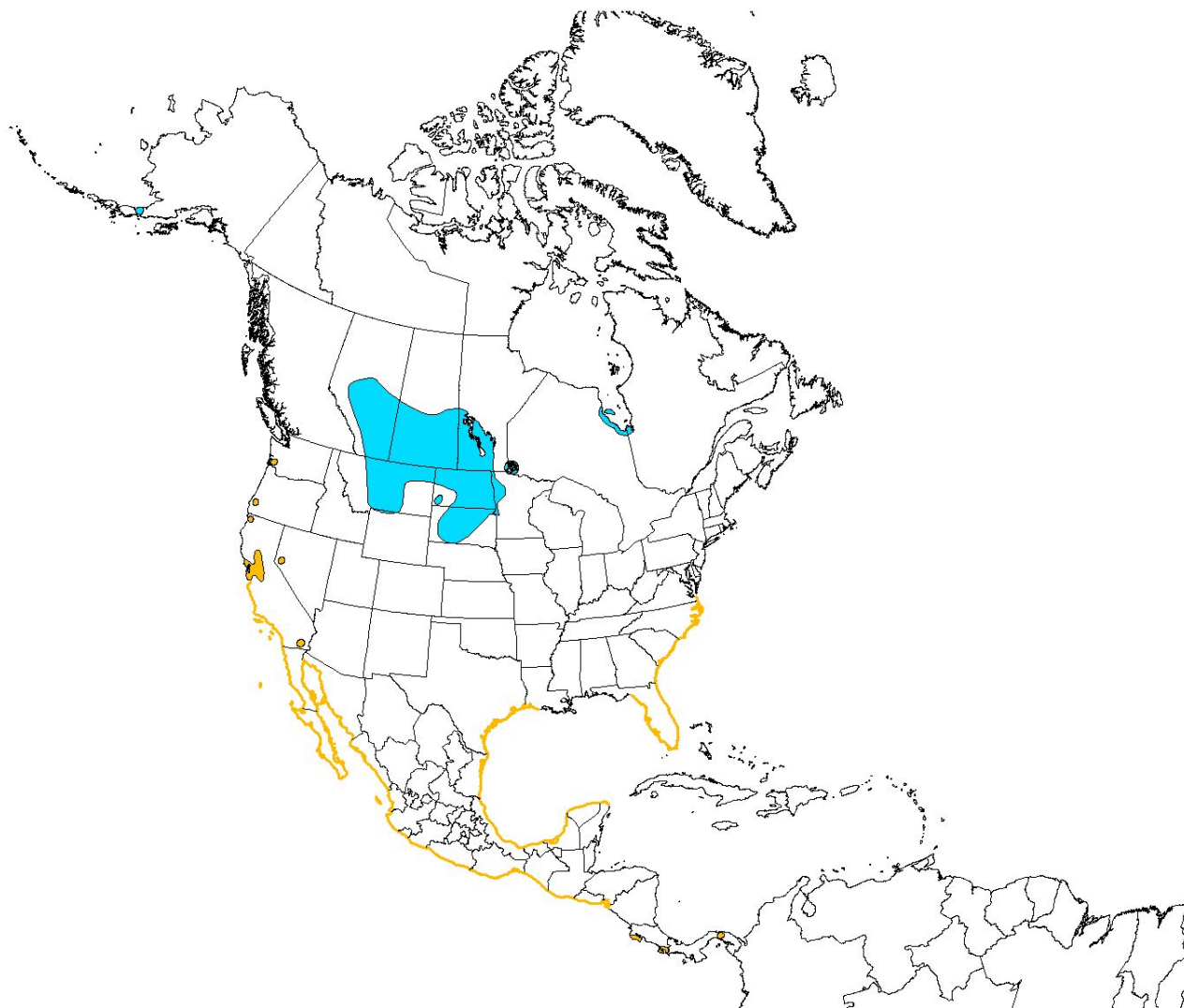


Figure 4.21 Breeding (blue) and nonbreeding (yellow) distributions of the Marbled Godwit. Note the small polygon of blue along the Alaska Peninsula.

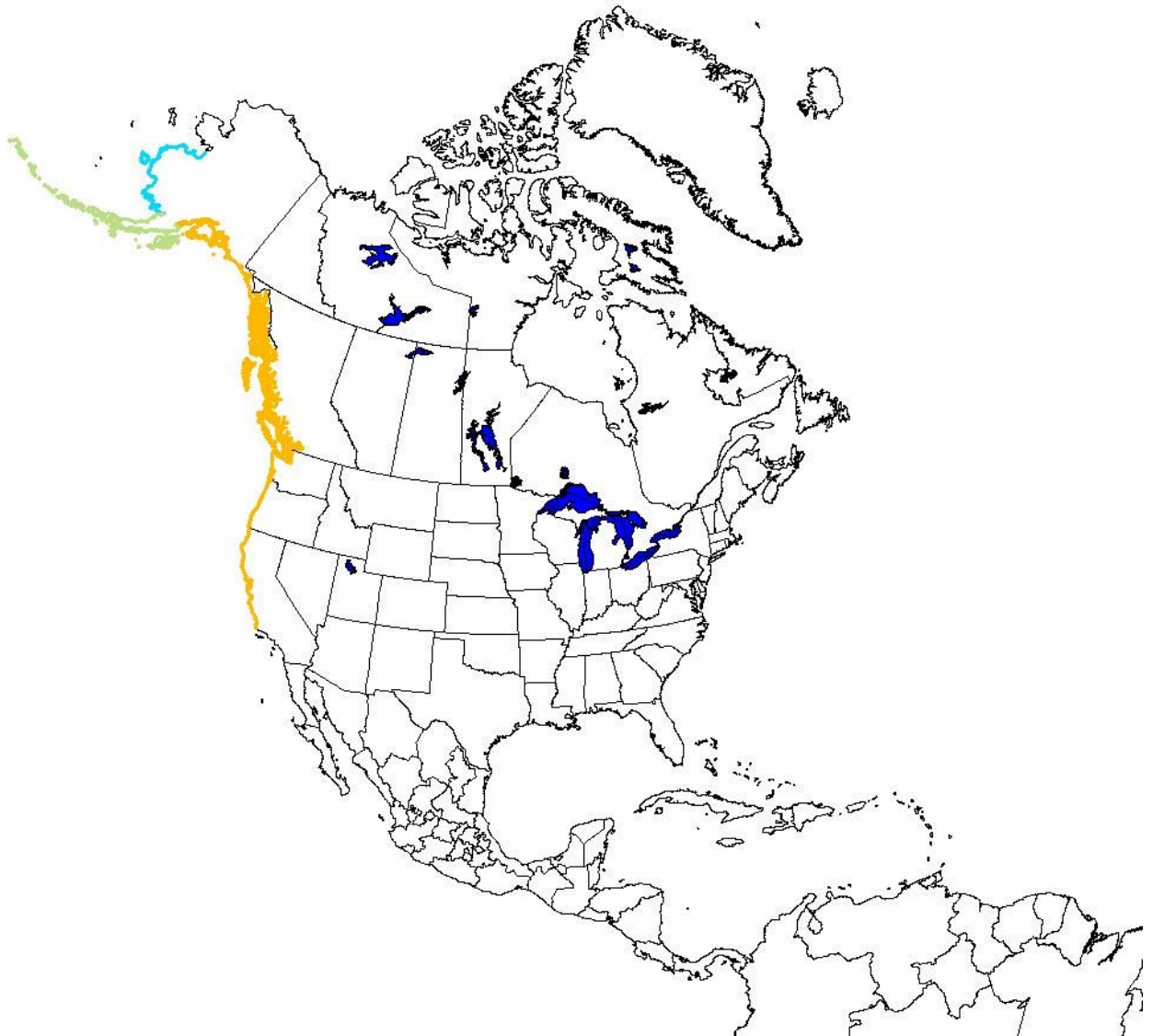


Figure 4.22 Breeding (blue), breeding and nonbreeding (green), and nonbreeding (yellow) distributions of the Rock Sandpiper. See narrative for breeding distribution of subspecific populations within Alaska.

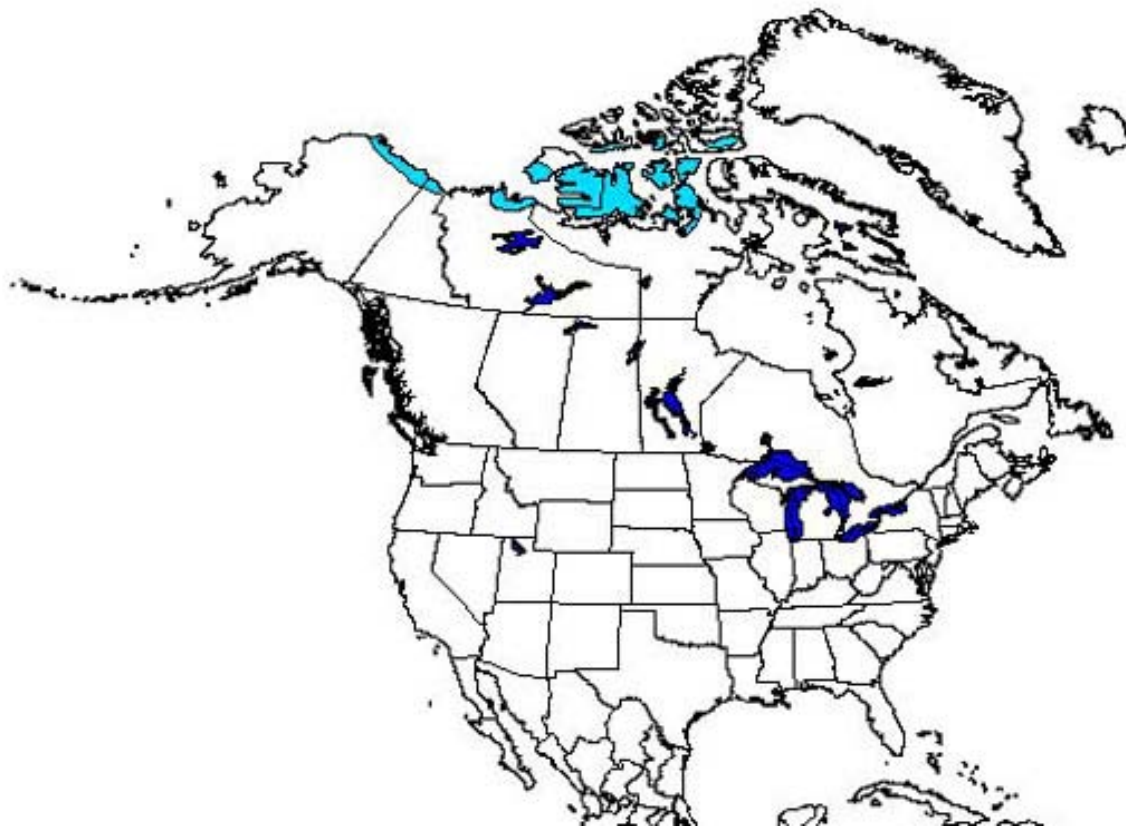


Figure 4.23 Breeding range (light blue) of the Buff-breasted Sandpiper, excluding small areas of Russia where the species occurs sporadically (from Lanctot and Laredo 1994).

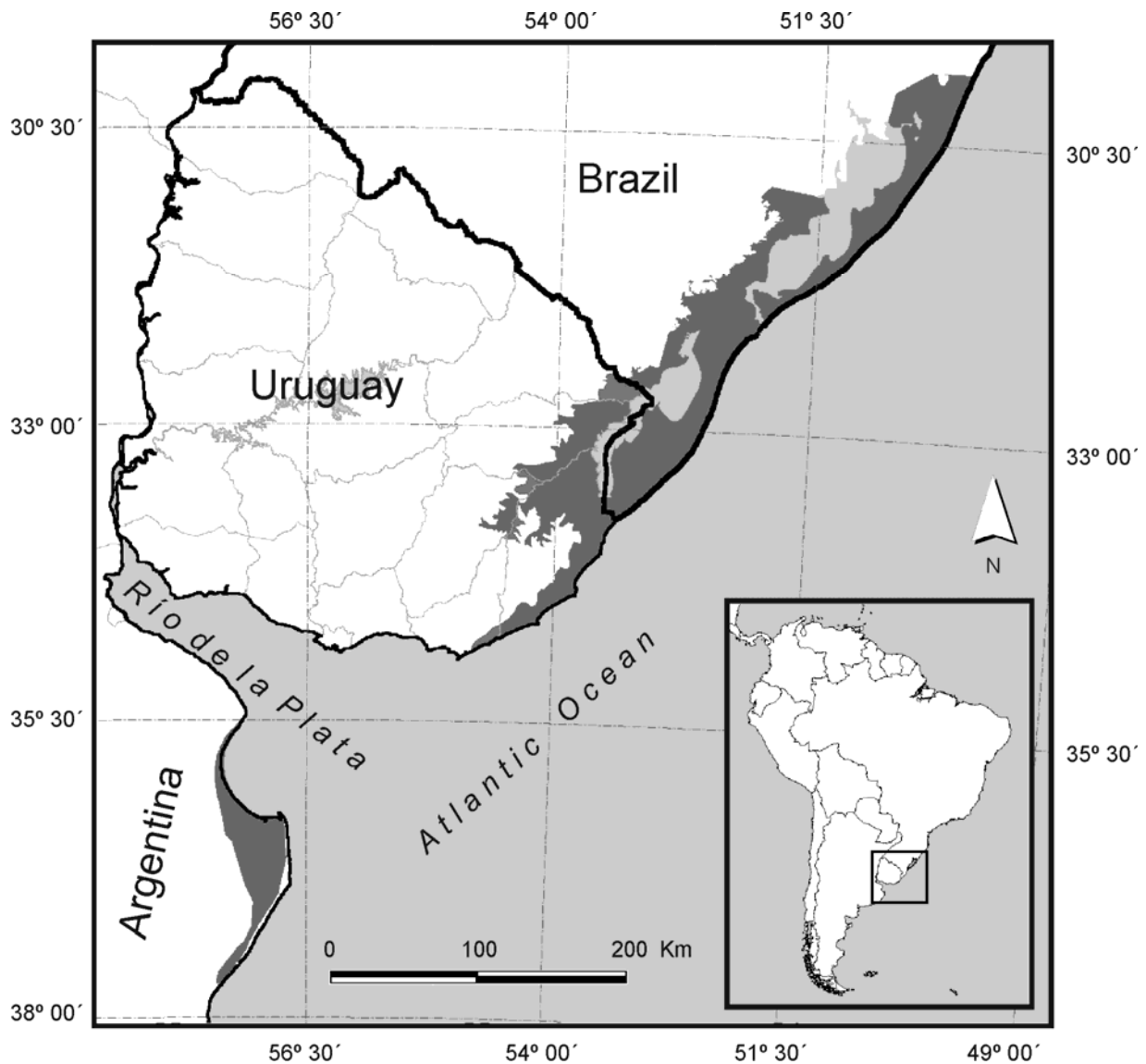


Figure 4.24 Primary nonbreeding range (dark gray) of the Buff-breasted Sandpiper excluding small areas of northwestern Argentina and southwestern Bolivia (from Lanctot et al. 2002).

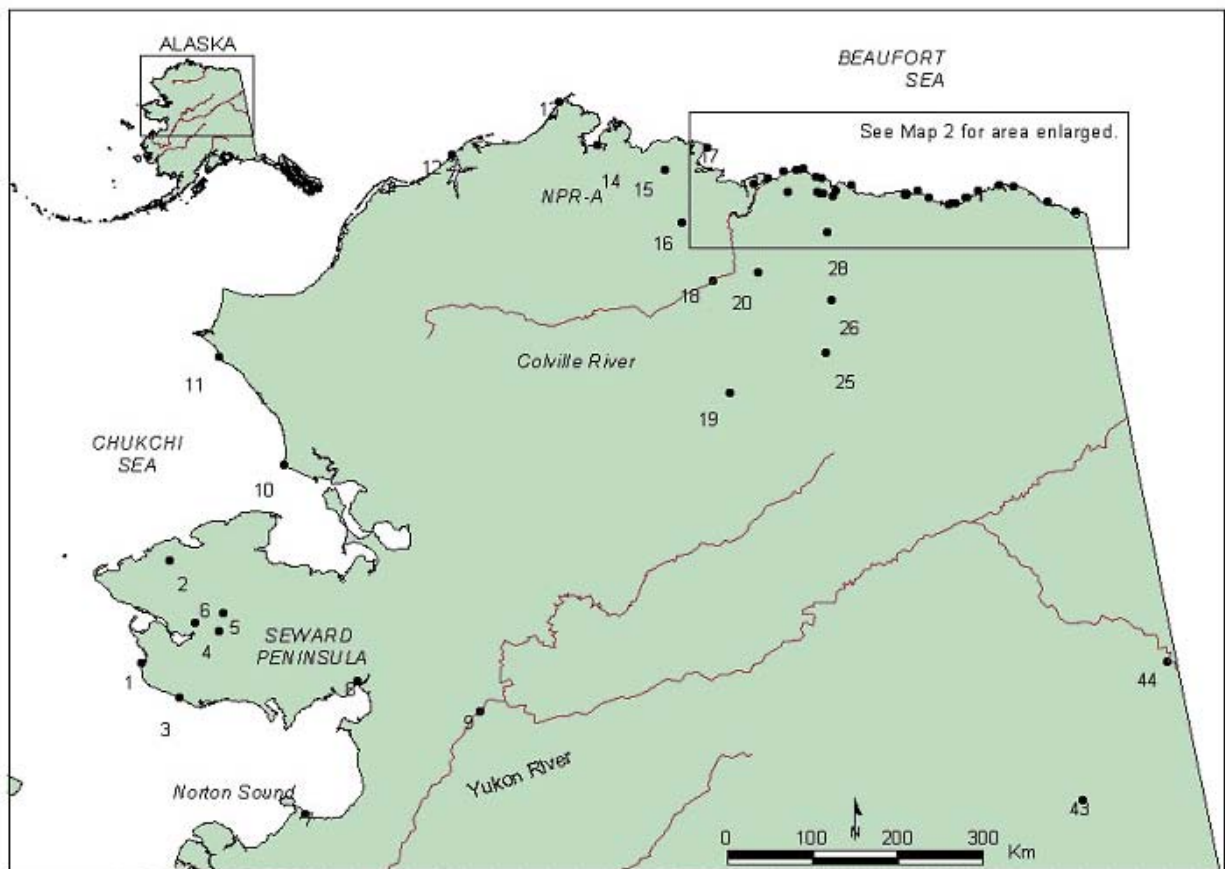


Figure 4.25 Location of Buff-breasted Sandpiper sightings in Alaska from 1883 to 2001. The lack of observations from an area does not indicate the area does not have Buff-breasted Sandpipers as many areas have not been searched, and the species occurs sporadically from year-to-year (from Gotthardt and Lanctot 2002).