U.S. SHOREBIRD CONSERVATION PLAN

A CONSERVATION PLAN FOR ALASKA SHOREBIRDS

Version 1.0

Prepared by

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Executive Summary

Because of its size and northerly position, Alaska provides breeding habitat for more shorebird species than any other state in the U.S. Seventy-one species of shorebirds have occurred in Alaska; 37 of them, including several unique Beringian species and Old World subspecies, regularly breed in the region. Most of these species migrate south of the U.S.-Mexico border and a third migrate to South America or Oceania. Concentrations of shorebirds at several coastal staging and migratory stopover sites exceed one million birds; on the Copper River Delta alone, five to eight million shorebirds stop to forage and rest each spring.

Using the species prioritization process developed for the U.S. National Shorebird Plan, we identified 14 taxa of shorebirds as species of high concern in Alaska. All species of concern tend to have small global population sizes and/or limited breeding distributions. Seasonal occurrence of priority species was examined within the geographic context of Alaska's six Bird Conservation Regions (BCRs). Most priority species, particularly breeding species, occur in the Western Alaska BCR. Southern regions (Cook Inlet and the Northern Pacific Rainforest BCRs) are primarily used by shorebirds during migration and winter. The Aleutian/Bering Sea Islands BCR is also an important wintering area for shorebirds.

Alaska's overall size and the size of its Bird Conservation Regions dictate that conservation considerations for shorebirds generally be framed within a landscape context. Except for the Arctic Plains/Mountains and Cook Inlet, where habitat for breeding shorebirds is being lost, most other shorebird habitats in Alaska remain relatively intact. The main threats to shorebirds in Alaska come from drilling, transport, and refining of oil and natural gas, especially in the Cook Inlet, Northern Pacific Rainforest, and Arctic Plains/Mountains BCRs.

It is unlikely that at anytime in the near future habitat will be deliberately manipulated to manage shorebirds in Alaska as it is elsewhere in the U.S. and Canada. Thus, an overall conservation goal for shorebirds in Alaska is to keep species and their habitats well distributed across not only the Alaska landscape, but also regions used by these same populations during other phases of their annual cycles. This will be achieved through a subset of goals and objectives specific to several major components of the Alaska Shorebird Conservation Plan that focus on population and habitat, research, and education/outreach. Specific actions for each component will be formulated during the first year following adoption of the plan. Biological elements of the plan will be based on well-designed, cost-effective, and well-coordinated efforts.

Acknowledgments

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Introduction

Shorebirds are among the world's most impressive avian migrants. Some species that nest in remote, high-arctic regions undertake annual, one-way migrations of over 10,000 miles. To complete these long-distance flights, most species rely on sites along the way where they stop to rest and replenish fat reserves to fuel the next leg of their migration. At many of these sites, particularly coastal ones, shorebirds can be found in concentrations that number in the millions of individuals. That many species fly such distances only to spend a few short months nesting and raising their young in inaccessible and often harsh northern regions only adds to the human fascination with this group of birds.

Shorebirds as a group are generally associated with water, and probably no other cover type in temperate North America has been and continues to be affected more by human perturbations than wetlands. The landscape of North America has been markedly altered through the loss of large expanses of estuarine, brackish, or freshwater wetlands. Not surprisingly then is the increasing awareness that shorebird populations throughout much of North America are in decline. 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 half of these taxa (n = 17) the declines are statistically significant. For many of these species, outright loss of habitat is the cause of their population decline; for others, it is less clear what factors are responsible for the observed declines. What is known is that any adversity shorebirds face during one phase of their annual cycle will likely manifest itself during subsequent phases of that cycle. Therefore, the ability to identify and assess changes in shorebird populations, especially among those species migrating throughout the Western Hemisphere, requires well-coordinated national and international efforts.

The impetus for the U.S. Shorebird Conservation Plan came from heightened awareness of problems facing migratory birds in general and from several recent national and international conservation initiatives focusing on migratory songbirds and waterfowl. Although shorebirds have long been afforded protection under North American laws and treaties, such strictures have largely been ineffective in preventing declines in their populations brought about primarily through loss of habitat. What is needed are greater efforts to conserve habitat and increase knowledge of shorebird biology. Such active conservation will halt the decline of many species and keep common species common. The vision of the U. S. Shorebird Conservation Plan, therefore, is to ensure that stable and self-sustaining populations of all shorebirds are distributed throughout their range and among a diversity of habitats across the Western Hemisphere.

To be effective, the U.S. Shorebird Conservation Plan must address shorebird conservation needs across each species' range and throughout the annual cycle. To accomplish this goal the U.S. Shorebird Conservation Plan has been developed around 12 geographical units, the same units being used for other migratory bird conservation plans throughout North America. Alaska constitutes 1 of these 12 units. Working with the national component of the U.S. Shorebird Conservation Plan, each of the 12 regional working groups is charged with compiling information and making conservation recommendations for its respective region. These recommendations, though based on regional needs, are expected to reflect annual cycle needs of

species and as such will involve conservation actions across regions, countries, and in many cases hemispheres.

The Alaska Shorebird Working Group (AKSWG) developed the Alaska Shorebird Conservation Plan presented here. The AKSWG was formed in 1997 to raise the visibility of shorebirds in Alaska, achieve consensus on needed conservation actions, and exchange information on issues, research findings, and education. The group meets annually and interacts throughout the year via an e-mail network; a report of the activities of AKSWG members is produced and distributed annually (for information, contact Heather_Johnson@fws.gov).

Academic and private researchers, federal and state agency staff, conservation organizations, and shorebird enthusiasts have accumulated data and impressions about Alaska's shorebirds for more than half a century. The Alaska Shorebird Conservation Plan is based on that wealth of information and on the expertise of shorebird biologists and enthusiasts from around the state. This plan provides the framework and background for conservation planning for shorebirds in Alaska. Large gaps in our knowledge of Alaska's shorebirds, however, exist. As new information becomes available, it will be incorporated into periodic revisions of the plan.

Shorebirds in Alaska

Seventy-one species of shorebirds have been recorded in Alaska (Appendices 1 and 2). Of these, 46 species have been documented breeding; 37 species are regular breeders and 9 species are irregular breeders or breed in small numbers (Gill et al. 1994, Gill and Senner 1996). Shorebirds generally use a variety of open habitats for breeding, but are mostly found along coastal habitats during staging and migratory stopovers. Twenty-three species nest only on coastal or alpine tundra in arctic and subarctic regions. Population sizes of migrant and breeding shorebirds in Alaska range from a few thousand to several million (Table 1).

The 71 species of shorebirds that occur in Alaska represent fully one-third of the world's shorebird species. That such diversity occurs in a relatively small portion of the globe is primarily the result of Alaska's placement relative to Asia and the series of paleogeographic changes that shaped the region's landcover and avifauna (Kessel and Gibson 1978**)**. Alaska is relatively far north with >80% of the state's landmass north of 60°N. In this region, tundra and taiga landscapes dominate, and shorebirds, more so than any other group of birds, have evolved and radiated. The same processes operating in Alaska also occurred over a large portion of northeast Asia that was connected intermittently with the North American landmass via the Bering Land Bridge. The shorebirds that evolved in this part of Asia are frequently seen in Alaska as accidental and casual visitors, or occasionally as breeders, as are many Alaska species in the Russian Far East (see Kessel and Gibson 1978**)**.

As a result of these geologic and evolutionary processes, the list of shorebird taxa restricted wholly or in large part to Alaska is indeed impressive (Table 1). For example, most of the world's populations of three species (Bristle-thighed Curlew, Black Turnstone and Western Sandpiper) and five subspecies (Dunlin *C. a. pacifica* and *C. a. arcticola*; Rock Sandpiper *C. p. ptilocnemis* and *C. p. couesi*; and Short-billed Dowitcher *L. g. caurinus*) occur entirely within

Alaska. For yet other forms, such as Surfbird and a subspecies of Rock Sandpiper (*C. p. tschuktschorum*), as much as 75% of the world's breeding population occurs in Alaska. Equally impressive is the large proportion of North American populations of several other taxa that occur in Alaska. These include Black Oystercatcher, Pacific Golden-Plover, Wandering Tattler, Whimbrel (*N. p. rufiventris*), Bar-tailed Godwit (*L. l. baueri*), and Red Knot (*C. c. roselaari*).

Shorebirds that breed in Alaska use numerous flyways enroute to wintering grounds in Australia, New Zealand, Central and South Pacific Islands, Southeast Asia, southern Canada, the contiguous U. S., and Central and South America (Boland 1991, Gill et al. 1994, Gill and Senner 1996; Appendix 1). Of 43 recognized shorebird taxa regularly occurring in Alaska, some portion of the populations of 38 of these spend the winter outside the U.S.; entire populations of 16 migrate to South American or Oceanic countries (Gill and Senner 1996). Only six species remain in Alaska in any numbers during winter (Black Oystercatcher, Black Turnstone, Surfbird, Sanderling, Rock Sandpiper, and Dunlin).

Spring and fall concentrations of shorebirds at coastal staging/migratory stopover sites in Alaska are impressive. The Copper River Delta, Yukon-Kuskokwim Delta, and lagoons on the north side of the Alaska Peninsula each annually support millions of migrant shorebirds. Numerous estuaries elsewhere along the coast of Alaska annually support >100,000 migrant shorebirds. The majority of the populations of several species can be found at a few Alaska sites during certain periods of the annual cycle.

Table 1. Percent of shorebird populations, relative to estimated North American population size, found in Alaska as either migrants or breeders.

Taxon	North America[1]	% in Alaska[2]	Taxon	North America	% in Alaska
Black-bellied Plover	>140,000	>25	Sanderling	200,000-450,000	<10
American Golden-Plover	>150,000	25-50	Semipalmated Sandpiper	3-4 million,	>25
Pacific Golden-Plover	~16,000	100	Western Sandpiper	2.8-4.3 million	100
Semipalmated Plover	>124,000	>25	Least Sandpiper	300,000-900,000	25-50
Killdeer	0.2-2.0 million	<1	White-rumped Sandpiper	300,000-500,000	<5
Black Oystercatcher	6,900-10,800	>60	Baird's Sandpiper	140,000-300,000	5-15
Greater Yellowlegs	>83,000	25-50	Pectoral Sandpiper	350,000-400,000	30-50
Lesser Yellowlegs	300,000-800,000	25-50	Sharp-tailed Sandpiper	10,000-30,000	>95
Solitary Sandpiper	25,000-150,000	>25	Rock Sandpiper (*ptilocnemis*)	20,000-30,000	100
Wandering Tattler	10,000-25,000	>50	Rock Sandpiper (*couesi*)	~75,000	100
Spotted Sandpiper	50,000-250,000	10-30	Rock Sandpiper (*tschuktschorum*)	~50,000	>75
Upland Sandpiper	>350,000	<5	Dunlin (*pacifica*)	~550,000	100
Whimbrel (*rufiventris*)	<50,000	>80	Dunlin (*arcticola*)	<750,000	100
Bristle-thighed Curlew	7,500-11,800	100	Stilt Sandpiper	50,000-200,000	5-10
Hudsonian Godwit	<50,000	<25	Buff-breasted Sandpiper	15,000-20,000	10-30
Bar-tailed Godwit (*baueri*)	~100,000	100	Short-billed Dowitcher (*caurinus*)	~150,000	100
Marbled Godwit (*beringiae*)	1,000-3,000	100	Long-billed Dowitcher	250,000-750,000	40-60
Ruddy Turnstone (*interpres*)	25,000-90,000	20-40	Common Snipe	1-3 million	25-50
Black Turnstone	61,000-99,000	100	Red-necked Phalarope	1-3 million	20-40
Surfbird	50,000-100,000	>75	Red Phalarope	1-2.5 million	10-30
Red Knot (*roselaari*)	84,000-136,000	30-50			

[1] Size estimates from Morrison et al. (2000). See same for accuracy classification of each estimate.
[2] From Gill and Senner (1996) and Alaska Shorebird Working Group.

The Planning Unit - Alaska and Alaska Bird Conservation Regions

The Alaska Environment

Alaska encompasses more than 574,179 square-miles (~1.5 million km^2), representing an area one-fifth the size of the contiguous United States. The region spans more than 20 degrees of latitude (51° to 71°N) and 57 degrees of longitude (130°W to 172°E), and is contained within almost 34,000 miles (55,000 km) of shoreline. The Yukon River, the third longest river in the U.S., flows through 1,875 miles of Alaska and drains a watershed encompassing over half (330,000 square-miles) of the state. Broad, shallow rivers and associated valleys are dominant features of Alaska's interior landscape, but equally prominent are numerous mountain ranges that criss-cross the state. For example, 9 of the 16 tallest peaks in North America occur within the Wrangell-St. Elias Mountains bordering the North Gulf of Alaska. The continent's highest peak, Mount McKinley (20,320 feet), is part of the Alaska Range that arcs across Southcentral Alaska to the base of the Alaska Peninsula. The periphery of the mostly mountainous interior of the state is a mixture of expansive coastal wetlands and riverine deltas, the extent of which exceeds that of all such habitat in the contiguous United States. Permafrost occurs throughout most of the state and is continuous north of the Arctic Circle. Finally, Alaska has over 40 active volcanoes, mostly along the Alaska Peninsula and Aleutian Islands, and more than 100,000 glaciers, which cover 5% of its land area.

Alaska's climate varies markedly by region. The maritime influence of the Gulf of Alaska brings warm winters, cool summers, heavy precipitation, and constant wind to most of southeastern Alaska. In contrast, interior Alaska has warm summers, very cold winters, little wind, and light precipitation. Cool summers, cold winters, moderate winds, and light precipitation are typical of western and northwestern Alaska. Periods of over two months of continuous darkness in winter and continuous sunlight in summer characterize northern Alaska.

The diversity of physiographic features has shaped an equally diverse assemblage of landcovers (Bailey et al. 1994) but, as is typical of northern ecoregions, biotic communities are generally of low species richness. For example, only 128 species of trees and shrubs are known from Alaska (Viereck and Little 1972). Vegetation across Alaska ranges from temperate rain forests in the southeast to high arctic tundra in the north.

Two-thirds of Alaska is publicly owned (Duffy et al. 1999; Appendix 3). Of the nation's conservation lands, the two largest National Forests, nine of the ten largest National Parks and Preserves, and 83% of all National Wildlife Refuge lands occur in Alaska. In northern Alaska the Bureau of Land Management administers the 37,000 square-mile National Petroleum Reserve-Alaska. Glacier Bay and Wrangell-St. Elias National parks in the U.S., and adjacent Kluane National Park and Tatshenshini-Alsek Wilderness Provincial Park in Canada, form the largest contiguous protected wilderness on the globe.

The human population of Alaska has doubled from 302,583 people in 1970 to 615,900 people in 1995, yet the state remains one of the least populated areas of North America with an average density of slightly more than one person per square mile. Nonetheless, a few major population centers exist, including Anchorage, where 42% of all Alaskans resided as of 1998. Outlying areas near Anchorage, including the Kenai Peninsula and Matanuska-Susitna Borough, support

another quarter of the state's population. Indigenous people constitute about 15% of the state's population.

Oil and gas development is the major revenue-producing industry in Alaska and is concentrated in Cook Inlet and on the Arctic Coastal Plain. In 1996, the State of Alaska received $1.87 billion in royalties from oil extracted from its lands. Alaska leads the country in oil production. In 1995, for example, 541.6 million barrels of oil came from Alaska oil fields, the largest of which is Prudhoe Bay on the North Slope. Oil development and its supporting infrastructure are major concerns for shorebird conservation in Alaska.

Alaska's current growth industry is tourism. In 1995, for example, 1.1 million visitors spent $750 million in the state. Within the past five years, the number of visitors to the state's capitol, Juneau, has increased by 50,000 per year. Ecotourism in general and bird-watching tours in particular, are also increasing in popularity throughout Alaska. Shorebird festivals have become important to two regional economies, those of Cordova and Homer.

Bird Conservation Regions

State, provincial, federal, and non-governmental organizations from Canada, Mexico and the U.S. met in Puebla, Mexico, in November 1998, to adopt an ecological framework that would facilitate coordinated conservation planning, implementation, and evaluation of major bird conservation initiatives. The scheme adopted by the group was based on the Commission for Environmental Cooperation's (1998) hierarchical framework of nested ecological units. From these, five Bird Conservation Regions (BCRs) were designated within Alaska (Figure 1). These roughly follow the Biogeographic Regions previously defined for the state by Kessel and Gibson (1978). The Alaska Shorebird Conservation Plan is drafted within the context of these five major BCRs. However, because shorebird resources and issues in Cook Inlet differ markedly from those elsewhere in the NW Interior Forest BCR, we treat Cook Inlet as a separate BCR. Following are descriptions of each BRC and the subregions therein; more detailed descriptions are provided in Gallant et al. (1995).

Arctic Plains and Mountains (BCR 1)

This 93,000-square-mile region includes low-lying, coastal tundra and drier uplands of the Arctic Foothills of the Brooks Range. Subregions include: 1A) Arctic Coastal Plain, and 1B) Arctic Foothills and north slope of the Brooks Range. It extends from the Alaska-Canada border at Demarcation Point westward and southward to the mouth of the Noatak River.

Because of thick, continuous permafrost, surface water dominates the landscape (20-50% of the land surface on the coastal plain). Freezing and thawing form a patterned mosaic of polygonal ridges and ponds. Several rivers (e.g., Colville River) bisect the plain and flow into the Arctic Ocean. Barrow, a city lying on the Arctic Ocean, experiences 67 days of darkness in the winter and 84 days of continuous sunlight in the summer. The ocean surface, except for leads, is frozen 9 to 10 months a year, and the ice pack is never far from shore.

Figure 1. Bird Conservation Regions, and subregions, of Alaska (based on the scheme of the Commission for Environmental Cooperation 1998).

Because of the large amount of surface water, waterfowl and shorebirds dominate the breeding avian community. The most abundant breeding shorebirds on the coastal plain include American Golden-Plover, Dunlin, Semipalmated Sandpiper, Pectoral Sandpiper, and Red Phalarope. Few bird species winter in the region. Old World shorebird species penetrate the region from the west (e.g., Bar-tailed Godwit) and shorebird species regularly breeding in the Canadian Arctic penetrate from the east (e.g., White-rumped Sandpiper and Sanderling).

Western Alaska (BCR 2)

This large, 113,000-square-mile region consists of the coastal plain and mountains of western and southwestern mainland Alaska. Subregions include: 2A) Subarctic Coastal Plain and Seward Peninsula, 2B) Ahklun and Kilbuck Mountains and Bristol Bay-Nushagak Lowlands, and 2C) Alaska Peninsula Mountains.

Permafrost is continuous except in southern parts of the region. Sea cliffs are present, as are mountains that exceed 3,300 feet in elevation. Volcanic peaks up to 8,500 feet are found along the Alaska Peninsula. Wet and mesic graminoid herbaceous communities dominate the lowlands

and numerous ponds, lakes, and rivers dot the landscape. Tall shrub communities are found along rivers and streams and low shrub communities occupy uplands; forests of spruce and/or hardwoods penetrate the region on the eastern edge and approach the coast along major rivers. The amount of intertidal habitat associated with the numerous river deltas of this region far exceeds that of any other region of Alaska.

Western Alaska has a unique breeding shorebird component (Table 2) that is largely restricted to Beringia (e.g., Pacific Golden-Plover, Bristle-thighed Curlew, Black Turnstone, and Western Sandpiper). Several Old World species also regularly breed in or migrate through this region (e.g., Sharp-tailed Sandpiper). High densities of breeding waterfowl and shorebirds are found on the coastal plain of the Yukon and Kuskokwim rivers. Intertidal habitats in this area and along the north side of the Alaska Peninsula support millions of shorebirds during migration, mostly sandpiper species such as Dunlin, Western Sandpiper, and Red Knot (Gill and Jorgensen 1979, Gill and Handel 1981, 1990).

Aleutian/Bering Sea Islands (BCR 3)

Included in this relatively small region (7,000 square miles) are the Aleutian Islands and the Bering Sea islands (i.e., Pribilofs, St. Matthew, Hall, St. Lawrence, and Little Diomede). The Aleutian Islands are volcanic in origin and extend westward from the Alaskan mainland for 1,100 miles.

Climate in the region is maritime and wind is ever present**.** Unlike in the Aleutian Islands, which are free of permafrost and unaffected by sea ice in winter, both processes are important features of islands in the northern portion of this BCR. Vegetation at higher elevations consists of dwarf shrub communities, mainly willow (*Salix* spp.) and crowberry (*Empetrum nigrum*). Meadows and marshes of herbs, sedges, and grasses are plentiful and ericaceous bogs occur on several islands.

Seabirds are a dominant component of this region's avifauna and several species breed only in this region. Breeding diversity of shorebirds is relatively low; primary species include the Black Oystercatcher, Dunlin, Ruddy Turnstone, and Rock Sandpiper. Numerous Old World species are regular migrants or visitants, and some of these regularly breed in the region in small numbers (e.g., Common Ringed Plover, Wood Sandpiper). Rock Sandpipers of three races occur on islands within the region.

Northwestern Interior Forest (BCR 4)

This BCR is an extensive (283,000 square miles) patchwork of ecoregions. Subregions include: 4A) Interior Highlands and Ogilvie Mountains, 4B) Interior Forested Lowlands and Uplands, Interior Bottomlands, and Yukon Flats, 4C) Alaska Range, Wrangell Mountains, and Copper Plateau, and 4D) Cook Inlet.

In the interior, winters are cold and summers are warm. In Fairbanks, for example, average minimum monthly temperatures in winter range between -17 and -5°F, while in summer average

Table 2. Seasonal distribution of shorebird species of high conservation concern in different Bird Conservation Regions in Alaska.[1]

	Arctic Plains/ Mountains		Western Alaska		NW Interior Forests		Aleutian/Bering Sea Islands			Cook Inlet			Northern Pacific Rainforests		
Species	B	M	B	M	B	M	B	M	W	B	M	W	B	M	W
Pacific Golden-Plover			**B**	**M**				m							
Black Oystercatcher			B	W			**B**		**W**				**B**		**W**
Wandering Tattler	b		**B**		**B**		b			b			B		
Whimbrel	B		B	**M**	B	m					**M**			m	
Bristle-thighed Curlew			**B**	**M**											
Hudsonian Godwit			**B**	**M**	b					**B**	**M**				
Bar-tailed Godwit	**B**		**B**	**M**											
Marbled Godwit[2]			**B**	**M**										**M**	
Black Turnstone	b		**B**	**M**										**M**	w
Surfbird			B		B					B				**M**	w
Rock Sandpiper			**B**	**M**			**B**		**W**			**W**			**W**
Dunlin[3]	**B**	**M**		**M**				m							
Buff-breasted Sandpiper	**B**														
Short-billed Dowitcher[4]			**B**	**M**						B	M		B	M	
Total number of species	6	1	12	11	4	1	3	2	2	4	3	1	3	5	4

[1] B = breeding, M = migration, and W = wintering. B, M, W = common or locally abundant; region is important to the species. **B**, **M**, **W** =. large concentrations or absolute numbers; area of high importance. b, m, w = uncommon to fairly common; region is within species' range but species occurs in low abundance relative to other regions. See Appendix 4 for more detailed definitions of categories.

[2] Includes only the subspecies *Limosa fedoa beringiae*.

[3] Includes only the subspecies *Calidris alpina arcticola*.

[4] Includes only the subspecies *Limnodromus griseus caurinus*.

monthly maximum temperatures range between 55 and 72°F. Because of a moderating maritime influence, the Cook Inlet subregion differs markedly from the rest of the interior in climate. Primarily for this reason, but also because of markedly different seasonal needs of shorebirds occurring there, special consideration is given to Cook Inlet (see below).

Much of the interior BCR is a mosaic of vegetation communities, but mostly of different types of forest that have arisen from the interplay of elevation, aspect, permafrost, surface water, and fire. Needleleaf, deciduous, and mixed forests are all represented. Dominated species include white spruce (*Picea glauca*), black spruce (*P. mariana*), poplars (*Populus* sp.), and paper birch (*Betula papyrifera*). Tall shrub communities occur along rivers, drainages, and near treeline. Bogs, consisting of low shrubs and shrub-graminoid communities, are common in the lowlands. Alpine dwarf shrub communities are common in Interior Highlands and throughout mountainous regions; highest elevations are generally devoid of vegetation.

Many bird species are shared among the subregions of this vast BCR. Lowlands support many species of migrating and breeding waterfowl and breeding shorebirds (e.g., Greater and Lesser yellowlegs, Solitary and Spotted sandpipers, and Common Snipe). American Golden-Plovers and Surfbirds are found in alpine habitats in the Interior Highland and mountainous ecoregions (Johnson and Connors 1996, Senner and McCaffery 1997).

Cook Inlet — Because of a strong maritime influence, the climate of the Cook Inlet subregion is mild relative to the rest of interior Alaska. In Anchorage, which borders the Inlet, average monthly minimum temperatures in winter range between 6 and 13°F; in summer average monthly maximum temperatures range between 55 and 62°F. The terrestrial communities within the Cook Inlet region are similar to those elsewhere in the Northwestern Interior Forest BCR with the exception of the vast expanses of intertidal habitats in Cook Inlet. These habitats are a major spring stopover site for Western Sandpipers and Dunlins and are also a primary wintering site for the nominate form of Rock Sandpiper (*C. p. ptilocnemis*). Significant numbers of Long- and Short-billed dowitchers and Hudsonian Godwits use upper Cook Inlet during migration (Gill and Tibbitts 1999). Two-thirds of Alaska's human population reside in the Cook Inlet subregion.

Northern Pacific Rainforest (BCR 5)

The coastal rainforest BCR encompasses 64,500 square miles and extends from extreme southern Alaska to the western Gulf of Alaska. Heavy precipitation and mild temperatures typical of a maritime climate characterize the region. Subregions include: 5A) Coastal Hemlock-Spruce Forests, and 5B) Pacific Coastal Mountains.

The region's stark, rugged features are a result of intense Pleistocene glaciation, remnants of which still cover much of the adjacent interior lands. The terrain in this BCR is generally steep, sloping from sea level up to 3,300 feet, but the coastline is frequently broken by large floodplains, alluvial fans, outwash plains, and river deltas. Needleleaf forests of Western Hemlock (*Tsuga heterophylla*) and Sitka Spruce (*Picea sitchensis*) dominate the region. Broadleaf forests mostly cover large mainland river drainages. Several other vegetative communities are present in this region, including tall, low, and dwarf shrub communities, tall and low shrub bogs and swamps, and wet graminoid and forb meadows.

The Copper and Stikine River deltas and the Yakutat Forelands are major stopover sites for migrating shorebirds, especially Western Sandpipers, Dunlins, Short-billed Dowitchers, and the Alaska subspecies of the Marbled Godwit (*L. f. beringiae*) (Iverson et al. 1996, Andres and Browne 1998, Bishop and Warnock 1998, Warnock and Bishop 1998). Compared to those in tundra BCRs, few shorebird species breed in this region, but among them are Greater Yellowlegs, Short-billed Dowitcher, and Black Oystercatcher. During winter, species like Black Oystercatcher, Black Turnstone, Rock Sandpiper, and Surfbird are found on marine shorelines throughout the area (Isleib and Kessel 1973, Andres and Falxa 1995).

Shorebird Species Priorities in Alaska

The Prioritization Process

The system for prioritizing shorebird species of concern was developed as part of the U.S. Shorebird Conservation Plan with input from many individuals participating in the Plan's Research and Monitoring Working Group, including representatives from across the U.S. and Canada. The goal of the system was to provide a clearly organized method for categorizing the various risk factors that affect the conservation status of each species in a format that can be easily updated as additional information becomes available. The system was designed in collaboration with Partners In Flight (PIF) to ensure that it was as compatible as possible with the PIF Plan while reflecting the unique biology of shorebirds.

The variables used in the National and Regional prioritization processes are presented in Appendix 4. Many of these variables, while widely agreed to affect conservation status, are very difficult to estimate. Nevertheless, prioritization is important to ensure that higher risk species are given the attention needed to avoid significant declines. Because appropriate data are often lacking, the classifications produced by this system are considered estimates of the actual conservation status of each species. Further study is needed for most species with respect to most of these variables. The classifications presented in the Alaska Shorebird Conservation Plan will be evaluated annually by the Alaska Shorebird Working Group.

Priority Species by Bird Conservation Region

Several species of high national concern were downgraded when setting Alaska priorities, primarily because threats to breeding areas in Alaska were less severe (e. g., Solitary Sandpiper) or non-breeding season threats were the primary cause for concern (e. g., American Golden-Plover, Ruddy Turnstone, Red Knot, and Sanderling) (Appendix 5). On the other hand, for species like Wandering Tattler and Rock Sandpiper and for subspecies of Dunlin (*C. a. arcticola*) and Short-billed Dowitcher (*L. g. caurinus*), conservation concern at the Alaska level was elevated over that nationally because of the importance of Alaska to their populations. No Alaska species is classified as "Highly Imperiled." (The Eskimo Curlew is considered highly imperiled at the national level, but because it has not been recorded in Alaska in the 20th century it is not discussed further.) Fourteen Alaska species or subspecies received the next highest designation, "Species of High Concern" (Table 2, Appendix 5). An additional 17 Alaska species were classified as "Species of Moderate Concern" while only 7 species ranked as "Species of Low Concern." Eleven of the 14 taxa of high concern in Alaska also appear under the same

category on the national list. Most species of high conservation concern in Alaska were classified as such because of their generally small global populations or limited breeding distributions with Alaska encompassing most of their breeding range. The following brief accounts summarize reasons for designation as "Species of High Concern."

Pacific Golden-Plover — The Pacific Golden-Plover is of primary importance within the Alaska Region because of its small population size (16,000) and because its North American breeding range is restricted to Alaska (Johnson and Connors 1996).

Black Oystercatcher — The region is of primary importance to this species because over half the population nests in Alaska, concentrated especially in Prince William Sound and the Kodiak Archipelago (Andres and Falxa 1995). The species is very susceptible to disturbance by humans and foxes (Andres 1997, 1998), an issue of concern in several regions of Alaska.

Wandering Tattler — Little is known about this species but it is of particular concern to the region because Alaska is the principal breeding area and the species' population is small—probably under 10,000 individuals—thus making it one of the least populous shorebird species in North America.

Whimbrel — The Whimbrel is of primary importance in the region because the majority of a subspecies (*Numenius phaeopus rufiventris*) breeds in Alaska (Gibson and Kessel 1997, Engelmoer and Roselaar 1998). The species' population is estimated at about 60,000 birds, of which as many as 40,000 occur in Alaska.

Bristle-thighed Curlew — This species is of interest because it nests only in Alaska in two relatively small, disjunct regions, the Andreafsky Wilderness near the north Yukon Delta and on the central Seward Peninsula. The total breeding population is among the smallest of all shorebirds and estimated at 3,200 pairs (Handel et al. 1990). Numerous lines of evidence suggest the population is being affected by anthropogenic factors on the nonbreeding grounds in central Oceania (Marks and Redmond 1994, Gill 1998)

Hudsonian Godwit — Alaska is important to this species because as much as 30% of the population may breed in the region (McCaffery 1996, McCaffery and Harwood in press). Recent findings suggest Alaska birds may warrant subspecific status (Haig et al. 1997).

Marbled Godwit — Alaska hosts a small (probably <3,000 birds), highly disjunct breeding population of sufficiently different morphology to warrant subspecific (*Limosa fedoa beringiae*) designation (Gibson and Kessel 1989).

Black Turnstone — This species is of importance because the entire population of about 80,000 birds nests in Alaska, primarily along a narrow section of the coastal Yukon-Kuskokwim River Delta (Handel and Gill 1992). Its affinity to nest in the lowest vegetated intertidal regions makes it especially susceptible to loss or change of habitat resulting from global sea level rise.

Surfbird — The Surfbird is of primary importance in the region because of its relatively small population (50,000-100,000 birds), >75% of which occurs in Alaska (Senner and McCaffery 1997). More importantly, most Alaska breeding birds concentrate for a few weeks each spring on traditional areas of Prince William Sound (PWS). Several of the areas used by Surfbirds in PWS were affected by the *Exxon Valdez* oil spill. There remains a high probability that other such events will occur in PWS and the Gulf of Alaska as long as the production and transportation of petroleum products continue at current levels.

Rock Sandpiper — This species is of importance to Alaska because of the restricted distributions of the multiple subspecies that have evolved in the region (Conover 1944). Two forms (*Calidris p. ptilocnemis* and *C. p. couesi*) breed exclusively in Alaska while the majority of a third (*C. p. tschuktschorum*) breeds within the region. Either the entire or the majority of the three populations winters in Alaska. None of the three populations is large, ranging in size from 25,000 to 75,000 individuals (R. Gill, unpubl. data). The nominate population breeds only on Bering Sea islands where habitat has been markedly altered by reindeer grazing, especially on the Pribilof Islands (A. Sowls, pers. comm.).

Dunlin — Alaska is of primary importance to two subspecies of Dunlin (*Calidris alpina pacifica* and *C. a. arcticola*) because both nest exclusively within the region (Warnock and Gill 1996). The population size of *C. a. pacifica* is about 500,000 (Page and Gill 1994), while that of *C. a. arcticola* is <750,000 (D. Troy pers. comm.). *C. a. arcticola* is of particular concern because it winters in East Asia where habitat continues to be lost and marked population declines have been reported (D. Troy pers. comm.).

Buff-breasted Sandpiper — The species' regional importance is based on the proportion of breeding birds supported in the state and the marked decline in the population, which is now thought to number less than 15,000 birds (Lanctot and Laredo 1994, R. Lanctot pers. comm.).

Short-billed Dowitcher — Alaska is of importance because the subspecies *Limnodromus griseus caurinus* breeds nowhere else. Its population is estimated at about 150,000 (PRBO unpubl. data), but some are concerned that numbers have declined, especially over the past decade (J. Jehl, R. Gill, and G. Page, pers. obs.).

Most species identified as high priority in Alaska, particularly breeding species, occur in the Western Alaska and to a lesser extent the Arctic Plains/Mountains BCR (Table 2). Southern regions (Cook Inlet and the Northern Pacific Rainforest) have a high proportion of priority species that occur as migrants or winter residents. The only other Alaska unit that hosts wintering shorebirds is the Aleutian/Bering Sea Islands BCR.

We used the vegetation classification system of Kessel (1979) to describe shorebird habitats in Alaska. This system is largely based on the vertical structure of vegetation and less so on plant

species composition. We augmented descriptions of unvegetated habitats to describe use more accurately, particularly by non-breeding birds. In Table 3 we present seasonal habitat associations of Alaska's high priority species; habitat preferences for all species appear in Appendix 6.

Table 3. Seasonal habitat associations of Alaska's high priority shorebirds. Habitat classification after Kessel (1979).

BREEDING

Tundra meadows (dwarf shrub meadows, salt grass meadows, or wet meadows)

Pacific Golden-Plover	Bar-tailed Godwit	Dunlin
Whimbrel	Marbled Godwit	Buff-breasted Sandpiper
Bristle-thighed Curlew	Black Turnstone	Short-billed Dowitcher
Hudsonian Godwit	Rock Sandpiper	

Alpine/rocky tundra (dwarf shrub mat)

Surfbird	Wandering Tattler	Rock Sandpiper

Rocky shore/riverine alluvia

Black Oystercatcher	Wandering Tattler

STAGING/MIGRATORY STOPOVERS OR WINTERING (W)

Tundra meadows (dwarf shrub meadows, salt grass meadows, or wet meadows)

Pacific Golden-Plover	Bristle-thighed Curlew
Whimbrel	Buff-breasted Sandpiper

Tidal flats

Hudsonian Godwit	Marbled Godwit	Short-billed Dowitcher
Bar-tailed Godwit	Dunlin	Rock Sandpiper

Rocky or gravel shorelines

Black Oystercatcher (W)	Black Turnstone (W)	Rock Sandpiper (W)
Wandering Tattler	Surfbird (W)	

Shorebird Conservation Issues in Alaska

The previous century witnessed unprecedented change to natural landscapes throughout much of the U.S. (Jehl and Johnson 1994, LaRoe et al. 1995). Alaska, however, remains largely unchanged with less than 1% of the state having been permanently altered by human settlement and activity (Duffy et al. 1999). This is not to imply that ecosystems in Alaska are not being affected by human activities. On the contrary, the nation's demand for natural resources drives Alaska's economy, particularly development and production of oil and gas, timber, and commercial fisheries. The threats to shorebirds posed by these and other activities are both real and potential. In Table 4, we summarize conservation issues throughout the Bird Conservation Regions of Alaska and in the following narrative discuss each in greater detail.

Table 4. Conservation issues affecting shorebirds among Bird Conservation Regions of Alaska.

Issue	Arctic Plains/ Mountains	Western Alaska	NW Interior Forest	Aleutian/ Bering Sea Islands	Cook Inlet	Northern Pacific Rainforest
Oil and gas development	•				•	
Oil pollution	•	•		•	•	•
Marine-based recreation					•	•
Mining		•	•			
Subsistence harvest		•		•		
Predators/exotic animals	•	•		•	•	

Oil and gas development and infrastructure

Oil and gas development is the driving force behind Alaska's economy (Strohmeyer 1993) and also the largest potential threat to shorebirds in the state. The types and severity of potential, negative effects of this development on shorebirds vary across the state and are not only specific to individual species and their habitats but also to the types of development involved. Spills, industrial pollution, facility construction and expansion, road building, and increased ground, air and water traffic can have deleterious effects on shorebirds throughout the year. Because oil or gas spills could have the most immediate and dramatic effects on shorebird populations, adequate measures for spill prevention and efficient cleanup procedures should be strongly encouraged. The most likely areas for large spills are Prince William Sound, Cook Inlet, and the Arctic Coastal Plain.

Up to eight million shorebirds use Prince William Sound annually for migration, breeding or wintering. Protection of this region, especially the Copper River Delta and Montague Island, is imperative for the conservation of Pacific Flyway shorebirds. Although safeguards have been, and continue to be, put in place to minimize oil spills in Prince William Sound, the high volume

of oil being transferred and transported there makes the Sound a high risk region. The 800-mile-long Trans-Alaska Pipeline terminates at the Valdez Marine Terminal in Prince William Sound. This 1,000-acre facility, capable of storing 9.2 million barrels of crude oil, pumps 1.3 million barrels of oil/day, and supports the berthing and loading of 58 oil tankers/month. All of these tankers, whose capacities range up to 1.9 million barrels each, travel from Valdez, through Prince William Sound, and into the Gulf of Alaska enroute to refineries along the west coast of the U.S.

Breeding and wintering populations of Black Oystercatchers and migrating or wintering populations of Black-bellied Plovers, Black Turnstones, Surfbirds, Marbled Godwit, Western Sandpipers, Dunlin, and Rock Sandpipers occur in Prince William Sound. Catastrophic spills or chronic low-level toxin exposure could have deleterious effects on these populations.

Oil and gas drilling, transport, and refining all add risks to shorebirds inhabiting Cook Inlet. These risks are increased because Cook Inlet lies along the Aleutian Arc, one of the most seismically active regions in the world. Petroleum developments must therefore withstand relatively frequent earthquakes and volcanic eruptions. Currently, 17 gas- and 7 oil-producing fields occur within Cook Inlet along with large storage and transfer facilities, a refinery, and a urea-production plant. Natural gas is the main resource in the region. Much of the drilling is offshore and a network of sub-seabed pipelines is used in local transport of both oil and gas. Nearly all of Cook Inlet has been opened to lease sales by either state or federal agencies. Additionally, 13 million barrels of jet fuel are transported each year beneath the intertidal zone between the Port of Anchorage and the Anchorage International Airport via a new subsurface pipeline. A spill or persistent discharge from drilling platforms, transfer facilities, or pipelines would be harmful to the marine, estuarine, tidal and intertidal environments. Furthermore, containment and cleanup efforts may be hampered by extreme currents and by ice floes that choke much of the Inlet in winter. Large numbers of wintering Rock Sandpipers, migrating Western Sandpipers and Dunlin, and breeding and migrating Hudsonian Godwits, Greater Yellowlegs, Lesser Yellowlegs, Solitary Sandpipers, and Short-billed Dowitchers use the Cook Inlet region (Gill and Tibbitts 1999). Thus, spills or allowable discharges could immediately affect a variety of shorebirds at any time of the year.

Alaska's Arctic Coastal Plain produces >20% of the nation's oil. Although production peaked in 1988, oil development is expanding in the Arctic as formerly uneconomical fields are being developed with new technology that allows profitable oil extraction. Several factors of expanding development may negatively affect shorebirds in this critical breeding area: 1) increased interest in developing smaller fields within the existing perimeter of development will encroach on existing breeding areas, and 2) diminished areas, along with higher road densities, increased noise, and increases in other anthropogenic disturbances will undoubtedly reduce numbers of shorebirds nesting in the oil fields. Beyond the Prudhoe Bay area, active exploration continues on the Colville River Delta and throughout the northern and eastern portions of the National Petroleum Reserve-Alaska (NPR-A), where an estimated six million shorebirds breed. The first Colville River Delta field, Alpine, has recently begun operations and other developments on the Delta have been proposed. Pipelines, airstrips, roads, and production facilities are now part of the Colville River Delta landscape. Additionally, the first offshore development (Northstar) will soon commence, and similar developments will most likely

continue as new discoveries are made. Although the Northstar Project has been reviewed and determined to be safe, offshore oil development in the Arctic is new and many potential problems exist. It is difficult to estimate the probability of spills, reliability of sub-seabed pipelines in the Arctic, adequacy of leak detection systems, and efficacy of spill response and cleanup systems in the Beaufort Sea.

With the expansion of offshore and Colville River Delta development there is an increased risk to breeding and staging shorebirds on Alaska's North Slope. Previously, spills were less likely to affect areas other than the immediate vicinity of spill sites. With the addition of delta and offshore development, and the relatively high spill risk associated with offshore drilling in the Arctic, the potential for widespread dispersion of spilled oil via river and ocean currents increases. An oil spill on the Colville Delta or from an offshore rig could impact distant mudflats and salt marshes used by tens of thousands of migrating and breeding shorebirds (Andres 1994). The effects of expanding onshore development, including displacement of individuals from breeding sites, direct, small-scale environmental damage due to spills, and potential long-term effects of pollutant exposure, remain potential threats.

Because rural Alaska relies on diesel oil for electrical generation and heating, all communities have diesel storage tanks. In coastal areas, diesel oil and gasoline are delivered once or twice each year via marine or river barge; 15-20 million barrels of non-crude fuels are transported by barge to rural Alaska each year. This high volume of barge traffic near critical shorebird breeding and stopover habitats is a potential threat. This threat is increased by the remoteness of potential spill sites and the myriad state and federal agencies that regulate spill reporting and response. Storage and transfer facilities in rural Alaska vary in quality and maintenance, but many are generally in poor condition; most villages lack consolidated fuel storage facilities. The Environmental Protection Agency and the Alaska Department of Environmental Conservation are currently involved in a statewide program to upgrade all fuel storage and transfer points in rural Alaska to meet safety and environmental laws. This effort will also strengthen reporting and response efficiency of spills and may help minimize threats to shorebirds.

Many industries and communities throughout Alaska rely on seagoing vessels. Commercial vessel groundings, at-sea discharges, lax fueling practices, and poor maintenance all contribute to spills in the marine environment. Spill reporting and response are regulated by several state and federal agencies (depending on location) and the Alaska Department of Environmental Conservation maintains a database of spills and discharges throughout the state.

Marine-based recreation/tourism

Road access to Prince William Sound from the west will commence in 2000. This improved access will result in increased recreational and commercial use of western Prince William Sound and subsequent increases in demand for recreation and fuel facilities away from ports. Additional fuel facilities would make all of Prince William Sound easily accessible by boat. Proposals to add floating lodges and other structures are currently being considered. Floating fuel barges in Prince William Sound will increase the chances of large-scale spills and of long-term, low-level contamination of shorelines by diesel fuel and gasoline. Areas of most concern

are beaches where Black Oystercatchers and Wandering Tattlers nest and shorelines that support large numbers of migrant Surfbirds and Black Turnstones.

Easier access to Prince William Sound will also undoubtedly result in increased use of beaches for outdoor recreation (campers, fishers, and kayakers). State and federal agencies are considering the suitability of many sites throughout the area for low-impact development (e.g., landings, picnic areas), and the use of these developments will probably be regulated. Regulating use of beaches and other sites that attract visitors is more difficult. Unfortunately, the most attractive beaches to people are often preferred breeding habitat for Black Oystercatchers, a species known to be sensitive to nest-site disturbance. Formulation and evaluation of some restrictive land-use regulations could prevent the extirpation of this species from portions of its original range.

The effects of shipping traffic, especially cruise ship traffic, on nesting birds have received little attention. Higher visitation to sensitive areas increases the likelihood of nest flooding by wakes and contaminant discharge, which could threaten breeding birds. Areas most likely to be affected include Prince William Sound, Kenai Fjords National Park, and Glacier Bay. Recently, protected bays in Southeast Alaska have come under increased demand for use by tourists, aquaculturalists, and log transfer facilities.

Many of the issues discussed in the previous section under fuel delivery/storage also apply here, especially at-sea discharges, lax fueling procedures, and poor vessel maintenance.

Mining development

Mining in western and interior Alaska remains a potential, albeit relatively small, threat to shorebirds. Most vulnerable are Wandering Tattlers, Spotted Sandpipers and Semipalmated Plovers that use riverine gravel bars and banks for breeding and foraging. Placer mining for gold makes up much of the region's small-scale mining activity. This technique often affects watersheds by direct physical modification of the river channel and bank, but it also directly and indirectly affects biological components through introduction of fuels, heavy metals, and acids into the environment. Physical modification of the watershed may result in displacement of breeding and foraging individuals, but in some cases such activity may actually benefit populations; indeed, some riparian corridors heavily disturbed by placer mining support some of the highest reported nesting densities of Wandering Tattlers. Contaminated sites may have broader effects due to persistence of the contaminant in the environment or effects far from the point source.

Subsistence harvest

Rural harvest of shorebirds has been estimated for only a few areas of Alaska; reports generally differentiate shorebirds into only two classes — large and small. Large shorebirds, mostly Bar-tailed Godwits, appear to be the most frequently taken species and mostly on the central Yukon-Kuskokwim Delta. Current hunter education and public outreach programs are addressing

shorebird issues in rural Alaska and are raising awareness of the importance of shorebird conservation.

Increased populations of native and introduced predators

Concomitant with oil and gas development on the Arctic Coastal Plain is the possible increase in red and arctic fox populations and a likely increase in shorebird nest predation rates (Day 1998). Poor sanitation protocols in and around oil production and seismic facilities could promote concentrations of foxes by limiting natural predation on them and providing anthropogenic food sources, thus increasing survival rates of young. Pressure on local governments— which are often responsible for solid waste disposal—to maintain and clean up disposal sites could help reduce this risk. Improperly maintained waste disposal sites in rural villages also attract large numbers of foxes and Common Ravens, especially throughout western Alaska. Landfills may become especially attractive to foxes during years of low microtine numbers. The maintenance of artificially high numbers of ravens at these sites could potentially contribute to increased mortality of nearby nesting shorebirds. Of particular concern is the population of Bristle-thighed Curlews nesting in the Nulato Hills north of the villages of St. Mary's and Mountain Village.

The occurrence of exotic predators, particularly foxes on islands throughout much of western Alaska, has likely reduced populations of ground- and cliff-nesting birds and prevented recolonization of sites where bird populations had been extirpated. By the 1930s, foxes had been introduced on nearly 460 Alaska islands, stretching from Southeastern Alaska to the western Aleutians, to supply a world-wide demand for pelts. Currently, foxes are present on about 10% of islands where they had been introduced, nearly all in the Aleutians. Although both the numbers and diversity of shorebirds breeding on these islands are low, one race of Rock Sandpiper (*C. p. couesi*) nests throughout the Aleutian Islands and its population has likely been held below capacity because of predation by foxes. Other exotic mammals were also introduced with foxes, mostly for fox food, including ground squirrels, voles, mice, hares, and marmots. All of these, with the possible exception of hares, are known to eat birds or bird eggs and have had dramatic effects on seabird populations in Alaska and elsewhere. Effects of exotic mammals on Alaska shorebird populations are not well documented, but recolonization by both Black Oystercatchers and Red-necked Phalaropes after fox eradication has been recorded (Byed et al. 1996). Accidental introductions, especially of rats by grounded or anchored vessels, may also put shorebirds at risk. Species at highest risk include Black Oystercatchers, Red-necked Phalaropes, Rock Sandpipers, and Ruddy Turnstones.

Shorebird Conservation Goals and Objectives for Alaska

Overview

The size of Alaska, and its Bird Conservation Regions, dictates that conservation considerations for shorebirds generally be framed within a landscape context. Although no shorebird species or habitat is threatened with extirpation or extinction, the effects of human activities on shorebirds and their habitats over the next 50 years will undoubtedly be deleterious. Except within the Arctic Plains/Mountains and Cook Inlet BCRs, where habitat for breeding shorebirds is being

lost, most other shorebird habitats remain relatively intact in Alaska. However, potential threats to migrant shorebirds from oil and gas development are high. Although conservation planning for catastrophic events such as oil spills is difficult, strategies can be developed to mitigate the systematic degradation of shorebird habitats (e.g., from onshore and offshore oil development). An overall conservation goal for shorebirds in Alaska is, therefore, to keep species and their habitats well-distributed across the landscape.

Because threats to shorebirds on the breeding grounds are less significant in Alaska than threats during other stages of the annual cycle, conservation actions in Alaska's Bird Conservation Regions will be less dramatic than in other regions of North America (where active habitat enhancement or restoration may be required). In Alaska, monitoring the size and trend of shorebird populations and the health and quality of their habitats will dominate conservation actions. Because Alaska will almost certainly suffer from incremental loss of habitat over the next few decades, the current "undisturbed" breeding habitat in the state provides an opportunity for identifying both important breeding habitat variables and processes necessary to sustain healthy shorebird populations. Without this knowledge, conservation efforts undertaken in Alaska, and elsewhere during the annual cycle, may be futile or misguided.

Although this plan focuses on priority shorebird species and habitats, there is a clear need for the development and evaluation of broad-scale, multi-species monitoring schemes within Alaska. Coordination of such a program with the National and other Regional shorebird planning efforts will help assure a reliable and cost-effective program to track populations of North American shorebirds.

Vision of shorebird conservation in Alaska

To ensure the conservation of shorebirds in Alaska we must develop a program that integrates components of research, monitoring, management, habitat protection, and education/outreach. This program will be accomplished within each of the six Bird Conservation Regions in Alaska, will have a landscape perspective, and will be based on biological considerations of species and ecosystems.

Populations and habitats

No shorebird species are currently threatened with extinction in Alaska. Accordingly, few shorebird habitats need restoration action. However, monitoring of shorebird population sizes and habitat quality is needed to ensure the persistence of stable populations in Alaska.

Goals

- Maintain or enhance current breeding populations, species diversity, and distribution of shorebirds and their breeding habitats in Alaska.

- Maintain or enhance habitat quality of current staging/migratory stopover sites in Alaska.

Objectives

- Identify shorebird habitats prone to human disturbance and develop mitigation prescriptions to reduce negative influences on them.

- Help develop plans to mitigate negative impacts of land development activities on shorebird populations and their habitats.

- Identify important shorebird habitats and designate them within the Western Hemisphere Shorebird Reserve Network or East Asian-Australasian Shorebird Reserve Network.

- Protect important habitats used by shorebirds during their breeding, stopover/staging, and wintering periods.

- Implement rigorously designed protocols for monitoring the status and trend of shorebird populations in Alaska.

Research

Basic knowledge of most aspects of the biology of shorebirds in Alaska resulted from a large body of work by natural historians, particularly between the late 1800s and late 1900s. Despite this rich history, gaps persist in knowledge of basic life history for many species. Modern science also demands long-term, quantitative data to understand complex issues such as population demographics and effects of fragmented landscapes on population viability. Information at the site- and landscape-levels is also needed to reasonably predict changes in shorebird communities that could result from human activities. Thus, there is an ongoing need for research at many levels. Because money for research will likely continue to be limited, it is paramount that applied shorebird research be well planned, integrated with research on other waterbird and habitats were and when feasible, and well coordinated among all research groups (e.g., regulatory agencies, non-governmental organizations, and land custodians).

As new information becomes available, it will need to be synthesized in a timely manner into a format that is useful to land managers and planners. This information can then be used to make shorebirds more prominent in land-use planning decisions. The Alaska Shorebird Working Group will endeavor to provide reliable information and professional input on the effects of land-use decisions on shorebird populations.

Goal

- Maintain a strong research program that will provide information necessary to effectively conserve shorebirds that depend on Alaska for all or part of their annual cycle.

Objectives

- Assure that relatively complete and up-to-date life history information is available for all species of shorebirds.

- Identify links between specific populations of shorebirds breeding in Alaska and areas used by these same populations during other critical periods of their annual cycles.

- Develop habitat-based models of seasonal distribution of Alaska shorebirds.

- Develop and test rigorous monitoring protocols and assessment methods for tracking size and trend of shorebird populations and associated habitats in Alaska.

- Monitor environmental health of staging/migratory stopover sites in Alaska.

Public outreach, technical support, and environmental education

The Alaska Shorebird Working Group will continue to inform governmental agencies, industries, non-governmental organizations, and private citizens (including school children) about Alaska's shorebirds and the importance of their breeding, wintering, staging, and migratory stopover habitats. Creating an awareness among these various groups about the complex natural history of Alaska's shorebirds may be one of the greatest contributions the Alaska Shorebird Working Group can make to the conservation of shorebirds in the Western Hemisphere.

Goals

- Increase opportunities to view, enjoy, and learn about shorebirds that occur in Alaska.

- Improve outreach to governmental agencies, industries, non-governmental organizations, and private citizens about Alaska's shorebirds and the conservation issues facing them.

- Increase international/national coordination, communication, and collaboration among shorebird conservation efforts.

Objectives

- Improve web sites that pertain to Alaska's shorebirds and continue operation of the Shorebird Sister Schools Program.

- Develop new shorebird outreach events and publications.

- Improve communication with rural Alaskans about shorebird resources and their conservation.

- Convene annual meetings of the Alaska Shorebird Working Group and participate in national and regional shorebird meetings.

- Support shorebird festivals in Alaska.

- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.

- Promote shorebird education curricula such as the Arctic-nesting Shorebird Curriculum and host workshops in villages in Alaska.

- Provide technical assistance and training to educators and managers about shorebird ecology and conservation issues.

Implementation and Coordination

The Alaska Shorebird Working Group will assume primary responsibility for coordinating and implementing the goals and objectives identified in the Alaska Regional Shorebird Conservation Plan. The Working Group's effort will be coordinated through the Alaska Region's seat on the U.S. Shorebird Plan Council and through formal interactions with other regional working groups. At the regional level, the Alaska Shorebird Working Group should be expanded to include representatives from all principal federal, state, local, and Native land custodial agencies. The working group should meet at least annually to identify and prioritize regional shorebird issues and determine fiscal means of implementing priority projects. At the national and international levels the Alaska Regional Shorebird Working Group will meet with other regional working groups during the annual meeting of the U.S. Shorebird Plan Council. Because Alaska, more so than other U.S. shorebird regions, has a strong link to Asian and Oceanic flyways, the Alaska Shorebird Working Group will continue to foster cooperative conservation and research efforts outside the Western Hemisphere.

Immediate Priority Projects for Shorebirds in Alaska

Populations and habitats

- Determine current population size of Bristle-thighed Curlew.

- Determine population size of Buff-breasted Sandpipers.

- Identify stopover sites in East Asia used by North-slope Dunlin.

- Identify important stopover sites on the NPR-A.

- Determine population size of Buff-breasted Sandpipers.

- Identify important wintering concentrations of Black Oystercatchers in the North Pacific Rainforest BCR.

Research

- Complete database on Beringian (Russia and Alaska) shorebirds.
- Determine effects of shoreline disturbance on Black Oystercatchers.
- Develop shorebird-habitat models for birds breeding and migrating through the NE Planning Unit of NPR-A.

Outreach

- Publish report on potential Western Hemisphere Shorebird Reserve Network Sites in Alaska and pursue nominations.
- Complete Alaska Shorebird Booklet.
- Maintain Alaska Shorebird Working Group
- Prioritize other shorebird issues and needs in Alaska.
- Pursue community-based programs for shorebird outreach.

Western Hemisphere Shorebird Reserve Network Sites in Alaska

The Alaska Shorebird Working Group has compiled an initial, but fairly detailed inventory of potential WHSRN sites in Alaska. It summarizes all information currently available through 1999 on sites meeting WHSRN criteria and discusses the basis for each site designation. For the Alaska Shorebird Conservation Plan we have condensed this information into a much more abbreviated document that includes Figure 2, Appendix 7, and the following narrative.

Currently there are 15 Hemispheric, 13 International, and 11 Regional sites dedicated within WHSRN. Alaska hosts two of these sites, the Copper River Delta, a Hemispheric site, and Kachemak Bay, an International site. An additional 51 sites have been identified in Alaska as meeting WHSRN criteria. These include up to 16 Hemispheric sites, 13 International sites, and 23 Regional sites. About half of the Hemispheric sites qualify based on numeric criteria while half qualify according to percentage criteria (Appendix 7, Figure 2).

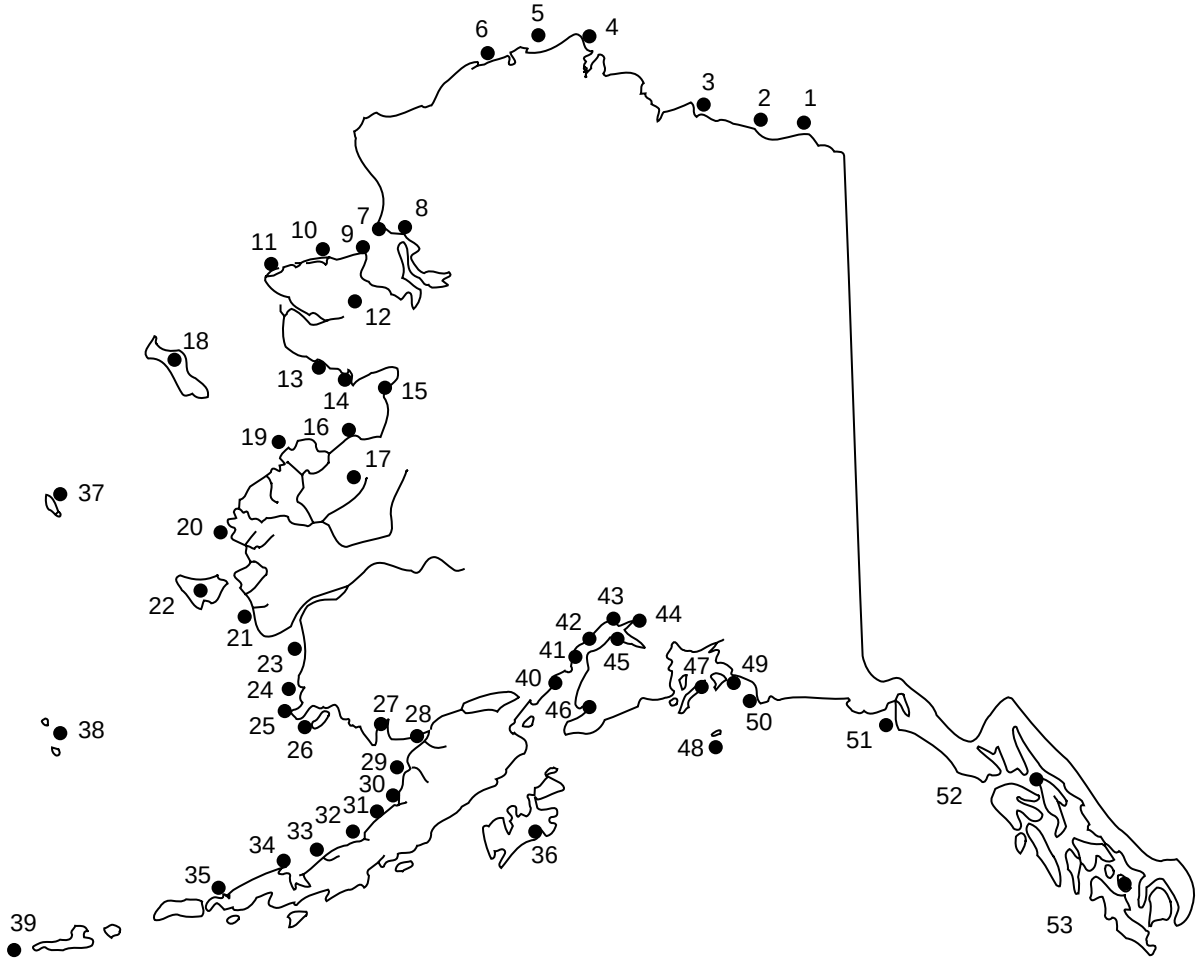

Figure 2. Location of potential Western Hemisphere Shorebird Reserve Network sites in Alaska. See Appendix 7 for site details.

WHSRN Classification: We have generally followed the two-tiered system used by Morrison et al. (1995) for their classification of potential WHSRN sites throughout Canada. These include (1) sites for which available data clearly establish the status of the site, and (2) sites that are important to shorebirds but for which available data do not allow designation of a specific WHSRN category. The former includes sites where single censuses of all shorebirds or maximum counts of all shorebird species exceed the criteria for a WHSRN category. It also includes sites where the aforementioned criteria are not met per se, but where specific methodologies incorporating such factors as seasonal turnover and length of stay among populations justify a certain WHSRN category. Where a site qualifies based on the percentage of a population supported, such as many of the Bering Sea islands, it is denoted as such (e.g., "International %"). In instances involving evaluations based on turnover rates or percentage of populations, details are provided in the narrative sections of the site profiles (not included in this Alaska Shorebird Conservation Plan).

For the second class of sites (i.e., sites where the WHSRN status is less certain), the assigned category is followed by a question mark. These include mostly two types of sites: 1) those whose evaluation was based on limited data (e.g., sites at which only one or two censuses were completed or sites not censused during a major portion of their use by shorebirds) or 2) those that meet a specific WHSRN category, but may be elevated to a higher category based on more rigorous censuses that include an assessment of turnover. For example, a site designated as "Regional?" indicates that additional information is needed to qualify the site as a Regional reserve. A site noted as "International-Hemispheric?" indicates sufficient data to support an International Reserve designation, but based on additional study it may qualify as a Hemispheric site. The basis for these questioned designations is also explained in each site profile (again, not included in this report).

Region: Potential sites are grouped according to the five Bird Conservation Regions within the state. These are based on obvious physiographic demarcations, but they also broadly reflect marked differences in landforms and habitats, which in turn affect the seasonal composition of shorebirds and their temporal patterns of occurrence.

Important Seasons and Species: Seasonal bounds are based on the general chronology of events within the annual cycle of shorebirds while in Alaska. These bounds are somewhat artificial because the timing of life-cycle events varies among different species, often varies among different age- and sex-cohorts with species, and varies latitudinally across a particular species' range. With this in mind we have defined seasons as: Spring (late April to early June), Summer (mid-June to late July), Autumn (early August to late October), and Winter (November to early April). Thus, for each site we list the seasons that are most important to shorebirds and under each season the numerically dominant species. If, for a particular site, there is no or limited information on shorebirds for a given season, we note such as "unknown" and discuss this within the narrative section of the site profile.

Custodian: The principal custodial agencies for a particular site are listed in order of the relative amount of lands under their respective jurisdiction. Within Alaska all lands below mean high tide are under the jurisdiction of the State of Alaska. At most sites, lands above mean high

tide are administered by either state or federal agencies or have been transferred or selected for transfer to Native regional or village corporations.

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Appendix 1. Wintering areas of shorebirds that commonly breed in or migrate through Alaska.

Common name	Scientific name[1]	Wintering area[2]
Black-bellied Plover	**Pluvialis squatarola**	The Americas, Oceania
American Golden-Plover	*Pluvialis dominica*	South America
Pacific Golden-Plover	*Pluvialis fulva*	Oceania, Australia
Semipalmated Plover	*Charadrius semipalmatus*	The Americas
Killdeer	*Charadrius vociferus*	The Americas
Black Oystercatcher	*Haematopus bachmani*	Alaska
Greater Yellowlegs	*Tringa melanoleuca*	The Americas
Lesser Yellowlegs	*Tringa flavipes*	The Americas
Solitary Sandpiper	*Tringa solitaria cinnamomea*	Central and South America
Wandering Tattler	*Heteroscelus incanus*	The Americas, Oceania, Australia
Spotted Sandpiper	*Actitis macularia*	The Americas
Upland Sandpiper	*Bartramia longicauda*	South America
Whimbrel	*Numenius phaeopus rufiventris*	The Americas, Oceania?
Bristle-thighed Curlew	*Numenius tahitiensis*	Oceania
Hudsonian Godwit	*Limosa haemastica*	South America
Bar-tailed Godwit	*Limosa lapponica baueri*	Oceania, Australia, New Zealand
Marbled Godwit	*Limosa fedoa beringiae*	North and Central America
Ruddy Turnstone	*Arenaria i. interpres*	The Americas, Oceania, SE Asia
Black Turnstone	*Arenaria melanocephala*	North America
Surfbird	*Aphriza virgata*	The Americas
Red Knot	*Calidris canutus roselaari*	The Americas
Sanderling	*Calidris alba*	The Americas
Semipalmated Sandpiper	*Calidris pusilla*	The Americas
Western Sandpiper	*Calidris mauri*	The Americas
Least Sandpiper	*Calidris minutilla*	The Americas
White-rumped Sandpiper	*Calidris fuscicollis*	South America
Baird's Sandpiper	*Calidris bairdii*	South America
Pectoral Sandpiper	*Calidris melanotos*	South America
Sharp-tailed Sandpiper	*Calidris acuminata*	Oceania, Australia, New Zealand
Rock Sandpiper	*Calidris p. ptilocnemis*	Alaska

Appendix 1. Wintering areas of shorebirds that commonly breed in or migrate through Alaska.

Common name	Scientific name[1]	Wintering area[2]
	C. p. couesi	North America
	C. p. tschuktschorum	Alaska
Dunlin	*Calidris alpina pacifica*	North and Central America
	C. a. arcticola	Southeast Asia
Stilt Sandpiper	*Calidris himatopus*	Central and South America
Buff-breasted Sandpiper	*Tryngites subruficollis*	South America
Short-billed Dowitcher	*Limnodromus griseus caurinus*	The Americas
Long-billed Dowitcher	*Limnodromus. scolopaceus*	North and Central America
Common Snipe	*Gallinago gallinago*	The Americas
Red-necked Phalarope	*Phalaropus lobatus*	SE Asia?, The Americas
Red Phalarope	*Phalaropus fulicaria*	The Americas

[1] Taxonomy after AOU (1957) and Engelmoer and Roselaar (1998).
[2] North America includes Mexico; The Americas include North, Central, and South America; SE Asia includes Indonesia and mainland SE Asia. Wintering areas from Hayman et al. (1986), Higgins and Davies (1996), Gill and Senner (1996), Piersma et al. (1998).

Appendix 2. Shorebirds uncommon to Alaska.[1]

Status	Common name	Scientific name
RARE OR SPORADIC BREEDERS FROM ASIA	Mongolian Plover	***Charadrius mongolus***
	Common Ringed Plover	*Charadrius hiaticula*
	Eurasian Dotterel	*Charadrius morinellus*
	Wood Sandpiper	*Tringa glareola*
	Common Sandpiper	*Actitis hypoleucos*
	Red-necked Stint	*Calidris ruficollis*
	Curlew Sandpiper	*Calidris ferruginea*
	Ruff	*Philomachus pugnax*
MIGRANTS OR VAGRANTS FROM ASIA	Oriental Pratincole (1 record)	*Glareola maldivarum*
	Little Ringed Plover (1 record)	*Charadrius dubius*
	Black-winged Stilt (1 record)	*Himantopus himantopus*
	Common Greenshank	*Tringa nebularia*
	Marsh Sandpiper (1 record)	*Tringa stagnatilis*
	Spotted Redshank	*Tringa erythropus*
	Green Sandpiper	*Tringa ochropus*
	Gray-tailed Tattler	*Heteroscelus brevipes*
	Terek Sandpiper	*Xenus cinereus*
	Little Curlew (1 record)	*Numenius minutus*
	Far Eastern Curlew	*Numenius madagascariensis*
	Black-tailed Godwit	*Limosa limosa*
	Great Knot	*Calidris tenuirostris*
	Little Stint	*Calidris minuta*
	Temminck's Stint	*Calidris temminckii*
	Long-toed Stint	*Calidris subminuta*
	Spoonbill Sandpiper	*Eurynorhynchus pygmeus*
	Broad-billed Sandpiper	*Limicola falcinellus*
	Jack Snipe (1 record)	*Lymnocryptes minimus*
	Pin-tailed Snipe (1 record)	*Gallinago stenura*
VAGRANTS FROM TEMPERATE NORTH AMERICA	Snowy Plover	*Charadrius alexandrinus*
	American Avocet (1 record)	*Recurvirostra americana*
	Eskimo Curlew (has bred?)	*Numenius borealis*
	Purple Sandpiper (1 record)	*Calidris maritima*

Appendix 2. Shorebirds uncommon to Alaska.[1]

Wilson's Phalarope (has bred)	*Phalaropus tricolor*

[1] Status and nomenclature from Gibson and Kessel (1997), D. Gibson pers. comm.

Appendix 3. State and federal conservation units within Bird Conservation Regions of Alaska.[1]

Bird Conservation Region/Conservation Unit	Size (sq. miles)	% of BCR
Northern Pacific Rainforest		
Kachemak Bay State Critical Habitat Area	347	0.5
Copper River Delta State Critical Habitat Area	933	1.4
Yakataga State Game Refuge	128	0.2
Glacier Bay National Park/Preserve	5,156	8.0
Wrangell-St. Elias National Park/Preserve	1,030	1.6
Kenai Fjords National Park	1,045	1.6
Tongass National Forest	25,781	40.0
Admiralty National Monument	1,494	2.3
Misty Fjords National Monument	3,359	5.2
Chugach National Forest	9,297	14.4
Chilkat Bald Eagle Preserve	77	0.1
Total	48,647	75.3
Western Alaska		
Lake Clark National Park/Preserve	6,328	5.6
Aniakchak National Monument/Preserve	938	0.8
Katmai National Park/Preserve	6,250	5.5
McNeil River State Game Sanctuary	131	0.1
Tugidak Island State Critical Habitat Area	78	0.1
Cape Krusenstern National Monument	1,031	0.9
Bering Land Bridge National Preserve	4,219	3.7
Alaska Peninsula National Wildlife Refuge	5,469	4.8
Becharof National Wildlife Refuge	1,875	1.7
Pilot Point State Critical Habitat Area	72	0.1
Port Heiden State Critical Habitat Area	113	0.1
Port Moller State Critical Habitat Area	199	0.2
Izembek National Wildlife Refuge	502	0.4
Izembek State Game Refuge	284	0.3
Kodiak National Wildlife Refuge	2,914	2.6
Selawik National Wildlife Refuge	3,359	3.0
Togiak National Wildlife Refuge	6,414	5.7
Yukon Delta National Wildlife Refuge	30,663	27.1
Total	70,839	62.7
Aleutian/Bering Sea Islands		
Alaska Maritime National Wildlife Refuge	5,369	77.3
Total	5,369	77.3
Cook Inlet		
Redoubt Bay State Critical Habitat Area	288	0.1
Trading Bay State Game Refuge	252	0.1
Susitna Flats State Game Refuge	470	0.1
Kenai National Wildlife Refuge	3,078	28.5
Total	4,088	37.9
NW Interior Fores		
Yukon-Charley Rivers National Preserve	3,906	1.4

Appendix 3. State and federal conservation units within Bird Conservation Regions of Alaska.[1]

Bird Conservation Region/Conservation Unit	Size (sq. miles)	% of BCR
Wrangell-St. Elias National Park/Preserve	19,577	6.9
Denali National Park/Preserve	9,419	3.3
Gates of the Arctic National Park/Preserve	13,125	4.6
Minto Flats State Game Refuge	781	0.1
Kobuk Valley National Park	2,734	1.0
Noatak National Preserve	9,375	3.3
Innoko National Wildlife Refuge	6,016	2.1
Koyukuk National Wildlife Refuge	5,547	2.0
Nowitna National Wildlife Refuge	2,438	0.9
Tetlin National Wildlife Refuge	1,094	0.4
Arctic National Wildlife Refuge	17,467	6.2
Kanuti National Wildlife Refuge	2,234	0.8
Yukon Flats National Wildlife Refuge	13,484	4.8
Steese National Conservation Area	1,875	0.7
White Mountain National Recreation Area	1,563	0.6
Total	110,635	39.1
Arctic Plains/Mountains		
Arctic National Wildlife Refuge	12,667	13.6
National Petroleum Reserve - Alaska	35,938	38.6
Total	48,605	52.2

[1] Includes only units greater than about 60 square miles. An additional 14 units, all administered by the State of Alaska and totaling some 283 square miles, are spread throughout mostly southern Alaska (DeLorme 1998).

Appendix 4. Variables and criteria used in National and Regional shorebird species prioritization.

Variables for National Priorities

Population Trend and Population Trend Uncertainty (PT)—The Population Trend variable uses available information on shorebird trends (e.g., Howe et al. 1989, Morrison et al. 1994) to estimate broad categories of population decline. Species with known declines in populations are likely to be at higher risk than species where ongoing study has detected no risk. However, many species may be declining even though trends have not been detected using current monitoring techniques. This is particularly true for species under-represented in ongoing monitoring programs. Only species with documented significant population declines ($p<0.10$) are included in category 5.

5 Significant population decline ($p<0.10$)
4 Apparent population decline
3 Apparently stable population or status unknown
2 Apparent population increase
1 Significant population increase

The Population Trend Uncertainty variable rates the relative level of uncertainty associated with the estimate of population trend. Uncertainty scores are rated on a scale of 1-5. These scores will be reported with the PT scores to emphasize the need for additional monitoring, and uncertainties associated with decisions based on reported trends, but do not enter into the categorization process for determining conservation priorities. High uncertainty about the trend estimate results in a high score. For the purposes of determining how representative available data are for the entire species, the data are classified into one of two categories: 1) comprehensiveness high = data estimated to represent more than half of the species range and/or half of the estimated population; or 2) comprehensiveness low = data represent less than half of both. Scores for these uncertainty estimates are being developed.

5 No information about population trend.
4 Significance test has medium or low power (<0.8) and comprehensiveness is low; or, no data but informed estimates about population trend possible.
3 Significance test has medium or low power (<0.8), and comprehensiveness is high.
2 Significance test has high power (>0.8), but comprehensiveness is low.
1 Significance test has high power (>0.8), and comprehensiveness is high.

Relative Abundance (RA)—This variable uses population size estimates to classify each species into 5 categories based on breaks in the distribution of population sizes among shorebirds. Species with smaller absolute population sizes are likely to be more at risk, either as a result of historic declines or from catastrophic disturbances. Population estimates were developed by Morrison et al. (unpublished report). Note that for some species, (including Upland Sandpiper, Solitary Sandpiper, Greater Yellowlegs, Semipalmated Plover, Killdeer, and Lesser Yellowlegs) the population estimates probably are low due to lower counts resulting from higher dispersion. For these species, the estimates may be inaccurate. However, most of these species (all except Solitary Sandpiper) are near the midpoints of their categories, so this factor may not result in misclassification. With increasing data about current population sizes, these estimates will be revised.

5 <25,000 individuals
4 25,000 - <150,000 individuals
3 150,000 - <300,000 individuals
2 300,000 - <1,000,000 individuals
1 >1,000,000 individuals

Appendix 4 continued

Threats During Breeding Season (TB)—This variable ranks the threats known to exist for each species, and generally reflects the limited knowledge available for determining threats to most shorebirds.

5 Known threats are actually occurring (e.g., significant loss of critical habitat), and can be documented.
4 Significant potential threats exist (e.g., oil spills), but have not actually occurred.
3 No known threats, or information not available.
2 Threats assumed to be low.
1 Demonstrably secure.

Threats During Non-breeding Season (TN)—This score uses the same criteria listed above for the breeding season scores, with the additional factor of concentration risk considered explicitly.

5 Known threats are actually occurring (e.g., significant loss of critical habitat), and can be documented. Concentration results in actual risk.
4 Significant potential threats exist (e.g., oil spills) but have not actually occurred. Concentration results in high potential risk.
3 No known threats, or concentration not a risk, or information not available.
2 Threats assumed to be low from all factors including concentration.
1 Demonstrably secure.

Breeding Distribution (BD)—This variable ranks the size of the breeding range for species that breed in North America, and only applies during the actual breeding season. The assumption is that species with relatively more restricted ranges are more susceptible to breeding failure from natural or human-induced causes. Threats that occur during migration to or from the breeding grounds are addressed in Non-breeding Distribution (ND) below.

5 <2.5% of North America (212,880 square-miles)
4 2.5 - 4.9% of North America
3 5.0 - 9.9% of North America
2 10 - 20% of North America
1 >20% of North America (1,703,008 square-miles)

Non-breeding Distribution (ND)—This variable refers to distribution during the non-breeding season, which includes migration to and from the breeding grounds. Threats resulting from concentration at some point during migration are addressed in threats to non-breeding above. This variable rates the relative risks associated with having a smaller absolute range size during the non-breeding season. Because different risk factors occur during the non-breeding season, the absolute sizes of these categories are different from those above. In addition, the added variable of length of coastline is used for coastal species where measuring area is not as representative of distribution.

5 Highly restricted: ≤50,000 square-miles, or very restricted along coastal areas or interior uplands.
4 Local: 50,000 - 200,000 square-miles, or along ≤1,000 miles of coast.
3 Intermediate: 200,000 - 2,000,000 square-miles, or along 1,000 - 3,000 miles of coast.
2 Widespread: 2,000,000 - 4,000,000 square-miles, or along 3,000 - 5,000 miles of coast.
1 Very widespread: 4,000,000 - 7,000,000 square-miles, or along 5,000 - 9,000 miles of coast.

Appendix 4 Continued

Criteria for National Priorities

The following categories are modified from those proposed by the AOU committee that was established to review the PIF prioritization system (Beissinger et al., unpubl.). The primary change is to move species with high population trend scores and some other high scores into the highest category.

Proposed Categories:

5 Highly Imperiled—All species listed as threatened or endangered nationally, plus all species with significant population declines and either low populations or some other high risk factor.

PT = 5 and RA, BD, TB, or TN = 5

4 Species of High Concern - Populations of these species are known or thought to be declining, and have some other known or potential threat as well.

PT = 4 or 5 and either RA, BD, TB, or TN = 4 or 5
RA = 4 or 5 and either TB or TN = 4 or 5
For regional lists only: AI = 5 and RA >3

3 Species of Moderate Concern - Populations of these species are either a) declining with moderate threats or distributions; b) stable with known or potential threats and moderate to restricted distributions; c) and d) relatively small and restricted; or e) declining but with no other known threats.

PT = 4 or 5 and RA, BD, ND, TN, or TB = 3
PT = 3 and RA, BD, ND, TN, or TB = 4 or 5
RA = 3 and BD or ND = 4, or 5
RA = 4 and BD and ND <4
PT = 5 and RA, BD, ND, TN, or TB > 1
For regional lists only: AI=4 and RA>3

2 Species of Low Concern - Populations of these species are either a) stable with moderate threats and distributions; b) increasing but with known or potential threats and moderate to restricted distributions; or c) of moderate size.

PT = 3 and RA, BD, ND, TN, or TB = 3
PT = 2 and RA, BD, ND, TN, or TB = 4 or 5
RA = 3
For regional lists only: AI = 3

1 Species Not at Risk - All other species

Variables and Criteria for Regional Priorities

To determine the relative importance of a species within a planning region, a matrix showing species life history stages and the relative importance of each Planning Region (e.g., Alaska Region) compared to other Regions was developed. Also considered are life history stages for each species within each Bird Conservation Region (BCR). Considering area importance at the regional scale ensures that conservation

Appendix 4 Continued

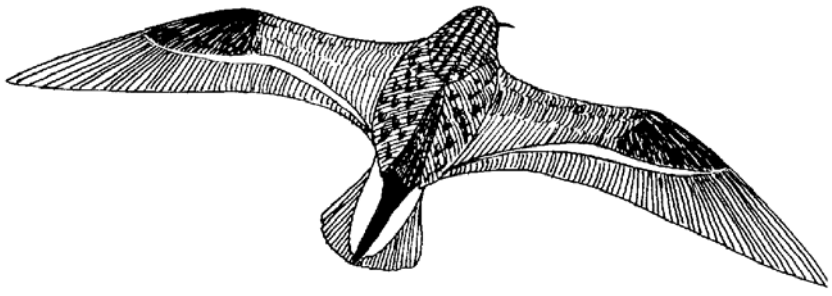
effort will not be misdirected toward species that are rare in a particular region only because they are close to the edge of their range.

Area Importance (AI)—Area importance scores are based on knowledge of distributions, expert opinion, and data on distributions for species where they are available. Species are ranked on a relative scale within each BCR.

Because management decisions based on species priorities are often linked to seasonal aspects of biology, the scores for these variables will be reported using a system that reflects both the relative area importance and the season or seasons during which the area is important, including breeding (B), wintering (W), and migration (M, spring and fall). This system is used at two scales, including the Shorebird Planning Regions and also the smaller Bird Conservation Regions within each Planning Region.

Score	Symbol	Description of occurrence within BCR or Planning Region, including relative abundance, importance relative to other regions, and importance of management and protection activities.
5	**B, W, M**	High concentrations or absolute numbers known to occur. Area of high importance to the species relative to the majority of other regions. The area is critical for supporting hemispheric populations of the species.
4	B, W, M	Common or locally abundant, with large numbers occurring or suspected to occur. Area of known or suspected importance relative to other regions, especially within the same flyway. The area is important for supporting hemispheric or regional populations.
3	b, w, m	Uncommon to fairly common. Area is within the primary range of the species, and it occurs regularly, but is present in low relative abundance.
2	*	Rare occurrences. Area is within the expected range of the species, but it occurs at a low frequency. (In general, management for these species is not warranted within the region.)
1	Blank	Does not occur in the area, or has only unpredictable, irregular occurrence as a vagrant. Area is outside of expected range.

The regional prioritization system uses the same criteria as for national priorities, with the additional rule that species can be assigned to a different category based on their area importance within the region. Species that are highly imperiled are included wherever they occur.



Appendix 5. Prioritization scores and distribution by Bird Conservation Region of shorebirds regularly occurring in Alaska.

	National scores[1]						Priority			Occurrence in Alaska Bird Conservation Regions					
Species	PT	RA	TB	TN	BD	ND	US	AK	Alaska use[2]	Arctic Plains/ Mountains	Western Alaska	Aleutians Bering Is.	NW Forest	Cook Inlet	Northeern Pacific Rainforest
Pacific Golden-Plover	3	5	2	2	5	4	4	4	**B**,**M**		**B**,**M**	m			
Black Oystercatcher	3	5	4	3	3	4	4	4	**B**,**W**		B,W	**B**,**W**			**B**,**W**
Wandering Tattler	3	5	2	2	3	2	3	4	**B**	b	**B**	b	**B**	b	B
Whimbrel	5	4	2	2	3	2	4	4	**B**,**M**	B	B,**M**		B, m	**M**	m
Bristle-thighed Curlew	3	5	2	4	5	3	4	4	**B**,**M**		**B**,**M**				
Hudsonian Godwit	3	4	3	4	4	4	4	4	**B**,**M**		**B**,**M**		b	**B**,**M**	
Bar-tailed Godwit	3	4	2	4	4	3	4	4	**B**,**M**	**B**	**B**,**M**				
Marbled Godwit[3]	4	3	4	4	3	3	4	4	B,M		**B**,**M**				m
Black Turnstone	3	4	4	4	5	3	4	4	**B**, **M,** w	b	**B**,**M**		*		**M**,w
Surfbird	4	4	2	4	4	3	4	4	**B**,**M**,w		B		B	B	**M**,w
Rock Sandpiper	3	3	3	4	5	4	3	4	**B**,**W**		**B**,**M**	**B**,**W**		**W**	**W**
Dunlin[4]	5	2	2	3	2	3	3	4	**B**,**M**	**B**,**M**	**M**	m			
Buff-breasted Sandpiper	4	5	3	4	3	4	4	4	**B**	**B**					
Short-billed Dowitcher[5]	5	2	2	4	3	2	3	4	**B**,**M**		**B**,**M**			B,M	B,M
Black-bellied Plover	5	3	2	2	2	1	3	3	**B**,**M**	**B**,m	**B**,M	m	m	M	**M**
American Golden-Plover	4	3	2	4	2	3	4	3	**B**	B	B	*	B		m
Killdeer	5	1	3	3	1	2	3	3	b				*	*	b
Greater Yellowlegs	3	4	2	2	2	1	3	3	**B**,M		B,M		b	B,m	B,m
Solitary Sandpiper	3	4	4	2	3	2	4	3	**B**	*	B		B	B	b
Spotted Sandpiper	3	3	2	2	1	1	2	3	B	b	B	b	B	B	B

Appendix 5 Continued

	National scores[1]						Priority			Occurrence in Alaska Bird Conservation Regions					
Species	PT	RA	TB	TN	BD	ND	US	AK	Alaska use[2]	Arctic Plains/ Mountains	Western Alaska	Aleutians Bering Is.	NW Forest	Cook Inlet	Northeern Pacific Rainforest
Ruddy Turnstone	4	3	2	4	2	2	4	3	**B**,**M**	**B**	**B**,m	b,**M**	*		m
Red Knot	5	2	2	4	3	3	4	3	**B**,**M**	B	B,M			*	M
Sanderling	5	2	2	4	2	1	4	3	b*,m,w	b*,m	m,w	w		m	m,w
Semipalmated Sandpiper	5	1	2	3	3	3	3	3	**B**,M	**B**,**M**	**B**,m		m	m	m
Western Sandpiper	3	1	2	4	4	2	3	3	**B**,**M**	b,m	**B**,**M**	b,m		**M**	**M**
Least Sandpiper	5	2	2	2	2	2	3	3	**B**,M	b	B,m	b	b	b,m	B,M
Sharp-tailed Sandpiper	3	3	3	3	3	3	3	3	**M**		**M**	m			*
Stilt Sandpiper	3	3	3	4	3	3	3	3	**B**	**B**			*		*
Common Snipe	5	1	3	2	1	2	3	3	**B**	b	B	b	B	B	B
Red-necked Phalarope	4	1	2	3	1	3	3	3	**B**,**M**	**B**,**M**	**B**,M	b,M	B,m	b	b,**M**
Red Phalarope	4	1	2	3	2	1	3	3	**B**,**M**	**B**,**M**	B,m	b,M		m	*
Semipalmated Plover	3	3	2	2	1	1	2	2	**B**,m	b	B,M	b	B,m	B,M	B,M
Lesser Yellowlegs	3	2	2	3	2	1	2	2	**B**,m	b	B	*	**B**	**B**,M	b
Upland Sandpiper	2	2	2	4	2	3	2	2	b	b			**B**		
White-rumped Sandpiper	3	2	2	2	3	3	2	2	**B**	B					
Baird's Sandpiper	3	2	2	2	3	3	2	2	**B**,m	**B**	B	b	B	m	m
Pectoral Sandpiper	3	2	2	3	2	3	2	2	**B**,**M**	**B**,M	b,M	*	m	m	M
Long-billed Dowitcher	2	2	2	3	4	3	2	2	**B**,M	**B**,**M**	**B**,**M**	b	b,m	m	M

[1] See Appendix 4 for definitions and criteria of categories.

[2] Importance of use of Alaska Region relative to that within other national Planning Regions. B = breeding, M = migration, and W = wintering. **B**,**M**,**W** = high numbers of species within respective season(s) relative to the majority of other regions. B,M,W = common or locally abundant, region important to the species. b,m,w = uncommon to fairly common, region within species

Appendix 5 Continued

range but occurs in low relative abundance relative to other regions. * = rare occurrence, area within expected range of species, but occurs at low frequency.

[3] Includes only subspecies *Limosa fedoa beringiae*.

[4] Includes only subspecies *Calidris alpina arcticola.*

[5] Includes only subspecies *Limnodromus griseus caurinus*.

Appendix 6. Breeding and staging/stopover habitat preferences of Alaska shorebirds

Species	Breeding habitat	Staging/stopover habitat
Black-bellied Plover	dwarf shrub meadow, wet meadow	wet meadow, silt tidal flat
American Golden-Plover	dwarf shrub meadow, dwarf shrub mat	dwarf shrub meadow, salt grass meadow
Pacific Golden-Plover	dwarf shrub meadow	dwarf shrub meadow, silt tidal flats
Semipalmated Plover	riverine alluvia, gravel beach	silt tidal flat, sand beach
Killdeer	riverine alluvia, unvegetated substrate	
Black Oystercatcher	rocky shore, gravel beach	gravel tidal flat, rocky shore
Greater Yellowlegs	scattered woodland, dwarf shrub meadow	salt grass meadow, silt tidal flat
Lesser Yellowlegs	scattered woodland, dwarf shrub meadow	salt grass meadow, wet meadow
Solitary Sandpiper	scattered woodland, mixed forest	wet meadow, salt grass meadow
Wandering Tattler	riverine alluvia, gravel beach	gravel tidal flat, rocky shore
Spotted Sandpiper	riverine alluvia, lacustrine shoreline	riverine alluvia, lacustrine shoreline
Upland Sandpiper	scattered woodland	grass meadow
Eskimo Curlew	dwarf shrub meadow	dwarf shrub meadow
Whimbrel	dwarf shrub meadow	dwarf shrub meadow, salt grass meadow
Bristle-thighed Curlew	dwarf shrub meadow	wet meadow, dwarf shrub meadow
Hudsonian Godwit	scattered woodland, dwarf shrub meadow	silt tidal flat, salt grass meadow
Bar-tailed Godwit	dwarf shrub meadow	silt tidal flat, dwarf shrub meadow
Marbled Godwit	dwarf shrub meadow	silt tidal flat
Ruddy Turnstone	dwarf shrub mat	silt tidal flat, dwarf shrub meadow
Black Turnstone	salt grass meadow	rocky shore, gravel tidal flat

Species	Breeding habitat	Staging/stopover habitat
Surfbird	dwarf shrub mat	rocky shore, gravel tidal flat
Red Knot	dwarf shrub mat	silt tidal flat, wet meadow
Sanderling	dwarf shrub mat	sand beach, silt tidal flat
Semipalmated Sandpiper	dwarf shrub meadow	silt tidal flat
Western Sandpiper	dwarf shrub meadow	silt tidal flat
Least Sandpiper	dwarf shrub meadow, scattered woodland	salt grass meadow, silt tidal flat
White-rumped Sandpiper	wet meadow	salt grass meadow
Baird's Sandpiper	dwarf shrub mat	silt tidal flat, salt grass meadow
Pectoral Sandpiper	wet meadow	salt grass meadow, wet meadow
Sharp-tailed Sandpiper[2]		wet meadow, silt tidal flat
Rock Sandpiper	dwarf shrub meadow, dwarf shrub mat	gravel tidal flat, rocky shore
Dunlin	wet meadow, dwarf shrub meadow	silt tidal flat, salt grass meadow
Stilt Sandpiper	dwarf shrub meadow	salt grass meadow
Buff-breasted Sandpiper	dwarf shrub meadow, dwarf shrub mat	salt grass meadow
Short-billed Dowitcher	wet meadow, salt grass meadow	silt tidal flat, salt grass meadow
Long-billed Dowitcher	wet meadow	salt grass meadow, silt tidal flat
Common Snipe	dwarf shrub meadow, scattered woodland	wet meadow, salt grass meadow
Red-necked Phalarope	lacustrine water, wet meadow	nearshore marine water, lacustrine water
Red Phalarope	lacustrine water, wet meadow	nearshore marine water, lacustrine water

[1] Habitat classification based on Kessel (1979). Ordered by preference if more than one habitat shown.
[2] Does not occur as a breeding species.

Appendix 7. Sites within Alaska Bird Conservation Regions (BCRs) that potentially qualify for inclusion within the Western Hemisphere Shorebird Reserve Network (WHSRN). See Figure 2 for site locations.

Bird Conservation Region/Site[1]	WHSRN Code[2]	Custodian[3]	Key species[4]	Numbers[5]	Season[6]
Arctic Plains/Mountains					
1. NE Alaska Lagoons	R-I	S, FWS, N	AGPL, LBDO, REPH, RNPH SESA, PESA	s10,000s	SP, S, A
2. Simpson Lagoon	R	S, N	REPH, DUNL	f 10,000s	S, A
3. Colville River Delta	R	S, N	DUNL, SESA, WESA, RNPH	f 10,000s	S, A
4. Elson Lagoon	R	S, N, BLM	DUNL, SESA, REPH	f 10,000s	S, A
5. Peard Bay	R?	N, S	REPH	s 1,000s	S, A
6. Kasegaluk Lagoon	R	S, BLM, FWS, N	DUNL, REPH	f 10,000s	SP, S, A
7. Krusenstern Lagoon	R	S, N, NPS	WESA, SESA, DUNL, LBDO	f 10,000s	SP, S, A
8. Noatak River Delta	I	N, S	WESA, SESA, DUNL, LBDO	s 10,000s	SP, S, A
Western Alaska					
9. Cape Espenberg	R?	S, NPS, N	WESA, SESA, DUNL, PESA	f 10,000s	S, A
10. Shishmaref Inlet	I	S, N, NPS	WESA, DUNL, SESA, BLTU	s 10,000s	S, A
11. Lopp Lagoon	R?	S, N, BLM, NPS	WESA, DUNL, SESA	s 10,000s	S, A
12. Central Seward Pen.	H%	S, NPS, BLM	BTCU, WHIM, BTGO, AGPL	s 1,000s	SP, S
13. Safety Sound	R	S, N	DUNL, SESA, WESA, RNPH	f 10,000s	S, A
14. Golovin Lagoon	R?	S, N	DUNL, SESA, WESA, RNPH	f 10,000s	S, A
15. Norton Bay	R	S, N, BLM	DUNL, SESA, WESA, RNPH	f 10,000s	S, A
16. Stebbins-St. Michael	R-I?	N	SESA, DUNL, RNPH	s 10,000s	S, A
17. Andreafsky Wilderness	H%	N, FWS, BLM	BTCU, WHIM, AGPL	s 1,000s	SP, S
18. St. Lawrence Island	I-H%	N, S	ROSA, DUNL	s 1,000s	SP, S, A
19. N. Yukon R. Delta[7]	H-H%	N, FWS, S	DUNL, LBDO, BTGO, RNPH	s 100,000s	SP, S, A
20. C. Yukon R. Delta[7]	H-H%	N, FWS, S	DUNL, WESA, BTGO, BLTU BTCU, WHIM, LBDO, REKN,	s 100,000s	SP, S, A

Appendix 7 Continued

Bird Conservation Region/Site[1]	WHSRN Code[2]	Custodian[3]	Key species[4]	Numbers[5]	Season[6]
			RNPH		
21. Kuskokwim R. Delta[7]	H-H%	N, FWS, S	DUNL, WESA, BTGO, BLTU BTCU, WHIM, RNPH	s 100,000s	SP, S, A
22. Nunivak Island[7]	R-I	N, FWS, S	ROSA, DUNL, WESA, LBDO	f 10,000s	S, A
23. Carter Bay	R	S, BLM, N	DUNL, WESA, HUGO	f 10,000s	S, A
24. Goodnews Bay	R?	S, N	DUNL, WESA	f 10,000s	S, A
25. Chagvan Bay	R	S, FWS, DFG, N	DUNL, WESA, ROSA, LESA	f 10,000s	S, A
26. Nanvak Bay	R	S, FWS, N	DUNL, WESA, ROSA, LESA	f 10,000s	S, A
27. Nushagak Bay	R-I?	S, N, FWS	DUNL, WESA, BBPL, PGPL	s 10,000s	S, A
28. Kvichak Bay	R-I?	S, N	DUNL, WESA, BBPL, PGPL	s 10,000s	S, A
29. Egegik Bay	I?-H%	S, DFG, N	DUNL, WESA, BTGO	s 10,000s	S, A
30. Ugashik Bay	R	S, DFG, N	DUNL, WESA, LBDO, MAGO	f 10,000s	S, A
31. Cinder-Hook Lagoons	R-I	S, DFG, N	DUNL, WESA, BTGO, MAGO	s 10,000s	S, A
32. Port Heiden	R-I?	S, DFG, N	DUNL, WESA, BTGO, ROSA	f 100,000s	S, A
33. Seal Islands	R-I?	S, N	DUNL, WESA, BTGO, ROSA	f 10,000s	S, A
34. Nelson Lagoon/ Mud Bay	I-H?	S, DFG, N	DUNL, WESA, BTGO, SBDO ROSA	s 100,000s	S, A
35. Izembek-Moffet Lagoons	R-H%?	S, DFG, FWS, N	ROSA, BTGO, DUNL	s 10,000s	S, A
36. Kodiak I.[7]	R?	S, N, FWS, FS	DUNL, WESA, SBDO, ROSA	s 1,000s	SP, S, A, W
Aleutian/Bering Sea Islands					
37. St. Matthew Island	I%	N, FWS	ROSA	s 1,000s	SP, S, A
38. Pribilof Islands	R-H%?	N, S	RUTU, ROSA	f 10,000s	S, A
39. Aleutian Islands	R-I%	FWS, S, N,	ROSA, BLOY, RUTU	s 10,000s	SP, S, A, W

Appendix 7 Continued

Bird Conservation Region/Site[1]		WHSRN Code[2]	Custodian[3]	Key species[4]	Numbers[5]	Season[6]
NW Interior Forest (Cook Inlet)						
40	Tuxedni Bay	I	S, NPS, N	WESA	s 10,000s	SP, S
41.	Redoubt Bay	H-H%	S, N, DFG	WESA, SBDO, HUGO, LESA	s 100,000s	SP, S, A
42.	Trading Bay	I	S, N, DFG	WESA, SBDO, HUGO, LESA	f 100,000s	SP, S, A
43.	Susitna River Flats	R-H%	S, DFG	SBDO, WESA, LESA	s 10,000s	SP, S, A
44.	Knik River Flats	R?	S, N	LESA, SBDO, GRYE	f 10,000s	SP, S, A
45.	Chickaloon Flats	R?	FWS, S, FS	SBDO, LESA	s 1,000s	SP, S, A
North Pacific Rainforest						
46.	Kachemak Bay	**I**	S, DFG, N	WESA, SURF, ROSA	f 100,000s	SP, S, W
47.	NE Montague Island	R-H%	S, N, FS	SURF, BLTU, RNPH, ROSA	s 10,000s	SP, W
48.	Middleton Island	R	N, S, FWS	WESA, BLTU, SURF, LESA	s 1,000s	SP, S, A, W
49.	Copper R. Delta	**H**	S, FS, N	WESA, DUNL, REKN, SBDO BBPL	s 100,000s	SP, S
50.	Controller Bay	H	S, FS, N	WESA, DUNL, REKN, BBPL	s 100,000s	SP, S
51.	Yakutat Forelands	I-H%	FS, S, N	WESA, MAGO, DUNL, LESA	f 100,000s	SP
52.	Mendenhall Wetlands	R	S, DFG, N	WESA, SBDO	f 10,000s	SP, S, A, W
53.	Stikine River Delta	I-H?	S, FS, N	WESA	s 100,000s	SP

[1] See Figure 1 for boundaries of BCRs. Almost all sites are coastal and thus represent mostly intertidal habitats, both unvegetated and vegetated.

[2] Western Hemisphere Shorebird Reserve Network criteria: H = Hemispheric Reserve (supporting >500,000 birds annually or >30% of a species' flyway population), I = International Reserve (>100,000 birds or >15% of a species' flyway population), and R = Regional Reserve (>20,000 birds or >5% of a species' flyway population). A fourth designation, Endangered Species, exists, but no Alaska shorebird currently qualifies under this category. Sites that qualify based on total numbers are shown with the appropriate letter (R, I, or H); a question mark follows site designations that may qualify at that level but additional study is needed. Those sites that qualify based on a percentage of a population are accompanied by a percent sign (%). For example, a site listed as I-H%

indicates it qualifies as an International site based on numbers as well as a Hemispheric site based on percent of a population using the site. Only two Alaska sites have been formally dedicated within the WHSRN system, both indicated in bold.

[3] N = Alaska Native Regional or Village Corporation (= private), FS = Forest Service, FWS = Fish and Wildlife Service, BLM = Bureau of Land Management, S = State of Alaska (all state lands below mean high tide), DFG = Alaska Dept. Fish and Game (state game refuges and critical habitat areas).

[4] Species that are numerically dominant on an area during an annual cycle. BBPL = Black-bellied Plover, AGPL = American Golden-Plover, PGPL = Pacific Golden-Plover, BLOY = Black Oystercatcher, GRYE = Greater Yellowlegs, WHIM = Whimbrel, BTCU = Bristle-thighed Curlew, HUGO = Hudsonian Godwit, BARG = Bar-tailed Godwit, MAGO = Marbled Godwit, RUTU = Ruddy Turnstone, BLTU = Black Turnstone, SURF = Surfbird, REKN = Red Knot, SEPA = Semipalmated Sandpiper, WESA = Western Sandpiper, LESA = Least Sandpiper, PESA = Pectoral Sandpiper, ROSA = Rock Sandpiper, DUNL = Dunlin, SBDO = Short-billed Dowitcher, LBDO = Long-billed Dowitcher, RNPH = Red-necked Phalarope, REPH = Red Phalarope.

[5] Total numbers of shorebirds (all species combined) likely to use a particular area during an annual cycle: f = few ($\leq$ 3); s = several ($\geq$ 4).

[6] Season when used: SP = Spring, S = Summer, A = Autumn, W = Winter.

[7] Indicates a site having several discrete sites, each meeting WHSRN criteria.