

# Shorebirds of the western Great Basin of North America: overview and importance to continental populations

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Large-scale studies of North American shorebirds have, for the most part, emphasized coastal regions. Nevertheless, interior regions also are critical to shorebird populations. Our aim here was to review the status of shorebirds in one important inland region, the western Great Basin of North America. We identified species on which management efforts should be concentrated, identified important wetlands, and estimated the global importance of western Great Basin shorebird populations. Nine species of shorebirds regularly breed in the western Great Basin and 24 species occur as migrants. The western Great Basin is an important breeding area for Snowy Plovers (*Charadrius alexandrinus*), Long-billed Curlews (*Numenius americanus*), American Avocets (*Recurvirostra americana*), Black-necked Stilts (*Himantopus mexicanus*), Wilson's Phalaropes (*Phalaropus tricolor*), Killdeer (*C. vociferus*), and Willets (*Catoptrophorus semipalmatus*). Among migrating birds, the western Great Basin supports large numbers, and significant proportions of the world's populations of Wilson's and Red-necked phalaropes (*P. lobatus*), Long-billed Dowitchers, Western Sandpipers (*Calidris mauri*) and American Avocets. Finally, we suggest priorities for conservation efforts for shorebirds in the western Great Basin.

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## Introduction

Shorebirds are among the world's most mobile organisms. In many cases, individuals spend parts of their lives in different nations and ecotypes. Hence, shorebird conservation is a complex international issue. In order to conserve these important aspects of our fauna, it is essential to understand the dynamics of shorebird movements across the landscape. The mobility of shorebirds yields an added element of complexity when it comes to determining population size, *i.e.*, changes in numbers may result either from population changes or from shifts in space use. Although estimates have been made of numbers of some shorebird species in regions of the western hemisphere (*e.g.*, western USA, Page & Gill 1994; South America, Morrison & Ross 1989a, b), for most species there are no accurate estimates of global population sizes.

Large-scale shorebird studies in North America have, for the most part, emphasized coastal regions (*e.g.*, Morrison & Ross 1989a, b; Helmers 1992). This is due in part to the large number of individuals of some shorebird species that congregate in coastal staging or overwintering sites. Nevertheless, interior regions also are critical to North American shorebird populations (Eldridge 1992; Skagen & Knopf 1993). In some cases, numbers of shorebirds at interior sites are similar to those at major staging areas on the coast (*e.g.*, 200,000+ recurvirostrids at Great Salt

Lake, Utah [Shuford *et al.* 1994], over 60,000 Wilson's Phalaropes [*Phalaropus tricolor*] at Mono Lake, California [Jehl 1988]; and 100,000 Long-billed Dowitchers [*Limnodromus scolopaceus*] in Lahontan Valley, Nevada [Neel & Henry, this volume]). Perhaps even more important, however, is that the vast majority of individuals of certain species rely on inland wetlands, particularly during migration (Senner & Howe 1984; Morrison & Myers 1989).

If shorebird management and conservation in North America are to be efficient, a thorough understanding of the biogeographic regions of the interior of the continent is needed. In this paper we address shorebirds in one of these important regions, the western Great Basin. Our goals are to review the status of shorebirds of this region, to identify those species on which management efforts should concentrate, and to estimate the global importance of western Great Basin shorebird populations.

The western Great Basin region (Figure 1), bordered to the west by the Sierra Nevada and Cascade ranges, is among the driest regions in North America. The mountains to the west form a rain shadow, and throughout the basin evaporation exceeds precipitation, sometimes by an order of magnitude. As a consequence, water is in short supply and biodiversity is concentrated disproportionately in wetlands (Brussard *et al.* in press). Ironically, and perhaps because of the extreme premium on surface water, wetlands of the region

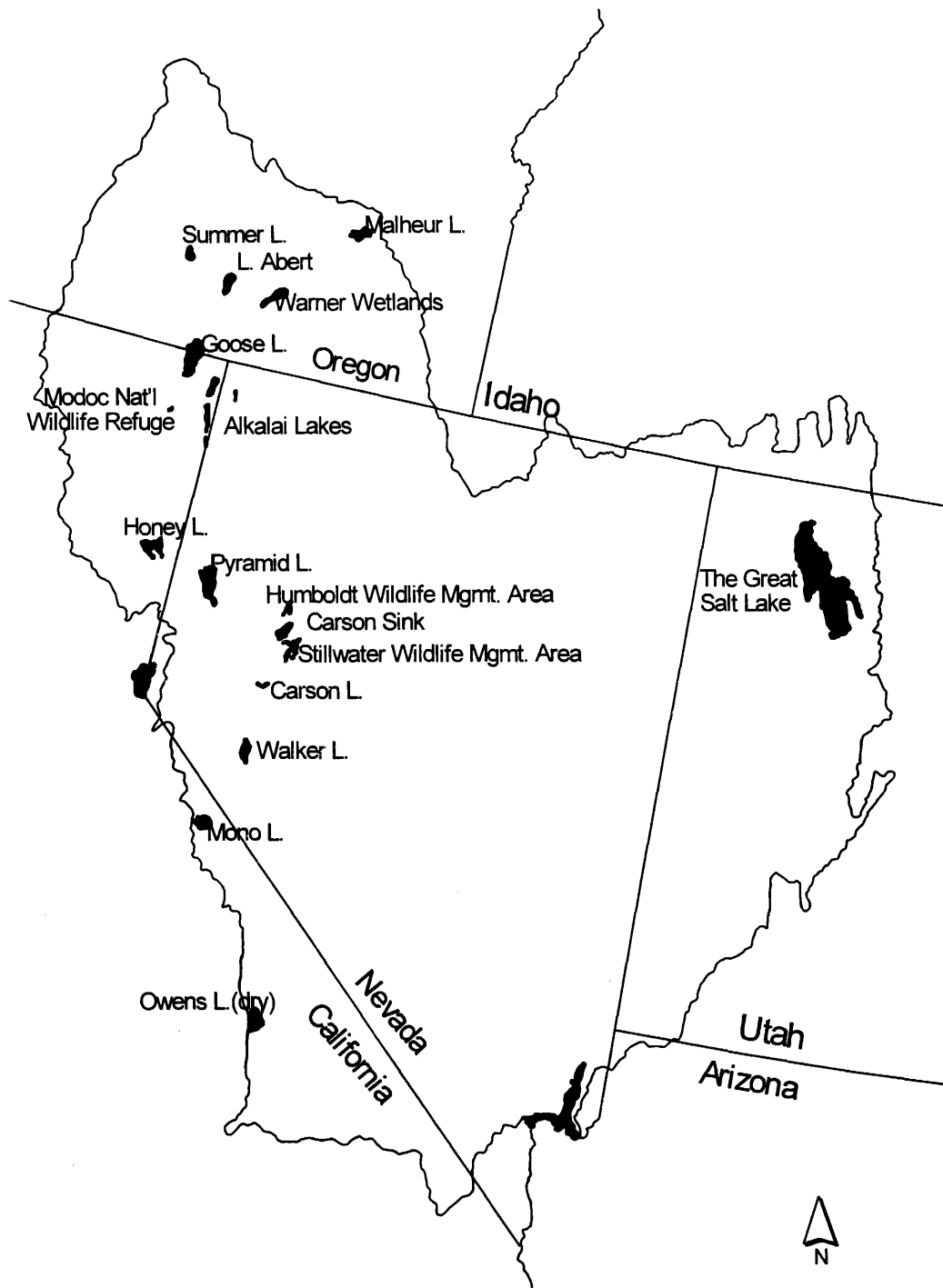


Figure 1. Major wetlands of the western Great Basin and the Great Salt Lake of the eastern Great Basin.

are of great importance to populations of a number of waterbird species.

Wetlands of the western Great Basin region include six general types: (1) ribbon-like riparian areas, (2) large deep lakes, such as Pyramid and Walker Lakes, Nevada and Mono Lake, California, (3) shallow saline lakes of varying sizes, including large lakes such as Lake Abert, Oregon and Goose Lake, Oregon/California, and numerous small saline playas and pans, (4) complex natural and managed wetlands (marshes), *e.g.*, Warner Wetlands, Oregon, (5) upland bogs and wet meadows, and (6) artificial reservoirs. These wetlands are characterized by spring recharge from snowmelt and enormous

interyear variability in existence (*e.g.*, Engilis & Reid, this volume). Types 2, 3, and 4 are especially important to shorebirds.

Although important to North American waterbirds, wetlands in the western Great Basin are increasingly threatened. Formerly extensive and diverse areas such as Stillwater/Carson Lake (Nevada), and Mono Lake (California), are recognized as Hemispheric (former) or International (latter) sites by the Western Hemisphere Shorebird Reserve Network (1993). Still, these areas are of great concern due to increased salinity and chemical loading caused by urban and agricultural uses (Jehl 1988; Rubega & Robinson, this volume). Other wetlands of comparable importance,

but not as well understood, also are threatened. For example, while Lake Abert is undergoing consideration as an Area of Critical Environmental Concern by the Bureau of Land Management (Kenna *et al.* 1990), there are proposals to mine minerals, harvest brine shrimp (*Artemia monica*), as well as a request for license from the Federal Energy Regulatory Commission license to alter water management of the lake (Devours 1990; Keister 1992; M. Stern, pers. comm.).

## Shorebird Populations of the Western Great Basin and their Relative Importance to Continental Populations

Nine species of shorebirds regularly breed in the western Great Basin and 24 species occur as migrants (Table 1). Seven of the 24 occur in small to very small numbers. At least six additional species have been reported one or more times as accidentals (Ryser 1985; Alcorn 1988; LWO and N. Warnock per. obs.). With several notable exceptions, the majority of which come from Mono Lake, California (*e.g.*, Jehl 1986, 1988; Herman *et al.* 1988; Rubega & Inouye 1994; Page *et al.* 1995; Shuford *et al.* 1995), there are few published studies of shorebirds in the western Great Basin. In addition to studies at Mono Lake, Hainline (1974) surveyed shorebirds in this area in the early 1970s, and various government agencies have conducted surveys (*e.g.*, Neel & Henry, this volume).

### Breeding Birds

The western Great Basin is an important breeding area for Long-billed Curlews, American Avocets, Black-necked Stilts, Wilson's Phalaropes, Killdeer, Willets, and western Snowy Plovers (*Charadrius alexandrinus nivosus*) (Table 2). Surveys of Snowy Plovers in Washington, Oregon, California, and Nevada showed a 20% decline in breeder numbers from the late 1970s to the late 1980s (Page & Gill

1994). In fact, birds disappeared from many of the sites in which they had been present: breeders at 20/53 California sites, 6/29 in Oregon, and 2/6 in Washington. Counts in northwestern Nevada have paralleled this decline. Herman *et al.* (1988) estimated that there were probably 2000 breeders in southeastern Oregon and western Nevada in 1980, and Bradley *et al.* (1991) reported numbers had dropped from 878 in 1980 to 139 in 1991. The 1991 count missed one historically important breeding site, but even if the 1991 estimate were doubled, it showed a severe decline.

Although there are only moderate numbers of Long-billed Curlews in the western Great Basin, because of their range-wide decline (Page & Gill 1994) this area might be important to continental populations. Locally dense populations of breeders have been recorded: 4-5,000 pairs of American Avocets and 1,000 pairs of Black-necked stilts (Table 2).

The western Great Basin is also important as breeding and migrating grounds for American Avocets and Black-necked Stilts. These species occur commonly and widely throughout wetlands of the region, and in some years large numbers of young are produced (Neel & Henry, this volume). Similarly, Killdeer and Willets breed in large numbers across the region, sometimes achieving high densities. For example, up to 80 pairs of Killdeers and 50 pairs of Willets bred around 100 ha of ponds in one year. These locally dense populations imply that numbers in the western Great Basin as a whole could be quite high.

### Migration

The western Great Basin is probably even more important to shorebirds during migration (Table 3). This area is extremely important to Wilson's and Red-necked phalaropes, Long-billed Dowitchers, and American Avocets. Some recent local peak counts support this assertion. Counts of both Wilson's and Red-necked phalaropes have been as high as 50,000-100,000 (July) at the Lahonton Valley, Nevada (Neel & Henry, this volume), Lake Abert, Oregon, and

Table 1. Habitats used by shorebirds in the western Great Basin.

Species	Habitat Needs
<b>Breeding:</b>	
Snowy Plover <i>Charadrius alexandrinus</i>	alkalai flats with freshwater inflows
Killdeer <i>C. vociferus</i>	broad, open areas near water, especially with dikes or roads
Black-necked Stilt <i>Himantopus mexicanus</i>	vegetated shallows or islands in complex wetlands
American Avocet <i>Recurvirostra americana</i>	open islands, wetlands with predator protection, freshwater inflows for chicks
Willet <i>Catoptrophorus semipalmatus</i>	complex wetlands with nearby grasslands or Great Basin desert
Long-billed Curlew <i>Numenius americanus</i>	short-grass prairie, grazed pastures, flooded meadows, irrigated pastures; some tall vegetation for chicks to hide
Wilson's Phalarope <i>Phalaropus tricolor</i>	flooded meadows, irrigated pastures, grasslands near complex wetlands
<b>Migrating and Post-breeding:</b>	
Western Sandpiper <i>Calidris mauri</i>	mudflats with soft substrate
Least Sandpiper <i>C. minutilla</i>	marsh edges, some vegetation
Long-billed Dowitcher	mudflats adjacent to marshes
Red-necked Phalarope <i>Phalaropus lobatus</i>	open water, especially in saline lakes
Wilson's Phalarope	open water, especially in saline lakes
American Avocet	mudflats with soft substrate, shallow water

**Table 2.** Important contributions of breeding shorebirds in the western Great Basin Region to North American Populations<sup>1</sup>.

Species	Wetland Type	Estimated Status in the Western Great Basin	Estimated Importance
American Avocet	shallow saline lakes and playas, complex vegetated wetlands	World population unknown; 4,000-5,000 pairs breeding at a single site (Neel & Henry, this volume).	Major contributor to species persistence.
Black-necked Stilt	complex vegetated wetlands	World population unknown; 1,000 pairs breeding at a single site (Neel & Henry, this volume).	Major contributor to species persistence.
Snowy Plover	shallow saline lakes and playas	In 1980, 671 individuals were reported in the Lahontan Valley, accounting for 69% of this species counted in western Nevada (Page <i>et al.</i> 1991); over 5% of western U.S. population (Page & Gill 1994).	Major contributor to persistence of western subspecies.
Long-billed Curlew	complex vegetated wetlands	Common breeder, surveys lack comprehensiveness.	Might be important contributor to species persistence.

<sup>1</sup>The western Great Basin region hosts five additional species of breeding shorebirds: Killdeer, Common Snipe (*Gallinago gallinago*), Spotted Sandpiper (*Actitis macularia*), Willet, and Wilson's Phalarope. However, we do not consider the region to be of critical importance to the persistence of these populations due to their general abundance and the widespread nature of their breeding distributions.

Mono Lake, California (Jehl 1981, 1986; LWO pers. obs.). On 29 April 1987, 100,000 Long-billed Dowitchers were seen at Carson Lake and Stillwater National Wildlife Refuge (Neel & Henry, this volume). This is 20% of those reported in western North America (Page & Gill 1994). Lake Abert has had over 28,000 avocets present on a single day (unpubl. data), and 64,030 were seen in the Lahontan Valley in 1987. This is over 25% of the birds estimated to be in western North America (Page & Gill 1994).

Other migrants for which the western Great Basin is also important include Western and Least sandpipers (especially in the spring). There was a combined count of 58,949 Least and Western sandpipers on the same day (species not distinguished) in the Lahontan Valley (Neel *et al.* 1990). Based on the ratio of birds identified to species, approximately 50,200 were Western Sandpipers. In August 1986, the Nevada Division of Wildlife reported 10,000 'peeps' that were mostly Least Sandpipers and 3,300 leasts in October 1987 (Neel, unpubl. data), and LWO saw 8,000 Least Sandpipers near Honey Lake, California (unpubl. data, spring 1994). Spring counts of over 23,000 Least Sandpipers have been reported for Summer Lake, Oregon (Paulson 1993).

## Wetlands of Critical Concern for Shorebirds in the Western Great Basin

Many wetlands in the western Geat Basin provide important habitat for large numbers of breeding or migrating shorebirds. Below we summarize the limited information available from published accounts and a few unpublished accounts. In the following list, reported lake sizes represent those in years of average precipitation (Grayson 1993).

### Oregon

*Malheur Lake:* This complex lake/marsh is 18,400 ha, and 1000-10,000 migrating shorebirds have been recorded annually (Fall) (Page and Gill 1994).

*Summer Lake:* This 10,100 ha shallow, alkaline lake supports 10,000-100,000 migrating shorebirds (Fall) (Page and Gill 1994).

*Lake Abert:* Jehl (1988) reports an estimated 150,000 migrant Wilson's Phalaropes in 1981 in this 14,800 ha shallow, alkaline lake. W. Devaurs (U.S. Bureau of Land Management, pers. comm.) recorded peak, single-day shorebird counts of 89,288, with 34,819 American Avocets (October, 1993), 19,313 Least and Western sandpipers combined (August, 1994), and 27,600 Wilson's and Red-necked phalaropes combined (August, 1994).

*Warner Wetlands:* There are no published data on shorebird use of this 13,000 ha wetland complex, but there is little doubt that the area is important to western Great Basin shorebirds, especially Black-necked Stilts, Willets, and Long-billed Curlews.

### Nevada

*Lahontan Valley:* The Lahontan Valley wetlands include Stillwater National Wildlife Refuge, Alkali Lake, Carson Lake State Game Management Area, and Humboldt National Wildlife Refuge. In 1988, this site was declared of Hemispheric importance in the Western Hemisphere Shorebird Reserve Network (Neel *et al.* 1989; Neel & Henry this volume). This designation results from the site harboring over 250,000 shorebirds during migration. Although the Lahontan Valley has not had this many shorebirds recently because of water diversions and drought, it still acts as a staging area for many shorebirds, and might return to its former importance with increased water allocation (for details see Neel & Henry, this volume). During wet years, as much as 80% of all Long-billed Dowitchers might use this area during migration. During April 1987, 100,000 were seen at Carson Lake and Stillwater National Wildlife Refuge (Neel *et al.* 1990). During some years, the Lahontan Valley has significant numbers of other species, such as phalaropes, stilts, and avocets (Rawlings *et al.* 1987; Neel & Henry, this volume). For example, Neel & Henry (this volume) reported 67,000 Wilson's

**Table 3.** Important contributions of transient shorebirds in the western Great Basin Region to North American Populations<sup>1</sup>.

Species	Wetland Type	Estimated Status in the Western Great Basin	Estimated Importance <sup>2</sup>
Long-billed Dowitcher	shallow, saline lakes and playas, complex vegetated wetlands	Counts of 100,000 locally <sup>3</sup>	Very important to species persistence
American Avocet	shallow, saline lakes and playas, complex vegetated wetlands	Counts to 64,000 locally <sup>3</sup>	Very important to species persistence
Red-necked Phalarope	shallow, saline lakes and playas, complex vegetated wetlands	Counts to 75,000 locally <sup>3</sup>	Critically important to species persistence
Wilson's Phalarope	shallow, saline lakes and playas, complex vegetated wetlands	Counts to 150,000 locally; approximately 10% of continental population <sup>4</sup>	Likely of importance for species persistence
Western Sandpiper	shallow, saline lakes and playas, complex vegetated wetlands	Approximately 60,000 locally <sup>3</sup>	Might be of importance for species persistence
Least Sandpiper	shallow, saline lakes and playas, complex vegetated wetlands	23,150 counted locally <sup>5</sup>	Probably important for persistence of western North American populations

<sup>1</sup>At least 24 species recorded as at least occasional transients in addition to 9 species of breeding shorebirds. Only those species in which transient populations are of continental importance are listed. Six or more additional species could be considered accidental.

<sup>2</sup>There are no good hemispheric estimates of numbers of these species, and these estimates are presented as hypotheses.

<sup>3</sup>Neel & Henry, this volume

<sup>4</sup>Jehl (1988)

<sup>5</sup>Paulson (1993)

Phalaropes at Stillwater National Wildlife Refuge (July, 1987).

## California

*Mono Lake:* Red-necked Phalaropes use Mono Lake during migration, with single-day counts as high as 21,600 (Winkler *et al.* 1977). Jehl (1988) reported peak counts of migrating Wilson's Phalaropes exceeding 60,000 (July, 1981), and Winkler (1977) reported 93,000 (July, 1976). Only Great Salt Lake (Utah) has more Wilson's Phalaropes during migration (Jehl 1988). During the 1930s, this deep, saline lake averaged over 22,000 ha. Although the lake has declined severely, recent water allocations will result in increased water levels.

*Honey Lake Valley:* This shallow, alkaline lake has a capacity for covering 23,000 ha. Page & Gill (1994) estimated that during migration, the lake averages 10,000-100,000 shorebirds (Spring). Recently developed wetlands in the Honey Lake Valley increase the importance of this area to shorebirds.

*Goose Lake:* On the border of Oregon and California, Page & Gill (1994) estimated that during migration this 39,400 ha lake supports 1,000-10,000 shorebirds; this estimate is conservative.

*Alkali Lakes:* Page & Gill (1994) estimated that during migration, these lakes have 1,000-10,000 shorebirds; this estimate is extremely conservative for years in which lake levels are up.

## Conclusions

Because time and money available for conservation are limited, conservation and management efforts should be extended to those species that will benefit the most. Monitoring and assessment of shorebirds

in the western Great Basin is exceedingly difficult because species track water availability across broad areas. Therefore, to properly monitor species' numbers requires a coordinated effort that covers a large spatial scale (Jehl 1988; Reed *et al.*, this volume) because from year to year individuals might move from one site to another depending on water levels.

There are no federally (U.S.A.) listed endangered or threatened shorebirds in the western Great Basin, but the Long-billed Curlew, Mountain Plover (*Charadrius montanus*), and western Snowy Plover are listed as species of concern. All shorebird species for which the western Great Basin is important to continent-wide populations, depend also on other biogeographic areas; and each of these species ranges across two or more countries (Table 4). Thus, we cannot rely on management efforts in the Great Basin alone to protect these birds. One important aspect of future research is movements of shorebirds within, into and out of the Great Basin. Conservation efforts should be made in accord with the following priorities:

1. Identify and maintain wetlands of critical concern for Great Basin shorebirds.
2. Concentrate enhancement efforts on areas with low cost, high quality water. Avoid reliance on deep groundwater, irrigation return flow water, or water with high concentrations of toxic elements or compounds.
3. Concentrate enhancement efforts in areas where these efforts are compatible with existing land use practices.
4. Assure that natural freshwater inflows to hypersaline wetlands are protected.
5. Support interstate and international efforts to establish wetland preserves and networks in accord with items 2-4.
6. Enhance existing Great Basin wetland preserves in accord with items 2-4.

**Table 4.** Shorebird species in the western Great Basin that are of importance to continental populations, and the countries in which they breed, migrate, and overwinter.

<i>Species</i>	<i>Breeding Area</i>	<i>Wintering Area</i>
<b>Breeding:</b>		
Snowy Plover	w and central U.S.	w coasts of U.S. and Mexico, Gulf of Mexico, Cuba, West Indies, w and n coasts of South America
American Avocet	interior w North America, ne Gulf of Mexico, central e coast of U.S.	w and e coasts of Mexico, Gulf of Mexico, Cuba, West Indies
Black-necked Stilt	sw, s central, and se U.S.	coastal Mexico, Central America, most of South America
Long-billed Curlew	interior w North America	w coast U.S. and Mexico, w and n Gulf of Mexico
Wilson's Phalarope	w and central North America	s and w South America, primarily central Argentina
<b>Migrant:</b>		
Western Sandpiper	nw coast Alaska, e coast Chukotski Peninsula (Siberia)	e and w coasts of U.S. Mexico, and Central America, n coast South America
Least Sandpiper	n North America	s North America through n South America
Red-necked Phalarope	holarctic	w central U.S., Pacific of South America coast, central and s Africa, Arabian Sea, East Indies
Long-billed Dowitcher	ne coast Siberia, n and w Alaska, n Yukon	w coast North America, s U.S., Mexico, n Central America

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