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SHOREBIRD NUMBERS IN WETLANDS OF THE PACIFIC FLYWAY:
A SUMMARY OF COUNTS FROM APRIL 1988 TO JANUARY 1992



Gary W. Page, W. David Shuford, Janet E. Kjelson & Lynne E. Stenzel

November 1992

A report of
Point Reyes Bird Observatory
4990 Shoreline Highway
Stinson Beach, CA 94970

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The data reported herein are part of an ongoing study of shorebird use of wetlands in the Pacific Flyway. For permission to cite the results from this report in the scientific literature, please contact the authors.

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INTRODUCTION

A diverse assemblage of birds including pelicans, grebes, waterfowl, herons, ibises, rails, shorebirds and terns depend on the food and shelter provided by the wetlands of the Pacific Flyway for their survival. The diking, draining and filling of wetlands for agricultural, industrial and residential development has destroyed or altered much of the wetland habitat in the Pacific Flyway. As a consequence the populations of some species of wetland-dependent birds such as Clapper Rails and ducks have declined sharply. Unfortunately because critical information on the abundance, population trends and key concentration areas of many birds is lacking, it is only possible to speculate on the fate of most species.

Among wetland species, waterfowl (swans, geese and ducks) have received the most attention because they are the most abundant aquatic birds in the Pacific Flyway and because they are important to hunters. Intense scientific study has documented, among other things, a precipitous decline in waterfowl abundance over the past 25 years. The decline, particularly of ducks, has been so great that federal, state and private agencies have pooled their conservation efforts into the North American Waterfowl Management Plan (NAWMP) with the goals of restoring critical wetland habitat and increasing waterfowl populations. The NAWMP recognizes that other wetland-dependent species should also benefit from habitat restoration but since there have been no large-scale studies of the abundance, population trends and key concentration areas of most other species, the NAWMP is handicapped in its conservation efforts.

After waterfowl the most numerous birds in Pacific Flyway wetlands are shorebirds, which include oystercatchers, avocets, stilts, plovers, willets, curlews, godwits, small sandpipers, dowitchers and phalaropes. Shorebird conservation should be based on a flywaywide overview of shorebird habitat requirements comparable to that underlying the waterfowl conservation plan but until recently no attempt had been made to gather the necessary information for such an overview. In 1988 Point Reyes Bird Observatory (PRBO) initiated the Pacific Flyway Project:

1. To identify wetlands of regional, national and international significance for shorebirds based on the number of shorebirds using them.
2. To identify the threats to these wetlands.
3. To synthesize the threat and bird use data into a comprehensive picture of the future prospects for shorebirds on the Pacific Flyway.

4. To use the data collected by the project for increasing public awareness and understanding of the need to protect shorebirds and their wetland habitats.
5. To develop sound conservation and management strategies for shorebirds and their wetland habitats.
6. To provide a data base which could form the basis for monitoring shorebird populations in the flyway.

In this report we attempt our first overview of shorebird use of the entire Pacific Flyway, defined as the system of coastal and interior wetlands that lie west of the Rocky Mountain system in Alaska, British Columbia, Washington, Idaho, Oregon, Utah, Nevada, California, Arizona, New Mexico, Baja California, and the Sonoran and Sinaloan coasts of Mexico. The overview is based primarily on information collected between April 1988 and January 1992; data for the Central Valley for April 1992 are also reported because that was the first season in which complete coverage of the Valley was obtained.

METHODS OF DOCUMENTING SHOREBIRD USE OF PACIFIC FLYWAY WETLANDS

The Pacific Flyway Project organizes volunteers to count shorebirds in wetlands during periods of peak shorebird use in spring, fall and winter. Staff of PRBO organize the counts of some wetlands directly, but in many cases, particularly outside California, this task is left to volunteer coordinators. The many persons from the private sector and from wildlife agencies who generously organize counts for the project are identified in the acknowledgments. Over 1,000 additional people have participated in the censuses.

Small wetlands are surveyed by a team of one or more observers, whereas larger ones are divided into subareas that are each covered by separate teams. Adjacent subareas are surveyed as close to simultaneously as possible to minimize the chances of counting the same birds more than once. Aerial (or boat) censuses are used for areas that are inaccessible by foot or vehicle or are too extensive to be covered by ground-based counters.

Counters tally each species of shorebird separately when possible. If they are unable to determine the number or proportion of the different species in mixed-species flocks, they are asked to record the size of the flock and which species comprise it. For each census site where the proportion and number of identified individuals are sufficiently high, we assume that the composition of unapportioned mixed-species flocks is similar to that of flocks of identified species and we incorporate the numbers of the unallocated birds into those of identified species accordingly (Stenzel and Page 1988).

Spring counts are timed to coincide with the peak occurrence of arctic-nesting shorebirds as they concentrate at staging areas south of their breeding grounds. Except in Alaska where counts are one to two weeks later than to the south, surveys have centered around the weekends of 16-17 April 1988, 22-23 April 1989, 14-15 April 1990 and 27-28 April 1991. Peak numbers in fall are difficult to obtain through a single census because fall migration is more protracted than in spring. In fall there may be several peaks for some species as birds of different gender and age return from the breeding grounds in successive waves. Fall counts have centered around the weekends of 10-11 September 1988, 19-20 August 1989, 8-9 and 15-16 September 1990, and 17-18 and 24-45 August 1991. In winter, when many shorebirds remain in residence at wetlands, counts have occurred from November through February in 1989-90, 1990-91 and 1991-92. Although we would like to obtain more censuses of each wetland annually, the counts of larger wetlands (generally the ones that hold the most shorebirds) require too much organization for this to be possible.

SHOREBIRD USE OF THE PACIFIC FLYWAY

Of the 47 species of shorebirds regularly breeding or wintering in the Pacific Flyway, 28 are relatively rare or concentrate primarily in nonwetland habitats such as rocky coastal shoreline or sandy beaches. The Pacific Flyway Project concentrates its census efforts on the 19 species that center their activities in wetlands of the Pacific Flyway. Thirteen of these species breed primarily in arctic or subarctic regions: Black-bellied Plover, Semipalmated Plover, Greater Yellowlegs, Lesser Yellowlegs, Whimbrel, Red Knot, Sanderling, Western Sandpiper, Least Sandpiper, Dunlin, Short-billed Dowitcher, Long-billed Dowitcher and Red-necked Phalarope. The remaining species are the Marbled Godwit which breeds primarily in the prairies; the Willet, Long-billed Curlew and Wilson's Phalarope which breed both in the prairies and the intermountain region of the Pacific Flyway; and the Black-necked Stilt and American Avocet which, in addition to the prairies and intermountain region, nest in southern coastal regions of the Pacific Flyway. The winter range of all of these species extends south of the Pacific Flyway, usually into South America. The degree to which each species' winter range extends beyond the flyway is quite variable.

The pattern of shorebird use of wetlands varies among subregions of the Pacific Flyway. We identify five subregions: the coastline of Mexico; the coast of the western United States and Canada; Alaska; the Central Valley of California and Willamette Valley of Oregon; and the arid intermountain region of the western United States. A list of the sites where shorebird counts have been conducted and dot diagrams comparing the relative abundance of key shorebird species by region and season can be found in Appendixes 1 and 2 at the end of this report. The overview of the Pacific Flyway that is emerging from the data collection is summarized as follows.

KEY TO FIGURE 1

- 1 NETARTS BAY
- 2 YAQUINA BAY
- 3 SIUSLAW RIVER ESTUARY
- 4 NEW RIVER ESTUARY
- 5 SMITH RIVER MOUTH
- 6 POINT ST. GEORGE
- 7 EEL RIVER MOUTH
- (8) POINT REYES/BODEGA BAY WETLANDS
 - BODEGA HARBOR
 - ESTERO AMERICANO
 - TOMALES BAY
 - DRAKES ESTERO
 - LIMANTOUR ESTERO
 - BOLINAS LAGOON
- (9) MONTEREY BAY AREA
 - PAJARO RIVER/WATSONVILLE SLOUGH
 - ELKHORN SLOUGH
 - SALINAS RIVER MOUTH
 - SALINAS SEWAGE PONDS
- 10 LOS ANGELES RIVER
- 11 SEAL BEACH NWR
- 12 BOLSA CHICA
- 13 SANTA MARGARITA RIVER MOUTH
- 14 BATIQUITOS LAGOON & SAN ELJO LAGOON
- (15) SAN DIEGO BAY AREA
 - MISSION BAY
 - SAN DIEGO BAY
 - TIJUANA RIVER MOUTH
- (16) BAHIA DE SAN QUINTIN AREA
 - BAHIA DE SAN QUINTIN
 - SAN QUINTIN SALT PONDS
 - LAGUNA FIGUEROA
- 17 STINKING LAKE
- 18 HARNEY LAKE
- 19 MUD LAKE
- 20 CAMPBELL LAKE
- 21 LOWER KLAMATH NWR
- 22 UPPER ALKALI LAKE
- 23 LYNETA RANCH WILD RICE PADDIES
- 24 LOWER ALKALI LAKE
- 25 COLUSA BASIN
- 26 BUTTE BASIN
- 27 SUTTER BASIN
- 28 AMERICAN BASIN
- 29 YOLO BASIN
- 30 SUISUN MARSH
- 31 SACRAMENTO-SAN JOAQUIN RIVER DELTA
- 32 SAN JOAQUIN BASIN
- 33 TULARE LAKE BASIN
- 34 BRIDGEPORT RESERVOIR
- 35 CROWLEY LAKE
- 36 TINNEMAHA RESERVOIR
- 37 EDWARDS AIR FORCE BASE
 - PIUTE PONDS
 - SEWAGE PONDS



COASTLINE OF MEXICO

At least 839,000 shorebirds winter in coastal wetlands within the Mexican subregion of the Pacific Flyway, based on aerial counts in January and February of 1992 by Guy Morrison of the Canadian Wildlife Service (CWS), Brian Harrington of Manomet Bird Observatory (MBO) and PRBO. The coastline of the states of Sonora and Sinaloa, the mouth of the Colorado River in the Gulf of California (includes part of the states of Sonora and Baja Norte) and the west coast of Baja California are the key areas for shorebirds within the Mexican subregion of the flyway.

Coastline of Sonora and Sinaloa

Excluding the Sonoran coast at the mouth of the Colorado River, 325,000 to 350,000 wintering shorebirds were recorded on the Sonoran and Sinaloan coast on the CWS and MBO aerial surveys in 1992. Particularly abundant were American Avocets, which exceeded 60,000 on the MBO count, and small shorebirds, which exceeded 230,000 on the CWS count. The majority of the small shorebirds were probably Western Sandpipers.

Mouth of the Colorado River

At the mouth of the Colorado River in the northern Gulf of California over 150,000 wintering shorebirds were recorded on the CWS count. Of these, 130,000 were small species, the majority of which were likely Western Sandpipers.

Baja California

The CWS surveys detected few wintering shorebirds along the eastern coast of Baja California, except at the mouth of the Colorado River. In contrast, the pooled surveys of the CWS and PRBO indicated that over 325,000 shorebirds were on the western Baja coast. By far the largest concentration was the 250,000 shorebirds in Laguna Ojo de Liebre. Staff and volunteers of the Centro de Investigacion Cientifica y de Educacion Superior de Ensenada (CICESE) and PRBO made ground counts at all but one major wetland site along the Pacific coast of Baja to extrapolate species compositions for the coarser aerial counts. These extrapolations indicated a minimum of 3,400 Black-bellied Plovers, 750 Black-necked Stilts, 1,300 American Avocets, 12,000 Willets, 50,000 Marbled Godwits, 750 Long-billed Curlews, 120,000 Western Sandpipers, 750 Least Sandpipers, 57,000 Dunlins and 17,000 dowitchers (mostly Short-billed Dowitchers) were wintering in the west coast wetlands of Baja California.

Presently we have complete spring and fall counts from only a few sites on the northwest coast of Baja. At the largest site with such data, Bahia de San Quintin, shorebird numbers are higher in winter than in spring or fall suggesting the west coast of Baja is

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 STINSON BEACH, CA 94970

CENSUS FORM

INLAND SITES: WINTER 1992

LOCATION _____ COUNTY _____ DATE _____

Census Team Members (First and Last Names) _____

Area →			Area →			Area →		
Start Time →								
End Time →								
Black-bellied Plover			Western Sandpiper			American Bittern		
Lsr. Golden-Plover (d)			Least Sandpiper			Great Blue Heron		
Snowy Plover (u)			Least/Western sandp. (*) Ratio →			Great Egret		
Semipalmated Plover (u)			Dunlin			Snowy Egret		
Killdeer			Least/Western/Dunlin (*) Ratio →			Cattle Egret		
Mountain Plover			Long-billed Dowitcher			Green-backed Heron		
Black-necked Stilt			dowitcher spp.			Blck-cr. Night Heron		
American Avocet			Common Snipe			White Pelican		
Greater Yellowlegs			Wilson's Phalarope (d)			White-faced Ibis		
Lesser Yellowlegs (u)			Other species (d)			Turkey Vulture		
yellowlegs spp.						Osprey		
Willet (u)						Black-should. Kite		
Spotted Sandpiper						Northern Harrier		
Whimbrel (u)						Red-tailed Hawk		
Long-billed Curlew						Ferruginous Hawk		
Marbled Godwit (u)						Rough-legged Hawk		
Sanderling (d)						American Kestrel		
						Merlin		
						Peregrine Falcon		
						Prairie Falcon		

(d) indicates species sufficiently rare at the time of the census to require written descriptions.
 (u) indicates species we suspect will be very uncommon or local.

Dowitchers – We suggest that censusers count all dowitchers as *dowitcher spp.* If dowitchers are identified to species we would like some information on determination was made.

Mixed Species Groups – Indicate the possible species and number. For example, if you saw a mixed flock of 155 Willet and Marbled Godwit, you would write Willet/Godwit and 155. Whenever possible, indicate proportions of mixed species groups.

(*) Use these spaces only to record numbers of sandpipers that you are unable to separate into Least, Westerns, or Dunlin. Count the species together and record number. If possible, list the ratio of the unseparated species.

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off the main chain of staging areas for shorebirds headed to Central and South America. Consequently, until information to the contrary is available we view the major importance of the west coast of Baja as a shorebird wintering area rather than a migratory staging ground.

COAST OF THE WESTERN UNITED STATES AND CANADA

We estimate that around 700,000 shorebirds wintered in coastal wetlands of the western United States and Canada during the past two winters, based on Pacific Flyway Project counts supplemented with information from Audubon Society Christmas Bird Counts and other published literature. The 700,000 shorebirds include at least 23,000 Black-bellied Plovers, 2,350 Semipalmated Plovers, 4,800 Black-necked Stilts, 24,000 American Avocets, 29,000 Willets, 33,000 Marbled Godwits, 3,000 Long-billed Curlews, 197,000 Western Sandpipers, 30,000 Least Sandpipers, 275,000 Dunlins and 26,000 dowitchers. Peak numbers of some species can be even greater in spring or fall as migrants pass through the region. This can best be illustrated with the survey results from California.

California

California held about 570,000 wintering shorebirds, including virtually all of the stilts, avocets, willets, curlews and godwits -- species that nest in the prairies or the intermountain region of the Pacific Flyway. Of the shorebirds that breed in arctic regions, we estimate that California held about 98% of the Semipalmated Plovers, Least Sandpipers and dowitchers wintering in the west coast wetlands of the United States and Canada and similarly 90% of the Black-bellied Plovers and 50% of the Dunlins.

The season when shorebird numbers reach a peak varies among species. In California, American Avocets and Dunlins are most numerous in coastal wetlands during winter; stilts and Least Sandpipers during fall; and Western Sandpipers and dowitchers during spring (Table 1). Numbers of Black-bellied Plovers and Willets are highest in fall and winter, whereas numbers of Marbled Godwits are fairly similar in fall, winter and spring. North of California, Western Sandpipers are much more abundant in wetlands in spring than at other seasons and Dunlins are most abundant in winter and spring.

San Francisco Bay, with 300,000 to 400,000 shorebirds in fall and winter and 600,000 to 1,000,000 in spring, annually has more shorebirds than all other coastal California wetlands combined in all seasons. The next largest concentrations along the California coast are at Humboldt Bay where up to 75,000 shorebirds have been recorded in winter and spring, Elkhorn Slough with up to 30,000 in fall and winter and Mugu Lagoon with up to 30,000 in spring. Counts at Morro and Tomales bays have each exceeded 20,000 shorebirds and at six other wetlands have exceeded 10,000.

Table 1. Total number of shorebirds from counts in California coastal wetlands at different times of year based primarily on data from 1990 and 1991.

SPECIES	FALL	WINTER	SPRING
Black-bellied Plover	18000	21000	10000
Black-necked Stilt	7500	5000	2000
American Avocet	18000	24000	6000
Willet	33000	28000	7000
Marbled Godwit	38000	33000	34000
Western Sandpiper	285000	195000	525000
Least Sandpiper	70000	30000	48000
Dunlin	--	155000	95000
Unidentified Dowitchers	32000	25000	50000
Total Shorebirds	550000	570000	780000

Oregon

In Oregon more than 100,000 shorebirds were recorded on the Columbia River estuary in spring. The next largest concentrations reported from the Oregon coast (all from fall counts) were 10,000 shorebirds at the Coquille River estuary, 7,500 at Coos Bay and nearly 5,000 on a partial survey of Tillamook Bay. The Western Sandpiper was the dominant species in all of the above locations.

Washington

Grays Harbor, Puget Sound and Willapa Bay are very important staging areas for shorebirds during spring migration on the Washington coast. On our first spring count over 250,000 shorebirds were found at Grays Harbor; in a prior spring nearly 1,000,000 shorebirds were recorded there (Herman and Bulger 1981). Our spring counts of Puget Sound and Willapa Bay each exceeded 100,000 shorebirds. At all locations the Western Sandpiper was the most abundant species. Upcoming fall and winter surveys will enable us to make seasonal comparisons of shorebird numbers along the Washington coast.

British Columbia

The Fraser River delta is the most important site for migrating shorebirds on the British Columbia coast (Butler and Campbell 1987). It holds up to 166,000 shorebirds in spring and 55,000 in fall (Rob Butler pers. comm.). The Tofino mudflats on the west

shore of Vancouver Island held 15,000 shorebirds on a fall count, making it the next most important shorebird staging area on the British Columbia coast. Western Sandpipers and Dunlins were the most numerous migrants at both locations. Audubon Society Christmas Bird Counts suggest that in winter the Fraser River delta may hold 27,000 shorebirds, nearly all of which are Dunlins.

ALASKA

The climate of Alaska is too cold for shorebirds to spend the winter in the coastal wetlands where large numbers concentrate during migration. The Copper River delta is the most highly publicized staging area for migrant shorebirds in Alaska. An estimated 186,000 shorebirds were there on a spring 1991 aerial count (Mary Anne Bishop pers. comm.). Prior work indicates that concentrations of over a million shorebirds are possible at this location in spring (Isleib 1979). Another major staging area is the Stikine River delta in southern Alaska which held 240,000 shorebirds on a 1991 spring count (Chris Iverson pers. comm.). Of these, over 200,000 were Western Sandpipers and 26,000 were Dunlins. Kachemak Bay has also proven to be an important spring staging area. A 1991 spring count for this location totalled about 20,000 shorebirds, over 18,000 of which were Western Sandpipers. Many other potential staging sites for migratory shorebirds have been identified in coastal Alaska (Bob Gill pers. comm.) but because of their remoteness it will be a challenge to make counts at them in the future.

INTERIOR WETLANDS

Interior wetlands of the Pacific Flyway fall within two main physiographic regions: (1) valleys west of the Cascade-Sierra axis, principally the Central Valley of California and the Willamette Valley of Oregon and (2) basins and plateaus of the Intermountain West which lie east of the Cascade-Sierra axis and west of the Rocky Mountains. Because most of these areas have arid climates subject to periodic drought and wet cycles, the amount of shallowly flooded habitat suitable to shorebirds can vary greatly over time. The Pacific Flyway Project surveys have all been conducted during a major drought that has affected much of the arid West for the past six years. Consequently, data also need to be collected during "normal" and wet periods if we are to adequately characterize the importance of interior wetlands to shorebirds. Other prior published and unpublished data suggest that these wetlands can at times hold many more shorebirds than are reported here. Also, because the Pacific Flyway counts are scheduled to coincide with the peak periods of migration of a variety of species, our data poorly represent the autumn passage of the early-migrating Wilson's Phalarope, which can number in the 10's or even 100's of thousands at some alkali lakes in the Great Basin (Jehl 1988).

CENTRAL VALLEY OF CALIFORNIA AND WILLAMETTE VALLEY OF OREGON

Central Valley of California

California's great Central Valley can be divided, generally from north to south, into three larger and 9 smaller subareas: (1) the Sacramento Valley consisting of the Colusa, Butte, Sutter, American and Yolo basins, (2) the Sacramento-San Joaquin River Delta and Suisun Marsh, and (3) the San Joaquin Valley consisting of the San Joaquin and Tulare Lake basins.

Taken as a whole the Central Valley supports more shorebirds in spring and winter than any other area in the interior of the Pacific Flyway. Our first complete survey (combining aerial and ground counts) of the Central Valley in April 1992 tallied 231,000 shorebirds. The largest concentrations were 84,000 in the San Joaquin Basin (principally in the Grasslands area near Los Banos), 53,000 in the Colusa Basin, and 34,000 in the Tulare Lake Basin. Of these, 136,000 were small sandpipers (dominated by Western Sandpipers), 70,000 were dowitchers (primarily Long-billed Dowitchers), 7,400 were Black-necked Stilts, 6,900 were Whimbrels (mostly in the Tulare Lake Basin), 4,600 were American Avocets and 3,900 were Black-bellied Plovers.

The spring 1992 totals are only minimally representative of the Central Valley's capacity to support shorebirds, as the San Joaquin and Tulare Lake basins alone supported over 219,000 shorebirds in April 1990 and 226,000 in April 1991. Federal and state wildlife refuges (representing only parts of the Colusa, Butte and Sutter basins) held 50,000 and 65,000 shorebirds in April 1990 and 1991, respectively. These same refuges in April 1992 held 51,000 shorebirds, or 45% of the Central Valley total outside the San Joaquin and Tulare Lake basins. Stated another way, if, similarly, 55% of the shorebirds in the northern reaches of the Central Valley were in unsurveyed regions in the springs of 1990 and 1991, then the totals for the Central Valley in those years would have been roughly 330,000 and 370,000 shorebirds, respectively.

Complete coverage in winter 1991-92 of the central and southern reaches of the Central Valley (including the Yolo Basin, American Basin, Delta, Suisun Marsh, San Joaquin Basin and Tulare Lake Basin) found 119,000 shorebirds, 60,000 of which were in the San Joaquin Basin. Of the total, 72,000 were small sandpipers (predominantly Dunlins), 31,000 were Long-billed Dowitchers, 7,000 were Black-bellied Plovers and 4,500 were Black-necked Stilts. Coverage of the northern Sacramento Valley was incomplete, but an additional 6,000 shorebirds were found there on federal and state wildlife refuges. The San Joaquin Basin also held 60,000 shorebirds in the winter of 1990-91.

Coverage of the Central Valley in fall has been most complete in the San Joaquin Valley where totals were 83,000 and 33,000 shorebirds in 1990 and 1991, respectively. Unlike spring and winter when greatest numbers were on private duck clubs and refuges in the San Joaquin Basin, in fall about 65% of the shorebirds were concentrated in agricultural evaporation ponds and sewage ponds in the Tulare Lake Basin. High totals for the San Joaquin Valley in late August or early September were 24,000 small sandpipers (Westerns and Least), 17,000 dowitchers (mostly Long-billed Dowitchers), 13,000 Black-necked Stilts, 10,000 American Avocets, 8,400 Red-necked Phalaropes, 5,400 Wilson's Phalaropes, 2,900 Long-billed Curlews, 2,100 Black-bellied Plovers and 1,800 Greater Yellowlegs.

Willamette Valley of Oregon

Currently only fragmentary information is available on the importance of wetlands in the Willamette Valley to shorebirds. Censuses to be coordinated by the U.S. Fish and Wildlife Service beginning in January 1993 should remedy this situation.

INTERMOUNTAIN WEST

Washington

Fall counts at 11 sites in eastern Washington in 1991 tallied 4,200 shorebirds, of which 2,300 were Western Sandpipers. Limited data indicate that many fewer shorebirds use these wetlands in spring. Although more data are needed, it appears that wetlands of interior Washington are of minor importance to shorebirds migrating through the intermountain region.

Oregon

The Great Basin of southeastern Oregon has important wetland complexes at Summer Lake, Abert Lake, the Warner Valley and the Malheur-Harney Lakes Basin. In 1991 these wetlands combined held 14,000 shorebirds in spring and 60,000 in fall; numbers were slightly lower in 1990 in both seasons. The highest shorebird totals (all in fall) were 23,000 at Abert Lake in 1990, 21,000 at Summer Lake in 1991, 15,000 at Malheur Lake in 1991 and 8,100 at Hart Lake in the Warner Valley in 1990. The combined fall wetland totals for 1990 were dominated by 19,000 Western Sandpipers, 16,000 Red-necked Phalaropes, 6,800 Least Sandpipers and 3,500 American Avocets, whereas those in 1991 were dominated by 24,000 American Avocets, 16,000 Western Sandpipers, 7,600 Red-necked Phalaropes and 4,000 dowitchers. Spring counts in both years were dominated by about 3,500 American Avocets and from 4,000 to 8,000 small sandpipers, represented by slightly more Western than Least sandpipers.

Idaho

American Falls Reservoir and Lake Lowell are the most important sites known for shorebirds in Idaho, though many other reservoirs in the state remain unsurveyed. In fall 1990 American Falls Reservoir held 5,800 shorebirds and Lake Lowell held 11,000. Of the combined totals for these two sites, 13,000 were Western Sandpipers and 2,000 were American Avocets. No sites in Idaho are known to hold large numbers of shorebirds in spring (Taylor et al. 1992).

California

The Salton Sea -- holding up to 100,000 shorebirds in spring and fall -- is the most important site for shorebirds in eastern California. A partial count there in winter produced 22,000 shorebirds. Unlike the majority of inland sites the Salton Sea hosts hundreds of Willets and Marbled Godwits in winter. It is also the only California location where a small population of Stilt Sandpipers regularly winters. Over 50,000 Western Sandpipers have been counted in spring and fall, up to 10,000 Whimbrels in spring and 20,000 American Avocets and 10,000 Black-necked Stilts in fall. Dowitchers have exceeded 10,000 birds on one of three fall counts and all three spring counts. The Salton Sea was formed from 1905 to 1907 when structural flaws in a canal system allowed water to flow unchecked from the Colorado River to the White Water River Basin. Since then agricultural runoff has maintained the Sea and created habitat for large numbers of shorebirds.

The next largest concentrations of shorebirds found in the interior of California east of the Cascade-Sierra Nevada mountains were 36,000 at Mono Lake and 23,000 at Goose Lake in fall and 26,000 at Mono Lake, 18,000 at Honey Lake, 11,000 at Lower Klamath NWR, 9,400 at Goose Lake, 9,000 at Piute Ponds and 8,500 at Owens Lake in spring. Species composition varied considerably among sites but overall Western Sandpipers, Least Sandpipers and American Avocets were the most numerous shorebirds in both spring and fall.

Nevada

Most shorebirds in the state are concentrated in the Lahontan Valley and Humboldt Sink areas of western Nevada. High shorebird counts during Pacific Flyway surveys were 82,000 at Carson Lake and 77,000 at Stillwater Wildlife Management Area (WMA) in spring and 62,000 at Stillwater WMA, 24,000 at Humboldt WMA and 20,000 at Carson Lake in fall. Following our late April surveys, on 4 May 1990 an estimated 80,000 to 100,000 Long-billed Dowitchers were at Carson Lake, further demonstrating the importance of this area. Overall for both spring and fall the most numerous species of shorebirds in Nevada were small sandpipers (mostly Westerns), Long-billed Dowitchers and American Avocets.

Utah

Great Salt Lake is the only site in Utah known to hold large numbers of shorebirds. Pacific Flyway counts there have exceeded 100,000 shorebirds in fall and 24,000 in spring, though these counts do not adequately survey the tremendous phalarope populations that use the lake. Counting outside our survey period and using methods conducive to counting shorebirds using open water habitats, personnel from the Utah Division of Wildlife Resources in recent years have counted from 350,000 to 600,000 Wilson's Phalaropes and up to 300,000 Red-necked Phalaropes on Great Salt Lake in late July (Don Paul pers. comm.). Flyway Project counts of other large populations using the lake were 51,000 American Avocets, 22,000 Black-necked Stilts and 13,000 dowitchers in fall and 13,000 avocets in spring. Unlike other large interior wetlands, Great Salt Lake supports relatively few small sandpipers, but does support the largest concentrations of Marbled Godwits -- up to 2,100 in spring and 1,700 in fall.

Arizona and New Mexico

Of 12 sites first surveyed in 1991 (4 in Arizona and 8 in New Mexico), only 3 (all in New Mexico) held more than 1,000 shorebirds. These were Bosque del Apache NWR with 2,400 shorebirds in spring, Bitter Lake NWR with 1,500 in spring and Holloman Lake with 1,100 in fall. The most numerous species were Western Sandpiper in spring and Wilson's Phalarope in fall. More counts in the future will provide a better picture of shorebird use in these states.

GEOGRAPHIC PATTERNS OF SHOREBIRD USE

Beyond identifying the importance of various Pacific Flyway wetlands to shorebirds, data collected by this project also enable us to describe broad geographic patterns of shorebird use of wetlands throughout the flyway. Preliminary maps of overall shorebird use show greatest concentrations along the Pacific Coast and in California's Central Valley in spring with Great Basin wetlands taking on increasing importance in fall (Figures 2a and 2b). Flyway data can also be used to map patterns of shorebird use for individual species. In spring when it is the most numerous species in the flyway, the Western Sandpiper is most abundant on the coast but it is also widespread and numerous at that season in the interior (Figure 2c). An example of a species that concentrates almost exclusively in fall at interior sites is the American Avocet (Figure 2d). In spring the Marbled Godwit concentrates primarily on the coast, whereas the Whimbrel stages more at that season in the interior (Figures 3a and 3b). These are but a few examples of regional and seasonal differences in patterns of shorebird use that can be derived from Pacific Flyway Project data.



Figure 2. Pacific Flyway maps of concentrations of total shorebirds in spring (a) and fall (b) and of Western Sandpipers in spring (c) and American Avocets in fall (d).

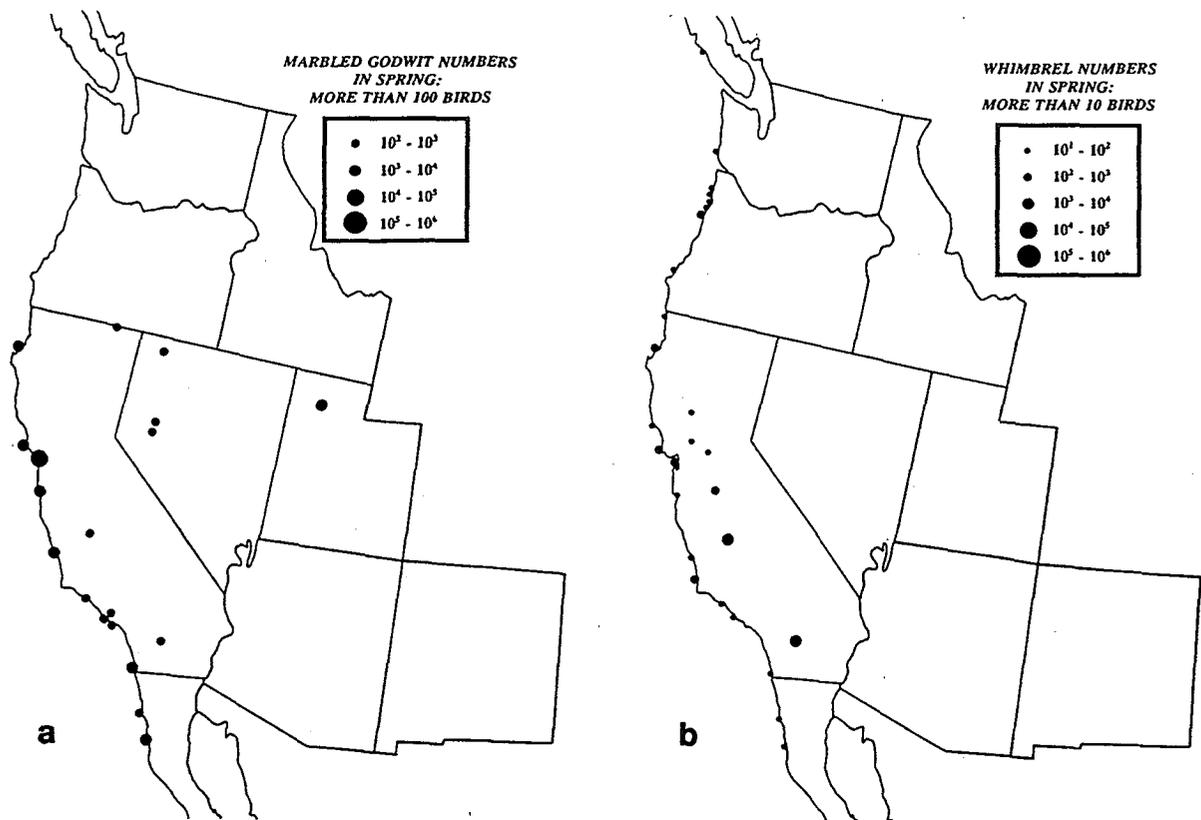


Figure 3. Pacific Flyway maps of concentrations of Marbled Godwits (a) and Whimbrels (b) in spring.

WINTER SHOREBIRD MOVEMENTS

In the winter of 1991-92 the Flyway Project began to investigate movements of color-marked Dunlin. Earlier census work on Point Reyes on the central California coast shows that numbers of Dunlin sometimes drop dramatically in winter during extended periods of heavy rainfall (Page et al. 1979). Biologists speculated that these birds were moving to interior sites.

From 12 December 1991 to 12 January 1992 PRBO dyed 51 Dunlin at Bolinas Lagoon and 25 Dunlin at Bodega Harbor yellow with a picric acid solution and color banded the birds with combinations indicating the site of capture. Both coastal and interior cooperators were asked to look for these birds and to report the details of all sightings to PRBO. Following periods of heavy rains in mid-December 1991 numbers of Dunlin on Bolinas Lagoon dropped from about 3,500 to 1,300 birds, and color-marked Dunlin began to be seen in San Francisco Bay. By late January and early February numbers of Dunlin on Bolinas Lagoon plummeted to 250 birds. In February at least three color-marked Dunlin were sighted in large flocks of Dunlin in the Delta and Yolo Basin of the lower

Sacramento Valley. Studies of Dunlin radio-tagged at Bolinas Lagoon also showed movements in the same period into the Delta and as far inland as the American Basin north of the city of Sacramento (Nils Warnock pers. comm.). These findings show that important movements of shorebirds do occur in winter and that in the same season some species rely on both coastal and interior wetlands for their survival.

FUTURE EMPHASIS

Because it is not possible to adequately characterize the importance of wetlands to shorebirds via one or more censuses in a single year we have established multi-year census objectives. Our goal is to obtain annually for three to five years one census in each wetland during both the peak of spring and fall migration and, where applicable, one during the nonmigratory winter period.

Now that we have obtained some censuses from almost all the important wetlands in the Flyway, we will strive in coming years to reach our census goal at all sites that have recently been incorporated in the census program while continuing censuses at sites that have already met the minimum census criteria. We stress the importance of obtaining data from all sites in the Flyway during the same period. Great changes may occur in the extent of interior wetlands during drought and wet cycles, and partial census coverage would not allow us to gauge population shifts among interior sites or between coastal and interior regions dictated by these changing habitat conditions. To date the project has collected most of its data during a drought period. We hope that wet conditions will prevail in upcoming years of the study so that we can assess the potential of wetlands to shorebirds under a range of climatic conditions.

In 1993 we will expand and consolidate work begun in California's Central Valley. This area deserves extra attention because its large size makes it very difficult to survey, limited data collected to date indicate it holds large numbers of shorebirds, and shorebirds there use a variety of managed wetlands and agricultural habitats that compete for precious water supplies.

As our census coverage becomes more complete we will increase our efforts to gather information on the nature, extent and seriousness of threats to wetlands upon which shorebirds depend.

It is clear that a project of the magnitude of the Pacific Flyway Project would not be possible without extensive voluntary census efforts coupled with the data contributed by a host of government agencies and private research organizations. We thank everyone who has helped on this project so far and encourage anyone interested in assisting in this collaborative effort to contact us at PRBO.

ACKNOWLEDGMENTS

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The Pacific Flyway Project has become a cooperative venture on a grand scale, and we are grateful to all who have supported our work in any way. At the risk of inadvertently leaving out important contributors, we would like to particularly thank the following groups and individuals for their help. Information on shorebird numbers in Baja California, Mexico, was kindly provided by Eduardo Palacios and Salvador Gonzalez in Ensenada and Fernando Heredia, Bernardo Sanabria and Carlos Sepúlveda in Guerrero Negro. The Southwest Division Naval Engineering Command, San Diego, and Tim Burr, Project Director, provided data from Mugu Lagoon, Seal Beach NWR and the Santa Margarita River mouth. The U.S. Fish and Wildlife Service at the San Francisco and San Pablo Bay NWR, PG&E, Cargill Incorporated, Oliver Brothers and Venture Corporation kindly provided access to their land on San Francisco Bay. Censuses in the Grassland Resource Conservation District of the San Joaquin Valley were made possible through the assistance of Gary Zahm and Joel Miller of the U.S. Fish and Wildlife Service; Pete Blake of the California Department of Fish and Game; Don Marciochi, Scott Lower, Veronica Woodruff and Melissa Cotta of the Grassland Water District; and Neal Nelson. Access to evaporation ponds in the southern San Joaquin Valley was provided by the respective owners and operators of Barbizon Farms, Carmel Ranch, Jack Stone Land Company, Jackson and Williams Farms, LeMoore Naval Air Station, Lost Hills Ranch, Lost Hills Water District, Martin Farms, Meyers Ranch, Pryse Farms, Sumner Peck Ranch, Tulare Lake Drainage District and Westlake Farms. Access to the Bakersfield Sewage Ponds was granted by the Bakersfield Department of Public Works. The commander of the Sierra Army Depot in Herlong provided access to restricted areas of Honey Lake. The Bureau of Land Management, California Department of Fish and Game, Oregon Department of Fish and Wildlife, Nevada Department of Wildlife, U.S. Fish and Wildlife Service and the Utah Division of Wildlife Resources were all very helpful in furnishing access and personnel to census shorebirds at lands and refuges under their jurisdiction. Likewise many landowners freely gave access to private wetlands.

We thank the hundreds of counters who have participated in the censuses summarized in this report. The following people deserve special mention because of their help, past and present, in organizing censuses at particular sites through January 1992:

COASTAL: **ALASKA:** Alaska Peninsula -- Joel Schmutz; Kodiak Island -- Richard MacIntosh; Anchorage area and Resurrection Bay -- Thede Tobish; Kachemak Bay -- George West; Copper River delta -- Mary Anne Bishop; Mendenhall wetlands -- Richard Gordon; Stikine River delta -- Chris Iverson. **BRITISH COLUMBIA** -- Rob Butler. **WASHINGTON:** Puget Sound and Willapa Bay -- Cascadia Research Collective; Grays Harbor -- Louise Vicencio; **WASHINGTON-OREGON BORDER:** Columbia River estuary -- Al Clark, Rebecca Goggans. **OREGON:** Seaside/Astoria sites -- Neal Maine; Tillamook Bay -- Craig Roberts; Sand Lake -- Verne Marr; Nestucca Bay -- Roy Lowe; Yaquina Bay -- Kathy Merrifield; Alsea Bay -- Dave Jensen; Siuslaw River estuary -- Tom Mickel; Coos Bay -- Jan Hodder; Coquille River estuary -- Larry Thornburgh; New River estuary -- Steve Langenstein; outer coast beaches and other estuaries -- Jim Collins, Rebecca Goggans, Joe Pesek and Susan Reimer. **CALIFORNIA:** Del Norte County -- Alan Barron; Humboldt Bay -- Mark Colwell, Eric Nelson; Mendocino County -- Bill Perry; Bodega Harbor and Estero Americano -- Peter Connors, John Maron; Tomales Bay -- John Kelly; San Francisco Bay -- Leora Feeney, Lina Prairie and Bob Richmond; Monterey Bay -- Bernadette Ramer; Morro Bay -- Marlin Harms, Phil Persons; Santa Maria River Mouth -- Jack Dougherty; Santa Barbara County -- Helen Matelson, Nancy States; Mugu Lagoon -- Tom Keeney; Los Angeles County -- Kimball Garrett; Bolsa Chica -- Esther Burkett, Loren Hays; Upper Newport Bay -- John Bradley, Loren Hays and Dick Kust; Seal Beach NWR and Santa Margarita River Mouth -- Dick Zemball; San Luis Rey River Mouth -- Max Johnson, Cora Wilson; Buena Vista Lagoon -- Max Johnson; Agua Hedionda -- Bob Chaney, Freeman Hall; Baticuitos Lagoon -- CC Gorman, Herb Williams; San Elijo Lagoon -- Robert Patton; San Dieguito Lagoon -- Jayne Lesley; Penasquitos Lagoon -- Alice DeBolt, Keith Smeltzer; San Diego Bay -- Patrice Ashfield, Deborah Parker-Chapman. **BAJA CALIFORNIA** -- Eduardo Palacios.

INTERIOR: **WASHINGTON** -- Lisa Fitzner, Randy Hill, Dale Litzenberger, Andy Stepniewski and Carole Vande Voorde. **OREGON** -- Mike Allen, Chris Carey, Gary Ivey, George Keister, Nick Lesthaby and Marty St. Louis. **IDAHO:** American Falls Reservoir and Lake Lowell -- Dan Taylor, Charlie Trost; Minidoka NWR -- Marti Collins; Mann's Lake -- Carole Vande Voorde, Merlene Koler. **NEVADA:** western Nevada -- Bill Henry, Anne Janik and Larry Neel; eastern Nevada -- Pete Bradley, Jeff Mackay; southern Nevada -- Connie Lyons. **UTAH** -- Suzanne Fellows. **CALIFORNIA:** Honey Lake and Sierra Valley -- Lin Jensen, Karen Laslo; Modoc County -- Paul Roush; Modoc NWR -- Kevin DesRoberts, Ron Ryno; Ash Creek WA -- Frances Bidstrup; Klamath Basin/Tule Lake -- Ray Ekstrom, Steve Summers; Sacramento Valley Refuges -- Greg Mensik, Eric Nelson and Mike Wolder; Colusa County -- Jeff Davis; Gray Lodge WA -- John Ranlett; Sacramento County -- Tim Manolis; Yolo County -- Ted Beedy; Upper Beach Lake -- Dan Airola; Stanislaus County -- Harold Reeve; Grassland Resource Conservation District -- Tim Poole; southern San Joaquin Valley Evaporation and Sewage Ponds -- Bob Barnes, Mark Chichester, Sam

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Fitton and John Wilson; Kern NWR -- Joe Engler; Preirrigation fields in Tulare Lake Basin -- Doug Barnum; Mono Lake -- Emilie Strauss; Crowley Lake and Tinnemaha Reservoir -- Tom and Jo Heindel; Owens Lake -- Michael Prather; Harper Dry Lake -- Eugene Cardiff; China Lake -- David Blue; EAFB Sewage Ponds -- Matt Heindel; Piute Ponds, EAFB and Rio Hondo Spreading Basin -- Kimball Garrett; Lake Isabella -- Robert Cheney, Kern River Research Center; San Jacinto Valley -- David Feliz; Salton Sea -- Robert McKernan. **ARIZONA:** Havasu NWR -- Greg Wolf; Buenos Aires NWR and Wilcox Playa -- Wayne Shifflett; San Bernadino NWR -- Kevin Cobble. **NEW MEXICO:** Morgan Lake -- Alan Nelson; Jicarilla Lakes -- Dale Stahlecker; Maxwell NWR -- Jerry French; Zuni Indian Reservation -- David Cleary; Las Vegas NWR -- Joe Rodriguez, Jr.; Bosque del Apache NWR -- John Taylor; Bitter Lake NWR -- Betsy Rosenbaum; Holloman Lake -- Catherine Sandell.

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APPENDIX 1a. COASTAL LOCATIONS SURVEYED FOR SHOREBIRDS, 1988 TO 1991.

<u>SITE</u>	<u>AREA</u>	<u>MAXIMUM</u>	<u>SEASON</u>	<u>#CENSUSES</u>
ALASKA				
	ANCHORAGE "BOWL"	467	S	1
	SEWARD BEACH, RESURRECTION BAY	5706	S	1
	KACHEMAK BAY	16793	S	2
	SELDOVIA BAY	2892	S	1
	WOMENS BAY, KODIAK ISLAND	31	S	1
	MIDDLE BAY, KODIAK ISLAND	6	S	1
	KALSIN BAY, KODIAK ISLAND	36	S	1
	CINDER RIVER LAGOON	1311	S	1
	PORT HEIDEN	288	S	1
	SEAL ISLANDS	62	S	1
	NELSON LAGOON	103	S	1
	COPPER RIVER DELTA	186434	S	1
	MENDENHALL WETLANDS	2535	S	1
	STIKINE RIVER DELTA	240053	S	1
BRITISH COLUMBIA				
	TOFINO MUDFLATS	15081	S	2
	FRASER RIVER DELTA	166462	S	4
	SIDNEY ISLAND	1042	F	1
WASHINGTON				
*	PUGET SOUND	113568	S	3
GRAYS HARBOR CO.	GRAYS HARBOR	261353	S	2
PACIFIC COUNTY	WILLAPA BAY	134973	S	2
OREGON				
CLATSOP COUNTY	COLUMBIA RIVER ESTUARY	149862	S	3
	NECANICUM RIVER ESTUARY	790	F	2
TILLAMOOK COUNTY	TILLAMOOK BAY	4573	S	1
	NETARTS BAY	4818	F	2
	SAND LAKE	307	F	3
	NESTUCCA BAY	531	S	3
LINCOLN COUNTY	SALMON RIVER ESTUARY	9	F	1
	SILETZ BAY	1998	F	4
	YAQUINA BAY	1740	S	4
	ALSEA BAY	1592	F	3
LANE COUNTY	SIUSLAW RIVER ESTUARY	2529	S	3
DOUGLAS COUNTY	UMPQUA RIVER ESTUARY/WINCHESTER BAY	1375	S	1
COOS COUNTY	COOS BAY	7484	F	4
	BANDON MARSH/COQUILLE RIVER ESTUARY	10271	F	4
	NEW RIVER ESTUARY	3755	S	2
	(OUTER COASTAL BEACHES)	13563	F	1
CALIFORNIA				
DEL NORTE COUNTY	SMITH RIVER MOUTH	3340	F	9
	LAKES TALAWA AND EARL	13310	F	9
	POINT ST. GEORGE	1528	F	9
	CRESCENT CITY HARBOR	675	F	9
HUMBOLDT COUNTY	HUMBOLDT BAY	79353	W	9
	EEL RIVER MOUTH	1911	S	2
	MATTOLE RIVER MOUTH	144	F	1
MENDOCINO COUNTY	PUDDING CREEK MOUTH	185	F	1
	GARCIA RIVER MOUTH	511	W	6
	GUALALA RIVER MOUTH	7	F	3
SONOMA COUNTY	SHELL BEACH/SEA RANCH	31	S	2
	BODEGA HARBOR	12901	W	10
	ESTERO AMERICANO	2855	F	5
MARIN COUNTY	TOMALES BAY	20689	W	10
	ABBOTTS LAGOON	652	F	10
	DRAKES ESTERO	13620	W	10
	LIMANTOUR ESTERO	5527	W	10
	BOLINAS LAGOON	12287	S	10
	BOLINAS SEWAGE PONDS	40	F	7
**	SAN FRANCISCO BAY	931561	S	10
SAN MATEO COUNTY	PESCADERO MARSH	496	F	4
	ANO NUEVO & WADDELL BEACH	691	F	8
	DAVENPORT LANDING	60	W	1
	LAGUNA CREEK BEACH	170	F	2
	WOODROW AVENUE TO ALIMAR AVENUE	150	W	2

APPENDIX 1a (CONTINUED)

<u>SITE</u>	<u>AREA</u>	<u>MAXIMUM</u>	<u>SEASON</u>	<u>#CENSUSES</u>
CALIFORNIA (CONTINUED)				
SANTA CRUZ COUNTY	CORCORAN LAGOON	70	F	6
	PAJARO RIVER/WATSONVILLE SLOUGH	1832	F	9
MONTEREY COUNTY	ELKHORN SLOUGH	32109	F	10
	SALINAS RIVER	1084	S	9
	SALINAS SEWAGE PONDS	2991	F	3
	(OUTER COASTAL BEACHES)	5039	S	9
SAN LUIS OBISPO CO.	MORRO BAY	20205	W	11
	SANTA MARIA RIVER MOUTH	513	S	4
SANTA BARBARA CO.	DEVEREUX	890	S	8
	GOLETA SLOUGH	179	S	8
	SANTA BARBARA BIRD REFUGE	442	F	3
VENTURA COUNTY	SANTA CLARA RIVER MOUTH	341	S	2
	MUGU LAGOON	32949	S	7
LOS ANGELES COUNTY	MALIBU LAGOON	270	W	7
	CABRILLO BEACH	5	F	1
	LOS ANGELES RIVER	5812	F	3
	SAN GABRIEL RIVER	765	S	4
ORANGE COUNTY	SEAL BEACH NWR	5042	W	5
	BOLSA CHICA	5406	F	6
	SANTA ANA RIVER MOUTH	34	F	2
	UPPER NEWPORT BAY	14825	W	7
SAN DIEGO COUNTY	SANTA MARGARITA RIVER MOUTH	1624	F	6
	SAN LUIS REY RIVER MOUTH	79	F	4
	BUENA VISTA LAGOON	80	S	3
	AGUA HEDIONDA	431	S	5
	BATIQUITOS LAGOON	2624	F	8
	SAN ELJO LAGOON	2285	F	8
	SAN DIEGUITO LAGOON	368	W	8
	PENASQUITOS LAGOON	280	S	8
	MISSION BAY & FLOOD CONTROL CHANNEL	6231	F	8
	SAN DIEGO BAY	17986	F	8
	TIJUANA RIVER ESTUARY	2724	F	8
BAJA CALIFORNIA, MEXICO				
	ESTERO DE PUNTA BANDA	6680	F	7
	BAHIA DE SAN QUINTIN	27291	W	6
	BAHIA DE SAN QUINTIN SALT PONDS	2751	F	2
	LAGUNA FIGUEROA	3475	W	2
	LAGUNA GUERRERO NEGRO	21787	F	1
	LAGUNA OJO DE LIEBRE	43913	F	1
	LAGUNA SAN IGNACIO	16199	W	1
	BAHIA MAGDALENA	7203	W	1
	NORTHERN GULF OF CALIFORNIA	486	S	1

KEY TO APPENDIX 1a

F FALL
W WINTER
S SPRING

* PUGET SOUND -- THURSTON, MASON, PIERCE, SNOHOMISH, SKAGIT, WHATCOM, ISLAND, KITSAP, SAN JUAN, CLALLAM AND JEFFERSON COUNTIES

** SAN FRANCISCO BAY -- SONOMA, NAPA, SOLANO, MARIN, SAN FRANCISCO, CONTRA COSTA, ALAMEDA, SAN MATEO AND SANTA CLARA COUNTIES

APPENDIX 1b. INTERIOR WETLANDS SURVEYED FOR SHOREBIRDS, 1988 TO 1991.

<u>SITE</u>	<u>AREA</u>	<u>MAXIMUM</u>	<u>SEASON</u>	<u># CENSUSES</u>
WASHINGTON				
LINCOLN COUNTY	REARDON PONDS	346	F	1
GRANT COUNTY	SOAP LAKE	241	F	1
	HIAWATHA ROOKERY	206	F	1
	WASTEWAYS ALONG DODSON ROAD	65	S	1
	CRAB CREEK PONDS	135	F	2
GRANT/ADAMS COS.	COLUMBIA NWR	58	F	2
ADAMS COUNTY	OTHELLO SEWAGE PONDS/ "PARA" WETLANDS	667	F	2
	SCABROOK FEEDLOT	758	F	1
BENTON COUNTY	BYRON PONDS, SUNNYSIDE WA	106	F	2
FRANKLIN COUNTY	KAHLOTUS LAKE	689	F	1
WALLA WALLA CO.	WALLA WALLA RIVER DELTA	954	F	1
ASOTIN COUNTY	ANATONE PONDS	1	S	1
	SNAKE RIVER	14	S	2
	ACME CEMENT	11	S	1
	HANFORD RANCH	47	S	1
	BARKER RANCH	4	S	1
OREGON				
COLUMBIA/ MULTNOMAH COS.	SAUVIE ISLAND	4376	F	3
LINN COUNTY	4 MILES WEST OF BROWNSVILLE	3	S	1
LANE COUNTY	WEST BEACON	691	S	1
LAKE COUNTY	ALKALI LAKE	64	F	1
	SUMMER LAKE	21082	F	4
	ABERT LAKE	23276	F	4
	CAMPBELL LAKE	1593	S	1
	LOWER CAMPBELL LAKE	19	S	1
	FLAGSTAFF LAKE	173	S	1
	MUGWUMP LAKE	8	S	1
	SWAMP LAKE	40	S	1
	ANDERSON LAKE	134	S	3
	BTWN ANDERSON & HART LAKES	452	S	1
	HART LAKE	8104	F	3
	CRUMP LAKE	454	F	3
	PELICAN LAKE	50	F	4
	GREASER LAKE	118	S	2
	HWY 140 EAST OF ADEL	6	S	1
	MC RANCH	289	S	4
	COLEMAN LAKE	40	S	2
HARNEY COUNTY	STINKING LAKE	1400	S	3
	HARNEY LAKE	1262	F	4
	MUD LAKE	1360	F	4
	MALHEUR LAKE	14815	F	4
IDAHO				
*	AMERICAN FALLS RESERVOIR	5780	F	3
CANYON COUNTY	LAKE LOWELL	11457	F	1
**	GRAYS LAKE NWR	10	S	1
POWER COUNTY	MINIDOKA NWR	24	S	1
NEZ PIERCE COUNTY	MANN LAKE	127	F	2
NEVADA				
WASHOE COUNTY	MOSQUITO LAKE	41	S	1
	ALKALI LAKE	452	S	1
	MASSACRE LAKE	511	S	1
	FORTYNINE LAKE	36	S	1
	PYRAMID LAKE	264	S	2
	LEMMON VALLEY SEWAGE PONDS	91	F	1
	LEMMON LAKE	220	S	1
	LEMMON VALLEY WAREHOUSE PONDS	53	S	1
	WASHOE LAKE WETLANDS	67	S	2
	MUD LAKE	22	S	1
	WABUSKA MARSHES	60	F	3
	MASON VALLEY WMA	760	S	3
WASHOE/PERSHING	WINNEMUCCA LAKE	46	S	1
PERSHING/CHURCHILL	HUMBOLDT WMA	23740	F	3

APPENDIX 1b (CONTINUED)

<u>SITE</u>	<u>AREA</u>	<u>MAXIMUM</u>	<u>SEASON</u>	<u># CENSUSES</u>
NEVADA (CONTINUED)				
CHURCHILL COUNTY	STILLWATER WMA	76988	S	6
	SODA LAKES	889	F	6
	CARSON LAKE	81933	S	6
	MAHALA SLOUGH	145	F	4
	MASSIE SLOUGH	109	S	1
	SHECKLER RESERVOIR	572	F	2
	HARMON RESERVOIR	104	F	2
	LETER RESERVOIR	165	S	1
	S-LINE RESERVOIR	71	S	2
	OLD RIVER RESERVOIR	61	F	1
LYON COUNTY	ARTESIA LAKE	254	S	1
	FERNLEY WMA	802	F	5
HUMBOLDT COUNTY	CONTINENTAL LAKE	2767	S	1
	GRIDLEY LAKE	777	S	1
	SUMMIT LAKE	488	S	1
	DEER CREEK	74	S	1
	SOLDIER MEADOWS	1	S	1
ELKO COUNTY	DAKE RESERVOIR	128	S	1
	BLUE LAKES	303	S	2
	SOUTH FORK RESERVOIR	242	S	1
	JIGGS RESERVOIR	32	S	1
	FRANKLIN LAKE	91	S	1
	RUBY LAKE NWR	537	S	2
WHITE PINE COUNTY	NEWARK VALLEY	86	S	1
	ILLIPAH RESERVOIR	25	S	1
	WARM SPRINGS RESERVOIR	28	S	1
LINCOLN COUNTY	PAHRANAGAT NWR & KEY PITMAN WMA	536	F	2
CLARK COUNTY	GLENDALE POND	2	F	2
	LOGENDALE RESERVOIR	108	F	2
	OVERTON WMA	356	S	1
	LAKE MEAD NRA	104	S	2
	LAS VEGAS SEWAGE PONDS	20	S	1
	HENDERSON SEWAGE PONDS	450	F	2
UTAH				
***	GREAT SALT LAKE	113703	F	6
JUAB COUNTY	FISH SPRINGS NWR	851	S	2
CACHE COUNTY	THE "BARRENS"	237	S	2
ARIZONA				
MOHAVE COUNTY	HAVASU NWR	210	F	2
PIMA COUNTY	BUENOS AIRES NWR	43	S	2
COCHISE COUNTY	WILCOX PLAYA	330	S	2
	SAN BERNADINO NWR	1	S	1
NEW MEXICO				
SAN JUAN COUNTY	MORGAN LAKE	10	S	1
RIO ARRIBA COUNTY	JICARILLA LAKES	448	S	2
COLFAX COUNTY	MAXWELL NWR	449	F	2
MCKINLEY COUNTY	ZUNI INDIAN RESERVATION LAKES	320	S	2
SAN MIGUEL COUNTY	LAS VEGAS NWR	138	S	1
SOCORRO COUNTY	BOSQUE DEL APACHE NWR	2431	S	2
CHAVES COUNTY	BITTER LAKE NWR	1485	S	2
OTERO COUNTY	HOLLOMAN LAKE	1102	F	2
CALIFORNIA				
NORTHEASTERN CALIFORNIA				
SISKIYOU COUNTY	BUTTE VALLEY WA	573	F	3
	LOWER KLAMATH NWR	10592	S	4
	TULE LAKE NWR	259	S	4
MODOC COUNTY	CLEAR LAKE	228	S	2
	BIG SAGE RESERVOIR	13	S	1
	GOOSE LAKE	23399	F	4
	MUD LAKE	6	S	1
	UPPER ALKALI LAKE	3475	S	3
	MIDDLE ALKALI LAKE	29	S	2
	LOWER ALKALI LAKE	4398	S	3
	MODOC NWR	502	S	3

APPENDIX 1b (CONTINUED)

<u>SITE</u>	<u>AREA</u>	<u>MAXIMUM</u>	<u>SEASON</u>	<u># CENSUSES</u>
NORTHEASTERN CALIFORNIA (CONTINUED)				
MODOC COUNTY	DONOVAN RESERVOIR	38	F	2
	LYNETA RANCH WILD RICE PADDIES	1577	F	2
	WEST VALLEY RESERVOIR	32	S	1
LASSEN COUNTY	JESS VALLEY MARSHES	13	S	1
	ASH CREEK WA	63	F	4
	SILVA FLAT RESERVOIR	69	S	2
	DILLON LAKE	19	S	1
	SAID VALLEY RESERVOIR	33	S	2
	MADLINE PLAINS	111	S	2
	WILLOW CREEK WA	837	S	2
PLUMAS/SIERRA CO.	HONEY LAKE	17884	S	5
	SIERRA VALLEY	552	S	4
CENTRAL VALLEY				
Colusa Basin		62906	S	5
TEHAMA COUNTY	CAPAY	180	S	1
GLENN COUNTY	SACRAMENTO NWR	22692	S	5
COLUSA COUNTY	DELEVAN NWR	29349	S	5
	COLUSA NWR	12832	S	5
Butte Basin		3927	S	5
GLENN COUNTY	ROAD Z (7 MILE LANE)	12	W	1
BUTTE COUNTY	CHICO OXIDATION PONDS	104	S	1
	SACRAMENTO RIVER NWR:	1042	W	1
	LLANO SECO UNIT			
	GRAY LODGE WA	3649	S	5
	WEST BUTTE ROAD	170	S	1
COLUSA COUNTY	GRIDLEY ROAD	47	W	1
	PAUL WATTIS SANCTUARY	12	W	1
	BEHRING RANCH	642	W	1
	COLUSA BYPASS	7	W	1
	BUTTE SINK NWR	10	F	2
SUTTER COUNTY		28697	W	5
Yolo Basin		18949	W	2
YOLO COUNTY	YOLO BYPASS	18949	W	2
	WOODLAND SUGAR PONDS	1985	F	2
	OLD WOODLAND SEWAGE PLANT	30	S	1
	MAGGOT PONDS	46	S	1
	TRESSLE PONDS	401	S	1
	ROAD 25	21	S	1
	CONAWAY RANCH	3151	W	2
	WEST DAVIS PONDS (F STREET)	22	F	1
	DAVIS SEWAGE PONDS	1165	F	3
	DAVIS LANDFILL WETLANDS	10	S	1
	LAKE WASHINGTON	6	F	2
	MACE RANCH	4	W	1
	MIDWAY POND	269	W	1
	"LAUREL G" PROPERTY	6324	W	1
	CHANEY LAKE	25	S	1
SOLANO COUNTY	LAGOON VALLEY LAKE	109	F	1
Sutter Basin		7199	S	3
SUTTER COUNTY	SUTTER NWR	7199	S	4
	SUTTER BYPASS	200	W	1
	DINGVILL	2000	W	1
American Basin		17920	W	3
YUBA COUNTY	ALOHA CLUB	487	W	1
	DISTRICT 10	1821	W	1
	TRIANGLE: HWY 70, HWY 65 & BEAR RIVER	2351	W	1
SUTTER COUNTY	W OF HWY 70/99, E OF SACTO RIVER & N OF SANKEY RD	85	W	1
SUTTER/PLACER COS.	COON CREEK - AUBURN RAVINE CREEK	6477	W	1
PLACER COUNTY	MOORE ROAD RICE FIELD	6464	W	1
SACRAMENTO CO.	NATOMAS DRAIN	2708	F	3
	SACRAMENTO AIRPORT SEWAGE POND	123	F	1
Suisun Marsh		5716	S	2
SOLANO COUNTY	SUISUN MARSH	5716	S	2

APPENDIX 1b (CONTINUED)

<u>SITE</u>	<u>AREA</u>	<u>MAXIMUM</u>	<u>SEASON</u>	<u># CENSUSES</u>
CENTRAL VALLEY OF CALIFORNIA (CONTINUED)				
Sacramento-San Joaquin River Delta				
SACRAMENTO CO.	UPPER BEACH LAKE	12006	W	3
	NORTH STONE LAKE	4090	S	3
	DELTA	11	S	1
SAN JOAQUIN COUNTY	LODI SEWAGE PONDS	11710	W	1
	STOCKTON SEWAGE PONDS	575	S	2
	TRACY SEWAGE PONDS	173	S	1
		148	S	1
San Joaquin Basin				
STANISLAUS COUNTY	MODESTO SEWAGE PONDS	185825	S	6
	CERES SEWAGE PONDS	2561	S	2
MERCED COUNTY	NORTH GRASSLANDS	271	W	1
	EAST GRASSLANDS	100051	S	6
	SOUTH GRASSLANDS	7438	S	5
	KESTERSON NWR	64910	S	6
	SAN LUIS NWR	9050	W	5
	MERCED SEWAGE PONDS	2364	S	6
	MERCED NWR	276	W	1
	VOLTA WA	8851	S	5
	LOS BANOS WA	11008	S	6
	AGRICULTURAL LAND	2598	W	5
		1542	F	2
Tulare Lake Basin				
FRESNO COUNTY	MENDOTA WA	75623	S	7
TULARE COUNTY	BRAVO LAKE	30800	S	6
	POND AT HWY 43 & ROAD 64	40	S	1
	ALPAUGH IRRIGATION DISTRICT	189	W	1
KINGS COUNTY	KINGS RIVER NEAR LEMOORE	98	W	1
	PRE-IRRIGATION FIELDS, TULARE LAKE BED	47	W	1
	CORCORAN IRRIGATION DISTRICT	1023	W	1
KERN COUNTY	KERN NWR	238	W	1
	KERN-WASCO DUCK CLUBS	808	W	2
	LAKE WOOLOMES	972	W	1
	SEMITROPIC/GOOSE LAKE	1733	W	1
	FAMOSA POND	309	W	2
	BUENA VISTA LAKE	2	W	1
	ARVIN AREA DUCK CLUBS	23	S	1
		50	W	1
Sewage Ponds				
FRESNO COUNTY	FRESNO-CLOVIS	1667	W	2
	ORANGE COVE	26	S	2
FRESNO/KINGS COS.	LEMOORE NAVAL AIR STATION	61	W	1
KINGS COUNTY	LEMOORE	136	W	1
	HANFORD	1646	SU	4
	CORCORAN	11993	S	5
TULARE COUNTY	DINUBA	2233	S	2
	VISALIA	6224	S	4
	WOODLAKE	200	S	1
	EXETER	178	S	1
	TULARE	1175	S	1
	LINDSAY	434	S	1
	PIXLEY	65	W	1
	EARLIMART	124	W	1
KERN COUNTY	DELANO	43	W	1
	BAKERSFIELD	2396	S	6
	TENNECO PONDS	4484	S	4
Evaporation Ponds				
FRESNO COUNTY	"TRANQUILITY" PONDS	20	F	1
	SUMNER PECK	36	SU	3
	BRITZ FIVE POINTS	19	S	2
KINGS COUNTY	JACK STONE LAND CO.	617	S	4
	WESTLAKE FARMS NORTH	3354	W	6
	FABRY	15	W	1
	MEYERS RANCH	715	S	4
	BARBIZON FARMS	6169	SU	4
	TULARE LAKE DRAINAGE DISTRICT NORTH	1024	SU	5
	WESTLAKE FARMS SOUTH	7437	S	6

APPENDIX 1b (CONTINUED)

<u>SITE</u>	<u>AREA</u>	<u>MAXIMUM</u>	<u>SEASON</u>	<u># CENSUSES</u>
CENTRAL VALLEY OF CALIFORNIA (CONTINUED)				
KINGS COUNTY	J & W FARMS	6261	SU	4
	TULARE LAKE DD HACIENDA RANCH	33724	SU	6
	4J CORPORATION	27	S	1
TULARE COUNTY	PRYSE FARMS	637	S	4
	BOWMAN FARMS	755	SU	5
	MORRIS FARMS	421	W	4
	MARTIN FARMS	1896	F	6
KINGS/KERN COS.	TULARE LAKE DRAINAGE DISTRICT SOUTH	30020	F	5
KERN COUNTY	LOST HILLS WATER DIST. (WESTFARMERS)	1090	SU	5
	CARMEL RANCH	3174	SU	5
	LOST HILLS RANCH (LATTER DAY SAINTS)	941	SU	5
	RAINBOW RANCH	201	W	1
EASTERN & SOUTHERN CALIFORNIA				
MONO COUNTY	BRIDGEPORT RESERVOIR	1313	F	1
	MONO LAKE	36338	F	6
	LITTLE HOT CREEK	12	S	1
	HOT CREEK GORGE	9	S	1
	ALKALI PONDS NORTH OF CROWLEY LAKE	450	S	1
	CROWLEY LAKE	1963	F	4
INYO COUNTY	OWENS LAKE	8497	S	6
	TINNEMAHA RESERVOIR	1048	S	4
KERN COUNTY	ISABELLA LAKE	389	F	3
KERN/SAN BERNADINO	CHINA LAKE	617	F	6
SAN BERNADINO CO.	HARPER LAKE	2114	S	5
LOS ANGELES CO.	EDWARDS AIR FORCE BASE SEWAGE PONDS	1247	F	2
	PIUTE PONDS, EDWARDS AIR FORCE BASE	8985	S	6
	LANCASTER SEWAGE PONDS	375	F	1
LOS ANGELES CO.	RIO HONDO SPREADING BASIN	997	S	1
RIVERSIDE COUNTY	SAN JACINTO WA	345	F	1
RIVERSIDE/IMPERIAL	SALTON SEA	105570	F	7

KEY TO APPENDIX 1b

F FALL
W WINTER
S SPRING
SU SUMMER

- * AMERICAN FALLS RESERVOIR -- BINGHAM, POWER AND BANNOCK COUNTIES
- ** GRAYS LAKE NWR -- BINGHAM, BONNEVILLE AND CARIBOU COUNTIES
- *** GREAT SALT LAKE -- BOX ELDER, TOOELE, DAVIS AND WEBER COUNTIES

Appendix 2b: Spring shorebird abundance in interior wetlands; more than 1000 birds.

- 1 - 10¹
- 10¹ - 10²
- 10² - 10³
- 10³ - 10⁴
- 10⁴ - 10⁵
- 10⁵ - 10⁶

	Black-bellied Plover	Semipalmated Plover	Black-necked Stilt	American Avocet	Yellowlegs	Willet	Whimbrel	Long-billed Curlew	Marbled Godwit	Red Knot	Sanderling	Western Sandpiper	Least Sandpiper	Dunlin	Dowitchers	Wilson's Phalarope	Red-necked Phalarope	Total Shorebirds
OREGON																		
Summer Lake	•	•	•	•	•	•		•	•			•	•	•	•	•		•
Abert Lake			•	•	•	•		•				•	•	•	•	•		•
Campbell Lake		•		•		•			•			•	•	•				•
Malheur Lake	•		•	•	•	•		•	•			•	•	•	•			•
NEVADA																		
Humboldt WMA		•	•	•	•	•			•			•	•	•	•	•	•	•
Stillwater WMA	•	•	•	•	•	•		•	•		•	•	•	•	•	•	•	•
Carson Lake	•	•	•	•	•	•		•	•			•	•	•	•	•	•	•
Continental Lake		•		•		•		•	•			•	•					•
UTAH																		
Great Salt Lake	•	•	•	•	•	•		•	•			•	•		•	•		•
NEW MEXICO																		
Bosque Del Apache NWR		•	•	•	•			•				•	•		•	•		•
Bitter Lake NWR			•	•	•			•	•			•	•	•	•	•		•
CALIFORNIA																		
<i>CENTRAL VALLEY</i>																		
Colusa Basin	•	•	•	•	•		•	•				•	•	•	•	•		•
Sacramento NWR	•	•	•	•	•			•				•	•	•	•	•		•
Delevan NWR	•	•	•	•	•			•				•	•	•	•	•		•
Colusa NWR	•		•	•	•		•	•				•	•	•	•	•		•
Butte Basin	•		•	•	•							•	•	•	•	•		•
Gray Lodge WA	•		•	•	•							•	•	•	•	•		•
Sutter Basin			•	•	•			•				•	•	•	•	•		•
Sutter NWR			•	•	•			•				•	•	•	•	•		•
Suisun Marsh	•		•	•	•	•			•			•	•	•	•	•		•
Sacto-S. Joaquin R. Delta	•	•	•	•	•	•	•	•				•	•	•	•	•		•
Upper Beach Lake	•	•	•	•	•	•	•					•	•	•	•	•		•

Appendix 2b (Cont.): Spring shorebird abundance in interior wetlands; more than 1000 birds.

- 1 - 10¹
- 10¹ - 10²
- 10² - 10³
- 10³ - 10⁴
- 10⁴ - 10⁵
- 10⁵ - 10⁶

Black-bellied Plover
 Semipalmated Plover
 Black-necked Stilt
 American Avocet
 Yellowlegs
 Willet
 Whimbrel
 Long-billed Curlew
 Marbled Godwit
 Red Knot
 Sanderling
 Western Sandpiper
 Least Sandpiper
 Dunlin
 Dowitchers
 Wilson's Phalarope
 Red-necked Phalarope
 Total Shorebirds

CALIFORNIA (Continued)

CENTRAL VALLEY (Continued)

	Black-bellied Plover	Semipalmated Plover	Black-necked Stilt	American Avocet	Yellowlegs	Willet	Whimbrel	Long-billed Curlew	Marbled Godwit	Red Knot	Sanderling	Western Sandpiper	Least Sandpiper	Dunlin	Dowitchers	Wilson's Phalarope	Red-necked Phalarope	Total Shorebirds
<i>San Joaquin Basin</i>	•	•	•	•	•	•	•	•	•			•	•	•	•		•	•
Modesto Sewage Ponds	•			•	•		•					•	•	•	•			•
North Grasslands	•	•	•	•	•		•	•	•			•	•	•	•			•
East Grasslands	•		•	•	•		•	•	•			•	•	•	•			•
South Grasslands	•	•	•	•	•		•	•	•			•	•	•	•		•	•
San Luis NWR			•	•	•	•		•	•			•	•	•	•			•
Merced NWR	•	•	•	•	•		•	•	•			•	•	•	•			•
Volta WA	•		•	•	•	•	•	•	•			•	•	•	•			•
Los Banos WA		•	•	•	•		•	•	•			•	•	•	•			•
<i>Tulare Lake Basin</i>	•	•	•	•	•	•	•	•	•			•	•	•	•	•	•	•
Mendota WA	•	•	•	•	•		•	•	•			•	•	•	•			•
Hanford Sewage Ponds	•		•	•	•							•	•	•	•			•
Corcoran Sewage Ponds	•	•	•	•			•		•			•	•	•	•			•
Dinuba Sewage Ponds			•	•	•							•	•	•	•			•
Visalia Sewage Ponds	•		•		•							•	•	•		•		•
Tulare Sewage Ponds			•	•								•	•	•	•			•
Bakersfield Sewage Ponds	•	•	•	•	•	•	•	•	•			•	•	•	•	•	•	•
Tenneco Ponds		•	•	•	•							•	•	•	•			•
Westlake Farms EP (N)		•	•	•	•		•					•	•	•	•	•	•	•
Barbizon Farms EP		•	•	•	•		•					•	•	•	•	•	•	•
Westlake Farms EP (S)	•	•	•	•	•	•	•	•	•			•	•	•	•	•	•	•
J & W Farms EP	•	•	•	•	•		•	•	•			•	•	•	•			•
TLDD Hacienda EP	•	•	•	•	•	•	•	•	•			•	•	•	•	•	•	•
TLDD South EP	•		•	•	•	•	•	•	•			•	•	•	•	•	•	•
<i>EASTERN & SOUTHERN CALIFORNIA</i>																		
Lower Klamath NWR	•	•	•	•	•	•	•	•	•			•	•	•	•	•	•	•

Appendix 2c: Fall shorebird abundance in coastal wetlands; more than 1000 birds.

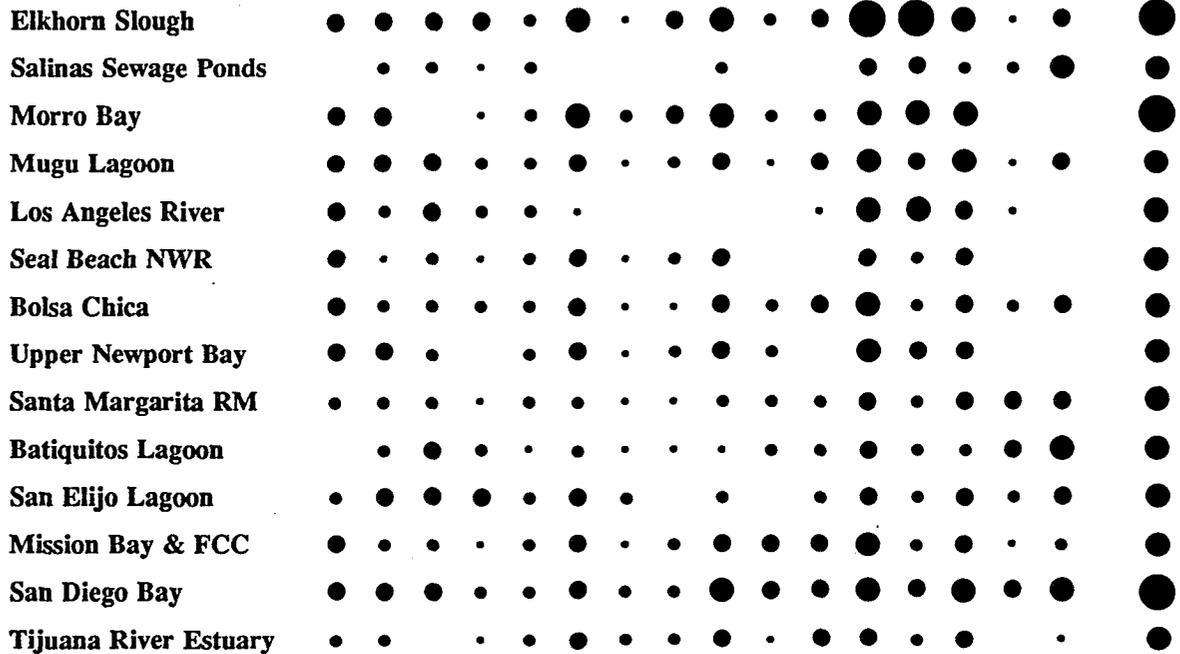
- 1 - 10¹
- 10¹ - 10²
- 10² - 10³
- 10³ - 10⁴
- 10⁴ - 10⁵
- 10⁵ - 10⁶

	Black-bellied Plover	Semipalmated Plover	Black-necked Stilt	American Avocet	Yellowlegs	Willet	Whimbrel	Long-billed Curlew	Marbled Godwit	Red Knot	Sanderling	Western Sandpiper	Least Sandpiper	Dowitchers	Wilson's Phalarope	Red-necked Phalarope	Total Shorebirds
ALASKA																	
Kachemak Bay	•	•			•		•					•	•	•			•
BRITISH COLUMBIA																	
Fraser River Delta	•				•							•					•
Sidney Island		•			•						•	•					•
WASHINGTON																	
Puget Sound	•	•		•	•		•		•	•	•	•	•	•		•	•
Grays Harbor		•			•		•				•	•	•	•			•
OREGON																	
Columbia River Estuary	•	•			•		•				•	•	•	•			•
Netarts Bay	•	•					•				•	•	•	•		•	•
Siletz Bay	•	•			•	•	•	•	•	•	•	•	•	•			•
Alsea Bay	•	•			•		•		•		•	•	•	•			•
Coos Bay	•	•			•	•	•		•		•	•	•	•		•	•
Bandon Marsh	•	•			•		•		•	•	•	•	•	•		•	•
CALIFORNIA																	
Smith River Mouth		•			•						•	•	•	•		•	•
Lakes Talawa & Earl	•	•		•	•	•	•		•	•	•	•	•	•		•	•
Point St. George	•	•				•	•				•	•	•	•		•	•
Humboldt Bay	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
Bodega Harbor	•	•			•	•	•	•	•	•	•	•	•	•		•	•
Estero Americano						•					•	•	•	•			•
Tomaes Bay	•	•		•	•	•	•	•	•	•	•	•	•	•		•	•
Drakes Estero	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•
Limantour Estero	•	•			•	•	•	•	•	•	•	•	•	•		•	•
Bolinas Lagoon	•	•			•	•	•	•	•	•	•	•	•	•		•	•
San Francisco Bay	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Pajaro R./Watsonville Sl.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

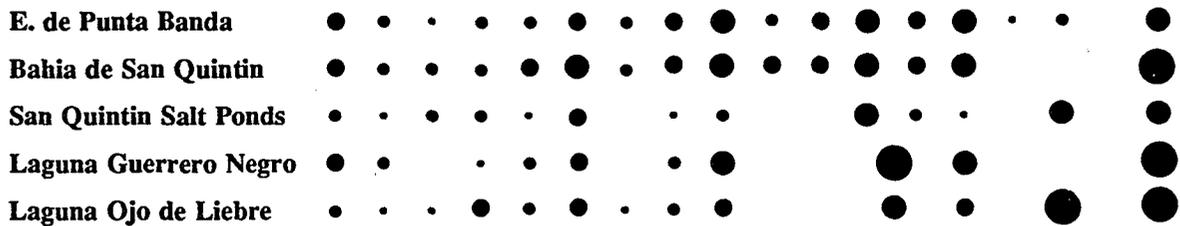
Appendix 2c (Cont.): Fall shorebird abundance in coastal wetlands; more than 1000 birds.



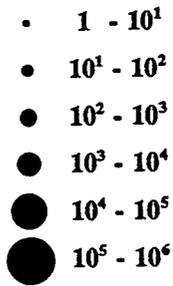
CALIFORNIA (Continued)



MEXICO

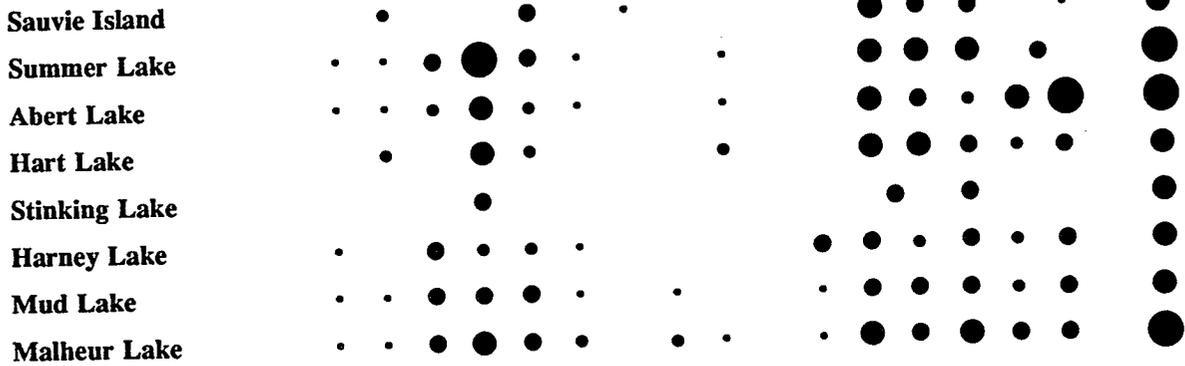


Appendix 2d: Fall shorebird abundance in interior wetlands; more than 1000 birds.



Black-bellied Plover
 Semipalmated Plover
 Black-necked Stilt
 American Avocet
 Yellowlegs
 Willet
 Whimbrel
 Long-billed Curlew
 Marbled Godwit
 Red Knot
 Sanderling
 Western Sandpiper
 Least Sandpiper
 Dowitchers
 Wilson's Phalarope
 Red-necked Phalarope
 Total Shorebirds

OREGON



IDAHO



NEVADA



UTAH

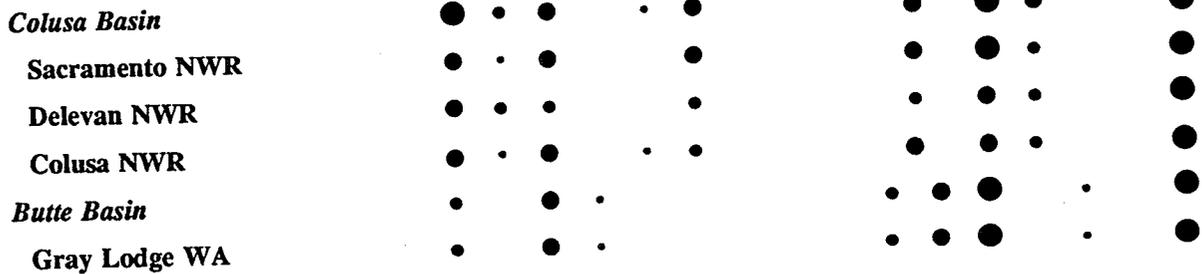


NEW MEXICO



CALIFORNIA

CENTRAL VALLEY



Appendix 2d (Cont.): Fall shorebird abundance in interior wetlands; more than 1000 birds.

•	1 - 10 ¹																		
•	10 ¹ - 10 ²																		
•	10 ² - 10 ³																		
•	10 ³ - 10 ⁴																		
•	10 ⁴ - 10 ⁵																		
•	10 ⁵ - 10 ⁶																		
		Black-bellied Plover	Semipalmated Plover	Black-necked Stilt	American Avocet	Yellowlegs	Willet	Whimbrel	Long-billed Curlew	Marbled Godwit	Red Knot	Sanderling	Western Sandpiper	Least Sandpiper	Dowitchers	Wilson's Phalarope	Red-necked Phalarope	Total Shorebirds	

CALIFORNIA (Continued)

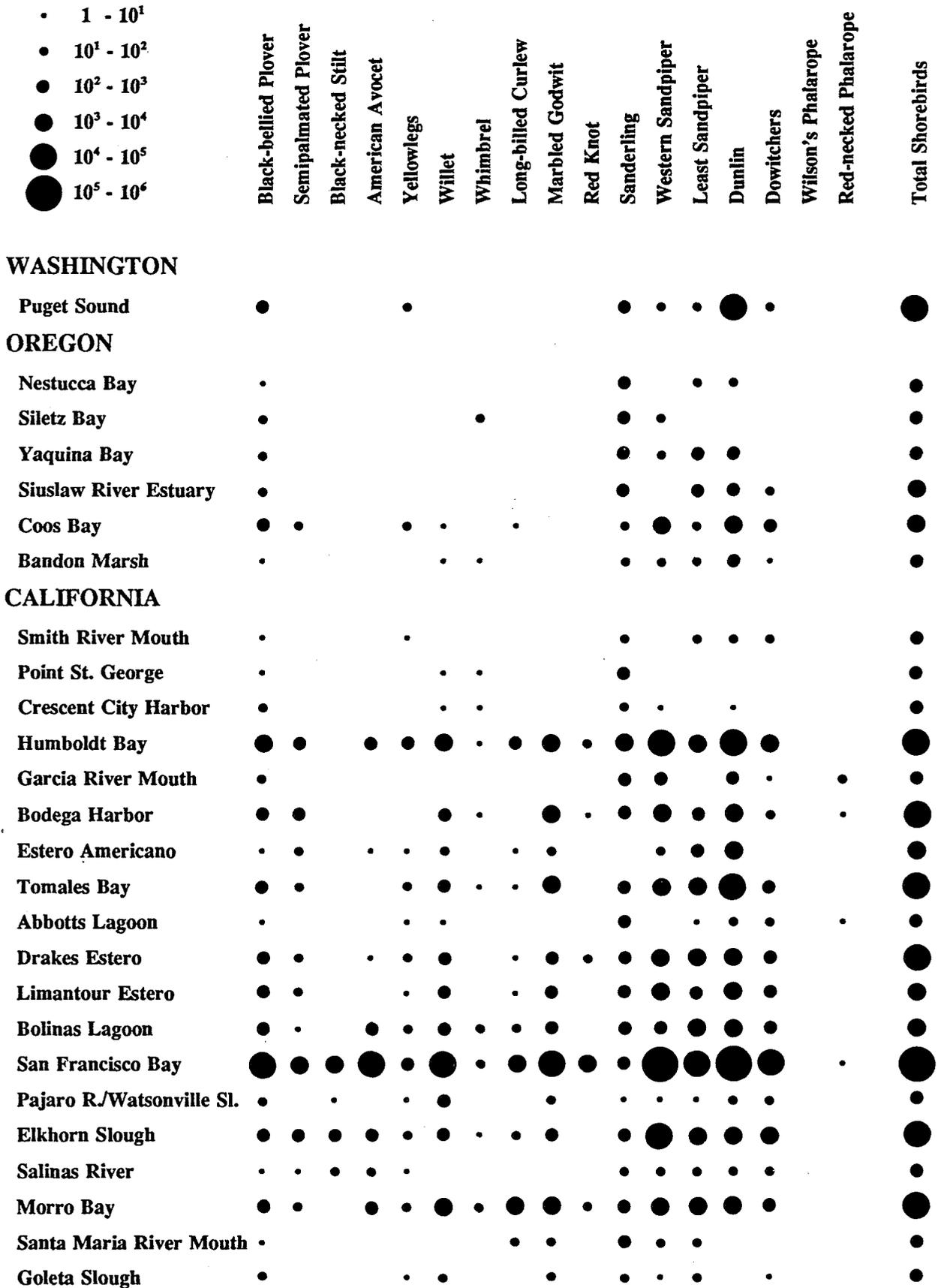
CENTRAL VALLEY (Continued)

<i>Yolo Basin</i>	•	•	•	•		•	•					•	•	•			•		•
Woodland Sugar Ponds				•	•				•				•	•	•				•
Davis Sewage Ponds	•	•	•	•				•	•					•	•			•	•
<i>American Basin</i>			•	•	•								•	•	•			•	•
Natomas Drain			•	•	•								•	•	•				•
<i>San Joaquin Basin</i>	•	•	•	•	•	•		•	•			•	•	•	•	•	•	•	•
North Grasslands	•		•	•	•				•				•	•	•			•	•
East Grasslands		•	•	•	•								•	•	•	•			•
South Grasslands	•		•	•	•				•				•	•	•	•	•	•	•
Volta WA		•	•	•	•				•				•	•	•				•
Los Banos WA			•		•								•	•	•				•
Agricultural Land	•		•		•			•	•				•	•	•				•
<i>Tulare Lake Basin</i>	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•
Mendota WA	•	•	•	•	•			•	•				•	•	•				•
Corcoran Sewage Ponds				•						•			•	•	•			•	•
Westlake Farms EP (S)	•	•	•	•	•	•		•					•	•	•	•	•	•	•
TLDD Hacienda EP	•		•	•	•	•			•				•	•	•			•	•
Martin Farms EP	•		•	•	•			•	•				•	•	•				•
TLDD South EP	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•
Carmel Ranch EP	•		•	•	•								•	•	•	•	•	•	•

EASTERN & SOUTHERN CALIFORNIA

Lower Klamath NWR	•	•	•	•	•	•		•	•			•	•	•	•	•	•	•	•
Goose Lake		•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•
Lyneta Rch. Rice Paddies			•	•	•								•	•	•	•	•	•	•
Honey Lake	•	•	•	•	•	•		•	•			•	•	•	•	•	•	•	•
Bridgeport Reservoir			•	•	•	•			•				•	•	•	•	•	•	•
Mono Lake	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•

Appendix 2e: Winter shorebird abundance in coastal wetlands; more than 100 birds.



Appendix 2e (Cont.): Winter shorebird abundance in coastal wetlands; more than 100 birds.

- 1 - 10¹
- 10¹ - 10²
- 10² - 10³
- 10³ - 10⁴
- 10⁴ - 10⁵
- 10⁵ - 10⁶

Black-bellied Plover	Semipalmated Plover	Black-necked Stilt	American Avocet	Yellowlegs	Willet	Whimbrel	Long-billed Curlew	Marbled Godwit	Red Knot	Sanderling	Western Sandpiper	Least Sandpiper	Dunlin	Dowitchers	Wilson's Phalarope	Red-necked Phalarope	Total Shorebirds
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CALIFORNIA (Continued)

Mugu Lagoon	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Malibu Lagoon	•				•	•	•	•		•	•	•						•
Seal Beach NWR	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Bolsa Chica	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
Upper Newport Bay	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Santa Margarita RM	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•
Agua Hedionda	•	•	•		•	•	•	•		•	•	•	•	•	•	•	•	•
Batiquitos Lagoon	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
San Elijo Lagoon	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•
San Dieguito Lagoon	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•
Penasquitos Lagoon	•	•	•		•	•	•	•		•	•	•		•				•
Mission Bay & FCC	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
San Diego Bay	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Tijuana River Estuary	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

MEXICO

E. de Punta Banda	•		•	•	•	•	•	•		•	•	•	•	•	•	•	•	•
Bahia de San Quintin	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
San Quintin Salt Ponds	•		•	•	•	•	•	•		•	•	•	•	•	•	•	•	•
Laguna Figueroa	•	•	•	•	•	•		•		•	•	•	•	•	•	•	•	•
Laguna San Ignacio	•			•	•	•	•	•		•	•	•	•	•	•	•	•	•
Bahia Magdalena	•				•	•	•	•		•	•	•	•	•	•	•	•	•

Appendix 2f: Winter shorebird abundance in interior wetlands; more than 100 birds.

- 1 - 10¹
- 10¹ - 10²
- 10² - 10³
- 10³ - 10⁴
- 10⁴ - 10⁵
- 10⁵ - 10⁶

Black-bellied Plover
 Semipalmated Plover
 Black-necked Stilt
 American Avocet
 Yellowlegs
 Willet
 Whimbrel
 Long-billed Curlew
 Marbled Godwit
 Red Knot
 Sanderling
 Western Sandpiper
 Least Sandpiper
 Dunlin
 Dowitchers
 Wilson's Phalarope
 Red-necked Phalarope
 Total Shorebirds

CALIFORNIA

CENTRAL VALLEY

Location	Black-bellied Plover	Semipalmated Plover	Black-necked Stilt	American Avocet	Yellowlegs	Willet	Whimbrel	Long-billed Curlew	Marbled Godwit	Red Knot	Sanderling	Western Sandpiper	Least Sandpiper	Dunlin	Dowitchers	Wilson's Phalarope	Red-necked Phalarope	Total Shorebirds
<i>Colusa Basin</i>			•	•	•							•	•	•				•
Sacramento NWR			•	•	•							•	•	•				•
Delevan NWR			•											•	•			•
<i>Butte Basin</i>					•			•				•	•	•				•
Sacramento River NWR					•			•							•			•
Behring Ranch					•			•					•	•				•
Gray Lodge WA					•							•	•	•				•
<i>Yolo Basin</i>	•	•	•	•				•				•	•	•	•			•
Yolo Bypass	•	•	•	•								•	•	•	•			•
Conaway Ranch			•		•			•				•	•	•	•			•
Midway Pond			•	•				•				•	•					•
"Laurel G" Property	•		•	•	•							•	•	•	•			•
<i>Sutter Basin</i>					•							•	•					•
Sutter NWR					•									•				•
Dingvill												•	•					•
Sutter Bypass												•	•					•
<i>American Basin</i>	•				•			•				•	•	•	•			•
Aloha Club					•			•					•	•				•
District 10	•											•	•		•			•
Hwy 70, 65, & Bear R.	•				•							•	•					•
Coon-Auburn Ravine Crk	•				•							•	•		•			•
Moore Road Rice Field					•			•				•	•	•	•			•
Natomas Drain					•									•	•			•
<i>Suisun Marsh</i>	•	•	•	•	•	•						•	•	•	•			•
<i>Sacto-S. Joaquin R. Delta</i>	•		•		•			•				•	•	•	•			•
Delta	•		•		•			•				•	•	•	•			•
Lodi Sewage Ponds	•											•	•					•

Appendix 2f (Cont.): Winter shorebird abundance in interior wetlands; more than 100 birds.

- 1 - 10¹
- 10¹ - 10²
- 10² - 10³
- 10³ - 10⁴
- 10⁴ - 10⁵
- 10⁵ - 10⁶

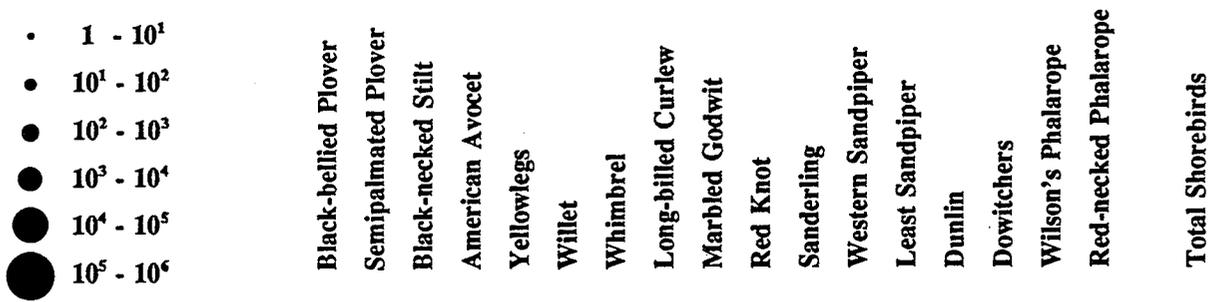
Black-bellied Plover
 Semipalmated Plover
 Black-necked Stilt
 American Avocet
 Yellowlegs
 Willet
 Whimbrel
 Long-billed Curlew
 Marbled Godwit
 Red Knot
 Sanderling
 Western Sandpiper
 Least Sandpiper
 Dunlin
 Dowitchers
 Wilson's Phalarope
 Red-necked Phalarope
 Total Shorebirds

CALIFORNIA (Continued)

CENTRAL VALLEY (Continued)

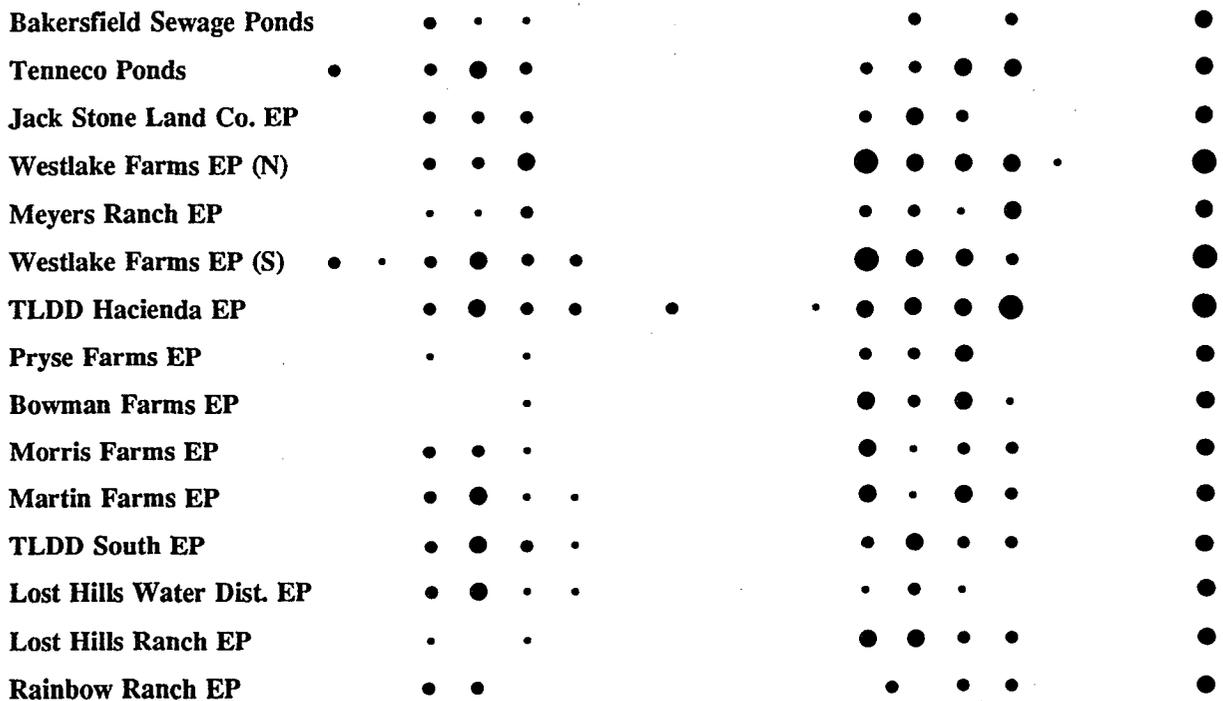
	Black-bellied Plover	Semipalmated Plover	Black-necked Stilt	American Avocet	Yellowlegs	Willet	Whimbrel	Long-billed Curlew	Marbled Godwit	Red Knot	Sanderling	Western Sandpiper	Least Sandpiper	Dunlin	Dowitchers	Wilson's Phalarope	Red-necked Phalarope	Total Shorebirds
<i>San Joaquin Basin</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Modesto Sewage Ponds	•		•										•	•				•
Ceres Sewage Ponds			•	•								•	•	•	•			•
North Grasslands	•		•	•	•	•	•	•	•			•	•	•	•			•
East Grasslands	•		•	•	•	•	•	•	•			•	•	•	•			•
South Grasslands	•	•	•	•	•	•	•	•	•			•	•	•	•			•
Kesterson NWR			•	•	•			•				•	•	•	•			•
San Luis NWR			•	•	•			•				•	•	•	•			•
Merced Sewage Ponds			•									•	•	•				•
Merced NWR			•	•	•			•				•	•	•	•			•
Volta WA	•		•	•	•			•				•	•	•	•			•
Los Banos WA	•		•	•	•			•				•	•	•	•			•
<i>Tulare Lake Basin</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Mendota WA	•		•	•	•			•				•	•	•	•			•
Pre-Irrigation Fields				•	•			•	•			•	•		•			•
Corcoran Irrigation Dist.				•	•			•				•	•	•	•			•
Hwy 43 & Road 64			•	•	•			•				•	•	•	•			•
Kern NWR	•		•		•			•	•			•	•	•	•			•
Kern-Wasco Duck Clubs			•	•	•							•	•	•	•			•
Lake Woolomes												•	•	•	•			•
Semitropic/Goose Lake				•	•							•	•	•	•			•
Fresno-Clovis SP	•		•		•			•				•	•	•	•			•
Lemoore Sewage Ponds			•	•	•							•	•	•	•			•
Corcoran Sewage Ponds	•				•								•	•	•			•
Dinuba Sewage Ponds												•	•	•	•			•
Visalia Sewage Ponds	•											•	•	•	•			•
Earlimart Sewage Ponds					•							•	•	•	•			•

Appendix 2f (Cont.): Winter shorebird abundance in interior wetlands; more than 100 birds.



CALIFORNIA (Continued)

CENTRAL VALLEY, Tulare Lake Basin (Continued)



EASTERN & SOUTHERN CALIFORNIA

