

Winter distribution and abundance of Snowy Plovers in SE North America and the West Indies

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In 2001, Snowy Plovers (Kentish Plovers) *Charadrius alexandrinus* were censused across the species' winter range on the Atlantic and Gulf coasts of the U.S. and on the islands of Puerto Rico and Cuba as part of the third International Piping Plover Winter Census. This was the first coordinated census of southeastern Snowy Plovers *C. a. tenuirostris* and involved 268 participants surveying 2,511 km of coastline and island habitat. A total of 1,083 birds were seen at 66 of 255 sites surveyed. Most Snowy Plovers (63.7%) were seen along the Texas coast. Only two sites (both in Texas) attracted >100 birds. Across the SE coast of the U.S., from SE Florida to SW Texas, Snowy Plovers were widely dispersed with ≤ 10 birds at 51.5% of sites. This was particularly true in Florida which had the highest number of occupied sites ($n = 34$) and all but one site had <20 birds. Birds were seen in a diversity of habitats including sandy beach, sand/salt flats, mudflats, gravel shores, algal mats, and oyster reefs. Data from the 2001 census were merged with historic data to produce a more complete picture of the distribution of Snowy Plovers across SE North America and the Caribbean. Census results provide essential information on distribution, abundance, and site use which can be used in conservation planning and assessment for Snowy Plovers. Future census efforts should focus on identifying all sites used by Snowy Plovers across their winter range including the east and west coasts of Mexico, the West Indies, and the interior U.S.

INTRODUCTION

Initial and ongoing steps toward achieving species conservation and recovery goals include estimating population size and distribution. For widely dispersed species that depend on ephemeral habitats, obtaining an accurate population estimate can be particularly challenging (Brown *et al.* 2001, Haig *et al.* in press). Small-scale monitoring efforts are common but insufficient, and coordination of surveys across a large portion of a species' range is rarely undertaken. However, the benefits of comprehensive coordinated monitoring are significant because it provides baseline information needed to assess threats, identify essential habitat, and prioritize conservation efforts at any scale.

Charadrius alexandrinus has a circumpolar distribution (Cramp & Simmons 1983) and two subspecies have been described in North America: *C. a. nivosus* breeds west of the Rocky Mountains and *C. a. tenuirostris* breeds east of the Rockies, primarily on the Gulf of Mexico (AOU 1957). Both subspecies have the common name 'Snowy Plover' within North America, but the species is called 'Kentish Plover' elsewhere. While subspecies designations are controversial (Gorman 2000, Haig & Mullins in prep.), there are conservation concerns about Snowy Plovers across North America. Snowy Plovers that breed on the west coast are declining and have been listed as threatened under the U.S. Endangered

Species Act (Federal Register 1992). Birds in the southeastern U.S. are also declining (Brown *et al.* 2001), and are vulnerable to many of the same factors known to have negatively impacted western Snowy Plovers such as coastal development and recreation. Southeastern Snowy Plovers are currently under consideration for federal listing and are state-listed as threatened in Alabama, Mississippi, Florida, Kansas and Puerto Rico.

Snowy Plovers have been inventoried across parts of their breeding and winter range in western North America (Page & Stenzel 1981, Page *et al.* 1991, Palacios *et al.* 1994). However, information on Snowy Plovers in SE North America and the Caribbean has always been sparse. Recently, a description of the distribution and abundance of southeastern Snowy Plovers was compiled from over 3,500 current and historic reports (Gorman & Haig 2002). While this information is invaluable, it was limited in that reports came from different years and methodology was not standardized. Lack of standardized data on Snowy Plovers across their range confounds efforts to determine their conservation status.

The International Piping Plover Breeding and Winter Census was initiated in 1991 and is repeated every five years to assess breeding and winter populations of Piping Plovers *C. melodus* throughout their geographic range (Haig *et al.* in press). Although there is little overlap in Piping and Snowy

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Plover breeding habitats (Gorman & Haig 2002), winter distribution of southeastern Snowy Plovers is within the range of wintering Piping Plovers and the two species winter sympatrically where their ranges overlap (Drake 1999, Ferland & Haig 2002). Therefore, the 2001 International Piping Plover Winter Census provided an opportunity to census Snowy Plovers across their winter range on the Atlantic coast of Florida, the U.S. Gulf of Mexico, Puerto Rico, and Cuba. In this paper, we report the results of this effort and combine data with previous work to describe southeastern Snowy Plover winter distribution comprehensively.

METHODS

2001 International Piping and Snowy Plover Winter Census

As part of the 2001 International Piping Plover Winter Census, Snowy Plovers were surveyed as they occurred throughout the winter range of Piping Plovers (Ferland & Haig 2002, Haig *et al.* in press). The 2001 International Piping Plover Census was conducted following methodologies of the 1991 and 1996 censuses (Haig & Plissner 1993, Plissner & Haig 2000) and was coordinated through a census coordinator (C. Ferland) and the International Piping Plover Coordination Group. Census coordinators were further designated for all states, territories, and countries where Piping Plovers were known or presumed to winter.

The census was conducted from 29 January to 12 February 2001. The likelihood of recounting individuals was minimized by limiting the survey to this short period. A few surveys completed during the weeks immediately prior to or following the census period were also accepted if it was unlikely that the birds were counted elsewhere.

The census was conducted along beaches, islands, and bays on the SE Atlantic and Gulf coasts of the United States, and on the coasts of Puerto Rico and Cuba. Local observers were provided with standardized census guidelines and data forms and asked to conduct a single survey within the designated census period, providing an exact count of the number of Piping and Snowy Plovers observed. Emphasis was placed on avoiding censuses during extreme weather conditions and minimizing disturbance to birds. Participants designated areas surveyed on maps to facilitate identification of specific locations of birds within a site and to facilitate comparison with future censuses. Sites were not uniformly defined and varied from 0.1 km to 104.8 km of shoreline. Additional information recorded included census time, weather and tidal conditions, general habitat characteristics, and extent of area censused. Requests for reports of Piping Plover and Snowy Plover sightings were also sent to key individuals in the Bahamas, Bermuda, Jamaica, Dominican Republic, French West Indies, and Mexico.

Additional data

Since the International Piping and Snowy Plover Census only censused wintering birds across a portion of their range, additional Snowy Plover data was examined to provide more comprehensive information on their winter distribution in SE North America and the West Indies. Information was compiled by Gorman & Haig (2002) from a variety of sources including published and unpublished accounts, the Audubon

Christmas Bird Count (CBC) data (<http://www.im.nbs.gov/birds/cbc.html>), museum specimens, and from a clearing-house of historic records maintained at the USGS Patuxent Wildlife Research Center. This information was supplemented by recent reports. Many records included the specific sites where birds were observed on dates confirming winter use. We also considered information from field guides on general areas where Snowy Plovers are known to winter or are likely year-round residents.

RESULTS

In the first systematic survey of wintering southeastern Snowy Plovers, 268 observers covered 255 sites comprising 2,511 km of coast and identified 1,083 Snowy Plovers. These were found along the Atlantic coast of Florida, throughout the Gulf coast of the U.S., and at various sites in Cuba and Puerto Rico (Fig. 1). Among sites surveyed, 66 (25.9%) contained Snowy Plovers (see Appendix) compared to a 33% site occurrence for Piping Plovers. Where their ranges overlapped, Snowy Plovers were detected at 38 (49.4%) sites occupied by Piping Plovers. Across their range, most sites with Snowy Plovers (93.9%) had 50 or fewer birds; 51.5% had 1–10 birds, whereas 42.4% had 11–50. As with Piping Plovers, most Snowy Plovers (63.7%) were seen along the Texas coast (Table 1). Snowy Plovers were also fairly common along the Gulf coast of Florida (28.7%). However, the site with the greatest number of Snowy Plover observations was inland: East Lake, Texas (144 adults). More birds were seen on islands (57.9%) than on the mainland (34.4%); however, these percentages were influenced by Padre Island, Texas, which was considered an island and included multiple sites with high numbers of Snowy Plovers. Among sites where birds occurred, 31.6% of Snowy Plovers were observed on sandy beaches, 21.4% on sand/salt flats, 21.0% on mudflats, 13.3% on gravel shores, 7.1% on algal mats, and 0.03% on oyster reefs. Most occupied sites were publicly owned (75.7%) and most birds (66.8%) were seen on public land. Ownership was part public and part private at seven sites representing 15.3% of birds; 17.9% of birds were seen on nine privately-owned sites.

Additional data suggests that wintering Snowy Plovers extend south along the Gulf coast of Mexico to the Yucatan Peninsula, with records of birds at many sites on the coast of Tamaulipas (Fig. 1; Gorman & Haig 2002). Snowy Plovers also winter at inland sites in NW and central Texas and in SE New Mexico, although it is unclear whether birds wintering in these areas breed in the southeastern or western U.S. Winter records in the West Indies exist for Grand Turks, Turks and Caicos (26 January 1991; S.M. Haig, unpubl. data), and for St. John, U.S. Virgin Islands (27 December 1981; R. Norton unpubl. data). Snowy Plovers are common year-round residents on islands in the Bahamas south of San Salvador and are uncommon residents on Bahamian islands north of San Salvador (Raffaele *et al.* 1998, Gorman & Haig 2002). Snowy Plovers are also common residents in the Dominican Republic (J. Collazo, J. Lyons, pers. comm.) and Anguilla, and uncommon residents in the U.S. and British Virgin Islands, St. Martin, and St. Barthélemy (Raffaele *et al.* 1998, Gorman & Haig 2002). Snowy Plovers have also been sighted on islands in the southern Caribbean off the north coast of Venezuela, including Tobago, Isla de Margarita, Islas los Roques, Bonaire, Curaçao, and Aruba (Ridgeley *et al.* 2003).



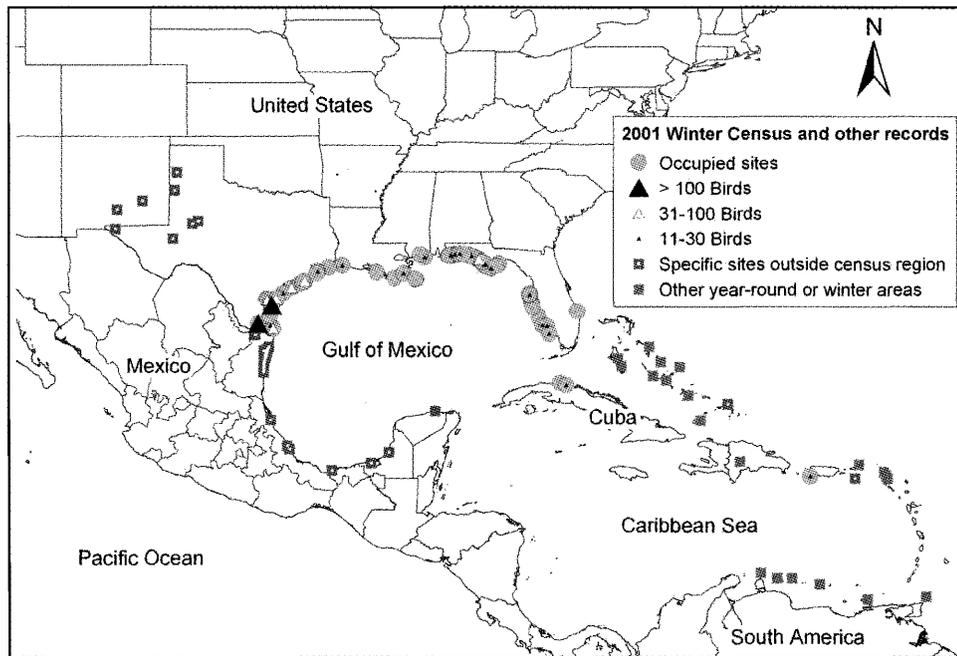


Fig. 1. Distribution and abundance of Snowy Plovers in winter 2001. Additional records from Gorman & Haig (2002) and others (see text).

DISCUSSION

The 2001 International Piping and Snowy Plover Winter Census is the first and only systematic winter survey of southeastern Snowy Plovers at a scale commensurate with the population's range. Results illustrate overall patterns of winter density and distribution across the southeastern U.S. and will assist federal consideration of their listing under the U.S. Endangered Species Act. The number of Snowy Plovers detected during the winter census (1,083) was similar to the estimate made by Gorman & Haig (2002) for the same population (900–1,000 individuals). However, Gorman & Haig estimated that over half the population occurred in Mexico. This suggests that a significant proportion may not have been covered by the 2001 winter census. Moreover, estimates of the breeding population of the southeastern U.S. are about 2–3 times the number of birds detected during the winter census (about 3,000 birds; Gorman & Haig 2002). Nevertheless this is still a relatively small number compared with estimates for most other North American shorebirds (Morrison *et al.* 2000) and is a strong indication of the species' vulnerability. Piping Plovers are currently listed as

threatened or endangered across their range, however, where their ranges overlap, 2,078 Piping Plovers were observed compared to only 1,083 Snowy Plovers.

The census results illustrate a high degree of sympatry between wintering Piping and Snowy Plovers. The percent of occupied sites was similar for both species and both species were present at many sites. Previous records do not suggest that many additional Snowy Plover winter sites exist within the southeastern U.S., or that such sites support large numbers of birds (Fig. 1; Gorman & Haig 2002). Thus, although the selection of sites for census was based on Piping Plover habitat, the results suggest that they were not biased toward that species and were equally appropriate for Snowy Plovers. In consequence, census coverage for the SE coastal U.S. was probably as complete for Snowy Plovers as it was for Piping Plovers.

One limitation of the International Piping and Snowy Plover Census is that it only systematically covered habitat on the SE coast of the U.S. and Puerto Rico. Since previous estimates suggest that large numbers of birds also winter along the Gulf coast of Mexico (Gorman & Haig 2002) and the proportion of winter migrants or residents in the West

Table 1. Distribution and abundance of wintering Snowy Plovers on the Gulf of Mexico, Puerto Rico and Cuba in 2001 (full details of the counts within each state/country are set out in the Appendix).

State/Country	Snowy Plovers		Sites surveyed		
	Number seen	% of total	Number	Total km	Participants
Florida	311	28.7	122	900	162
Alabama	0	0.0	13	47	10
Mississippi	13	1.2	12	167	9
Louisiana	36	3.3	26	202	23
Texas	690	63.7	50	1,075	53
Cuba	16	1.5	29	105	8
Puerto Rico	17	1.6	3	15	3
Total	1,083		255	2,511	268



Indies is unknown, censusing only within the U.S. does not yield comprehensive information on distribution or abundance. To date, this limitation has been insurmountable because the census has been carried out as a stand-alone survey on each occasion and is not organized in conjunction with ongoing population monitoring. It requires significant effort to cover known sites in the U.S., hence exploration of areas outside the country has rarely been possible. Since birds also breed in Mexico (Howell & Webb 1995) and the West Indies (Gorman & Haig 2002), we cannot circumvent this problem by censusing the U.S. during the breeding season as this would also underestimate numbers. Therefore, the only way to obtain an accurate population estimate is to expand the census area to regions outside the U.S. It is particularly important to include such key sites as the Laguna Madre de Tamaulipas and associated beaches in Mexico, as has been attempted in the past (Haig & Oring 1985, Mabee *et al.* 2001). Since little is known about the number of resident birds on the Gulf coast of Mexico, and some birds that breed in the southeast U.S. may winter in the west, a breeding census across SE North America would be extremely informative. Additional surveys in Cuba, the Bahamas, and Caribbean are also essential.

This comprehensive approach to censusing Snowy Plovers is helpful in determining the importance of geographic regions and sites for wintering birds. There were two sites in Texas (East Lake and Padre Island) that supported a large proportion of birds (>10%) and should be considered important for the southeastern population of Snowy Plovers. However, Snowy Plovers are relatively dispersed in winter, indicating that they require many sites across their range. It has been suggested that the tendency of some shorebird species to concentrate at staging areas increases their vulnerability to habitat loss and human disturbance (Myers 1983). In contrast, Snowy Plovers wintering around the Gulf of Mexico are widely dispersed. However, they occur in a part of the world where coastal habitats are subject to intense recreational disturbance. Therefore they may be no less vulnerable to disturbance than more concentrated populations. Also, in the case of highly dispersed populations like Snowy Plovers, identifying important sites is difficult and funneling resources into the conservation of a few sites will not ensure the species' survival.

Previous work (Page *et al.* 1981, Page *et al.* 1995b) suggests that between and within-year fidelity to sites identified during the winter census is probably high. Colour-banded Snowy Plovers have been re-sighted over multiple consecutive years on the same coastal California winter grounds and while birds shift location in response to storm events, re-sightings suggest that some birds may stay at a single site for the entire winter (Page *et al.* 1981, Page *et al.* 1995b; M. Ruhlen pers. comm.). Since habitat along the Gulf coast may be more stable and winter temperatures are mild, fidelity of Snowy Plovers to their southeastern winter grounds is likely as high as in the western U.S. This further supports the need to conserve all occupied sites.

The diversity of habitats used by Snowy Plovers suggests that within sites, multiple habitat types may be important. Birds were most frequently seen on sandy shores, but a high proportion were also observed on sand/salt flats, mudflats, and gravel shores. At some sites, birds were seen using several different habitats. Although selection of particular habitats cannot be inferred from census data, long term work on Snowy Plovers along the Texas coast suggests that they do

select for particular habitat characteristics at winter roost sites, and foraging areas often differ from roosting habitats (Drake 1999). Therefore, conservation efforts should recognize that multiple habitats within a site may be important to Snowy Plovers and aim to protect this diversity where it exists.

Since many sites were difficult to survey, we must not conclude that some are unimportant to Snowy Plovers merely because none were detected during the census. Extremely low tides, prevalent in Texas in January, expose vast expanses of sand and mudflats that are difficult to access. Such areas provided habitat for most of the known wintering Piping and Snowy Plovers. Hence miscounting them would be a significant error. In 2001, the census period was altered by one week to mitigate this problem. However, prolonged high winds in exposed coastal habitats may have led some birds to move to more sheltered sites inland with the result that they were missed from the census. High winds might explain why so few Snowy Plovers were counted at Laguna Atascosa National Wildlife Refuge, Texas, a site that provided the highest count in a previous census (Gorman & Haig 2002). Weather conditions also prevented a survey of the Chandeleur Islands, Louisiana, a site where Snowy Plovers have been found in the past and which should be a focus of future efforts (S. M. Haig unpubl. data). Since weather conditions during this census may have affected coverage and detection of birds at certain sites, all recent records of Snowy Plovers should be considered for the purposes of habitat conservation. In view of the extensive human development of the Gulf coast and low numbers of Snowy Plovers, it may be important to protect potential Snowy Plover sites as well as occupied ones. This will facilitate the colonization of new habitat when populations rebound and provide alternative sites if occupied ones are disturbed.

The 2001 International Piping Plover Census was a useful vehicle for providing critical distribution data on wintering southeastern Snowy Plovers. Coverage of U.S. sites was thorough and numerous wintering sites were identified. However, efforts should be expanded to attain rangewide coverage and detection rates should be assessed. As with Piping Plovers and west coast Snowy Plovers, detection probability is likely higher when surveying during the breeding season. Since the breeding ranges of Piping and Snowy Plovers differ greatly, it would not be practical to carry out a combined survey. Therefore those involved in Snowy Plover conservation should consider organizing a separate breeding census along the lines of the 2001 survey. Since the conservation status for multiple Snowy Plover populations in the U.S. is uncertain, collaboration with researchers across the U.S. and perhaps even worldwide would be valuable in improving the systematic collection of distribution and abundance data for this species.

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APPENDIX

Snowy Plover occurrence during the 2001 International Piping Plover Winter Census on the Gulf of Mexico, Puerto Rico and Cuba.

State/ Country surveyed	Sites	Occupied sites	County/ Region	km surveyed	Snowy Plover count	Per cent of census total
Florida	122	34	Bay	900 ^a	311	28.7
		Crooked Island E, Tyndall AFB	Bay	11.9	1	<0.1
		Crooked Island W, Tyndall AFB	Bay	15.2	14	1.3
		Shell Island	Bay	12.9	43	4.0
		St Andrews Park, Shell Island	Bay	5.6	2	0.2
		Sunnyside (Camp Helen, east to 12th Street)	Bay	8.1	3	0.3
		Knight Island, Palm Island Resort	Charlotte	3.2	7	0.6
		Big Marco Pass Shoal	Collier	3.2	17	1.6
		Big Lagoon State Park	Escambia	1.6	7	0.6
		Big Sabine Point, Santa Rosa Island	Escambia	3.2	19	1.8
		Gulf Islands National Seashore, Fort Pickens area	Escambia	12.3	15	1.4
		Gulf Islands National Seashore, Perdido Key, east	Escambia	12.9	7	0.6
		Lanark Reef	Franklin	4.5	2	0.2
		Little St George Island	Franklin	16.1	12	1.1
		St George Island State Park	Franklin	29.0	2	0.2
		St Vincent NWR	Franklin	24.2	4	0.4
		St Joe Beach to Oak Grove	Gulf	11.3	13	1.2
		St Joseph Peninsula, north	Gulf	27.4	18	1.7
		St Joseph Peninsula, south	Gulf	10.5	1	<0.1
		Estero Island	Lee	1.6	15	1.4
		Sanibel Island Beach	Lee	5.9	17	1.6



Appendix (Continued)

State/ Country surveyed	Sites surveyed	Occupied sites	County/ Region	km surveyed	Snowy Plover count	Per cent of census total
Florida (cont.)		Beer Can Island	Manatee	2.0	2	0.2
		Sailfish Point Flats	Martin	4.8	1	<0.1
		Eglin AFB (public), Okaloosa Island	Okaloosa	4.2	9	0.8
		Eglin AFB (restricted), Santa Rosa Island	Okaloosa	21.0	11	1.0
		Anclote Key sandbar	Pasco	0.8	6	0.6
		Anclote Key State Park, south	Pinellas	1.6	2	0.2
		Caladesi Island State Park	Pinellas	3.2	4	0.4
		Ft. DeSoto County Park, north	Pinellas	0.8	5	0.5
		Honeymoon Island State Park, north	Pinellas	2.4	7	0.6
		Shell Key	Pinellas	0.8	5	0.5
		Three Rooker Bar	Pinellas	4.0	16	1.5
		Navarre Beach State Park	Santa Rosa	4.0	1	<0.1
		Camp Creek Inlet (east of Deer Lake SP)	Walton	5.6	14	1.3
		Topsail Hill State Preserve	Walton	5.0	9	0.8
Alabama	13	0		47 ^a	0	0.0
Mississippi	12	2		167 ^a	13	1.2
		Pt. Cadet to Long Beach Harbor Beaches	Harrison	13.0	2	0.2
		Horn Island	Jackson	49.5	11	1.0
Louisiana	26	6		202 ^a	36	3.3
		East Jetty to Rutherford Beach	Cameron	22.6	11	1.0
		Unnamed island betw. Timbalier and E. Timbalier Islands	LaFourche	3.2	2	0.2
		East Grand Terre Island	Plaquemines	0.8	15	1.4
		South Pass, west #2 (Pass A L'outre WMA)	Plaquemines	0.8	6	0.6
		South Pass, west #3 (Pass A L'outre WMA)	Plaquemines	0.8	1	<0.1
		Atchafalaya Delta	St Mary	7.3	1	<0.1
Texas	50	21		1,075 ^a	690	63.7
		San Jose Island bayside, south/Harbor Island	Aransas	14.0	46	4.2
		San Jose Island, Gulf beach	Aransas	29.0	8	0.7
		Wolf Island	Brazoria	6.5	62	5.7
		Matagorda Island NWR	Calhoun	72.6	28	2.6
		Welder Flats Coastal Preserve	Calhoun	2.4	28	2.6
		South Padre Island	Cameron	80.6	35	3.2
		Unit 4, Laguna Atascosa NWR	Cameron	16.1	24	2.2
		Big Reef; Galveston Island	Galveston	1.6	10	<0.1
		High Island to Bolivar Flats	Galveston	46.8	17	1.6
		East Lake (Sal Vieja, Sal Del Ray)	Hidalgo/Willacy	16.1	144	13.3
		McFaddin NWR; Sabine Pass to High Island	Jefferson	32.3	1	<0.1
		Padre Island National Seashore, north bayside	Kleberg	4.0	121	11.2
		Padre Island National Seashore, gulf beach	Kleburg/Kenedy/ Willacy	104.8	4	0.4
		North Matagorda Peninsula Beach	Matagorda	35.5	1	<0.1
		Sargent Beach	Matagorda	17.7	16	1.5
		South Matagorda Peninsula Beach	Matagorda	40.3	40	3.7
		Redfish Bay/Ingleside Point	Nueces	41.9	29	2.7
		Ward Island	Nueces	1.0	1	<0.1
		Indian Point and Sunset Lake	San Patricio	7.9	1	<0.1
		Nueces Delta	San Patricio/Nueces	4.7	20	1.8
Tule Lake	San Patricio/Nueces	6.6	54	5.0		
Cuba	29	2		105 ^a	16	1.5
		Las Salinas de Bidos	Matanzas	1.0	14	1.3
		Península de Hicacos	Matanzas	3.8	2	0.2
Puerto Rico	3	1		15 ^a	17	1.6
		Cabo Rojo Salt Flats	Cabo Rojo	6.5	17	1.6
Total	255			2,511^a	1,083	

^a Numbers represent minimum total km of occupied and unoccupied sites. Not all participants included this information.