

**State of California
Natural Resources Agency
Department of Fish and Wildlife
Wildlife Branch**

**The Western Snowy Plover in Los Angeles and Orange Counties,
California: September 2012 to June 2014**

By

**Thomas Ryan, Stacey Vigallon,
Ross Griswold, and Jennifer Gummerman**

Nongame Wildlife Program, 2014-04

Final Report

To

State of California
Department of Fish and Wildlife
South Coast Region
3883 Ruffin Road
San Diego, CA 92123

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ABSTRACT

Here we report on monitoring, research, and community outreach activities performed by the Los Angeles County Snowy Plover Research Team between Fall 2012 and Spring 2014. From Fall 2011 to Spring 2014, project biologists and volunteers conducted county-wide surveys of all suitable roosting habitat in March, May, September and January. Project biologists conducted surveys of just the main roost sites and nearby beaches in February, April, June, August, October, November, and December. The January and May surveys corresponded to the USFWS' winter and breeding season window surveys. From 2012 to 2014 the population of Snowy Plovers in coastal Los Angeles County (LAC) has declined from a peak of 326 in 2012 to just 251 in 2014. LAC supports 23% of Recovery Unit 6 (RU-6) and 6% of the range-wide non-breeding Snowy Plovers. Non-breeding Snowy Plovers have increased on Orange County (OC) Beaches over the past 11 year span, but inconsistent efforts at all beaches make it difficult to provide total numbers present countywide, with the exception of this year. OC supports 23% of RU-6 and 6% of the range-wide non-breeding Snowy Plovers. The average size of daily Snowy Plover winter roosts is 73.0 m (239 ft) long, 27.7 m (90.9 ft) wide, and covers an area of 0.29 hectares (ha) (0.71 acres [ac]) (SE = 0.01). On average, over the course of a year, the Snowy Plovers used an area 238.6 m (782 ft) long by 90.2 m (296 ft) wide. We recommend that these areas be considered as Special Protection Zones for the non-breeding Snowy Plovers.

¹ Ryan, T. P., S. Vigallon, R. Griswold, and J. Gummerman. 2014. The Western Snowy Plover in Los Angeles and Orange Counties, California: September 2012 to June 2014. California Department of Fish and Wildlife, Wildlife Management, Nongame Wildlife Unit Report. 2014-04. Sacramento, CA 28 pp + Appendices.

INTRODUCTION

Here we report on monitoring, research, and community outreach activities performed by the Los Angeles County Snowy Plover Research Team between Fall 2012 and Spring 2014. We provide an annual update to the summary of efforts compiled in *The Western Snowy Plover in Los Angeles County* (Ryan et al 2010). For complete information on the species background, project background, methods, all beach maps, status and distribution prior to 2009, origins and site fidelity, complete recommendations, conservation background, regulatory framework, outreach and education, handouts, and datasheets, please refer to this report. It is available for sale at the Los Angeles Audubon bookstore and can be downloaded free, along with other study materials, from the Los Angeles Audubon website (<http://losangelesaudubon.org/>).

History. Prior to 1945, the Western Snowy Plover (*Charadrius nivosus nivosus*) (Snowy Plover) nested on beaches throughout Los Angeles County (LAC) (Grinnell and Miller 1944, WFVZ unpubl. data). Historically, Snowy Plovers have nested at Redondo, Ballona (Venice/Marina Del Rey), Los Angeles, and Malibu Beaches (LA Breeding Bird Atlas Data, Unpublished). However, increased human use of sandy beaches brought with it disturbance from beachgoers, lifeguards, maintenance staff, introduced predators, and sand grooming, reducing the ability of Snowy Plovers to nest on LAC beaches. In 1949, the last active nest of a Snowy Plover on LAC beaches was reported at Manhattan Beach (Stager 1949 in Page and Stenzel 1981). Since 1949, there have been no documented cases of a Snowy Plover nesting within LAC, although no systematic survey of suitable LAC beaches had been conducted since the 1970s (Gary Page pers. comm.). Despite the lack of documentation since 1949, Snowy Plovers have continued to overwinter on LAC beaches. The Santa Monica Bay Audubon Society (SMBAS) conducted surveys between 2004 and 2006 and found between 260-334 wintering Snowy Plovers (USFWS Unpubl. data, SMBAS Unpubl. data). Approximately 7% of Snowy Plovers wintering in California occur on LAC beaches (USFWS unpubl. data).

In Orange County (OC), Snowy Plovers nested at Anaheim Landing, Sunset Beach Bay Fill, Sunset Beach, Bolsa Chica Beach, Bolsa Chica Salt Flats, Newport Beach, and Balboa Beach prior to 1940 (Page and Stenzel 1981). During their 1979-78 survey, Page and Stenzel (1981) found that Orange County supported 2% of the pairs on the mainland coast, all at the Bolsa Chica Oil Fields (previously Bolsa Chica Salt Flats). As in LAC, they concluded that the only other likely nesting location was at the Sunset Aquatic Park and that the lack of nesting plovers elsewhere was due to beach raking and heavy human use (Page and Stenzel 1981).

Status. The Snowy Plover is a species of conservation concern. The Pacific coast population of the Western Snowy Plover was listed as federally threatened in 1993 (USFWS 1993). Critical Habitat for the Snowy Plover was revised in June 2012. The USFWS now lists six beaches in LAC and three beaches (and the Bolsa Chica Reserve - Subunits CA46 B-F) in OC as critical habitat for the Snowy Plover (USFWS 2012). These include Zuma Beach (Unit CA 43), Malibu Beach (Unit CA 44), Santa Monica Beach (Subunit CA 45A), Dockweiler North (Subunit CA 45B), Dockweiler South (Subunit CA 45C), Hermosa State Beach (Subunit CA 45D), Bolsa Chica State Beach (CA 46A), Santa Ana River Mouth (Subunit CA 47), and Balboa Beach (Subunit 48) (USFWS 2012). All roosts, except for Dockweiler State Beach (DSB) 58 and Hermosa in LAC and Surfside and Salt Creek are now located within designated Critical Habitat (USFWS 2012). These beaches are protected as wintering habitat (USFWS 2012). It should be

noted that activities that have a federal nexus are subject to Federal Review. Relevant sections, including Unit/Subunit descriptions and maps can be found in Appendix 4.

A Recovery Plan was completed by USFWS in 2007 and LAC and OC are within Recovery Unit 6, whose goals include protecting wintering Snowy Plovers and increasing the breeding population to 500 breeding individuals from the current level of 243 (2005-2009 average) (USFWS unpubl. data, USFWS 2007). The Snowy Plover is also considered a Bird Species of Special Concern by California (Shuford and Gardali 2008).

Biology. For the Pacific coast population of the Snowy Plover, the nesting season extends from February through late September. On the California coast, where breeding tends to occur a few weeks earlier, nests usually appear by the third week of March (Page et al. 2009). Primary nesting habitats include sand spits, dune-backed beaches, beaches at creek and river mouths, and salt pans at lagoons and estuaries (Stenzel et al. 1981). Nests generally consist of a shallow scrape lined with beach debris and typically occur in flat, open, sandy areas with little vegetation (Widrig, 1980, Stenzel et al. 1981). Multiple pre-nest scrapes may be dug, with one selected as the nest; these typically begin to appear in late January-early February. Driftwood, kelp, and dune plants provide cover for chicks and harbor invertebrates, an important food source (Page et al. 2009). Nests are usually found within 100 meters (328 feet) of water, whether ocean, lagoon, or river mouth (Page and Stenzel 1981, Page et al. 2009). In addition to nest scrapes, Snowy Plovers build roost scrapes throughout the year; these are typically shallower, with no materials placed inside, and are often made from scraped-out footprints in the sand.

Threats. While several factors contribute to the degradation of winter roosting habitat and the disappearance of nesting Snowy Plovers in LAC and OC, we suggest that the main problems are daily beach grooming in LAC and occasional grooming at Salt Creek, development of upper beach habitats such as dunes, heavy recreational use, vehicular traffic, domestic animals, and predators attracted to human refuse. Daily beach grooming removes many of the favorable nesting habitats described above, harms food resources, and likely destroys nest scrapes and eggs of Snowy Plovers (Page et al. 2009). Because grooming also removes naturally occurring kelp as well as trash, it has been shown to drastically reduce the invertebrate population that has adapted to break down kelp, including prey items favored by Snowy Plovers (Dugan et al. 2003, Page et al. 2009). Dugan and Hubbard (2003) found that Snowy Plover abundance on southern California beaches was positively correlated with the mean cover of wrack and abundance of wrack-associated invertebrates. Further, Dugan and Hubbard (2009) demonstrated that grooming increases rates of beach erosion, increasing the need for beach replenishment. Development of upper beach habitat removes cover and foraging resources and increases the presence of domestic animals and predators. Vehicular traffic is known to cause mortality, crush foraging resources (kelp, vegetation and wrack), and regularly flush resting Snowy Plovers from their roosts. There are over 50 million visitors to LAC beaches annually (County of Los Angeles 2009); their activities, including sunbathing, swimming, dog walking, and sports, require support services such as police and lifeguard patrols, water quality monitoring, erosion control, and trash pick-up, which also cause an increase in vehicles on the beach. Furthermore, human activity and local residences attract predators such as cats, dogs, and American Crows by providing food in the form of refuse and outdoor pet food.

Outreach and Education. Public awareness of and support for Snowy Plover conservation in LAC is essential to species recovery. During both the 2007 and 2008 meetings of the LAC Snowy Plover Working Group a large part of the dialogue centered on how to combat lack of public awareness. The 3-year report published in early 2010 summarized in detail the volunteer/outreach activities from 2007-2009. In this report, we summarize volunteer/outreach activities completed from Winter/Spring 2013 to April 2014.

Summary of Previous Study Findings. Prior to beginning this study, little was known about the wintering Snowy Plovers in LAC and OC. We summarize the prior data collected in OC in this report. Observations for LAC have been published in reports from 2009, 2010 and 2011 (Ryan and Vigallon 2009, 2010 and 2011). We found that in coastal LAC, the Snowy Plover annually inhabits seven roosting sites at Zuma LT9/Zuma Lagoon, Malibu Lagoon, Santa Monica, Dockweiler State Beach near Tower 47 (DSB LT47), Dockweiler State Beach near Tower 58 (DSB LT58), Hermosa Beach, and Cabrillo Beach. They occasionally use sites at Leo Carrillo State Beach, Paradise Cove, Dan Blocker County Beach, Big Rock Beach, Will Rogers State Beach, Venice Beach, central Dockweiler State Beach, El Segundo Beach, Manhattan Beach, Redondo Beach, and Terminal 400 in LA Harbor. We found that 96% of all detections were at the main roosting sites. Of these, six, Zuma LT9, Malibu Lagoon, Santa Monica, DSB LT47, DSB LT58, and Hermosa Beach consistently support the largest numbers of Snowy Plovers. We suggest that conservation efforts be focused on six locations that make up approximately 1.9 km (1.2 miles) or approximately 1.6% of the linear coastline and 3.4 % of broad, sandy beaches in LAC. We found that they have inhabited roughly the same locations all six years of the study. Historic records find that they have likely been found at these locations for most of the past century (WFVZ, LAC Breeding Bird Atlas, Unpubl. data).

In Orange County, Ross Griswold has been conducting surveys of the roosts at Bolsa Chica State Beach, Huntington State Beach and Balboa Beach since February 2012. We summarize these data along with our current results in this report.

During the non-breeding season (July-March) between 196 to 334 Snowy Plovers occur in LAC and approximately 119-203 Snowy Plovers occur in OC. This is approximately 45% of wintering Snowy Plovers in RU-6 and 10% of the California population (USFWS Unpubl. Data 2010). Snowy Plover populations in LAC have declined in recent years. This was mostly due to declines at Zuma LT9 in winter 2005-2006 and all beaches except Malibu in winter 2006-2007. All beaches have appeared to recover except Zuma, which has still seen over a 50% decline during the study period. This is especially significant because this is the largest roost in LAC with approximately 42% of the population. Winter window surveys indicate that the OC population is either stable or increasing (USFWS Unpubl. Data).

The Snowy Plovers that roost at LAC beaches create large numbers of scrapes, at least throughout the winter and spring months. These scrapes are used as resting areas and provide protection from wind and aid in hiding Snowy Plovers from predators. Scrapes outside of protected enclosures are destroyed on a regular basis by beach grooming, vehicle traffic, and pedestrians. If nesting attempts are being made, evidence is likely removed by the above disturbances and egg predators prior to discovery. In other areas, protection of winter roosts has led to establishment of nesting areas (Lafferty et al. 2006). We suggest that this would likely

occur in LAC if these areas were protected. This would aid in meeting the recovery goals for the Snowy Plover in Recovery Unit 6 (USFWS 2007).

We find that LAC and OC are important non-breeding areas for Snowy Plovers from breeding colonies throughout California and Oregon based on observations of color-banded individuals. We suggest that individuals show high site fidelity and have observed individuals returning to LAC to the same beach for as many as six years (Ryan and Vigallon 2010). There is some movement of individuals among the Zuma LT9, Malibu, and Santa Monica roosts. However, we have not detected intra- or inter-year movements among the northernmost and southernmost roosts. Individuals have been recorded up to seven years old, with an average age of 2.8 years.

We have documented mortality by vehicle strikes and capture by dogs at nearby beaches. We suggest that these may be regular causes of mortality and normally go undocumented due to a lack of observers and the likelihood that Snowy Plover carcasses are scavenged or removed by beach grooming prior to discovery.

We find that there are many threats to the wintering Snowy Plovers. These likely threaten the current non-breeding roosting Snowy Plovers and prevent nesting on LAC beaches as well.

Threats include:

1. A lack of public awareness of the presence of Snowy Plover roosts and a lack of information about how to avoid disturbing the Snowy Plovers while enjoying the beach;
2. Lack of training and information on locations of Snowy Plover roosts among some staff that drive and operate equipment on the beaches;
3. Regular disturbance, removal of foraging resources, and occasional mortality resulting from beach grooming, operation of heavy equipment, and regular vehicular traffic;
4. Regular disturbance and occasional mortality from off-leash dogs;
5. Beach management practices that remove kelp and associated arthropods;
6. Recreational activities and occasional large events that flush Snowy Plovers from roosts and leave large amounts of refuse near roosts; and
7. Native and non-native predators drawn in unusually large concentrations to human refuse on and near the beach and pet food placed outside at nearby residences.

We believe that public awareness of and support for Snowy Plover conservation in Los Angeles County is essential to species recovery, such that developing education and outreach strategies has been concurrent with meeting the scientific goals of this study. With outreach initially targeted at colleges and universities we were able to increase volunteer participation in the monitoring program from 37 people in 2007 to 158 by the end of 2009, and volunteers contributed 1,681 hours during those years. Since 2009, we have maintained a core of 45-60 community volunteers, with new volunteers joining each year to assist with monitoring, enclosure set-up, and outreach efforts. In addition to volunteer participation, steps towards establishing a formal docent program have included a public service announcement video, development of a conservation brochure as well as docent and classroom materials, creation of a website, drafting signage for plover enclosures, and development of a beach-driver handout. Maintaining positive relationships with beach management agencies and collaborating with other conservation-oriented organizations will be key in establishing a sustainable outreach program.

In summary, the major accomplishments of the project include:

1. The involvement of over 300 community volunteers and an outreach program that has reached hundreds more;
2. Current, up-to-date knowledge of the location and population status of Snowy Plovers;
3. Knowledge of details of their habits and biology, including migration timing, origins, and age structure;
4. Knowledge of the location and area requirements for adequate roosting space on beaches they currently occupy;
5. Detailed recommendations for the restoration of protected areas for roosting wintering plovers and a plan for steps to be taken if breeding occurs; and
6. Ongoing outreach to and discussions with local beach management agencies that will allow for greater protection of plovers while agencies continue to perform their vital duties.

Study Goals. This study was designed to provide year-round information on the Snowy Plovers on LAC and OC beaches to determine: (1) year-round attendance patterns at the main roosting areas; (2) the size and location of these roosts; (3) the overall population and distribution in LAC and OC; and (4) management recommendations for protecting winter roosts and creating conditions by which nesting may return.

METHODS

Population Status at Winter Roosting Sites

Countywide Surveys. From Fall 2011 to Spring 2014, project biologists and volunteers conducted county-wide surveys of all suitable roosting habitat in March, May, September and January (Ryan et al. 2010). The January and May surveys corresponded to the USFWS' winter and breeding season window surveys. All volunteers used a consistent survey method adapted from the Western Snowy Plover Winter Window Survey Protocol (Elliott-Smith and Haig 2006). All Snowy Plover counts were made in a single pass. On broad beaches, surveyors walked alongside each other and/or zigzagged during surveys. Field data were collected on a datasheet, and surveyors marked the presence of Snowy Plovers and the area covered on a map or aerial photograph. Surveyors observed the birds for color bands. These were reported to the PRBO Conservation Science, who then provided information on origin and banding date. Data sheets were submitted to the survey coordinator. Data collected for each survey location included the number, location, and sex of all Snowy Plovers, color band combinations, the time, and weather conditions of each survey, and a general and specific habitat description of each beach and Snowy Plover sighting. Surveyors also observed and recorded the level of human activity at each beach, such as presence of walkers, joggers, and individuals engaged in other recreational activities, the presence of on- and off-leash dogs, as well as the presence of vehicles and beach grooming equipment. In addition, surveyors recorded the presence of potential predators. During the breeding season surveys, volunteers noted breeding behaviors such as copulation, nest construction, incubation, or signs of agitation such as a broken wing display. All detections of Snowy Plovers and their nests were mapped from volunteer drawings and GPS locations using ArcView and overlaid on aerial photographs of the beaches.

Roost Surveys. Project biologists conducted surveys of just the main roost sites and nearby beaches in February, April, June, August, October, November, and December. Counts also followed protocols described by Elliott-Smith and Haig (2006). During these surveys, all snowy plovers were counted and the roosting area recorded on a GPS. This was accomplished by walking the perimeter of the colony at a distance that did not cause disturbance to the birds (typically 20-30 ft). During and immediately after the roost survey, the biologist scanned the roost to determine if birds were sitting on the sand. Observations of potential breeding behaviors, such as calling, aggressive displays, territorial displays and male-female paired individuals, were also noted. No nest surveys were conducted.

Disturbance, Threats, Predation and Mortality

During the County-wide surveys and the roost and nesting surveys, the volunteers and biologists recorded adjacent beach use information and recorded any events that occurred near the roosts that could potentially harm the plovers, disturb the plovers, or result in the mortality of plovers. They noted any dead birds found on the beach.

Education and Outreach

During volunteer training sessions, volunteers received training in both monitoring protocol and in ways of speaking with the public about plover conservation. In addition, Los Angeles Audubon staff worked with the Dockweiler Youth Center and Annenberg Community Beach House to establish a series of beach walks for the public, and collaborated with Los Angeles Unified School District public schools to facilitate in-school presentations and field trips to view Snowy Plovers at Dockweiler Beach. High school students from Los Angeles Audubon's Baldwin Hills Greenhouse Program received docent training and led elementary students through a plover-themed curriculum during select field trips.

RESULTS AND DISCUSSION

Population Status: Los Angeles County

Countywide & Window Surveys. From 2012 to 2014 the population of Snowy Plovers in coastal LAC has declined from a peak of 326 in 2012 to just 251 in 2014 (Tables 1 & 2). Population levels have remained stable at Zuma, but still well below the pre-2006 levels. They have seen large month-to-month fluctuations at Malibu Lagoon, and plovers were not observed at all during some surveys at Malibu Lagoon. The plovers appear to have mostly abandoned the roost at DSB 58 since January 2013, but have increased by a similar number at the protected area near DSB 47. The Hermosa Beach roost appears to be stable or increasing. Overall, LAC supports 23% of RU-6 and 6% of the range-wide non-breeding snowy plovers (USFWS Unpublished Data 2014).

Table 1. Results of Countywide Surveys in Los Angeles County 2012-2014.									
No.	Beach Name(s)	Sep 12	Jan 13	Mar 13	May 13	Sep 13	Jan 14	Mar 14	May 14
1	Leo Carillo State Beach/Nicholas Cyn CB								
2	El Sol, El Pescador, La Piedra SB		ns				ns		
3	El Matador, Lechuza Beach		ns	ns			ns		
4	Zuma Beach	6	80	1		35	73		
5	Zuma Beach (morning view to Pt Dume)								
6	Dume Cove, Paradise Cove, Escondido B.								
7	Dan Blocker CB, Puerco Beach	ns	9				0		
8	Malibu Bluffs SP, Amarillo B, Malibu B.								
9	Malibu Lagoon, Carbon Beach	38	60	27	1	32	25		
10	La Costa B., Las Flores B., Big Rock B.								
11	Las Tunas CB, Topanga CB					1			
12	Castle Rock B								
13	Will Rogers SB North								
14	Will Rogers SB South								
15	Santa Monica State Beach North	48	47	37		41	37	25	
16	Santa Monica State Beach South								
17	Venice City Beach North								
18	Venice City Beach South		2		2			2	
19	Dockweiler Beach North	41	29	43		62	45	36	
20	Dockweiler Beach Central		5						
21	Dockweiler Beach South	39	3						
22	El Segundo & Manhattan Beach		2				4		
23	Hermosa Beach North	39	40	37		39	60	48	
24	Hermosa Beach South & King Harbor								
25	Redondo County Beach North								
26	Redondo CB South & Torrance CB		ns						
30	Portuguese Bend								
32	Point Fermin & Cabrillo Beach					3	7		
35	Alamitos & Junipero Beach								
36	Belmont Shore & Peninsula Beach	2							
	Total Observed	213	277	145	3	213	251	111	0
	No. of Beaches	7	10	6	2	7	8	4	0

Beach	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Leo Carrillo State Beach/Nicholas Cyn CB	0	0	0	8	0	0	0	0	0	0	0
Zuma Beach	130	133	213	52	32	82	80	86	85	80	73
Zuma Beach South	0	0	0	0	48	0	0	0	0	0	0
Dune Cove, Paradise Cove, Escondido B.	0	0	0	6	0	0	0	0	0	0	0
Dan Blocker CB, Puerco Beach	0	0	0	23	0	0	0	0	2	9	0
Malibu Lagoon, Carbon Beach	33	28	12	34	37	36	67	47	78	60	25
La Costa B., Las Flores B., Big Rock B.	0	ns	ns	2	0	0	0	0	0	0	0
Will Rogers SB North	0	0	ns	2	0	0	0	0	0	0	0
Will Rogers SB South	0	0	ns	0	0	1	0	ns	0	0	0
Santa Monica State Beach North	32	40	42	16	30	40	41	58	58	47	37
Venice City Beach North	ns	0	ns	0	0	1	0	0	0	0	0
Venice City Beach South	ns	0	ns	2	0	0	0	8	4	2	0
Dockweiler Beach North	12	34	23	9	10	20	6	34	33	29	45
Dockweiler Beach Central	0	0	0	0	0	4	6	0	0	5	0
Dockweiler Beach South	13	0	0	4	11	15	16	23	13	3	0
El Segundo & Manhattan Beach	0	0	0	0	3	0	4	0	0	2	4
Hermosa Beach North	33	41	36	23	29	26	11	44	49	40	60
Hermosa Beach South & King Harbor	0	0	0	8	0	2	0	0	0	0	0
Redondo County Beach North	0	0	0	0	0	ns	0	0	0	0	0
Point Fermin & Cabrillo Beach	13	9	8	7	0	6	5	2	0	0	7
Total Observed	266	285	334	196	200	233	244	302	326	277	251
No. of Sites (N)	7	6	7	14	8	11	9	8	9	10	8

Roost Surveys. The roost surveys showed a similar overall decline through this study period (Table 3a & 3b). When comparing monthly roost surveys between Fall 2012-Spring 2013 and Fall 2013-Spring 2014, we see a decline in 2013-2014 in all months except April, June and August, with the biggest differences between the numbers present in December and February (Table 3a & 3b). This tracks the overall declining trend seen since the peaks in Winter 2012.

Table 3a. Results of Roost Surveys in 2012-2013.								
Beach Name(s)	Jul 12	Aug 12	Oct 12	Nov 12	Dec 12	Feb 13	Apr 13	Jun 13
Zuma Beach	32	43	53	88	8	75	0	0
Malibu Lagoon,	3	34	6	75	64	52	0	0
Santa Monica North	12	32	59	56	54	43	0	0
Dockweiler Beach North	28	4	43	49	62	44	0	0
Dockweiler Beach South	0	6	57	0	12	0	0	0
Hermosa Beach North	0	13	36	6	56	47	0	0
Total Observed	74	132	254	274	256	261	0	0
No. of Beaches	4	6	6	5	6	6	0	0

Table 3b. Results of Roost Surveys in 2013-2014.								
Beach Name(s)	Jul 13	Aug 13	Oct 13	Nov 13	Dec 13	Feb 14	Apr 14	Jun 14
Zuma Beach	0	39	35	5	91	67	ns	0
Malibu Lagoon,	1	38	51	0	8	24	0	0
Santa Monica North	0	31	22	74	48	18	8	0
Dockweiler Beach North	53	85	71	61	39	36	0	0
Dockweiler Beach South	0	0	0	0	0	0	0	0
Hermosa Beach North	3	33	79	28	43	40	4	0
Total Observed	57	226	228	254	209	185	12	2*
No. of Beaches	3	5	5	4	5	5	2	1

*observed in front of the tern enclosure on Venice Beach South.

Population Status: Orange County

Countywide & Window Surveys. County-wide surveys showed that there is a large non-breeding population of Snowy Plovers on OC Beaches (Table 4). Observations showed that 72% of the non-breeding plovers are present in September, but only 35% in March (Table 4). Complete county-wide surveys also showed that plovers occur away from the “traditional” known roosts, appearing at Seal Beach, Surfside, Newport Beach, and Crystal Cove State Park (Table 4).

Beach	May 2013	Sept 2013	Jan 2014	Mar 2014
Seal Beach	0	1	2	0
Surfside	0	18	10	0
Sunset	0	0	16	0
Bolsa Chica SB	2	60	31	26
Huntington City Beach	0	0	0	0
Huntington SB	0	12	21	57
Newport Beach	0	0	1	0
Balboa Beach	0	90	125	5
Corona Del Mar	0	0	0	0
Crystal Cove State Park	0	0	7	0
Laguna Beach	0	0	0	0
Salt Creek	0	0	16	0
Doheny SB	0	0	0	0
Capistrano	0	0	0	0
San Clemente City Beach	0	0	0	0
San Clemente SB	0	0	0	0
Total Observed	2	181	252	88
No. of Sites (N)	1	5	9	3

Comparing data collected by our project in 2014 with previous year’s data provided to the USFWS, non-breeding Snowy Plovers have increased on OC Beaches over the past 11 year span (USFWS Unpublished Data 2014, Table 5). Surveys in OC have suffered from variable efforts. From 2004 to 2013, between 4 and 18 beach segments were surveyed during the survey window (USFWS Unpublished Data 2014, Table 5). Comparing observations in 2014 with the last year when all beaches were reported as having been surveyed (2005), the population has nearly doubled over that 10 year span. Overall, OC supports 23% of RU-6 and 6% of the range-wide non-breeding snowy plovers (USFWS Unpublished Data 2014).

Beach	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Seal Beach	NS	2	NS	0	NS	0	NS	NS	NS	NS	2
Seal Beach NWS	NS	11	0	0	NS	14	0	0	NS	NS	0
Surfside	0	0	17	10	11	17	15	4	5	0	10
Sunset	NS	0	0	0	NS	NS	0	0	NS	7	16*
Bolsa Chica SB	11	47	43	16	23	9	26	39	44	36	31
Bolsa Chica ER/wetlands	0	9	0	34	17	26	0	NS	NS	3	23*
Huntington City Beach	0	0	NS	0	NS	NS	NS	0	0	0	0
Huntington SB	NS	0	26	23	30	13	13	81	21	20	21
Newport Beach	0	0	NS	NS	NS	NS	NS	NS	NS	NS	1
Balboa Beach	NS	12	25	9	24	77	63	40	63	64	125
Corona Del Mar	NS	0	NS	NS	NS	NS	NS	NS	NS	NS	0
Crystal Cove State Park	20	19	2	0	NS	0	2	0	10	NS	7
Laguna Beach	NS	0	0	NS	NS	NS	NS	NS	NS	NS	0
Salt Creek	38	30	48	0	NS	0	0	0	46	45	16
Doheny SB	0	0	0	0	NS	0	0	0	0	0	0
Capistrano	NS	0	NS	NS	NS	NS	NS	NS	NS	NS	0
San Clemente City Beach	NS	0	NS	NS	NS	NS	NS	NS	NS	NS	0
San Clemente SB	0	0	0	0	NS	0	NS	NS	NS	NS	0
Total Observed	69	130	161	92	105	156	119	164	189	175	252
No. of Sites (N)/Surveyed	3/9	7/18	6/12	5/13	5/5	6/11	5/10	4/10	6/8	6/9	9/18

*USFWS Unpublished Data.

Roost Surveys. Roost surveys in OC show a similar annual pattern to those in LA, with the plovers mostly gone in May and June, returning in July, peaking between August and February and departing in March and April (Table 6a & 6b). Comparing the two complete years of surveys done by R. Griswold (pers. comm.) and this survey effort, with the roosts at Salt Creek and Trestles removed, it does appear that there was an increase in the number of Snowy Plovers at the roosts in OC between 2012-2013 and 2013-2014 by approximately 35-40 individuals (Table 6a & 6b). One pattern that appears regularly is that the plovers appear to move between Huntington SB and Balboa Beach, when numbers are large at one, they appear to decline at the other (Table 6a & 6b). It is likely that these plovers move regularly between these roost sites.

Beach Name(s)	Jul 12	Aug 12	Oct 12	Nov 12	Dec 12	Feb 13	Apr 13	Jun 13
Surfside	ns	15	18	11	22	ns	ns	ns
Bolsa Chica SB 2	0	29	6	43	12	0	19	3
Huntington SB	0	34	50	81	152	55	10	0
Balboa Beach 2	19	76	106	43	12	71	1	0
Salt Creek	ns	ns	ns	ns	ns	ns	0	0
Trestles	ns	ns	ns	ns	ns	ns	28	0
Total Observed	19	139	162	167	176	126	58 (30)	3 (3)
No. of Beaches	1	4	4	4	4	2	3	1

Beach Name(s)	Jul 13	Aug 13	Oct 13	Nov 13	Dec 13	Feb 14	Apr 14	Jun 14
Surfside	ns	ns	21	16	15	10	0	0
Bolsa Chica SB 2	27	22	47	36	31	42	2	1
Huntington SB	16	17	93	101	25	21	32	0
Balboa Beach 2	65	93	67	72	110	89	1	0
Salt Creek	0	0	0	3	26	0	0	ns
Trestles	0	0	0	39	67	41	0	ns
Total Observed	108 (108)	132 (132)	207 (207)	251 (209)	259 (166)	203 (162)	35 (35)	1 (1)
No. of Beaches	3	3	4	6	6	5	3	1

*The roosts at Salt Creek and San Clemente State Beach/Trestles were not regularly surveyed until April 2013; counts without these roost numbers are provided below in parenthesis so that population trends can be compared.

Roosting Sites – Los Angeles County

Zuma County Beach. Zuma is now the second largest roost and supports approximately 21% of the county population in 2012-2014. However, it was previously the largest roost and supported 41% of the population from 2004-2010 (Ryan et al. 2010) and the flock here has still not recovered and has declined slightly from 82-85 plovers in 2010-2011 to 73 plovers in 2014. At Zuma, the flock remained north of Lifeguard Tower 9, and as in previous years, frequently the flock would spread to the north along the top of the beach slope following beach grooming at their main roosting location (Appendix Figure 1). Their population fluctuated considerably during the non-breeding season (Tables 1, 3a, and 3b). This roost is not protected and is regularly

groomed and driven through. Heavy equipment is used to raise and lower sand berms to protect infrastructure each year.

Malibu Lagoon. Malibu is the fourth largest roost and typically supports about 16% of the county population (Ryan et al. 2010). In 2012-2014, it supported 15% of the LAC non-breeding population. The population fluctuated from 0 to 75 plovers throughout the non-breeding season. Especially in Fall 2013 and Winter 2014, the flock was very erratic here. It was frequently missed by surveyors, but detected by other surveyors during the same week. It is possible that it is being flushed early by off-leash dogs, which continue to be a problem here.

Each spring, we coordinate with California State Parks to set up a symbolic enclosure at this site. In 2013, enclosure set-up occurred in mid-March and removal occurred in mid-October. In 2014, the enclosure was set up on March 19.

On July 15, 2013 we observed an LAC Lifeguard speeding on an ATV; it passed within 6-8 feet of roosting Snowy Plovers. This was reported to State Parks Staff. On August 19, 2013 a Snowy Plover was struck and killed by an LAC Lifeguard travelling on an ATV at approximately 20 mph. It was observed and reported by State Parks staff. Our staff then attended a meeting with the USFWS warden, State Parks, LACBH, and LAC Lifeguard personnel. This is the second plover that has been documented to have been struck and killed by vehicles on the beach.

On April 25, 2014 a berm was cut through the west end of the plover enclosure at Malibu Lagoon. No plovers were observed that day. However, it was reported that subsequently several of the enclosure stakes were flooded.

The ground work for the Malibu Lagoon Restoration Project has been completed. The construction area does not include the sand bar. We have not identified or suspected any impacts from the restoration project on the Snowy Plovers. This should continue to be monitored throughout the restoration process.

We are also concerned about the placement of the Surf Camps each summer. These camps enroll large numbers of children and involve a large number of beach activities such as soccer, Frisbee, and other popular beach activities. In the past several years, one has been placed immediately outside the plover enclosure on the LAC portion of the west side of the beach. We strongly suggest that any permits issued for these camps place them at least 300 ft from the boundary of plover roosts. The plovers return in July and the camps run through August.

Santa Monica State Beach. The roost at Santa Monica usually supports about 8% of the countywide wintering population of plovers (Ryan et al. 2010), but supported 19% of the population in 2012-2014. We observed between 54-59 plovers here in 2012-2013 and 22-74 in 2013-2014. This is more than was detected here during the 2004-2009 surveys (Ryan et al. 2010, Table 2). Lu Plauzoles provided a summary of the 2013-2014 seasons. He noted that the plovers spent 305 days, or 83% of the year at Santa Monica and noted that, "This species is not 'wintering' on our beaches, but rather, spending all but a short breeding window in Santa Monica." Lu suggested the possibility of a year-round enclosure. He noted that, "The location this year seemed to be well-chosen for the needs of the birds. Even when they were flushed by

encroaching vehicles, they seemed to eventually return and there were far more observations of the birds inside the enclosure than in previous years. Some lifeguards were suggesting to me the enclosure could be deeper without endangering their operations.” Lu provided the following recommendations:

1. Measuring the summer gap from edge to fence at 12 feet would leave room for a lifeguard vehicle, but would discourage the County/City water testing pickup trucks from crossing the roost;
2. Immediately erecting the fence extension to the berm edge after Labor Day would provide the best protection from vehicles and joggers;
3. Adding a “No Vehicles except on emergency calls” with a seaward arrow at the end of the fencing would further protect the birds; and
4. Allowing, and in fact encouraging, dune building inside the enclosure seems to attract the birds to the area. “Dunelets” only a foot high mimic an ungroomed beach and in windy situations provide welcome roosting shelter for the birds.

We are also concerned about the placement of the Surf Camps each summer. These camps enroll large numbers of children and involve a large number of beach activities such as soccer, Frisbee, and other popular beach activities. In the past several years, one has been placed directly where the traditional plover roost is located. We strongly suggest that any permits issued for these camps place them at least 300 ft from the boundary of plover roosts. The plovers return in July and the camps run through August.

Venice Beach. In 2012-2014, the snowy plovers were again observed at Venice Beach in January, May 2013 and March 2014.

Dockweiler State Beach. In 2012-2014 the northern roost near **Lifeguard Tower 47 (LT 47)** was the largest snowy plover roost in LAC. It supported between 29-71 plovers from October to February (Table 1, 3a and 3B). Overall, 23% of the LAC winter roosting population overwintered here. This is an increase from 2-3% of the population from 2004-2009 surveys (Ryan et al. 2010, Table 2). We attribute these increases to the presence of an enclosure that has protected the core roosting area since 2009. On August 14, 2010 a wooden-slat fence replaced the snow fencing and it remained in place through the entire 2014 season (Figure 4).

Los Angeles Audubon, USFWS, and LACBH have all worked as a team to maintain the fence and pick up trash. There was no vandalism to the fence and during most clean-up visits, only a few pieces of trash are recovered. There are four native coastal strand/dune plant species that are voluntarily colonizing the enclosure area. These include *Atriplex leucophylla* [beach saltbush] *Abronia maritima* [red sand verbena], *Ambrosia chamissonis* [silver beachweed or silver beach burr], and *Camissonia cheiranthifolia* [beach primrose].

Observers did note the presence of vehicle tracks in front of the enclosure, especially during months when the beach widens. We recommend that vehicles avoid this area to the extent possible because the plovers are often located between the enclosure and top of the beach slope. We also observed dog tracks in the enclosure and support enforcement of existing dog regulations on this beach.

At the southern roost, north of **Lifeguard Tower 58 (LT 58)**, (Figure 5) we detected 0-57 plovers in 2012 and none have been detected during surveys since January 2013. It only supported 3% of the population (Ryan et al. 2010, Table 2). This roost is not protected and is regularly groomed and driven through. A berm is installed and removed annually to protect nearby infrastructure and fire pits are placed in front of the adjacent RV park. We recommend that an enclosure be considered for this location as it is between the Dockweiler Youth Center and the RV park in an area not often used by the beach-going public. This roost site also has great educational value, as it is the focus of the beach walks jointly coordinated by Los Angeles Audubon and Dockweiler Youth Center.

Hermosa Beach. In 2012-2014 we detected between 28-79 plovers at these roosting areas from October to March and supported 18% of the non-breeding population in LAC (Tables 1, 3a, and 3b). This is an increase over past years (Ryan et al. 2010). As in past years, the location of the roost was variable (Figure 6). They moved regularly they were observed adjacent to 19th to 22nd Streets and from 26th to 28th Streets. The reason for this movement is unknown. However, this roost is regularly groomed, patrolling vehicles regularly pass through it, and dog tracks are regularly observed in the area. We have also seen movements like this at Zuma, another beach with heavy disturbance at the roost site (Ryan et al. 2010).

Other Beaches. Snowy Plovers were also reported from Dan Blocker County Beach, Topanga County Beach, Dockweiler Central, El Segundo Beach, Cabrillo Beach and Belmont Shore (Table 1).

Roosting Sites – Orange County

Surfside. Surfside Beach supported a small roost of 10-22 Snowy Plovers between July 2012 and April 2014. This represents about 5% of the total non-breeding plovers in the county. The population here appears to be stable when compared with winter window survey data (USFWS Unpublished Data 2014, and observations made by Ryan and Hamilton 2009). This beach is not formally groomed, but the local homeowners remove kelp from the beach. This beach also has a large number of off-leash dogs. In 2009, a dog captured a Snowy Plover and it was brought to a wildlife rehabilitation facility (P. Knapp pers. comm. *in* Ryan and Hamilton 2009).

Bolsa Chica State Beach. Bolsa Chica SB supports the third largest roost in the county and is immediately adjacent to the main nesting area in OC, the Bolsa Chica Wetlands Ecological Reserve. We observed between 6-60 plovers here between October and February each year; this represents 14% of observations. This is a broad sandy beach, with a public parking lot backing it. It is very popular with beachgoers during the summer months.

Huntington State Beach. Huntington SB supports the second largest roost in the county. We observed between 21-152 plovers here between October and February each year; this represents 32% of observations. This is a broad sandy beach, with a public parking lot backing it. It is very popular with beachgoers during the summer months.

Balboa Beach. Balboa Beach supports the largest roost in the county and is immediately adjacent to a large residential area on the Balboa Peninsula. We observed between 12-125 plovers here between October and February each year; this represents 42% of observations. This

is a broad sandy beach, with residential homes backing it. It is very popular with beachgoers during the summer months. It also supports a small dune restoration area where a pair of plovers has nested in recent years. This is the only known beach nesting plover pair on the mainland in LAC or OC.

Crystal Cove State Park. Volunteers observed a flock of 7 Snowy Plovers at Crystal Cove State Park during the January 2014 beach-wide survey. The plover is listed as “occasional” during the Fall, Winter and Spring months on the park’s bird checklist (Bales, unknown date). It was not observed here during any other survey, but should be included in future roost surveys.

Salt Creek. Project biologists found Snowy Plovers roosting at the upper end of Salt Creek in November and December 2013. In December 26 individuals were found, but they were not observed by volunteers during the January 2014 beach-wide survey. This beach is very popular throughout the year. It is visited by guests at the adjacent Ritz Carlton Hotel and the Monarch Bay Club, as well as public access through the Salt Creek Beach Park. It is well-patrolled and off-leash dogs were not observed. Part of the beach is regularly groomed and the outlet of Salt Creek is occasionally opened using machinery.

San Clemente State Beach/Trestles. Project biologists observed Snowy Plovers roosting in front of the San Mateo Creek Lagoon at the southern end of San Clemente State Beach. This flock is likely the same one detected at Green Beach/Trestles during surveys conducted at Marine Corps Base Camp Pendleton. These birds appear to shift their roosting area during the year and use the Orange County side of the line. We observed 39-67 individuals here between November 2013 and February 2014.

Nesting

No nesting was detected on Los Angeles County Beaches in 2012-2014. One Snowy Plover pair nested at Balboa Beach in Orange County. It was monitored and reported on separately by City of Newport Beach Natural Resources Protection Division.

Roost Size Study

The average size of daily Snowy Plover winter roosts is 73 m (239 ft) long, 28 m (91 ft) wide, and covers an area of 0.29 hectares (ha) (0.71 acres [ac]) (SE = 0.01). The average length of roosts ranged from 48 m (157 ft) (DSB LT58) to 108 m (355 ft) (Zuma). The average width of roosts ranged from 24 m (79 ft) (Zuma) to 29 m (96 ft) (DSB LT47). The area of the average roost ranged from 0.10 ha (0.26 ac) (DSB LT58) to 0.40 ha (0.99 ac) (Malibu) (Table 7a, 7b, 7c).

Table 7a. Length of Snowy Plover Roosts 2009-2014.			
Roost Location	Length (m)	Count (n)	Std Dev (m)
Zuma	108.31	21	78.04
Malibu	64.72	28	25.70
Santa Monica	72.61	31	31.97
Dockweiler LT 47	61.57	25	29.18
Dockweiler LT 58	47.95	13	23.35
Hermosa	79.64	18	61.14
Total	73.0	136	47.23

Roost Location	Width (m)	Count (n)	Std Dev (m)
Zuma	24.20	21	12.20
Malibu	29.08	28	7.75
Santa Monica	28.08	31	11.36
Dockweiler LT 47	29.43	25	7.96
Dockweiler LT 58	26.88	13	9.46
Hermosa	27.48	18	10.71
Total	27.7	136	9.97

Roost Location	Area (m²)	Count (n)	Std Dev (m²)
Zuma	2403.07	18	2325.31
Malibu	4006.72	20	3728.73
Santa Monica	2631.31	23	2451.84
Dockweiler LT 47	3431.29	19	4411.81
Dockweiler LT 58	1046.96	11	438.01
Hermosa	3170.97	15	3017.70
Total	2879.93	108	3131.89

When each daily roost was overlaid and the boundaries combined by year, it provides the overall size of the Snowy Plover roost for each site annually. On average, over the course of a year, the Snowy Plovers used an area 239 m (782 ft) long by 90 m (296 ft) wide. Average non-breeding season roosts ranged from 140 m (460 ft) to 451 m (1,480 ft) in length, and 55 m (180 ft) to 136 m (446 ft) in width (Table 8).

Roost Location	Length (m)	Width (m)
Zuma	451.18	72.18
Malibu	332.20	55.15
Santa Monica	302.21	109.26
Dockweiler LT 47	140.41	55.85
Dockweiler LT 58	190.35	80.81
Hermosa - Main	385.17	136.11
Average	238.64	90.92

Recommendations for Special Protection Zones

We recommend that all non-breeding plover roosts in LAC and OC be considered as Special Protection Zones (Ryan et al 2010). We would suggest that efforts to protect these Snowy Plovers be implemented within 75 m (250 ft) perpendicular from the coast from the high tide line and within the 500 feet of the central roost location parallel to the coast. These measures should be implemented from the arrival of the first returning birds in July until they depart in April to May each year. We suggest that these areas be referred to as “**Special Protection Zones**” and provided management and maintenance differently from adjacent areas of beaches without roosting Snowy Plovers. We suggest the following to avoid further intentional and unintentional take of Snowy Plovers within Special Protection Zones.

Routine Operation of Vehicles and Heavy Machinery

1. All drivers of vehicles and machinery that are operated on sections of beach where Snowy Plovers occur should be trained in Snowy Plover avoidance annually.
2. Vehicles should avoid operating within Special Protection Zones, with the exception of essential activities such as lifeguard rescue, essential patrols, trash pick-up and other activities deemed essential and agreed to by wildlife agencies. Vehicles simply transiting between points should not be allowed within these areas.
3. Visible markers, possibly with signage should be placed within 100 feet of the top of the beach slope and at the inland corners of the Special Protection Zones to remind vehicle operators of their presence.
4. When essential activities must occur, vehicles should remain below a maximum 10 mile per hour speed limit and if birds are encountered, the driver should back up 50 feet and alter their route to avoid flushing Snowy Plovers.

Beach Maintenance and Clean up

5. Regular sand grooming should be discontinued within Special Protection Zones. This activity both flushes the birds and removes important foraging resources. We recommend that these small areas be cleaned by hand crews, trained in Snowy Plover avoidance.
6. If mechanical clean-up is necessary, it should be done in the presence of a qualified Snowy Plover monitor who will locate the roosting Snowy Plovers and ensure that machinery does not flush or disturb them.

Recreational Activities

7. We suggest that activities such as walking, jogging, surfing, and sunbathing do not pose as much of a threat to the Snowy Plovers as fast moving vehicle strikes and removal of foraging habitat and that these continue normally within these areas.
8. We suggest that “refuge areas” be created using symbolic fencing or other barrier deemed suitable for this use during periods of extremely high beach use at popular beaches in July, August, and September. We recommend that these be erected in a 200 foot diameter (or other configuration suitable for the beach, but roughly 200 feet long) around the traditional center of the Snowy Plover’s roosting areas on popular beaches such as Zuma,

DSB 58, and Hermosa. Signage should be placed on the barrier such as has been done at Malibu using signs made by local school children.

9. Large-scale recreational activities including things like triathlons, surf camps, beach volleyball camps, etc. should not be permitted within the Special Protection Zones. Docents should visit camps adjacent to the Special Protection Zones to talk to participants about plovers.
10. Increased enforcement of existing regulations for off-leash dogs within the Zones.

Education and Outreach

Formalized Docent Program. The project team secured funding in 2008 to develop a Snowy Plover docent program, and brochures and interpretive materials aimed at the general public have been created. The project team is currently working with Dockweiler Youth Center (LACBH) and the Annenberg Community Beach House to lead a series of plover-focused beach walks for the general public, and to coordinate public school presentations and visits to observe plovers (Table 6). From Fall 2012 to Spring 2014, 8 volunteers collectively spent 38 hours either working directly with the public through field trips, walks and presentations or by meeting with Los Angeles Audubon staff and working independently to strategize on expanding outreach. Through outreach activities, we have worked to establish community connections that will provide volunteers for both data collection and docent activities.

Volunteer participation in the Snowy Plover monitoring program. From September 2012 to March 2014 57 individuals volunteered to monitor plovers in LAC, contributing over 490 person-hours to the project. Of these 57 people, over half participated in 2 or more surveys, and 40% participated in 4 or more surveys.

In OC in 2013-2014, team leaders volunteered over 460 person hours to complete administrative tasks, surveys, volunteer training, and outreach. A total of 81 volunteers participated in surveys in Orange County, contributing 537 person hours to monitoring efforts. Sea and Sage Audubon exceeded their goal of 50 trained volunteer surveyors with 65 in-class formally trained surveyors and 57 field trained surveyors for a total of 122 trained surveyors by the end of their first project year. Each was provided with a training manual, based on the LAC manual. Training sessions were held on May 18, 2013, September 7, 2013, and January 11, 2014.

Orange County Outreach

Outreach for the first year of the project has been aimed at recruitment of surveyors and public awareness of the survey and Snowy Plovers. The survey is announced at every Sea and Sage Audubon General Meeting (monthly), every 4th Tuesday Conservation Lecture (8 per year), and various events throughout the year. Our Science Committee Chair contacts nearby Universities to recruit students to the program and our Facebook Chair posts every survey multiple times. Flyers, posters and business cards are also placed at various venues and email announcements are sent to science/conservation interest lists.

School Outreach Program. We explored multidisciplinary ways to engage young, inner-city students in plover conservation. In 2008, we worked with Dorsey High School to create a public service announcement about Snowy Plover conservation. Since its creation, it has been viewed over 3,500 times on youtube.com and is also being used as part of the Ventura Audubon

chapter's outreach efforts. Snowy Plover conservation posters created by elementary school students in the spring 2010 continue to draw viewers to Los Angeles Audubon's online gallery (<http://losangelesaudubon.org/education-mainmenu-194/science-illustration-mainmenu-244/624-snowy-plover-gallery>), and these signs have been used at both the Malibu Lagoon seasonal enclosure and the Dockweiler Youth Center display case. Our online gallery has garnered over 4,400 web hits since it was posted in the summer of 2010.

In Fall 2012, we again worked closely with two Los Angeles Unified public schools at the elementary and high school level to provide them with in-class presentations and field trips to view plovers in their native habitat at Dockweiler Beach. Since August 2010, the plover enclosure at Dockweiler Beach 19 has proven to be an outstanding resource for education and outreach as well as conservation. Access to restrooms and parking is conveniently located nearby, offering a safe and spacious staging area before volunteers lead students on a short walk to view plovers at the enclosure. Los Angeles Audubon has also begun to integrate coastal issues, like Snowy Plover conservation, into its education programs at upland sites within the Los Angeles basin. Dorsey High School students in Los Angeles Audubon's Baldwin Hills Greenhouse Program developed a plover-themed environmental science curriculum, received docent training, and subsequently led elementary school students on field trips to Dockweiler Beach. This same group of students was also responsible for setting up and implementing a bilingual plover and tern information table at public school events in the May 2011 and May 2012 that drew hundreds of community members. In the summer of 2013, in collaboration with Audubon California and San Diego Audubon, Los Angeles Audubon received a Whale Tail Grant to expand plover-themed outreach efforts in public schools. This allowed us to work with 4 schools in addition to Dorsey High and Politi Elementary during the 2013-2014 school year. See Table 7 for a complete list of all outreach activities conducted.

General Public Outreach. Since the fall of 2010, we have coordinated with the Dockweiler Youth Center to provide a series of guided beach walks for the public. In February 2012, we began collaborating with the Annenberg Community Beach House in Santa Monica to provide a similar program at their facility. We participated in eco-fairs and meetings from Fall 2012 to Spring 2014 to provide the public with information about plover conservation in LAC (Table 7). Capitalizing on our strong partnership with California State Parks at Malibu Lagoon, we collaborated with this agency to provide an enclosure of symbolic fencing with interpretive signage from March through October 2013 and March 2014 to present, and we aim to move forward to establish a small site-specific core of volunteers to help monitor this site and establish permanent interpretive signage. In addition, we gave presentations at the Recovery Unit 6 meeting and at the Sea & Sage Audubon general meeting.

Table 7. Outreach and education conducted from Winter/Spring 2013 through Spring 2014, including presentations, tabling events, beach walks, and fieldtrips.

Activity	Date	Location	Demographic	No. Attending
Dockweiler Youth Center (beach walks)	9 Feb 2013 16 Feb 2013 23 Mar 2013 13 Oct, 2013 23 Nov 2013 11 Jan 2014	Dockweiler Beach	General public	31
Annenberg Community Beach House (beach walks)	20 Jan 2013 29 Dec 2013 19 Jan 2014	Santa Monica Beach	General Public	158
Public School Field Trips	19 Oct 2013 17 Jan 2014 31 Jan 2014 7 Feb 2014 13 Feb 2014	Dockweiler State Beach	Inner-city public school students	360
Public School Presentations	25-Sep-13 26-Sep-13 17-Oct-13 13-Jan-14 29-Jan-14 5-Feb-14 10-Feb-14 25-Apr-14	Dorsey High School, Politi Elementary School	Public school students	~490
Public Presentations	4 May 2013 11 Sep 2013 15 Jan 2014	Southern California Academy of Science; Pepperdine University (Marine Bio class)	Science and beach management professionals; upper division college students	~80
Eco-fairs and other tabling events	Spring 2013 Spring 2014	Cabrillo Aquarium Conservation Art Show (Politi Elementary)	General public	Hundreds

Creation of public displays. As mentioned above, we worked with elementary school students to create Snowy Plover conservation posters in 2010. The public may view this artwork online at the Los Angeles Audubon website. During 2013-2014, we again worked with students to create visual plover-themed media, including posters, a film, and scale models (physical and digital) of wildlife-friendly urban beaches. We will continue to collaborate with other organizations to provide venues in which to display interpretive information about plover conservation on both a temporary and permanent basis.

Creation and maintenance of a website. Los Angeles Audubon currently hosts a Snowy Plover website within its general website (losangelesaudubon.org). Volunteer materials, annual reports, updates, maps of plover locations from volunteer observations, and student conservation posters have been posted to this site. Since we set it up in 2008, the main webpage containing Snowy Plover conservation information received over 7,000 page views, and our gallery of student conservation posters received over 4,400 page views since 2010.

Sea and Sage Audubon currently hosts a Snowy Plover website for Orange County within its general website (seaandsageaudubon.org), created and maintained by volunteer staff. General Snowy Plover information is available as well as information about this survey. All volunteer materials are available for download as well as a list of beach segments with downloadable maps. In the weeks prior to a survey through the weeks after, this site becomes the active place for the volunteer surveyors to select their beach segment. It displays which segments are available. It also displays which segments have completed their survey and turned in the data.

Create signage for the winter and breeding season fencing. The project team secured funding for the creation of signage for the enclosure at Dockweiler, and signs were installed in August 2010. In addition, conservation posters created by elementary school students were printed on durable plastic and were used again at the seasonal enclosure at Malibu Lagoon from March - October 2012 and March 2014 - present.

Create and implement a beach driver-training program. The project team created an informational handout to be provided to all lifeguards and included in their training program. It covers information about identifying, detecting and avoiding Snowy Plovers and provides maps to the plover roosting areas. This was also provided to LACBH for inclusion in their training program. The project team has offered to provide presentations to both groups upon request, and we have provided materials to California State Parks and Sea and Sage Audubon as well.

Recommendations for Future Education and Outreach

The following recommendations range from sustaining existing programming to greatly expanding aspects of outreach and education. All are contingent on future funding opportunities and staff availability. Opportunities to seek collaborative funding with colleges and universities, beach management agencies, beach-oriented non-profit organizations, and other coastal Audubon chapters appear to be the best way to move forward with these ideas:

- Continue to work towards sustainability in docent and outreach programs. Expansion to more public schools and interested groups throughout LAC is an ultimate goal. However, the project team feels that it is extremely important to maintain a solid, consistent training program for volunteers and develop strong, sustainable relationships with the agencies charged with managing sites where the docent program will be conducted.
- Continue to link Snowy Plover outreach efforts to other conservation programs. Los Angeles Audubon also coordinates volunteers for monitoring and habitat restoration of the Venice Beach Least Tern colony. Recent outreach presentations have addressed the similar conservation needs of both species, and a concerted effort to link volunteer recruitment between the two programs could greatly benefit both. In addition, connecting these avian programs to grunion conservation efforts could help promote sandy beach conservation in general.
- Create a questionnaire for beachgoers at sites in need of additional protections. Questionnaires should be provided to local residents and tourists during both the winter “off season” and “peak use” summer months, inquiring about feelings on sharing the beach with plovers, types of beach use, what part of the beach is used by the public and when (time of day and time of year), and preferences for different types and placement of protections for the plover. The answers gathered could then be considered in the design and placement of

protective measures, including enclosures, and could also help direct and refine outreach efforts. The project team believes that to develop a public survey with genuine scientific credibility it will be important to partner with a university graduate program or other professional organization with expertise in the social sciences to design and implement the questionnaire. A similar survey was conducted by Heal the Bay (Stevenson et al. 2011) to gain insight into subsistence angler opinions about marine protected areas. We hope to learn from Heal The Bay's process and potentially propose a similar collaborative project to address plover conservation.

- Continue to establish organizational partnerships. In LAC, a large number of government and non-profit organizations maintain sites or conduct events at or near the beach. Establishing positive collaborations with organizations like California State Parks, the Annenberg Community Beach House, the Dockweiler Youth Center, local aquaria, and Heal The Bay to develop public displays and events will help integrate Snowy Plover conservation outreach into a broader ecological context, give it a wider audience, and provide greater funding opportunities.
- Continue to establish academic partnerships. The project team should continue to find ways to integrate undergraduate students from local colleges and universities in community-based science and docent programs. In addition, securing funding to attract graduate students to the project would be an excellent way to expand the ecological and sociological aspects of the study while maintaining the core efforts of monitoring and outreach.
- Continue to improve signage and place signage near enclosures and plover roost sites when possible. This is needed to inform the public about the enclosures and why protecting the Snowy Plover is important.
- Create a media packet for local business and homeowner associations that operate near plover beaches. The packet should include a DVD of the public service announcement as well as resources regarding dogs on the beach and general plover conservation awareness.

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LITERATURE CITED

- Bates, J. Date Unknown. Field Checklist: Birds of Crystal Cove State Park. Crystal Cove Alliance, Newport Coast, California. 2 pp.
- County of Los Angeles, Department of Beaches and Harbors. 2009. Beach History. Accessed at: <http://beaches.co.la.ca.us/BandH/Beaches/BeachHistory100708.pdf>. Accessed August 13, 2009.
- Dugan, Jennifer. 2003. Ecological Impacts of Beach Grooming on Exposed Sand Beaches. Coastal Ocean Research October 2003.
- Dugan, J. and D. M. Hubbard. 2009. Loss of Coastal Strand Habitat in Southern California: The Role of Beach Grooming. Estuaries and Coasts. DOI 10.1007/s12237-009-9239-8
- Elliott-Smith, E. and S.M. Haig. 2006. Western Snowy Plover Recovery Plan: Appendix J: Monitoring Guidelines for the Western Snowy Plover, Pacific Coast Population. California/Nevada Operations Office, U.S. Fish and Wildlife Service, Sacramento, California.
- Grinnell, J. and A.H. Miller. 1944. The distribution of the birds of California. Pacific Coast Avifauna. No. 27. Berkeley, California.
- Lafferty, K. D., D. Goodman, and C. P. Sandoval. 2006. Restoration of breeding by Snowy Plovers following protection from disturbance. Biodiversity and Conservation 15(7): 2217-2230.
- Los Angeles Breeding Bird Atlas. Unpublished. Los Angeles Audubon.
- Page, G. W., and L. E. Stenzel. 1981. The breeding status of the Snowy Plover in California. Western Birds 12: 1-40.
- Page, Gary W., Lynne E. Stenzel, G. W. Page, J. S. Warriner, J. C. Warriner and P. W. Paton. 2009. Snowy Plover (*Charadrius alexandrinus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/154>
- Ryan, T.P. and R. Hamilton. 2009. Surfside Beach Sand Replenishment Project, Snowy Plover Monitoring, Final Report. Prepared by Ryan Ecological Consulting, Pasadena, CA. 19 pp + appendices.
- Ryan, T. P., S. Vigallon, L. Plauzoles, C. Almdale, R. Montijo, and S. Magier. 2010. The Western Snowy Plover in Los Angeles County, California. Prepared for the California Department of Fish and Wildlife, Sacramento, CA. Prepared by Ryan Ecological Consulting, Pasadena, CA. 56 pp + appendices.

- Santa Monica Bay Audubon Society. Unpubl. data. Santa Monica Bay Audubon Society.
- Stenzel, L.E., S.C. Peaslee, and G.W. Page. 1981. II. Mainland Coast. Pages 6-16 in Page, G.W. and L.E. Stenzel, (eds.). The breeding status of the Snowy Plover in California. *Western Birds* 12(1):1-40.
- Stevenson, C., S. Abramson Sikich, and M. Gold. 2011. Engaging Los Angeles County subsistence anglers in the California marine protected area planning process. Article In Press. Currently available online at <http://www.sciencedirect.com/science/article/pii/S0308597X11001369>.
- Tingco, L. In Prep. Impact of Disturbance on Roosting Behavior of *Charadrius alexandrinus nivosus*. Master of Science Thesis. California State University, Los Angeles.
- U.S. Fish and Wildlife Service [USFWS]. 1993. Endangered and threatened wildlife and plants: determination of threatened status for the Pacific coast population of the western Snowy Plover; final rule. *Fed Regist.* 58(42):12864-12874.
- U.S. Fish and Wildlife Service [USFWS]. 2005. Endangered and threatened wildlife and plants: designation of critical habitat for the Pacific coast population of the Western Snowy Plover; final rule. *Fed Regist.* 70: 56970 - 57119.
- U.S. Fish and Wildlife Service [USFWS]. 2007. Recovery plan for the Pacific coast population of the Western Snowy Plover (*Charadrius alexandrinus nivosus*): Vol. I, Recovery plan. U.S. Fish and Wildlife Service, Sacramento, California. 274 pp.
- U.S. Fish and Wildlife Service [USFWS]. 2012. Endangered and threatened wildlife and plants: revised designation of critical habitat for the Pacific coast population of the Western Snowy Plover; final rule. *Fed Register* 77 (118): 36728-36869
- Widrig, R. S. 1980. Snowy Plovers at Leadbetter Point. Willapa National Wildlife Refuge, U.S. Fish and Wildlife Services, Ilwaco, WA.

APPENDIX 1: ROOST MAPS

Figure 1. Zuma Beach Roost Map (see legend below).



Figure 2. Malibu Beach Roost Survey Map.



Figure 3. Santa Monica Roost Survey Map.



Figure 4. Dockweiler LT 47 Roost Survey Map.



Figure 5. Dockweiler LT 58 Roost Survey Map.



Figure 6. Hermosa Beach Roost Survey Map.



Figure 7. Surfside Roost Survey Map.

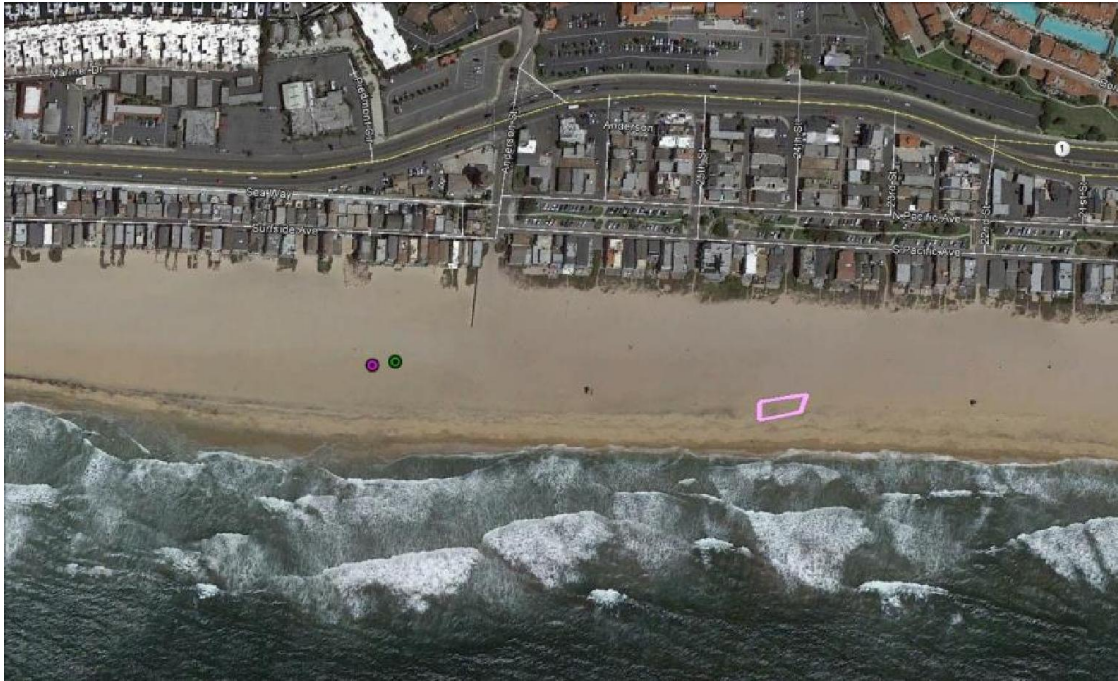


Figure 8. Bolsa Chica State Beach Roost Survey Map.



Figure 9. Huntington State Beach Roost Survey Map.



Figure 10. Balboa Beach Roost Survey Map.

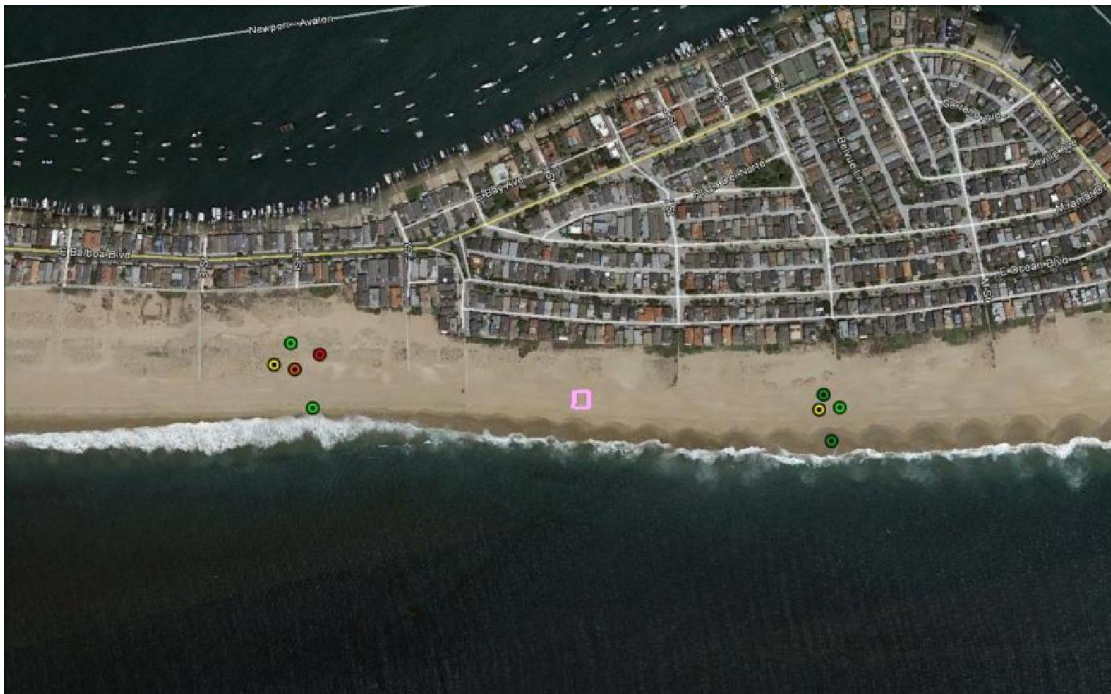


Figure 11. Salt Creek Roost Survey Map.

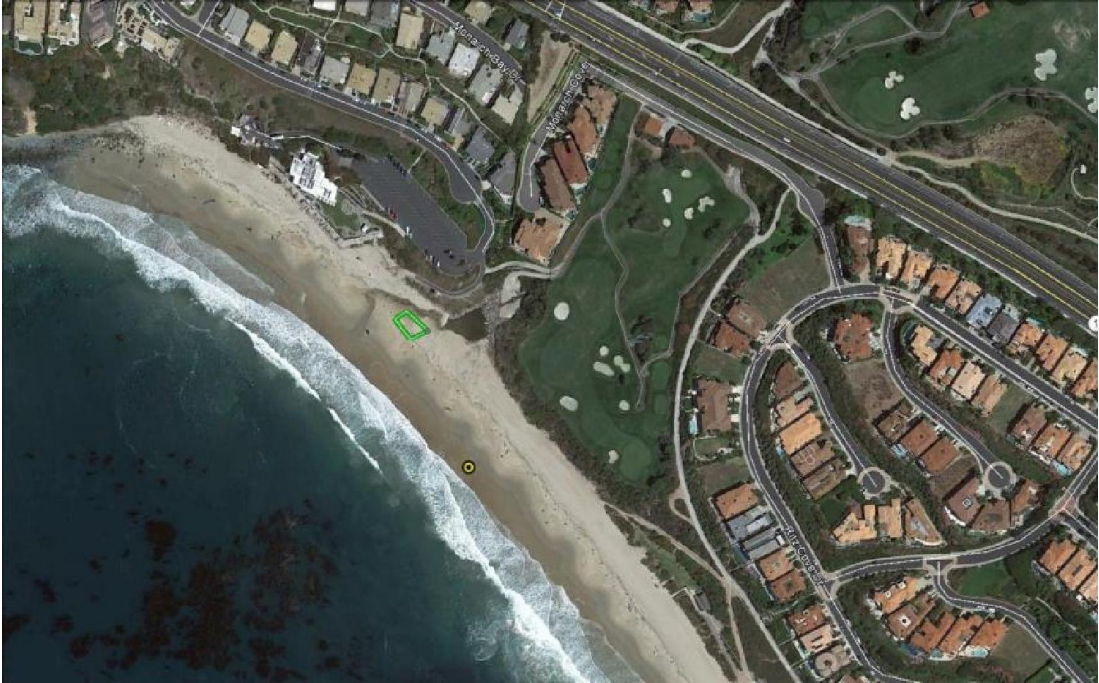


Figure 12. San Clemente State Beach Roost Survey Map.



Figure 13. Location of Snowy Plover Observations During Beachwide Surveys at Venice Beach South.

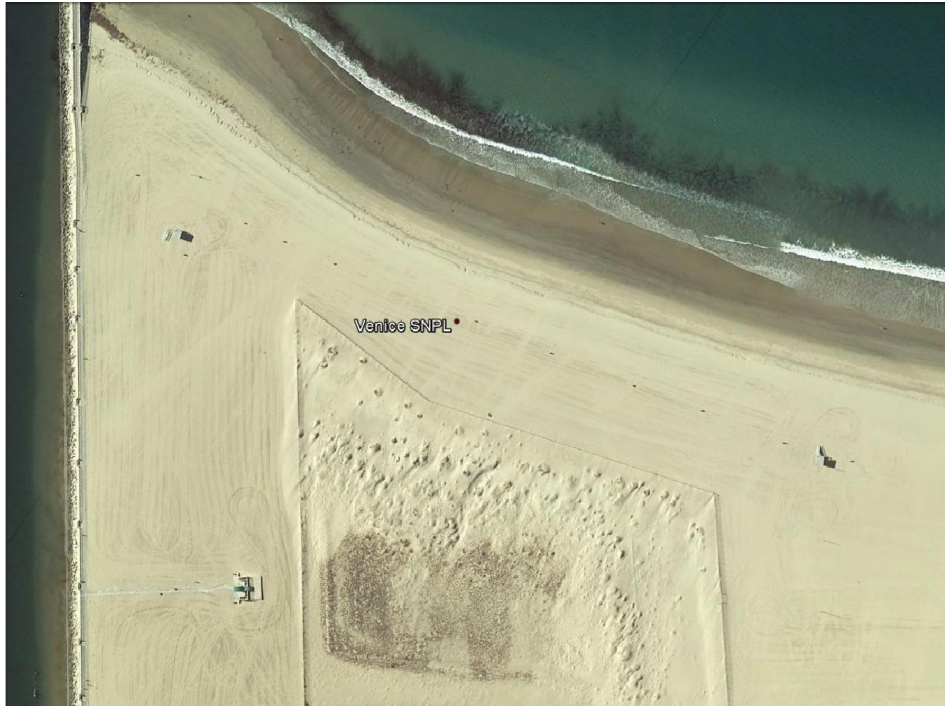


Figure 14. Location of Snowy Plover Observations During Beachwide Surveys at Crystal Cove State Beach.



Legend for Roost Maps

September 2012 – Blue
October 2012 – Purple
November 2012 – Light Blue
December 2012 – Light Purple
February 2013 – Dark Red
July 2013 – Orange
August 2013 – Red
October 2013 – Light Green
November 2013 – Yellow
December 2013 – Dark Green
February 2014 – Light Pink

APPENDIX 2. PHOTOS FROM PLOVER SURVEYS IN 2012-2014

Photos 1 & 2. Surf camps located at plover roosts at Santa Monica (top) and Malibu (bottom).



Photo 3. Snowy plover stuck and killed by the LA County Lifeguard at Malibu Lagoon in August 2013.



APPENDIX 3. PHOTOS FROM OUTREACH EVENTS IN 2013-2014

