State of California
Natural Resources Agency
Department of Fish and Wildlife
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The Western Snowy Plover in Los Angeles and Orange Counties, California: September 2014 to February 2017

by
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Nongame Wildlife Program, 2017-01

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 between 2014 and 2017 in Los Angeles (LAC) and Orange (OC) counties. Project biologists and volunteers conducted county-wide surveys of all suitable roosting habitats in September, January, March, and May. Project biologists conducted surveys of the main roost sites and nearby beaches in October, November, December, February, April, and June. The January and May surveys corresponded to the U.S. Fish and Wildlife Service's (USFWS) winter and breeding season window surveys. The population of Snowy Plovers in coastal LAC has declined from a peak of 334 in 2006 to 174 in 2017. During the study period, it declined from 251 in 2014 to a low of 140 plover in 2016, with a slight recovery to 174 in 2017. The largest declines are at Zuma and Dockweiler State Beach (Lifeguard Tower 58). In OC, the roost population appears stable, after a decline in 2016. Human recreation and a construction project appear to have reduced numbers at traditionally large roosts at Huntington State Beach and on the Balboa Peninsula. Plover inhabit their non-breeding roosts in both counties between July and April each year. The average daily dimension of plover non-breeding roosts is 244 x 83 feet, and the annual dimensions of plover roosts average 915 x 210 feet. We concur and support recommendations made by USFWS to State Parks in their January 19, 2016 letter and further recommend Best Management Practices when work does need to occur near plover roosts. In both counties, education and outreach programs have reached community members and school children.

[1] Ryan, T. P., S. Vigallon, L. Plauzoles, C. Egger, S. Sheakley, R. Griswold, and B. Eastman. 2017. The Western Snowy Plover in Los Angeles and Orange Counties, California: September 2014 to February 2017. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2017-01. Sacramento, CA. 55 pp + appendices.

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INTRODUCTION

Prior to 1945, the Western Snowy Plover (*Charadrius nivosus nivosus*) (plover) nested on beaches throughout Los Angeles and Orange Counties (LAC and OC, respectively) (Grinnell and Miller 1944, Western Foundation for Vertebrate Zoology unpubl. Data, Allen et al. 2016). Historically, plovers have nested at Redondo, Ballona (Venice/Marina Del Rey), Los Angeles, and Malibu Beaches (Allen et al. 2016). 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 plovers to nest on LAC and OC 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 (Allen et al. 2016), although no systematic survey of suitable LAC beaches were conducted between the 1970s and 2004 (Gary Page pers. comm. 2010, Ryan et al. 2010). Despite the lack of documentation since 1949, 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 plovers (USFWS unpubl. data, SMBAS unpubl. data). In more extensive surveys conducted between 2007 and 2009, Ryan et al (2010) found this number had declined to 196 to 233 plovers. This is approximately 28.5% of wintering plovers in RU-6 and 7.3% of the California population. Snowy Plover populations in LAC have declined in recent years. This was mostly due to declines at Zuma LT9 in winter 2005-06 and all beaches except Malibu in winter 2006-07. All beaches appeared to recover by 2009 except Zuma, which saw a 50% decline from 2004 to 2009. This was especially significant as this is the largest roost in LAC with approximately 42% of the population.

In Orange County, 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 OC 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).

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) and a California Bird Species of Special Concern (Shuford and Gardali 2008). Critical Habitat for the Snowy Plover was revised in June 2012 (USFWS 2012). The U.S. Fish and Wildlife Service (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 in OC 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 USFWS (2012)

A Recovery Plan was completed by USFWS in 2007 and LAC and OC are within Recovery Unit 6, whose goals include protecting wintering 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).

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). This has begun to trend earlier with first nests detected on March 10, 2016 and March 14, 2015 (USFWS unpubl. Data). Primary nesting habitats include sand spits, dune-backed beaches, beaches at creek and river mouths, and saltpans 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, 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.

While several factors contribute to the degradation of winter roosting habitat and the disappearance of nesting 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 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 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 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.

There are successful examples of protection of wintering and nesting Snowy Plover, increasing local populations. At Coal Oil Point, the protection of a wintering roost by roping off an area and having docents present led to the return of nesting at this site. A study conducted by Lafferty (2001) suggests that protecting a 400 m length of beach and prohibiting dogs provides the most protection while limiting impacts to recreation. This agrees with a study of roosting areas at the six main roosts in LAC, where the average area used in a season was 318.7 m x 75.3 m.

Summary of Previous Study Findings

Prior to beginning this study, little was known about the wintering 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 2010, 2011, 2013, 2014, 2015, and 2016 (Ryan and Vigallon 2011, 2013, Ryan et al. 2010, 2014, 2015, 2016). 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, Terminal 400 in LA Harbor, and Belmont Shore. 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 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 (Allen et al. 2016). 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.

During the non-breeding season (July-March) between 196 and 334 plovers occur in LAC and approximately 119-203 plovers occur in OC. This is approximately 45% of wintering 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 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 plovers from predators. Scrapes outside of protected exclosures 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 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 plovers. These likely threaten the current non-breeding roosting plovers and prevent nesting on LAC and OC 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 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 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 suggest that public awareness of and support for Snowy Plover conservation in LAC and OC is essential to species recovery, such that developing ongoing 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, exclosure set-up, and outreach efforts. In addition to volunteer participation, establishing a formal docent program has 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 Snowy Plover exclosures, development and update of a beach-driver handout, guided

beachwalks for the public at two different locations, and a field trip program for public school students. Maintaining positive relationships with beach management agencies and collaborating with other conservation-oriented organizations remains key in establishing a sustainable outreach program.

In summary, the major accomplishments of the project since 2007 include:

1. The involvement of over 300 community volunteers and an outreach program that has reached thousands more.
2. Current, up-to-date knowledge of the location and population status of 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.
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 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.

In this report, we document annual population trends and seasonal attendance patterns, and document the locations of roosting and potential nesting sites in LAC. We establish the long-term use of these sites by individual plovers. We identify and discuss threats that could represent both direct and indirect take, and make recommendations to help beach managers minimize impacts to plovers on their beaches. We hope to enable area beach managers to better manage for plovers and to help meet the goals of the recovery plan by identifying site-specific threats and providing information needed to create a management plan. We also hope to begin to develop mechanisms that ensure the long-term survival of the plovers on LAC and OC beaches.

METHODS

Our program conducts three types of surveys, a county-wide survey, a roost survey and a nesting survey. The county-wide survey is an effort at all suitable sandy beaches four times per year. The roost surveys are conducted at areas of highest concentration during the other eight months. The nest survey was done using the same methods as the roost survey, but concentrating on locating scrapes and nests in years when funding was available and was a more intense weekly nest searches within known roosting areas between February and April. Each type of survey is designed to provide an index of the population, allowing us to provide both an overall estimate of the population and track trends from month to month and year to year.

County-wide Surveys

For plover surveys summarized here, methods for county-wide surveys conducted from 2004 to 2006 followed those recommended in the draft recovery plan (USFWS 2007). Surveys from 2007 to 2017, followed the Western Snowy Plover Winter Window Survey Protocol (Elliott-Smith and Haig 2006) (Appendix E). Since 2007, volunteers participated in training sessions conducted by Ryan Ecological Consulting (REC), Los Angeles Audubon (LAAS), and Sea and Sage Audubon (SSA) staff each year. Staff and volunteers then completed county-wide surveys between January and April in 2007, and switched to January, March, May and September from 2008 to 2017.

All Snowy Plover counts were made in a single pass (Appendix E). 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 plovers and the area covered on a map or aerial photograph. Data sheets were submitted to the survey coordinator. Data collected for each survey location included the number, location, and sex of all 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. Surveyors observed the birds for color bands. These were reported to the Point Blue Conservation Science (formerly Point Reyes Bird Observatory), who then provided information on origin and banding date. 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 plovers and their nests were mapped from volunteer drawings and GPS locations using Google Earth.

Roost Surveys

Project biologists conducted surveys of just the main roost sites (Figures 1 and 2) and nearby beaches in July, August, October, November, and December, February, April, and June from 2007 to 2016. Surveys were conducted weekly at the main roost sites from February 15 to April 30, or when the plovers had departed the site for two consecutive weeks. Counts also followed protocols described by Elliott-Smith and Haig (2006). During these surveys, all plovers were counted and the roosting area recorded on a GPS and mapped using Trimble Navigator Outdoors (version 5.6.16) or Google Earth. 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. Most surveys were completed during the morning hours and on rising tides under good conditions; surveyors were instructed not to survey during rain, heavy wind or on extremely cold mornings. The surveyed beaches were Zuma County Beach at Lifeguard Tower 9 (Zuma LT9) and Zuma Lagoon (Zuma Lagoon), Malibu Lagoon State Beach (Malibu), Santa Monica State Beach (Santa Monica), Dockweiler State Beach Lifeguard Tower 47 (DSB LT47), Dockweiler State Beach Tower 58 (DSB LT58), and Hermosa Beach (Hermosa) in Los Angeles County; and Surfside

Beach, Bolsa Chica State Beach, Huntington State Beach, Balboa Beach, Crystal Cove State Park, Salt Creek, and San Clemente State Beach (aka Trestles).

Surveys of roost sites occupied in April and May 2007, February to May 2008 and February to April 2009 were searched by project biologists for nests and scrapes. Biologists used volunteer observations and maps to locate roost sites and then visited them every one to two weeks during the nesting season. All nest scrapes were counted and observations of potential breeding behaviors, such as calling, aggressive displays, territorial displays and male-female paired individuals, were noted. First the permitted biologist scanned the roost at a distance to determine if birds were sitting on the sand. If birds were sitting, the biologist walked the entire roost, visually searching the sand for scrapes and nests. This was done as quickly as possible to minimize disturbance to the plovers.

Observations were reported monthly in letter reports to California Department of Fish and Wildlife (CDFW), team members, and partners. They were then summarized in an annual report and presented at beach managers meetings sponsored by Pepperdine University. These meetings were attended by local biologists, beach managers, agency staff and other interested parties. The goal was to bring a multidisciplinary approach to solving issues facing the protection of the Snowy Plover.

Figure 1. Map of Los Angeles County Study Area.

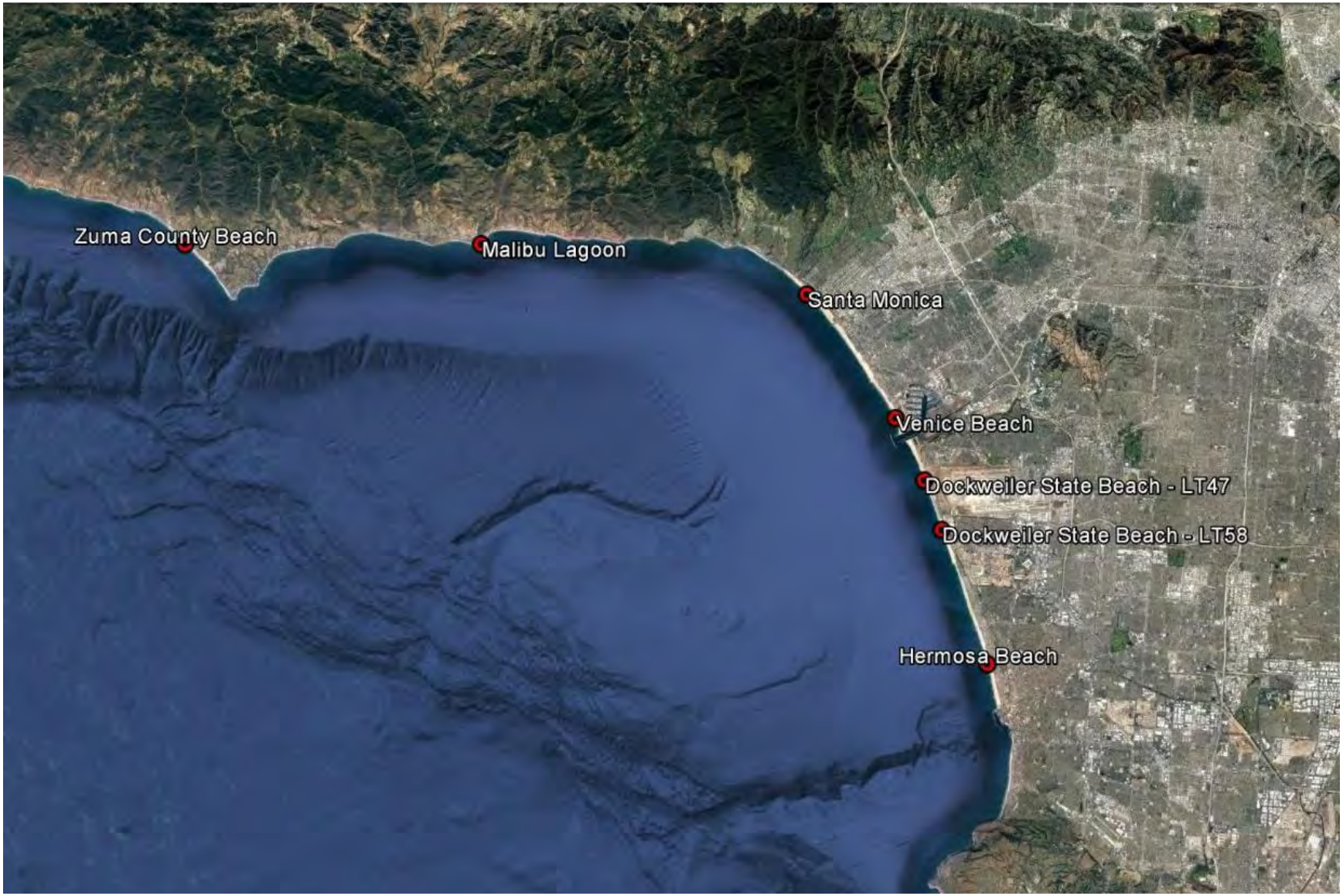
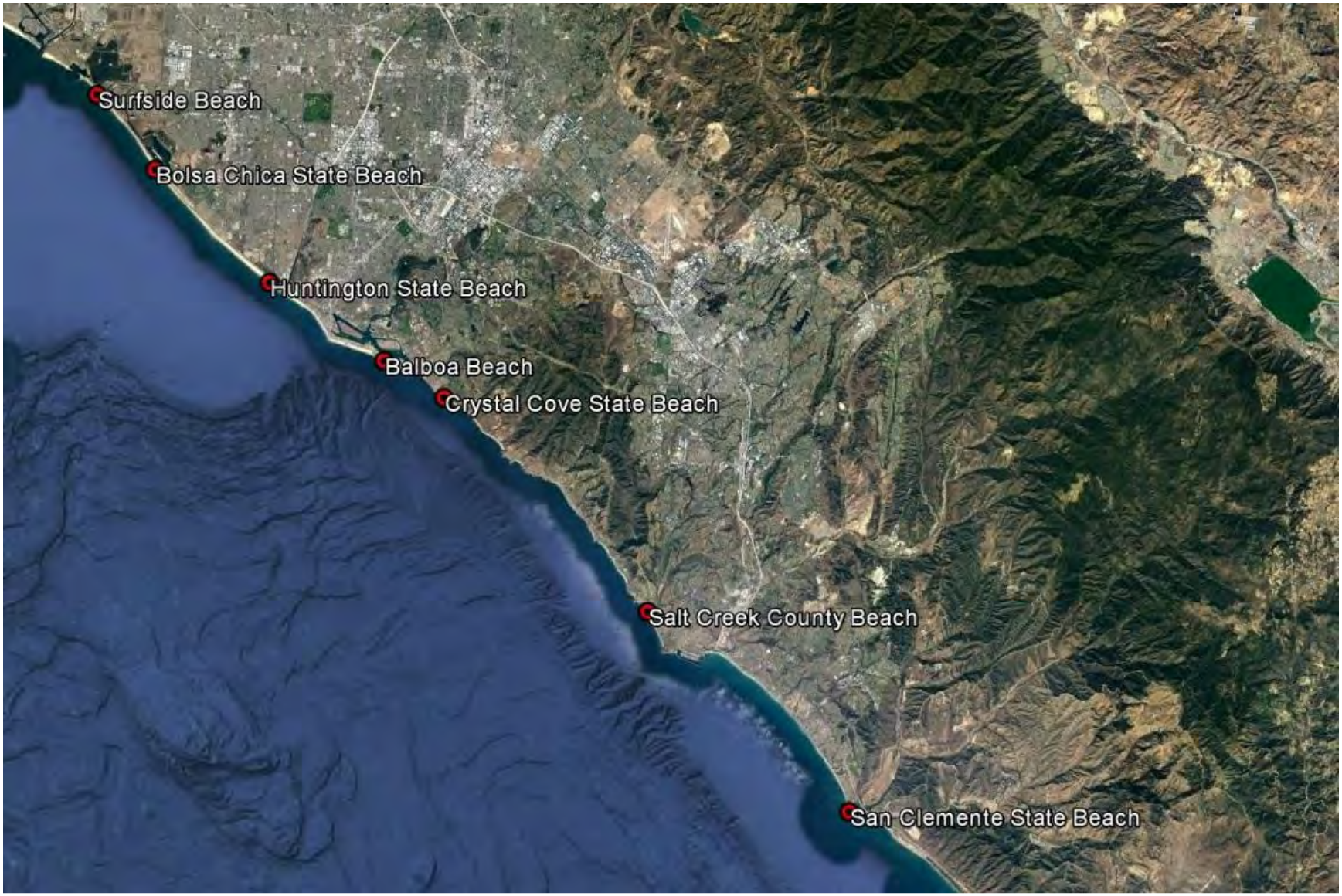


Figure 2. Map of Orange County Study Area.



RESULTS AND DISCUSSION

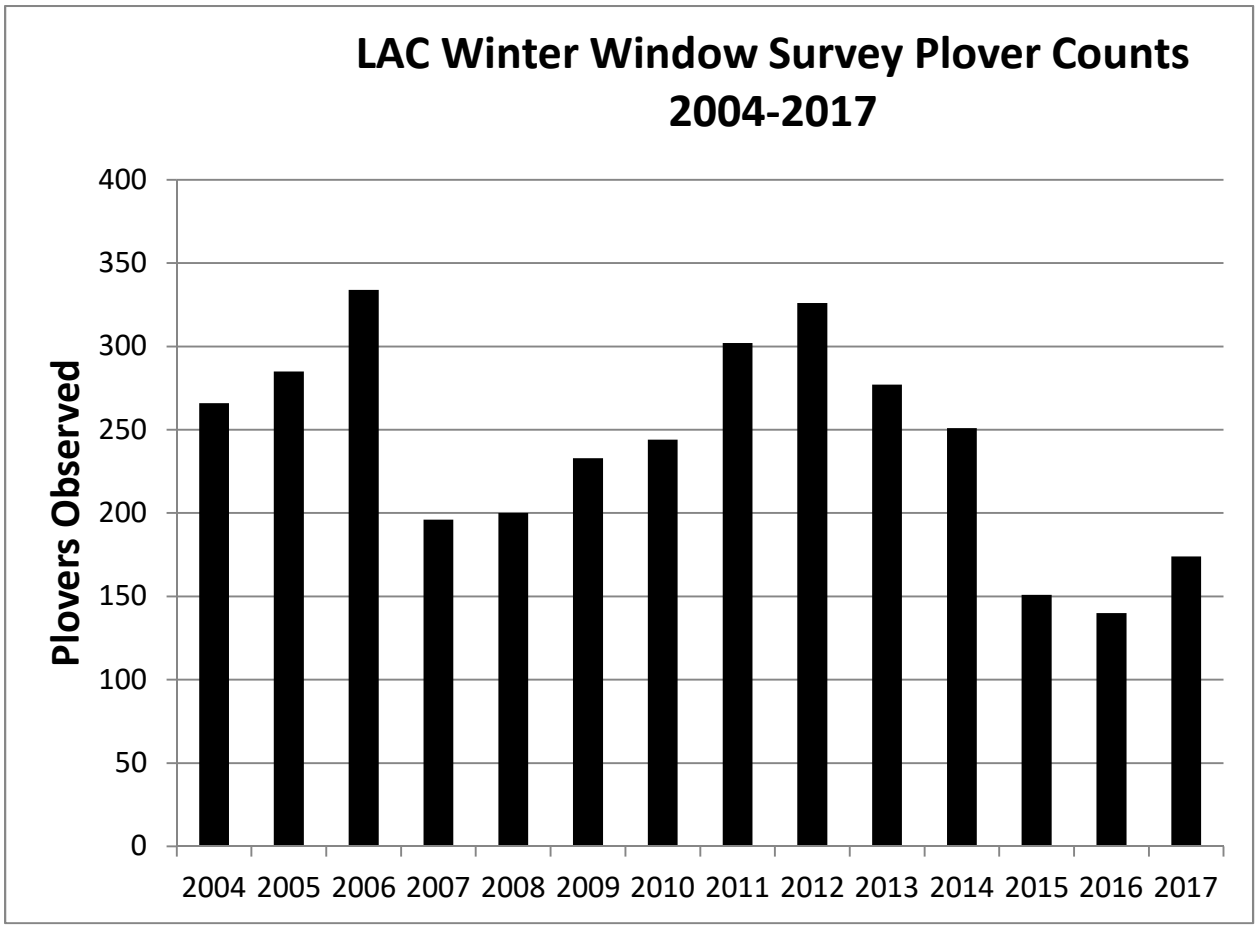


Figure 3. Number of plovers present during winter window surveys in LAC 2004-17.

Population Status

Wintering populations of plovers in LAC have fluctuated with an overall declining trend in LAC during the study period (Figure 3, Table 1). During the first decline, their number was reduced from 334 to 196 (2005-2007), the second decline has been much steeper with number declining from 326 to 174 (2012 to 2017) (Figure 3, Table 1). The roost at Zuma Beach accounts for a large portion of this decline. Formerly this beach supported 130-213 roosting plovers, following the 2005-07 decline, and 80-86 plovers roosted here, since 2015 (Table 1). The roost at Dockweiler State Beach near Tower 58 was mostly abandoned in 2015, with birds observed foraging here occasionally since. Declines have also been observed since 2012 at Malibu Lagoon.

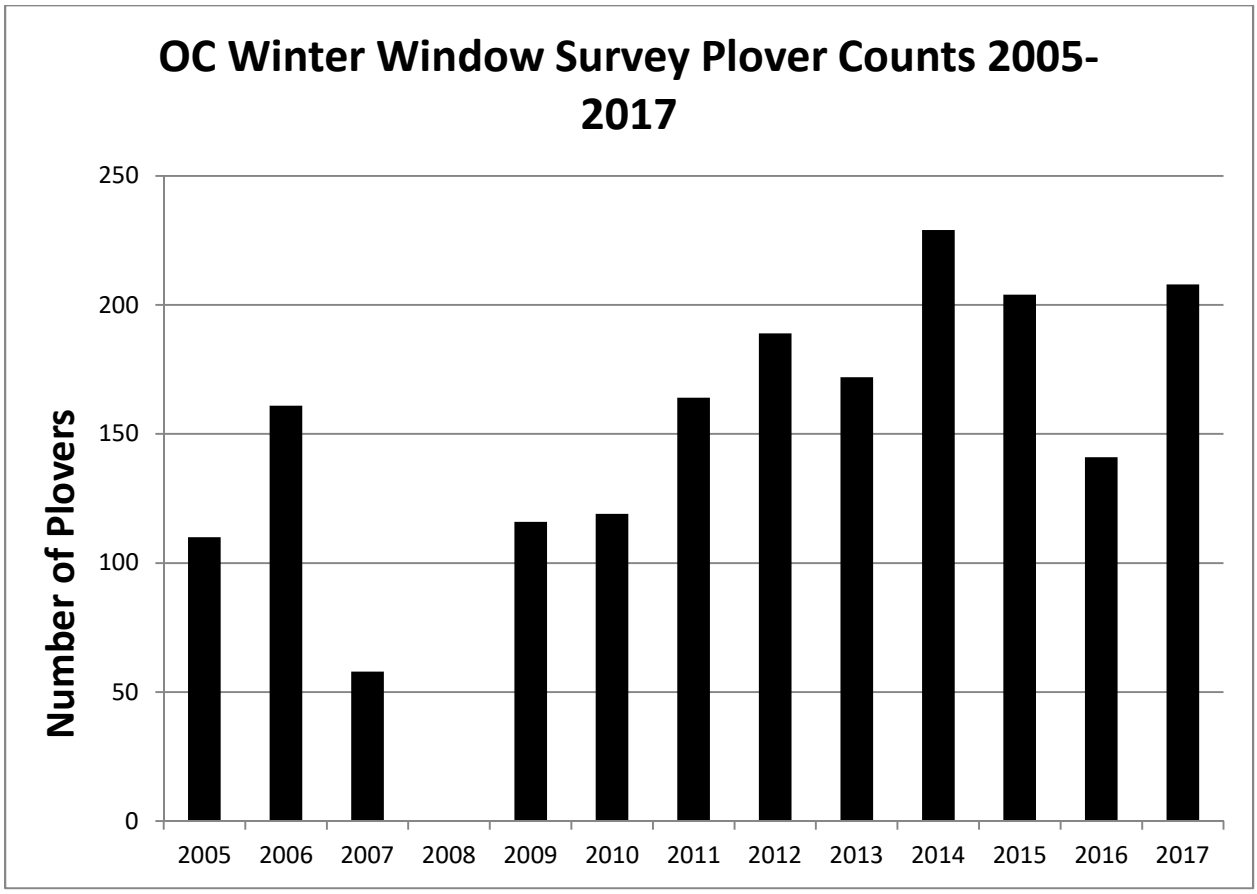


Figure 4. Number of plovers present during winter window surveys in Orange County 2005-17.

In Orange County, years in which counts were made at most of the major roosts (Table 2) indicate an overall increasing trend from 2005 to 2017, with a decrease in 2016 (Figure 4, Table 2). These data need to be viewed with some caution because prior to 2014, not all beaches were counted in all years, and visits tended to be made specifically at roost sites, instead of walking the entire beach as has been done since 2014. Declines were detected between 2014 and 2017 at Huntington State Beach and the Balboa Peninsula (Table 2). We observed the largest decline on the Balboa Peninsula (Table 2) following the installation of a walkway on the beach that was placed within the area traditionally used by roosting plovers.

Table 1. Annual Detections of Plovers in Los Angeles County during Winter Window Surveys 2004-2017.

Beach	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Leo Carrillo State Beach/Nicholas Cyn CB	0	0	ns	8	0	0	0	0	0	0	0	0	0	0
El Matador/Lechuza Beach	0	0	ns	ns	0	0	0	0	0	ns	ns	7	0	0
Zuma Beach	130	133	213	52	32	82	80	86	85	80	73	0	10	46
Zuma Beach South	0	0	0	0	48	0	0	0	0	0	0	0	0	0
Dume Cove, Paradise Cove, Escondido B.	0	0	0	6	0	0	0	0	0	0	0	0	0	0
Dan Blocker CB, Puerco Beach	0	0	0	23	0	0	0	0	2	9	0	0	0	0
Malibu Lagoon, Carbon Beach	33	28	12	34	37	36	67	47	78	60	25	0	18	19
La Costa B., Las Flores B., Big Rock B.	0	ns	ns	2	0	0	0	0	0	0	0	0	0	0
Will Rogers SB North	0	0	ns	2	0	0	0	0	0	0	0	0	2	0
Will Rogers SB South	0	0	ns	0	0	1	0	0	0	0	0	0	2	0
Santa Monica State Beach North	32	40	42	16	30	40	49	58	58	47	37	32	25	33
Venice City Beach North	ns	0	ns	0	0	1	0	0	0	0	0	0	0	0
Venice City Beach South	ns	0	ns	2	0	0	6	8	4	2	0	9	11	8
Dockweiler Beach North	12	34	23	9	10	20	6	34	33	29	45	16	26	27
Dockweiler Beach Central	0	0	0	0	0	4	0	ns	0	5	0	0	0	0
Dockweiler Beach South	13	0	0	4	11	15	16	23	13	3	0	25	1	9
El Segundo & Manhattan Beach	0	0	0	0	3	0	4	ns	0	2	4	9	4	1
Hermosa Beach North	33	41	36	23	29	26	11	44	49	40	60	46	34	31
Hermosa Beach South & King Harbor	0	0	0	8	0	2	0	0	0	0	0	3	1	0
Redondo County Beach North	0	0	0	0	0	ns	0	0	0	ns	0	0	0	0
Point Fermin & Cabrillo Beach	13	9	8	7	0	6	5	2	4	0	7	4	6	0
Total Observed	**266**	**285**	**334**	**196**	**200**	**233**	**244**	**302**	**326**	**277**	**251**	**151**	**140**	**174**
No. of Sites (N)	**7**	**6**	**7**	**14**	**8**	**11**	**30**	**8**	**30**	**10**	**10**	**9**	**12**	**8**

Table 2. Annual Detections of Plovers in Orange County during Winter Window Surveys 2005-2017.

Beach	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Seal Beach	2	ns	0	ns	0	ns	ns	ns	ns	2	0	1	0
Surfside	0	17	10	11	17	15	4	5	0	10	16	0	13
Sunset	0	0	0	ns	ns	0	0	ns	7	16	9	0	11
Bolsa Chica SB	47	43	16	23	9	26	39	44	36	31	55	1	63
Huntington City Beach	0	ns	0	ns	ns	ns	0	ns	0	0	0	0	0
Huntington SB	0	26	23	30	13	13	81	21	20	21	12	15	7
Newport Beach	0	ns	ns	ns	ns	ns	ns	ns	ns	1	3	0	1
Balboa Beach	12	25	9	24	77	63	40	63	64	125	17	48	15
Corona Del Mar	0	ns	ns	ns	ns	ns	ns	ns	ns	0	0	0	0
Crystal Cove State Park	19	2	0	ns	0	2	0	10	0	7	25	4	58
Laguna Beach	0	0	ns	ns	ns	ns	ns	ns	ns	0	0	0	0
Salt Creek	30	48	0	ns	0	0	0	46	45	16	18	33	29
Doheny SB	0	0	0	ns	0	0	0	0	0	0	11	1	11
Capistrano	0	ns	ns	ns	ns	ns	ns	ns	ns	0	0	ns	0
San Clemente City Beach	0	ns	ns	ns	ns	ns	ns	ns	ns	0	0	3	0
San Clemente SB	0	0	0	ns	0	ns	ns	ns	ns	0	38	35	0
Total Observed	**110**	**161**	**58**	**88**	**116**	**119**	**164**	**189**	**172**	**229**	**204**	**141**	**208**
No. of Sites (N)	**5**	**6**	**4**	**4**	**4**	**5**	**4**	**6**	**5**	**9**	**10**	**9**	**9**

The declines between 2005-06 and 2006-07 were seen throughout California and the range of the Pacific Coast population (USFWS Unpubl. data). Within California, winter populations fell by 17% (USFWS unpubl. data). The cause was not determined, but an unusually strong cold spell along the Pacific Coasts of Oregon and California in December 2006 and January 2007 was suspected to have increased mortality. There was also a die-off on the breeding grounds in San Diego in 2006 (E. Copper pers. comm. 2009).

During this second decline (2012-16), numbers of plovers within California have remained stable and near their highest numbers (3762-4561 plovers) (USFWS unpubl. data). Within Recovery Unit 6, where LAC is located, numbers have declined during this period from 1115 to 742 plovers (USFWS unpubl. data). However, the numbers of plovers in Central and Northern California (Units, 2, 3 and 4) have increased and there appears to be a shift with more plovers inhabiting non-breeding roosts farther north.

Roost Occupancy

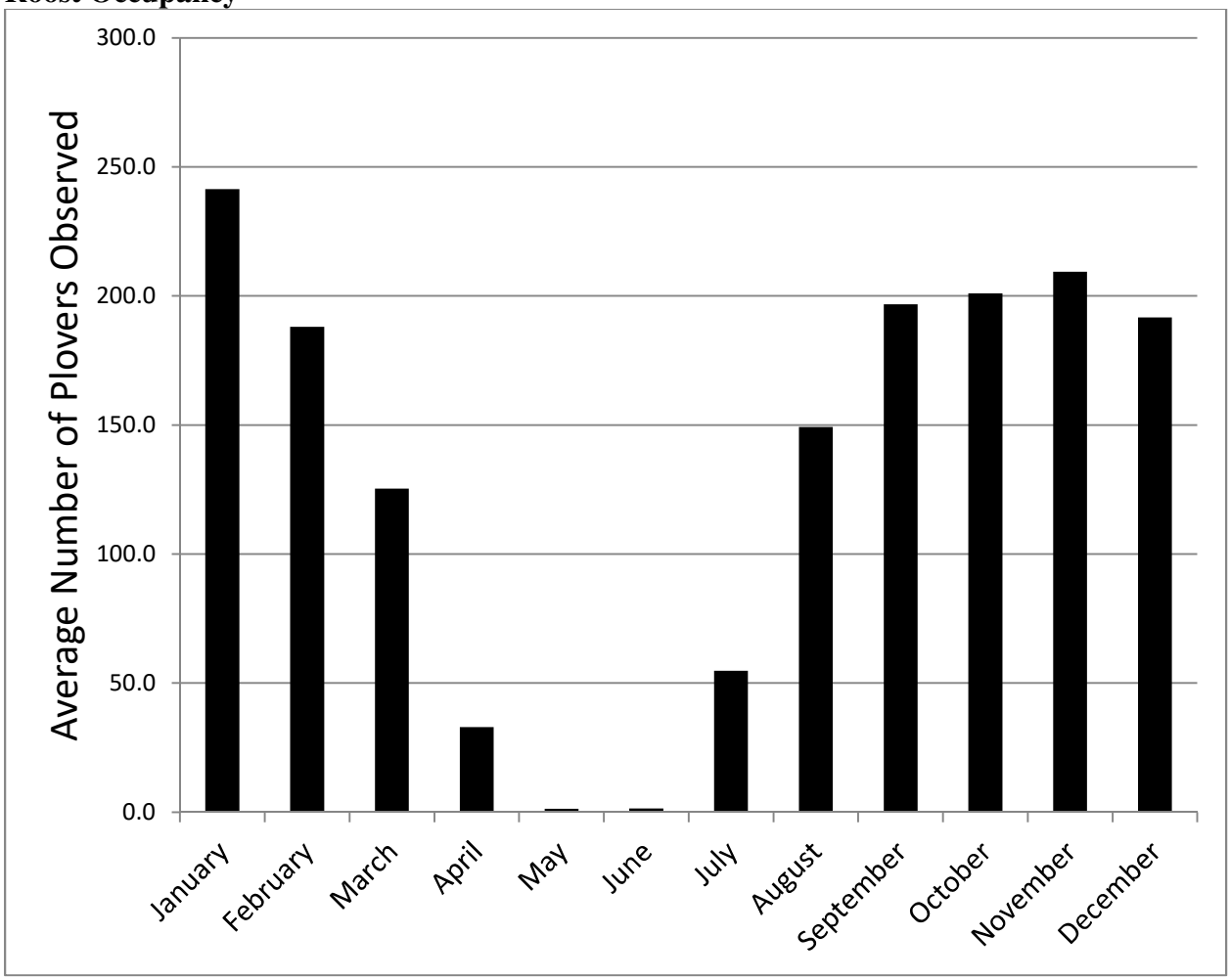


Figure 5. The average number of plovers detected at roost sites in Los Angeles County during each month of the year (2007-2017).

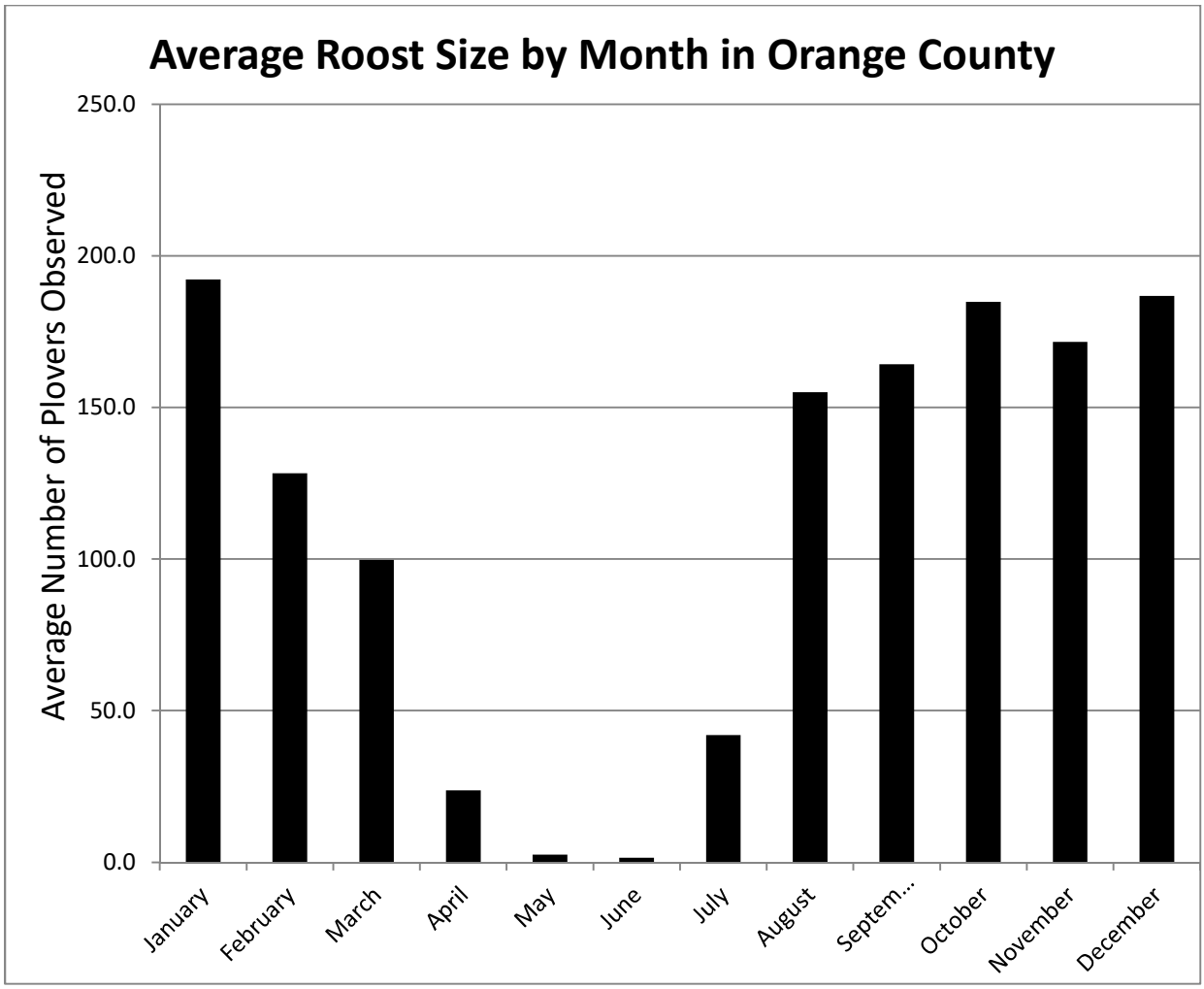


Figure 6. The average number of plovers detected at roost sites in Orange County during each month of the year (2012-2017).

Snowy Plovers are found in both LAC and OC during all months (Tables 3 and 4, Figures 5 and 6). The highest populations occur here between August and March. Most depart for nesting areas between March and April and most return from nesting areas between July and August (Tables 3 and 4, Figures 5 and 6). The "wintering" or "non-breeding" population is relatively stable between August and February. In LAC, populations averaged between 149 and 253 individuals between 2007 and 2017, peaking at 254 in January (Table 3). In OC, populations averaged between 128 and 201 individuals between 2012 and 2017, peaking at 201 in December (Table 4).

The finding that most plovers return by August and most roosts are occupied by July indicates that protective measures need to be considered, even during the busy summer tourist season when recreational use, beach driving and beach grooming activities are all at their peak. This supports findings made in Ryan et al. (2010).

Table 3. Average Number of Detections of Plovers in Los Angeles County by Month 2007-2017.

Month	Average Count	SEM	No. of Surveys
January	241.1	16.59	14
February	188.1	18.04	12
March	125.3	12.49	20
April	33.0	9.34	13
May	1.4	0.39	11
June	1.4	0.68	5
July	54.8	11.54	8
August	149.2	16.19	9
September	196.8	17.96	10
October	201.0	15.63	10
November	209.4	24.84	10
December	176.4	31.11	10

Table 4. Average Number of Detections of Plovers in Orange County by Month 2012-2017.

Month	Average Count	SEM	No. of Surveys
January	192.2	13.47	5
February	128.3	17.25	6
March	99.7	8.50	10
April	23.8	6.58	8
May	2.5	0.25	4
June	1.5	0.56	4
July	42.0	19.49	4
August	155.0	7.57	4
September	164.2	15.42	5
October	184.8	12.65	5
November	171.6	25.74	5
December	186.8	25.20	5

Distribution – Los Angeles County

Plovers were observed on 23 beach segments between 2007 and 2017, however 96% of observations from 2004-17 are from six main roosting sites at Zuma LT9, Malibu Lagoon, Santa Monica, DSB LT47, DSB LT58, and Hermosa Beach (Table 1). They also used small roosts and foraged on beach segments at Leo Carrillo State Beach, El Matador/Lechuza Beach, Paradise Cove, Dan Blocker County Beach, Big Rock Beach, Topanga County Beach, Will Rogers State Beach, Venice Beach, central Dockweiler State Beach, El Segundo Beach, Manhattan Beach, Redondo Beach, and Belmont Shore and Peninsula Beach in Long Beach (Table 1). No surveys were conducted along reaches of Malibu and the Palos Verdes Peninsula with rocky shoreline and where the high tide reaches below the pilings of houses and up to the cliffs or in the Port of Los Angeles and Port of Long Beach.

Zuma County Beach

Zuma (Appendix A, Figure 1) was previously the largest roost and supported 41% of the LAC population from 2004-2009 (Ryan et al. 2010), but 29% from 2004-2017. However, in the past three years, 2014-2016, it has supported only 16% of the LAC population, reaching its lowest point in 2015-16, with just 7%. The flock here first declined between 2006 and 2007 and remained between 70-90 plovers until 2013-14. This declining trend has continued into 2015-17, with only 10-45 plovers occupying the roost between October and March (Table 1).

There is currently no barrier in place indicating the presence of the roost and the roost is open to disturbance. This beach and the roosting area are within Critical Habitat Subunit CA-43 (USFWS 2012). In October 2014 observers noted the presence of a new volleyball court installed by Los Angeles County Beaches and Harbors within the area that had previously supported the main roost of plovers at Zuma Beach (Ryan et al. 2015). In both 2015 and 2016, heavy equipment placed a large berm within the previous main roosting area at Zuma. In past years heavy equipment was used to place this berm both north and south of the main roosting area, but avoided the roosting area itself (Ryan et al. 2016). On February 23, 2016, the biologist noted, bulldozers and loaders were working on a berm south of the Special Protection Zone (SPZ), but did not appear to have any biological monitor present. Fresh tracks of bulldozers were observed on the berm within the Zuma SPZ, likely from earlier that day.

During the summers of 2014 and 2015 as many as three beach camps were placed within and adjacent to the SPZ for the plovers (Ryan et al. 2016). These camps are regularly attended by large numbers of children. A Google Earth image taken on May 1, 2015 clearly shows as many as 21 surfboards and three large easy ups placed within the recommended SPZ at Zuma (Ryan et al. 2015).

Beach grooming and lifeguard vehicles were observed throughout the year, including after the USFWS letter was sent in January 2016. A large film shoot that appeared to include large outdoor lighting was observed immediately adjacent to the traditional roost site in March (Ryan et al. 2016).

The beach grooming, non-emergency transit by vehicles, film shoot, camps, volleyball court and the berm are all contrary to recommendations made in past reports and modified here (see below) and by the USFWS (2016) as well as area beach managers, including the Los Angeles County Department of Beaches and Harbors (LACBH) by the USFWS (2016) (Appendix C).

Here we recommend: 1) requesting the surf camps operate outside the SPZ shown in Figure 1; 2) moving the volleyball court outside of the SPZ; and 3) only creating berms at locations where they were placed in previous years, using data provided in this and previous reports to determine potential Snowy Plover roosting areas and avoiding them, as well as the use of monitors and best management practices to avoid harassing the plovers during the installation and removal of these berms.

Malibu Lagoon State Park

Malibu (Appendix A, Figure 2) is the fourth largest roost and formerly supported 16% of the LAC population from 2004 to 2009, and continues to support 16% of the population from 2004 to 2017. Courtship, territorial displays and scrapes were detected here in 2008 and 2009 (Ryan et al. 2010). However, following the January 2016 count, the plovers disappeared. A few individuals were detected by local birdwatchers in February and early March (ebird 2016). However, none were detected by surveyors until mid-March, when 3 were observed. From April 2016 to June 2016, a male and female were present. Courtship was observed and scrapes, including potential nest scrapes were found. No eggs or young were detected. Because of the presence of this potential pair, the exclosure was left standing and an additional exclosure was installed in the area where scrapes were observed. In the fall of 2016, 26 plovers were observed in September and October, but they were not detected in either November or December. Fewer returned in 2017 as well (Table 1). This beach and the roosting area are within Critical Habitat Subunit CA-44 (USFWS 2012).

The Malibu Lagoon sand spit is subject to large fluctuations in size and location. When heavy surf occurs it can be subject to erosion and become very narrow. It can also be overwashed by extreme high tides. Alternatively, it can also widen and since the previous report has gained height along the northwest corner and now supports some dune vegetation. We suspect that this variation may influence plover numbers, with numbers declining when the spit gets narrow or is overwashed. Additionally, we frequently observe dog tracks prior to our surveys and have observed off-leash dogs during surveys. Given the narrow site, these dogs may flush plovers from the beach prior to counting. Regular beach grooming does not occur.

Since 2008, an exclosure has been installed each year to protect the northwestern portion of the sand spit as an area for roosting plovers. The public has responded well to the exclosure: no major vandalism has occurred and we regularly receive positive comments from beachgoers. The plovers have used this area; however, more often, the plovers prefer the central part of the beach, east of the exclosure. There were also more reports of people within the exclosure in 2015 and 2016, including people with unleashed and leashed dogs and homeless.

On August 19, 2013, a California Department of Parks and Recreation (State Park) employee reported that a western snowy plover was struck by a lifeguard quad vehicle and killed. Surveyors had noted a near miss by a LAC Lifeguard quad on August 15, 2013 and had reported it to State Parks. A meeting was held with USFWS and representatives from LACBH, LAC Lifeguards, State Parks, CDFW, and LAAS at Malibu Lagoon in September 2013. Additionally, State Parks requested that LACBH and LAC Lifeguards limit vehicular access to the sand spit to emergency situations. Despite this, a quad was observed parked within 40 ft of plovers in October 2014. This incident resulted in the Ventura Field Office of the USFWS issuing a letter to State Parks and other beach management agencies in LAC providing recommendations for reducing the potential for take (Appendix C). A meeting was held at Baldwin Hills Scenic Overlook State Park on August 30, 2016 where this letter was reviewed and current observations of the status and distribution of the plover were presented. Specific recommendations were made to beach management agencies to address compliance with the USFWS 2016 (Appendix C).

For Malibu Lagoon, we recommend: 1) requesting the surf camps and large surfing events operate outside the SPZ (Appendix 1: Figure 2); or given the configuration remain outside of State Park jurisdiction; 2) that there be increased enforcement of dog regulations; and 3) increased outreach by State Parks staff and rangers to keep people out of the exclosures, particularly those who set up informal camps within the exclosure.

Santa Monica Beach

The roost at Santa Monica (Appendix A, Figure 3) previously supported about 8% of the countywide wintering population of plovers (Ryan et al. 2010), and this site has increased to 18% of the population (Table 1). Potential nest scrapes have been detected here between February and April. This beach and the roosting area are within Critical Habitat Subunit CA-45A (USFWS 2012).

It has an existing winter exclosure that was initiated by Santa Monica's Environmental Programs Division in 2005. Overall, the public has responded well to this exclosure: there has been no vandalism and is generally respected by most beachgoers. This exclosure is maintained by City of Santa Monica Open Space Management and monitored by volunteers from the Santa Monica Bay Audubon Society and LAAS. It was 100 x 600 ft from 2005 to 2007, and 100 x 300 ft in 2008 and 2017 (Ryan et al. 2010. Prior to 2007, most Snowy Plover sightings were within this protected exclosure, with some plovers found immediately north and south of the enclosed area. In 2008, the City of Santa Monica attempted to create a sub-exclosure 50 ft x 150 ft to protect potential nest scrapes from off-leash dogs and pedestrians. This exclosure was apparently too confining and the plovers abandoned the exclosure between March 10 and March 18 (Ryan et al. 2010). The original location of the exclosure was approximately 350-600 feet south of the current Annenberg Community Beach House walkway (2005-2009). From 2010 to 2015 it was shifted another 400-500 feet south, and then another 250 feet south in 2015 to its current location 1340 feet south of the walkway. Unfortunately, the plovers are not often found within the exclosure, and have continued to roost north of the location of the current exclosure in the area where the exclosure had been located from 2005-2009. We continue to recommend that the City of Santa Monica consider increasing the size of the exclosure to its previous dimensions of 600 x 100 ft. and shift it north, closer to its original location to cover areas frequented by the Snowy Plover (Ryan et al. 2016).

This beach has moderate use during the winter by fishermen, walkers, and joggers. There are a large number of off-leash dogs on this beach and their tracks are regularly observed within the exclosure. Maintenance and lifeguard vehicles regularly drive around the exclosure, and have been driving through the current roost location at speeds in excess of 10 mph throughout 2015 and 2016. A line of trash cans runs through the current roosting area and immediately adjacent to the current roost. Observers have noted the trash truck moving in excess of 10 mph and flushing roosting plovers. Regular beach grooming occurs around the exclosure year-round and within the enclosed areas during the months when the fence is removed (~April to September). In recent years (~2011), surf camps consisting of canopies with between 10-75 participants have begun to use the beach. Of particularly heavy use is the area south of the Annenberg Community Beach House, where the plovers typically roost. Observations indicate that plovers begin to arrive in July and August, and we suggest that these camps may cause a significant disturbance to the plovers. We strongly suggest that any permits issued for these camps place them outside the SPZ

as recommended by the USFWS (2016) (Appendix C). Additionally, on January 15, 2017 there was a frisbee football tournament on North Beach and the area from Annenberg to south of Montana Avenue was covered with people playing the game and spectators around each set of teams. Our volunteer estimated 1800 people in the area, mostly north and east of the exclosure level.

On November 20, 2015, volunteer Lu Plauzoles found a fresh dead snowy plover approximately 40 m north of the exclosure within the area shown on the attached map (Figure 3). It was found within 4-5 inches of fresh tire track. The carcass was collected and provided to the USGS Wildlife Health Center in Madison, Wisconsin, where staff attempted to necropsy the carcass, but it was too decayed to be necropsied.

Venice Beach

Low numbers of plovers have been detected at Venice Beach since 2007 (Ryan et al. 2010) (Appendix A, Figure 4), with one observation of 14 individuals in November 2010. In 2015-16, 7-13 plovers were again observed at Venice Beach during beachwide surveys in January, March, and September. This beach has heavy use with off-leash dogs, sand grooming, and regular lifeguard and police patrols through the area supporting the plover roosting area. We recommend that this site be included in future roost surveys and that a Special Protection Zone be created for this site between Privateer and Lighthouse (Ryan et al. 2016). This roost is not within Critical Habitat (USFWS 2012).

Dockweiler State Beach

Dockweiler State Beach was surveyed in three segments: Dockweiler State Beach North (DSB North), Central (DSB Central), and South (DSB South) (Table 2, Appendix A, Figures 5 and 6). There are two primary roosting areas: one on DSB North: near Lifeguard Tower 47 (DSB LT47), and one on DSB South between the RV Park and the volleyball courts north of Lifeguard Tower 58 (DSB LT58). These roosts supported 3% and 2% of the Snowy Plover Population in LAC respectively between 2004 and 2009 (Ryan et al. 2010). Currently, the roosts support 18% and 5% of the LAC population. However, the roost at DSB LT58 has been only occasionally used since 2012 (Table 1). In 2007, a pair of plovers remained near DSB LT47 into May and potential nest scrapes have been seen near both roosts between February and May (Ryan et al. 2010). DSB North and roosting area DSB LT47 are within Critical Habitat Subunit CA-45B (USFWS 2012). DSB South and roosting area DSB LT58 are within Critical Habitat Subunit CA-45C (USFWS 2012).

At DSB LT47, a protected area, delineated by orange road cones was established from August 2008 to January 2010 (Ryan et al. 2010). This was replaced by wood-slat fencing on August 14, 2010. This fencing has remained in place since that time. LAAS, USFWS and LACBH have all worked as a team to maintain the fence, pick up trash, and remove invasive plant species. There was no vandalism to the fence and during most clean-up visits, only a few pieces of trash are recovered. As noted by Dan Cooper in an August 4, 2011 email, there are now four native coastal strand/dune plant species that are voluntarily colonizing the exclosure area. These include *Atriplex leucophylla* [beach saltbush] (7 individuals, all in the "upper wrack line"), *Abronia maritima* [red sand verbena] (3 individuals, a CNPS rare species), *Ambrosia chamissonis* (2) [silver beachweed or silver beach burr], and *Camissonia cheiranthifolia* (2) [beach primrose].

He further commented that he was unaware of, "any other site in the county (mainland) that supports *Atriplex leucophylla*. *Abronia maritima* is almost as rare in the area." In spring 2016, LACBH requested that all vegetation, both native and non-native, be removed from the exclosure. During the summer of 2016, after photo-documenting the site, vegetation was removed by hand, and sections of the fence with heavy sand deposits were dug out by hand as well. Evidence of fossorial small mammals was observed repeatedly, as well as the presence of active ant colonies, and numerous other unidentified invertebrate species.

There are a large number of off-leash dogs on this beach and their tracks are regularly observed within the exclosure. Maintenance and lifeguard vehicles regularly drive up the beach from the exclosure. Regular beach grooming occurs around the exclosure year-round. Since August 2010, the area within the exclosure has been disturbed by joggers and off-leash dogs. Most vehicles travel around the exclosure. However, since 2014, we have observed regular vehicle tracks in front of the exclosure and vehicles flushing roosting plovers driving in front of the exclosure, some at speeds exceeding 10 mph. This problem has increased in 2016 (Ryan et al. 2016). In September 2016, a lifeguard trucks were reported speeding and ATV tracks were observed inside the exclosure in October. In February, a lifeguard truck was observed and video was taken of it driving in front of the exclosure and through the roosting flock, causing them to flush. Observers also noted the presence of vehicle tracks in front of the exclosure in other months, including fresh vehicle tracks in December, February, and on March 8, 15, 22, and 29. We recommend that vehicles avoid this area to the extent possible because the plovers are often located between the exclosure and top of the beach slope. Portions of DSB North and the roost at DSB LT47 are within Critical Habitat Subunit 21B (USFWS 2012).

At DSB LT58, (Appendix A, Figure 6) we have occasionally detected roosting plovers including in as many as 8 plovers in 2015-16. This roost is not protected and is regularly groomed and driven through. In March 2009 a black-bellied plover was found dead in vehicle tracks and was likely struck and killed by a vehicle. A second black-bellied plover was struck by a vehicle and taken to wildlife rehabilitation (Ryan et al. 2010). A berm to protect nearby infrastructure and fire pits placed in front of the adjacent RV park is installed and removed annually north of the Snowy Plover roosting area. We recommend that an exclosure 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 LAAS and Dockweiler Youth Center.

Hermosa Beach

Hermosa Beach (Appendix A, Figure 7) supported 8% of the Snowy Plover population in LAC from 2004-2009 (Ryan et al. 2010), and currently supports 15% of the population (Table 1). There appears to be two distinct clusters of activity, one between 18th to 22nd Streets, and another between 26th and 28th Streets (Figure 7). The plovers on this beach tend to move their roosting. This may be in response to regular disturbance. LAC lifeguard trucks and LACBH trucks have been observed driving through the plover roost at >15 mph causing the plovers to flush. Roosts are regularly groomed, patrolling vehicles regularly pass through it, and dog tracks are regularly observed in the area. This beach has among the highest human use of any roosting beach in LAC. Portions of Hermosa Beach are within Critical Habitat Subunit CA-45D, however the main roosting areas are north of it (USFWS 2012).

Distribution – Orange County

Plovers were observed on 17 beach segments between 2012 and 2017, however 98% of observations from 2012-17 are from seven main roosting sites at Surfside (4.5%), Bolsa Chica State Beach (12.5%), Huntington State Beach (20.8%), Balboa Beach (34.7%), Crystal Cove State Beach (3.6%), Salt Creek (10.7%), and San Clemente State Beach (Trestles) (11.6%) (Table 2, Figure 2). They also used small roosts and foraged on beach segments Seal Beach, Sunset Beach, Huntington City Beach, Newport Beach, Doheney State Beach, and San Clemente City Beach (Table 2). No surveys were conducted along reaches of Laguna Beach and Capistrano Beach with rocky shoreline and where the high tide reaches below the pilings of houses and up to the cliffs.

Surfside

Surfside Beach (Appendix A, Figure 8) normally supports a small roost of 1-22 plovers or 4.5% of plovers in Orange County. In 2015-16, 20 plovers were observed during migration in August, but only one was observed until December, then none after that (Ryan et al. 2016). 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). This beach received sand replenishment through offshore dredging in 2009 (Ryan and Hamilton 2009). A berm was installed in the winter months in 2015 and 2016. This beach is not within any USFWS Critical Habitat Units (USFWS 2012).

Bolsa Chica State Beach

Bolsa Chica SB (Appendix A, Figure 9) typically supports the third largest roost of between 6-60 plovers (12.5%) in OC and is immediately adjacent to the main nesting area in OC, the Bolsa Chica Ecological Reserve. In 2015-16, only 0-3 plovers were present between October and February, in March a flock of 20-37 plovers was present for three weeks. Most plovers were observed on the broad beach north of the Bolsa Chica tidal inlet (Ryan et al. 2016). This is a broad sandy beach, with fire pits and a public parking lot backing it. It is very popular with beachgoers during the summer months. Surf camps are regularly set up within the SPZ. A large surfing event was held here in September 2016. Off-leash dogs were regularly observed here flushing the plover flock. This beach and the roosting area are within Critical Habitat Subunit CA-46A (USFWS 2012).

Huntington State Beach

Formerly the second largest roost in OC (20.8%), this roost only supported 7% of non-breeding plovers in 2014-15, and 11% in 2015-16. In 2015-26, 90 plovers were observed in migration during October, but only 4-16 remained for the rest of the non-breeding season. The plovers were observed at the southern end of this beach, between Magnolia and the Santa Ana River outlet (Ryan et al. 2016) (Appendix A, Figure 9). This beach and the southern portion of the roosting area are within Critical Habitat Subunit CA-47 (USFWS 2012).

In September 2015 the adjacent Huntington City Beach, the Wetlands and Wildlife Care Center received two sanderlings and one juvenile Snowy Plover with observed symptoms similar to avian botulism. The Snowy Plover was found at the Dog Beach at Huntington City Beach. The Snowy Plover and one of the sanderlings died, the other sanderling recovered and was released. Autopsies were inconclusive.

This is a broad sandy beach, with fire pits and a public parking lot backing it. It is very popular with beachgoers during the summer months. During the course of the year this area hosts music festivals, one occurred in September 2015 (Appendix B), another in April-May 2016. It is also a popular beach for commercial filming. Speeding vehicles were observed here. Off-leash dogs were frequently observed here (Appendix B).

Given the recent decline at this roost, we would suggest that State Parks consider moving these types of events outside the recommended SPZ (Ryan et al. 2016) at the main roosting location. If this is not possible, then we suggest that a monitor observes the plovers during these events and documents any changes in behaviors, observing the roost 3-5 days prior to the set-up of the event, during set-up operations, during the event itself, and then 3-5 days following the event. We suggest that the observers should record roost numbers and locations hourly, the number, duration, and if necessary, distance of flushing events and observed causes (if any). These data should be analyzed and recommendations made regarding minimizing disturbance to roosting plovers on the beach.

Balboa Beach

Balboa Beach (Appendix B, Figure 11), supports the largest roost in OC (34.7%). Interestingly, it often has the highest numbers between September and October, during plover migration. In recent years the roosting numbers have declined from what was regularly as many as 80-100+ to 20-50 individuals and this may be due to a sidewalk extension built in the fall of 2014 (see below). This roost had the highest numbers of speeding vehicles in 2015-16, a City of Newport Fire Department vehicle was observed in September and two City of Newport trucks in October. Off-leash dogs we reported here from every survey, including dogs flushing the plovers. This beach, including the SPZ is groomed regularly. This beach and the northern roosting area between C Street and F Street are within Critical Habitat Subunit CA-48, the southern roosting areas between L Street and M Street are south of designated Critical Habitat (USFWS 2012).

In the fall of 2014, the City of Newport Beach constructed a 300 foot long sidewalk adjacent to the fence at the Balboa Beach Snowy Plover roost, extending from E Street (Ryan et al. 2015). This ran immediately adjacent to a fenced Snowy Plover area and directly into one of the main Snowy Plover roosting areas from 2014 (Ryan et al. 2014). This disturbance likely flushed the plovers from this roosting area in 2015 and likely contributed to the reduced numbers here in 2014-15. It appears that this effect has continued into 2015-16. Additionally, this beach became narrower during the fall months due to beach erosion from late summer/fall hurricanes in the central Eastern Pacific. 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 1.24 hectare dune restoration area where a pair of plovers has nested in recent years. This is the only known beach nesting Snowy Plover pair on the mainland in LAC or OC, although they did not nest here in 2014, 2015 or 2016.

Crystal Cove State Park

The Snowy Plover had been listed as "occasional" during the fall, winter and spring months on the park's bird checklist (Bales, unknown date). We included Crystal Cove State Park in the 2014-2015 roost surveys. That year, we detected 0-31 plovers here between September 2014 and April 2015, representing 9% of the OC nonbreeding population (Ryan et al. 2015). In 2015-16, we detected between 4 and 19 plovers here from their arrival in November until their departure the third week of March (Appendix 1, Figure 12). This beach is a relatively small and narrow pocket beach, there is no grooming, but it is subject to wave erosion and there are maintenance and lifeguard vehicles that patrol it. No speeding vehicles were reported while plovers were present. This beach and roost are not within designated Critical Habitat (USFWS 2012).

Salt Creek

Salt Creek (Appendix B, Figure 13) typically is the 5th largest roost in OC (10.7%), with 15-18 plovers present (Table 2). However, it appears to be increasing in recent years, possibly taking plovers that have left Balboa. In 2015-16, it was the second largest, with 23% of the OC population of plovers. 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. Part of the beach is regularly groomed and the outlet of Salt Creek is occasionally opened using machinery. Vehicles have been observed speeding and flushing plovers. Off-leash dogs were reported here in March and April. There is a large surf camp/junior lifeguard program here during the summer months. In 2016 a falconer was hired to drive gulls off the beach using a Harris' hawk (Ryan et al 2016). This was reported to CDFW and USFWS and they negotiated restrictions for the remainder of the season with the City of Dana Point. This beach and roost are not within designated Critical Habitat (USFWS 2012).

San Clemente State Beach/Trestles

The plover roost at Trestles/San Clemente State Beach (Appendix B, Figure 14), is the 4th largest roost in OC. It typically supports 26-76 plovers (Table 1). In 2015-16, was the second largest roost, with 15-35 plovers present between October and March, representing 25% of the OC population. These birds appear to shift their roosting area during the year and sometimes move south of our survey area and onto Marine Corps Base Camp Pendleton's Green Beach near Lower Trestles.

This beach is heavily used by surfers throughout the year. However, most of the year the surfers tend to transit the area used by roosting plovers, minimally disturbing them. During the summer months it can fill-up with beachgoers. Speeding vehicles were observed. In February 2016, a boat washed ashore and was placed on the sandy beach. Off-leash dogs were reported here. This beach and roost are not within designated Critical Habitat (USFWS 2012).

Nesting

No nesting was detected at Snowy Plover roosts in LAC between 2004 and 2017. However, beginning in 2007 increased efforts detected behavioral signs indicative of nesting including increasing creation of nesting scrapes, territorial displays, and male-female pairs present during

the known breeding season. These observations were mostly from all main roosting sites. Attempts from 2007-2009 are summarized in Ryan et al. (2010). More recently, a pair remained at Malibu Lagoon throughout the nesting season in 2016. Potential nest scrapes were identified and protected using snow fencing, however, large portions of the beach were overwashed during high tides in May and June, including portions of the enclosed area.

In OC, a pair of snowy plovers nested at Balboa Beach in 2008, 2009, and 2013 (P. Knapp pers. comm., R. Griswold pers. obs.). There were no nesting attempts detected between 2014 and 2016.

Mortality

Documenting plover mortality is difficult because, unless found quickly, a bird as small as a plover is likely to be scavenged by a gull or other scavenger, or to be removed as part of regular beach raking. Since 2007, we have documented two plovers struck and killed by moving vehicles, and encountered a third that was likely struck and killed by a vehicle. Additionally, we are aware of a dog capturing a Snowy Plover at Surfside Beach in OC. On January 9, 2007 at Zuma Beach, volunteers found a dead Snowy Plover that had been very recently struck by a vehicle. It was sitting within the fresh tracks of the vehicle, most likely a lifeguard truck, and appeared to have been crushed by the vehicle (Ryan et al. 2010). A second plover was struck and killed by a lifeguard quad at Malibu Lagoon State Park on August 20, 2013 (Ryan et al 2014). The LA Lifeguard quad was moving at an estimated 20 mph on State Parks property and the incident was observed and reported by a State Parks employee. The third incident occurred at Santa Monica Beach on November 20, 2015 (Ryan et al. 2016). A volunteer found and collected a fresh dead snowy plover approximately 40 m north of the exclosure. It was found within 4-5 inches of fresh tire track. The carcass was collected and provided to the CDFW's Wildlife Investigations Laboratory in Rancho Cordova, California; however, it was too decayed to be necropsied. At Surfside Beach, Orange County, California a Snowy Plover was captured by a dog in September 2009, but was recovered, rehabilitated and released (Ryan and Hamilton 2009). Vehicle strikes have also been reported at Oceano Dunes State Vehicular Recreation Area in California, where 6 adult plovers that were found dead between 2002 and 2008 were probably struck by vehicles (R. Glick in Page et al. 2009).

USFWS Guidance for Special Protection Zones

We recommend that all non-breeding Snowy Plover roosts in LAC and OC be considered as SPZs (USFWS 2016) and suggested measures be implemented within these zones to better protect the plovers and reduce the potential for non-permitted take by local beach agencies (Ryan et al. 2010). Vehicles are regularly reported exceeding their agencies' recommended speed of 10 mph. Beach grooming has continued to remove valuable foraging resources adjacent to known roosts at all but the Malibu Lagoon roost in LAC and at the Surfside, Balboa and Salt Creek roosts in OC. Off-leash dogs are regularly observed and reports of them flushing plovers are regular as well. We have suggested that the flushing or driving of plovers from their winter roosts represents harm and harassment as defined by the federal Endangered Species Act (ESA) (USFWS 2016) and violated California's Fish and Game Code (Ryan et al. 2010). Agencies have been reminded of this as part of our annual reports and at beach managers meetings.

On January 19, 2016, the Ventura Fish and Wildlife Office (Ventura FWO) issued guidance to beach managers regarding avoiding the "Take" through "Harm" and "Harassment" of plovers protected as a Threatened species by the ESA (USFWS 2016, Appendix C). The Ventura FWO recommends that the agencies consider applying for a Habitat Conservation Plan (HCP) in order to permit activities that they consider to be "Take" under the ESA. These activities include beach driving, mechanical raking (beach grooming), recreational use, presence of domestic animals (i.e. dogs), and human refuse that attracts predators (Appendix C). They recommend that efforts be implemented within 500 feet of the central roost locations. These measures should be implemented from the arrival of the plovers (typically July) to their departure (typically April or May), with measures at Surfrider Beach in Malibu (Malibu Lagoon) implemented year-round. They refer to these areas as SPZs and recommend that they be managed differently until an HCP can be implemented.

These recommendations include the training of all beach drivers, avoidance of SPZs by all drivers, with exception of essential patrols, which should remain below 10 mph and back up and avoid plovers when encountered, and emergency response activities. It recommends that regular sand grooming be discontinued in SPZs, and if needed, trash should be removed by trained individuals. Wrack should be left in place. The SPZ's should be marked with signage. Within the SPZs "refuge areas" should be created in a suitable configuration, but approximately 300 feet in diameter using symbolic fencing or other suitable barrier during periods of high beach use. Additionally, large scale recreational activities and camps should not be permitted by agencies within SPZs.

In Appendix A, we provide maps of each Snowy Plover roost in both LAC and OC. We have provided recommended SPZs based on mapped roost locations from 2007 to present in LAC and 2014 to present in OC (Ryan and Vigallon 2011, 2013, Ryan et al. 2010, 2014, 2015, 2016). We did this by measuring the center point based on these maps, and then measuring 500 ft from the center point linearly along the beach. Inland, we placed the boundaries based on physical barriers such as recreational areas, beach trails, cliffs, or housing that plovers are not known to use and appear to avoid. We recommend that these be used as a starting point, but that they may be modified depending on annual plover movements.

CONCLUSIONS

LAC and OC host between 7% and 15% of non-breeding plovers in California. There has been a declining trend in LAC over the study period and a decline since 2014 in both LAC and OC. In LAC, the largest decline has been observed at Zuma Beach, the roost Dockweiler State Beach LT58 has been mostly abandoned, and the roost at Malibu has declined as well. In OC, there are fewer roosting plovers at Surfside/Sunset, Bolsa Chica State Beach, Huntington State Beach, and the Balboa Peninsula. We observed the largest decline on the Balboa Peninsula following the installation of a walkway.

The one thing that all sites appear to have in common is either continued or human-related disturbances. At all beaches roosting plovers are regularly driven through by vehicles, are increasingly impacted by surf camps as the plovers return, and LAC beaches are groomed (except Malibu). Some beaches have particular problems, including the installation of a volleyball net and new winter berm on the former roosting area at Zuma; early morning off-leash

dogs at Malibu Lagoon; large scale surf events and concerts at Bolsa Chica and Huntington State Beaches; and the installation of a beach sidewalk at the roosting area at Balboa. While all these disturbances contribute to increased use of energy, susceptibility to predation, and roost displacement, of particular concern to direct mortality are off-leash dogs and frequent disturbance from motorized vehicles, some disregarding their own beach management agencies recommendation of 10 mph. We have documented two vehicle strikes and a third that was likely a vehicle strike, all resulting in mortality. We have documented a dog catching a plover as well. Even sites with established exclosures are seeing increases in disturbance. The movement of the exclosure at Santa Monica to the south has left the actual roosting site exposed to vehicular traffic and daily grooming. The exclosure at Dockweiler State Beach is regularly driven in front of and a groomer was recently observed grooming the beach directly in front of the exclosure. While many of the previous recommendation have helped reduce disturbance, daily flushing of plovers by beach agency staff and removal of foraging resources continues. We suggest that unless these practices are curtailed near these roosts, the roosting numbers will continue to decline. Recently, many of these practices were stated to be illegal and violations of the Federal Endangered Species Act by the USFWS and in violation of Fish and Game Code by CDFW. We strongly urge beach management agencies to follow the recommendations made in the USFWS letter (2016), see below.

Additional observations made since Ryan et al. (2010) continue to confirm that plovers return to both counties in July and the majority are present by August. Roosts begin to disperse in March, and most are at breeding sites elsewhere by May. The plovers continue to use their traditional roosting areas in both counties, with 95-98% of roosting plovers found at these main roosts. Roosts have appeared at Venice Beach and have become occasional at DSB LT58. With increased number of years, plovers have now been found foraging on most sandy beaches in LAC.

It appears that nesting attempts are being made at Malibu Lagoon. Additionally, the only confirmed nest of a snowy plover on the sandy beaches in either county was at Balboa Beach in 2013, where they have not bred since.

RECOMMENDATIONS

Following the documented vehicles strike at Malibu Lagoon in 2013, LAAS staff met with USFWS, CDFW, and beach management agencies, including LACBH, and LAC Lifeguards. Following this meeting, between 2013 and 2015 LAAS worked with staff at the Ventura FWO of the USFWS on a set of recommendations that were then reviewed by the beach management agencies. These discussions resulted in the Ventura FWO issuing a letter to California Department of Parks and Recreation, Los Angeles District (State Parks) and the beach management agencies on January 19, 2016 letter (USFWS 2016, Appendix C). We concur with the findings of this letter and suggest that the implementation of the measures discussed in this letter would improve conditions for non-breeding plovers on both LAC and OC beaches. Although these are written specifically for LAC beaches, we urge that these measures be implemented on OC beaches as well.

Protective Measures for Western Snowy Plover on Beaches in Los Angeles County, California

USFWS acknowledged: a) the importance of overwintering habitat by including such areas in critical habitat designated; b) that beach grooming decreases wrack-associated invertebrates, removes nesting habitat; and likely destroys nest scrapes and eggs; and c) that other activities that could lead to disturbance of plovers include recreational use, vehicular traffic, domestic animals, and predators attracted to human refuse.

They recommended that, “efforts to protect wintering western snowy plovers on Los Angeles County Beaches should be implemented within 500 feet of the central roost location (see roost maps, Appendix A). The following measures should be implemented from the arrival of the first returning western snowy plovers in July until they depart in April to May each year. Specifically, at Surfrider Beach [Malibu Lagoon] in Malibu these measures should be implemented year-round for the entirety of California Department of Parks and Recreation (State Parks) property. For all beaches in Los Angeles County, these areas should be referred to as "Special Protection Zones" and managed and maintained differently from adjacent areas of beaches without roosting western snowy plovers.

Routine Operation of Vehicles and Heavy Machinery

All drivers of vehicles and machinery that are operated on sections of beach where western snowy plovers occur should receive annual training per a Service approved program to avoid western snowy plovers. Training logs should be kept for all staff. State Parks staff should have successfully completed the Beach Driving Operations Training Course and annual refresher courses.

Vehicles should avoid operating within SPZs, with the exception of activities such as essential patrols, trash pick-up and other activities agreed to by Wildlife Agencies as being essential. Vehicles simply transiting between points should not be allowed within these areas. For Surfrider Beach specifically, the following measures should be implemented: 1) all beach vehicle operation will be limited to emergency response activities (e.g., Code "R" responses; rescue preventions, including boat warnings; urgent law enforcement issues; and emergency medical service calls); and 2) if heavy equipment is needed onsite for emergency activities (boat rescue, structure protection) or other projects consistent with State Park's mission, State Parks resource staff will be contacted for approval prior to accessing the site, and as needed, to provide monitoring for vehicles at all times when onsite.

Visible markers, possibly with signage should be placed within 100 feet of the top of the beach slope and at the inland comers of the Special Protection Zones to remind vehicle operators of their presence (this is not applicable at State Park's section of Surfrider Beach because the entire area is within a SPZ).

When essential activities must occur, vehicles should remain below a maximum 10 miles per hour speed limit and if western snowy plovers are encountered, the driver should back up at least 50 feet and/or alter their route to avoid flushing plovers.

Beach Maintenance and Clean-up
Regular sand grooming should be discontinued within SPZs. This activity both flushes the birds and removes important foraging resources (e.g. surf-cast kelp). These small areas should be cleaned by hand crews, trained in western snowy plover avoidance. If mechanical clean-up is necessary, it should be done in the presence of a qualified western snowy plover monitor who will locate the roosting plovers and ensure that machinery does not flush or disturb them.

For Surfrider Beach, as agreed to by State Parks and Los Angeles County, sand grooming is not permitted at Surfrider Beach on State Park's property. Wrack is to be left in place and trash removed by hand.

Recreational Activities
"Refuge Areas" should be created using symbolic fencing or another barrier deemed suitable for this use during periods of high beach use at popular beaches in July, August, and September. These should be erected in a 300-foot diameter (or other configuration suitable for the beach, but roughly 300 feet long) around the traditional center of the plover's roosting areas on popular beaches such as Zuma, Dockweiler State Beach 58, and Hermosa Beach. Signage should be placed on the barrier such as has been done at Surfrider Beach in Malibu (which used signs made by local school children).

Large-scale recreational activities such as triathlons, surf camps, beach volleyball camps, etc. should not be permitted within the SPZs. Docents should visit camps adjacent to the SPZs to talk to participants about western snowy plovers. Enforcement of existing regulations for off-leash dogs should be increased within the SPZs.

Western Snowy Plover Awareness Training
Any staff personnel that operate motorized vehicles on LAC beaches should be required to attend annual training to increase their awareness of western snowy plovers. This training should include a short instructional tutorial that describes the biology of the western snowy plover, its habitat and life history, its legal status, and the consequences of violating the Act. The tutorial slide show (e.g., power point type presentation) or informational hand-out would be developed by the FWS with input from respective agencies, CDFW, and the LAAS. In addition to the tutorial, staff should view a video provided by the FWS that demonstrates safe driving techniques on beaches with sensitive wildlife. Staff members should be required to sign a statement acknowledging they have viewed and understand the tutorial and video. The signed statement would be kept on file with the respective agencies in the employee's record.

Habitat Conservation Plan
Although these measures should help reduce the potential for take of western snowy plovers, take, as defined earlier, is still likely to occur. And any take of listed species that would result from activities on beaches would require either (a) exemption from the prohibitions against take in section 9 of the Act pursuant to section 7 or (b) take authorization pursuant to section l0(a)(l)(B) of the Act. Unless a Federal nexus exists that could cover the entire action area under an interagency consultation pursuant to section 7, we recommend that beach management

agencies seek an incidental take permit through the habitat conservation planning process, pursuant to section l0(a)(l)(B) of the Act.

CHAPTER 2: THE PLACEMENT AND SIZE OF ROOST SITES OF WINTERING PLOVERS IN LOS ANGELES COUNTY, CALIFORNIA.

INTRODUCTION

Throughout their range, the Pacific Coast population of the western Snowy Plover (*Charadrius alexandrinus nivosus*) (Snowy Plover) has suffered heavy declines (USFWS 1993, 2007, 2012). This has mostly been due to conflicts between their nesting and roosting habitat and human development, manipulation and recreational activities in the same locations. They are currently considered a Federally Threatened species (USFWS 1993) and a California Bird Species of Special Concern (Shuford and Gardali 2008). In Los Angeles County (LAC), California, plovers occur in moderate to large non-breeding roosts on sandy beaches, which also sustain heavy human use. Five areas of LAC beaches have been designated critical habitat for the Snowy Plover (Figure 1) (USFWS 2012). Prior to 1948, plovers commonly nested on LAC beaches (McCormick 1899, WFVZ unpubl. data); they have not been known to nest in LAC since 1949 (Allen et al. 2016). This has been attributed to a combination of disturbance by humans and pets, increased predation, and removal of foraging resources by regular beach grooming (Page et al. 1995).

Plovers occur in LAC year-round, with the largest populations present between July and April (Chapter 1, Table 3, Figure 4). Numbers decrease in late spring (April-May) as birds disperse to coastal or inland breeding sites and increase again in their post-breeding period (July-August). There are seven distinct roosting areas where they have been found since regular surveys began in 2004 (Appendix A) (Chapter 1, Table 1). These roosts consist of groups of plovers loosely aggregated on the upper sandy beach (Chapter 1). At these sites, plovers tend to sit in depressions made by footprints, scrapes they dig themselves, and tire tracks. Here they are vulnerable to many types of disturbance.

It has been documented that plovers are most frequently disturbed when approached closely by animals and people (Lafferty 2001a). A study of wintering Snowy Plover disturbance at Coal Oil Point Reserve (COPR), Santa Barbara County by Lafferty (2001b) concluded that they were disturbed when closely approached within 30 m (96 ft) by dogs, humans, crows, and horses, with dogs disproportionally disturbing the roosting plovers. Such disturbances altered the spatial distribution of the plovers, causing them to fly to less disturbed areas. Lafferty (2001b) also noted that the disturbance caused plovers to feed more in the early morning than in the afternoon (when disturbance was highest). Studies of nesting plovers indicated that adults left their nests 78% of the time when people were within 50 m (164 ft) and 34% of the time when people were within 100 m (320 ft) (Page et al. 1977). When disturbed, roosting plovers tend to run directly away from the disturbance or toward the ocean. For sudden, immediate threats, such as a running dog or fast-moving vehicle, they may fly away as a group. When the group is disturbed, they will often disperse and re-congregate a short distance from the original roost site (T. Ryan pers. obs.). We have documented direct mortality by vehicle strikes of plovers (2007, 2013) and black-bellied plover (2009) in LAC (Chapter 1) and capture by dogs in nearby Orange County (Ryan and Hamilton 2009). However, it is more difficult to assess the long-term, but non-lethal impacts of regular disturbance and flushing. It is known that short flights are energetically costly (Nudds and Bryant, 2000) and that shorebirds with low fat reserves have low survival rates (Brown et al., 2000). Flights also increase the risk of predation by resident Cooper's hawks (*Accipiter*

cooperii), peregrine falcons (*Falco peregrinus*), American kestrels (*Falco sparverius*), as well as wintering sharp-shinned hawks (*Accipiter striatus*), and merlins (*Falco columbarius*). Protected areas could help to limit direct mortality by vehicle strikes and indirect mortality caused by frequent disturbance.

Little is known about the detailed requirements for wintering roosts of plovers. Lafferty (2001b) presented a management model, showing that for the plovers at COPR, a closed area 400 m in length protected 90% of the roosts and 96% of the plovers. Information is available on the size of roosts includes the sizes of existing winter exclosures established for them elsewhere in California (C. Sandoval pers. comm. 2009). Most of these exclosures appear to be determined by the extent and geographic characteristics of the beach, the use of the beach by the public and the agency staff managing the beach. Exclosure sizes have ranged from 300 ft x 100 ft to over 4000 linear feet (Chapter 1, C. Sandoval pers. comm. 2009). In LAC, an irregularly shaped exclosure covering approximately 100 ft x 220 ft using symbolic fencing was placed at Malibu Lagoon in 2008 and 2009 (Chapter 1). An exclosure using drift fencing has been placed at Santa Monica annually since 2005. In 2005-2007 it was approximately 100 ft x 600 ft and since 2008 100 ft x 300 ft. In 2008, a smaller area, approximately 50 x150 ft, was completely enclosed and the plovers abandoned the exclosure (Chapter 1). At DSB North, the roost at DSB LT47 was initially delineated by road cones in 2008 and a 100 x 300 ft fence in 2010 (Chapter 1). Of these, the exclosure at DSB LT47 has had the most success. It was placed at the traditional site and has remained in place since 2010. The exclosure at Santa Monica was initially successful when it was 100 x 600 ft and placed at the roost site. As discussed in Chapter 1, the size was reduced and the City has moved it south. In recent years it has seen less use by plovers.

As part of on-going efforts to protect wintering plovers on LAC beaches, we have recommended several protective measures for roosting areas, these were incorporated into USFWS (2016) as measures that beach management agencies could use to prevent take. These measures include protective exclosures around roost sites, enforcing existing dog regulations, avoidance of roosts by non-emergency vehicles, and public education through docents and signage (Chapter 1). Agency staff who would implement these measures requested information on the location and size of Snowy Plover roosts in order to determine the location and size of the exclosures and areas for increasing enforcement and management actions. Here, we attempt to provide this information.

We suggest that the key characteristics for determining the size of an effective enclosed area are: 1) size of areas currently occupied by plovers; 2) distance at which plovers are disturbed by beach activities; 3) physical characteristics such as the stability (from beach erosion) and protective characteristics (from wind and rain); and 4) food availability within the enclosed area and nearby. Disturbance distance has been established (Lafferty 2001a, Page et al. 1995). Individuals familiar with the erosion patterns of specific beaches can best evaluate physical characteristics and make recommendations for where to locate an exclosure so that it will not be damaged or destroyed by beach erosion and wave action. The Snowy Plover's diet has been documented by Tucker and Powell (1999). Dugan (2003) and Dugan et al. (2003) found that regular beach grooming reduces the richness, abundance, and biomass of many species of invertebrates that many species of shorebirds, including plovers, feed upon.

Here, we investigate the size of existing Snowy Plover roosts in LAC, and document the variation in the location of roosting wintering plovers and the area they occupy throughout the winter season. The goal is to answer the questions: 1) what are the dimensions of the daily and seasonal roosting areas; and 2) what is the location of the roost, and does it change over the season.

METHODS

We visited the six most consistently occupied plover roosting sites in LAC as part of regular plover monitoring. These sites are located at Zuma State Beach (Zuma) (Appendix A, Figure 1), Malibu State Beach (Malibu) (Appendix A, Figure 2), Santa Monica State Beach (Santa Monica) (Appendix A, Figure 3), Dockweiler State Beach near Lifeguard Tower 47 (DSB LT47) (Appendix A, Figure 5) and Lifeguard Tower 58 (DSB LT58) (Appendix A, Figure 6), and Hermosa Beach (Hermosa) (Appendix A, Figure 7).

During each visit, the observer located the roosting plovers. For the purposes of this study, a roost was any group of more than 2 individuals sitting or standing (not foraging, running or flying) on the beach. The observer approached the roosting birds to the closest distance possible without flushing the plovers (usually 10-30 m). If the plovers stood up, moved away or otherwise showed reaction to the observer, the observer backed up until they resumed their previous activity. Therefore, these data on roost size also include a buffer zone around the roosting plovers.

The observer then walked around the group of birds with a Trimble GeoXT Global Positioning Satellite (GPS) receiver (2009-10). This procedure was modified and four waypoints were taken at the four corners of the roost using Garmin GPS76 (2010-12), and then the GPS features of an iPhone (2012-16). Using this we obtained a measure of the area occupied by each group of roosting plovers during each visit. Each area was mapped as a polygon. We then measured the length, width, and area of each roost site on each day. We used these data to determine the average range of the daily roost site use (Tables 5). We then calculated the overall average range and standard error for each roost site (Table 5). We calculated the mean area (hectares) and standard error for all roosts each year and for all roosts for each month (Tables 6 and 7). We analyzed the length, width and area for each roost site; and area for each year and month using ANOVA (Analyze-it 2016).

We also measured the total beach area used by plovers each year by creating an annual polygon around all daily polygons (Appendix A, Ryan et al. 2010) measured in each year (Table 8). This provided a measure of the total length, width and area occupied by plovers at each roost in a given year. We calculated the overall average length, width and area for all years. For 2009-10 and 2010-11 we used measurements taken from July 2009 – June 2010 and July 2010 to June 2011, and in subsequent year, we used measurements taken from January to December 2014, 2015, and 2016. We eliminated months and years with fewer than 7 measurements.

STUDY AREA

The study area includes six sites along the LAC Coastline, California (Figure 1). The six sites are within beach segments known to support roosting plovers during the non-breeding season (Chapter 1) and are listed above. Zuma consists of a broad (60-90 m), sandy, flat beach. It is

backed by a parking lot, a restroom, and Pacific Coast Highway behind the Snowy Plover roost. Malibu is a sandy peninsula between 80 and 350 m long and 25 to 65 m wide at the outlet of Malibu Creek, a small estuary. Illegal dog walking is common. The configuration of the peninsula varies widely both within and among years. Santa Monica is a broad (200 m), sandy, flat beach. It is backed by a recreational trail, parking lots, residences, and a city beach club. DSB LT47 is a broad (185 m), sandy flat beach located below the north runway for Los Angeles International Airport (LAX). It is backed by a recreational trail, ~20 m bluffs and Pacific Coast Highway. DSB LT58 is a broad (160 m), sandy flat beach located below the south runway for LAX. It is backed by a recreational trail, volleyball courts, a small dune restoration area, RV park, ~20 m bluffs and Pacific Coast Highway. Hermosa is a broad (120 m), flat sandy beach backed by a recreational trail and residential housing. The LAC beaches have over 50 million visitors annually (County of Los Angeles 2009). Zuma, Malibu and Hermosa Beach tend to be the most heavily used by surfers, fishermen, dog walkers, joggers, and other beachgoers during the winter. Santa Monica and DSB LT47 and DSB LT 58 are less used during winter. All beaches face greater use during the summer months, particularly Zuma, Malibu, and Hermosa. All beaches except Malibu are subject to regular (> weekly) sand grooming. All sites have beach drivers and illegal dog walking.

RESULTS AND DISCUSSION

Daily Roost Size

The average size of daily Snowy Plover non-breeding roosts is 74.5 m (244.6 ft) (SE = 3.27 m) long, 25.4 m (83.3 ft) (SE = 0.64 m) wide, and covers an area of 2.37 hectares (ha) (5.86 acres [ac]) (SE = 0.19) (Table 5). The length of roosts ranged from 15.2 m (49.7 ft) (Hermosa) to 263.8 m (865.4 ft) (Hermosa) (Table 5). The width of roosts ranged from 5.8 m (19.1) (Santa Monica) to 62.8 (206.0 ft) (Hermosa) (Table 5). The area of the average roost ranged from 0.20 ha (0.49ac) (Zuma) to 19.16 ha (47.35 ac) (Zuma).

Among the six LAC roosts, using ANOVA, we detected significant differences in length ($N = 239$, $F = 6.46$, $p < 0.01$) and width ($N = 239$, $F = 2.94$, $p = 0.013$), but no significant difference among the area ($N = 209$, $F = 1.50$, $p = 0.19$). The roost at Zuma and Hermosa Beach extend along a much larger length than the other beaches. The roost at Malibu is more square in shape, and thus much wider than other beaches. The width of the beach at Zuma is bound by the parking structure and the beach is subject to beach erosion making it narrower than other beaches.

These dimensions provide a measure of the roosting area used by the plovers on a daily basis. These areas represent what the average observer would note on a single visit to the roosting area at a point in time. However, we have found that, while plovers have a high fidelity to a portion of the beach, the specific location of the roost moves around considerably, both within a 24-hour period and over the course of the non-breeding season. As was noted by Lafferty (2001b), daily movements are often in response from a major disturbance such as a dog, fast moving vehicle, or beach grooming. It was rare to observe a roost relocation based on less obtrusive activities such as humans walking, jogging, or sunbathing nearby (>30 m). At Zuma, the roost was often located farther away from the shore, in a smaller area near Lifeguard Tower 9. When disturbed, the plovers flushed to a secondary area closer to the ocean.

The total area occupied by plovers at the six main roosts was significantly different among years (ANOVA: N = 209, F = 13.43, p < 0.01) (Table 6), but this was mostly due to a large average area of 6.49 ha in 2010. There was no significant difference found in the area occupied by plovers among months (ANOVA: N = 206, F = 0.87, p = 0.53) (Table 7).

Table 5. Size and dimensions of daily occupancy of Snowy Plover roosts.

Site and Dimension	Avg.	Range	SE	N
Zuma				
Length (m)	106.8	15.9 - 261.0	12.08	42
Width (m)	20.8	8.3 - 49.8	1.51	42
Area (ha)	2.48	0.20 – 19.16	0.53	39
Malibu				
Length (m)	60.9	28.9 - 152.4	4.05	36
Width (m)	28.5	13.0 - 53.7	1.45	36
Area (ha)	3.23	0.57 – 16.56	0.64	28
Santa Monica				
Length (m)	64.9	25.5 - 169.1	4.17	55
Width (m)	25.9	5.8 - 58.8	1.40	55
Area (ha)	1.95	0.29 – 9.00	0.29	47
DSB LT47				
Length (m)	66.8	22.4 – 194.0	5.21	47
Width (m)	27.1	8.4 – 48.5	1.30	47
Area (ha)	2.56	0.35 – 17.52	0.50	41
DSB LT58				
Length (m)	49.2	23.0 – 108.1	5.31	17
Width (m)	25.3	14.0 – 46.4	2.21	17
Area (ha)	1.07	0.48 – 2.06	0.13	15
Hermosa				
Length (m)	85.5	15.2 – 263.8	9.21	42
Width (m)	24.8	7.3 – 62.8	1.57	42
Area (ha)	2.46	0.22 – 11.82	0.38	39
All Beaches				
Length (m)	74.6	15.2 – 263.8	3.27	239
Width (m)	25.4	5.8 – 62.8	0.64	239
Area (ha)	2.37	0.20 – 19.16	0.19	209

Table 6. Average area occupied by snowy plover roosts (hectares) from 2009-2016.

Year	Area (ha)	SE	N
2009	1.76	0.29	68
2010	6.49	0.51	22
2012	3.33	0.90	7
2013	2.45	0.75	10
2014	2.53	0.51	22
2015	1.90	0.48	25
2016	1.49	0.32	55

Table 7. Average area occupied by snowy plover roosts (hectares) by month from 2009-2016.

Month	Area (ha)	SE	N
February	1.94	0.33	59
March	2.11	0.34	57
April	3.17	0.90	8
July	1.56	0.90	8
August	2.13	0.81	10
October	2.94	0.49	27
November	2.87	0.57	20
December	1.91	0.62	17

Total roost area used each year

The total average area used during a year by plovers from 2009-2016 was 15.8 hectares, an average length of 279 m and average width of 64 m (Table 8). Area ranged from 1.95 to 53.16 hectares, length from 79-887 m (Table 8). As with the daily measurements, roosts at two of the most disturbed sites, Zuma and Hermosa occupied the largest areas, likely because these birds are regularly flushed by disturbance. At Hermosa, in some years the flock settles in two distinct roosting areas and in other years, they roost together. The roost that consistently uses the smallest area is Malibu, likely due to the relatively confined nature of the sand spit. Roosts with exclosures at DSB LT47 and Santa Monica tend to remain in smaller areas around the exclosure. However, in the case of Santa Monica, where the exclosure has been moved south of their roosting area, they have tended to use a much larger area (Table 8).

When creating management areas and deciding upon the size and location for protective exclosures for the plovers, we suggest that Wildlife Agencies take into account these regular inter- and intra-annual movements in their planning. We have documented that while roosts may remain in the same general area, their specific location can vary both throughout a single year and between years (Appendix B). Roost maps in Ryan et al (2010) and Appendix A of this report document these movements and the range of each beach where these roosts have been located and will likely continue to be located.

Based on these measurements and maps, we recommend that Special Protection Zones (Chapter 1) of 500 feet (152 m) on either side of a central roost point would likely protect most roosts, as the average roost length is 279 m (915 feet). However, we do recommend that the center points

be reviewed each Fall, and if the central roost location shifts, that the protected area shift as well. We further recommend that a width dimension be added to the recommendation for Special Protection Zones of 200 feet (61 m) from the top of the beach slope. This is based on our average width of 64 m (210 feet).

Table 8. Dimensions of total annual roosting area 2009-2016, Los Angeles County, California.

Beach	Year	Length (m)	Width (m)	Area (ha)
Zuma	2009-10	461	73	
	2011-12	285	51	
	2014	279	54	9.63
	2015	345	34	10.86
	2016	348	48	12.98
Malibu	2009-10	274	108	
	2011-12	275	40	
	2014	79	29	1.95
	2015	88	70	3.85
	2016	79	62	3.84
Santa Monica	2009-10	175	61	
	2011-12	145	52	
	2014	254	88	15.14
	2015	208	116	18.17
	2016	266	119	19.91
DSB 47	2009-10	175	61	
	2011-12	124	48	
	2014	194	41	6.83
	2015	133	52	5.18
	2016	267	112	18.62
DSB 58	2009-10	221	59	
	2011-12	121	47	
	2014			
	2015			
	2016			
Hermosa	2009-10	536	69	
	2011-12	218	38	
	2014	427	42	15.16
	2015	887	64	53.16
	2016	678	94	41.37
Average		279	64	15.8

CONCLUSIONS AND RECOMMENDATIONS

Based on these findings, we suggest that local beach management agencies consider protecting areas approximately 64 m wide and 279 m long and approximately 15.8 ha between when the plovers return in July and depart in April. These measurements agree well with current USFWS recommendations (USFWS 2016). In Chapter 1 and Appendix A we make recommendations for the specific locations of Special Protection Zones and exclosures.

LAC has 121 km (75 miles) of mainland beaches (County of Los Angeles 2009). Of this, approximately 56.8 km (35.3 miles) is sandy beach that is not covered by high tide and is suitable Snowy Plover roosting habitat. The total length of the areas occupied by Snowy Plover roosts is 1,674 m, 1.7 km (5,492 ft/1.0 miles) or approximately 1.4% of the linear coastline and 3.0 % of broad, sandy beaches in LAC. In terms of total area covered, the Snowy Plover roosts cover 15 ha and cover between 0.4% and 2.1% of the beach segments (Chapter 1) where they occur. Here, we propose that protecting these relatively small areas on the beach to protect flocks would reduce disturbance to wintering plovers on LAC beaches.

CHAPTER 3. EDUCATION AND OUTREACH

INTRODUCTION

Public awareness of and support for Snowy Plover conservation in LAC is essential to species recovery. Since 2007 at meetings of the LAC Snowy Plover Working Group, a large part of the dialogue has centered on how to combat lack of public awareness. Over the course of this study the project team has taken a varied approach to addressing the concerns and recommendations about education and outreach. Between fall 2014 and Jan 2017, 98 volunteers participated in monitoring and/or outreach for a combined contribution of 950 person-hours devoted to Snowy Plover conservation in LAC.

LOS ANGELES COUNTY OUTREACH

Volunteer participation in the Snowy Plover monitoring program

From September 2014 through January 2017, 89 individuals volunteered to monitor Snowy Plovers in LAC, contributing over 720 person-hours to the project. Of these 89 volunteers, 55% participated in more than one survey and 36% participated in four or more surveys. In the spring and summer of 2015 and 2016, eight volunteers collectively contributed 14 hours to installing and maintaining symbolic fencing at Malibu Lagoon. Capitalizing on our strong partnership with California State Parks at Malibu Lagoon, we hope to continue coordinating a small site-specific core of volunteers to help monitor this site. The training that monitoring volunteers received prior to beach-wide surveys complied with recommendations and regulations set forth in the Western Snowy Plover (*Charadrius nivosus nivosus*) Pacific Coast Population Draft Recovery Plan. Topics covered include biology, ecology, and behavior of Snowy Plovers; identification of adult plovers, their young, and their eggs; threats to plovers and their habitats; survey objectives, protocols, and techniques; regulations governing the salvage of carcasses or eggs; special conditions of the existing recovery permit; other activities such as reading color bands, tracking, predator identification, and engaging the public. Trainings take place in the field, typically at a plover roost site where volunteers can observe plovers and other shorebirds first-hand. New volunteers were then encouraged to join a survey team led by a biologist or long-time volunteer.

Public Outreach

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. From Fall 2014 to January 2017, 18 volunteers collectively spent 212 hours working directly with the public through field trips, walks, presentations, and tabling events. Through outreach activities, we have worked to establish community connections that will provide volunteers for both data collection and docent activities.

The project team continues to work with Dockweiler Youth Center (since 2010) and the Annenberg Community Beach House (since 2012) to lead a series of Snowy Plover-focused beach walks for the general public. Guided beach walks at these sites in Fall 2014 to January 2017 collectively served over 300 total participants. Staff and volunteers participated in twenty eco-fairs, other tabling events, and professional meetings from Fall 2014 to January 2017 to provide the public with information about Snowy Plover conservation in Los Angeles County,

and we estimate that approximately 2,500 people were reached through these venues. See Appendix F for a complete list of all outreach activities conducted.

School Outreach

Since 2008, we have explored multidisciplinary ways to engage young, inner-city students in Snowy Plover conservation. We worked with Dorsey High School to create a public service announcement about Snowy Plover conservation. Since its creation, it has been viewed over 4,300 times on youtube.com and has 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/index.php/education-mainmenu-194/science-illustration-mainmenu-244/42-photo-galleries-section/photo-galleries-category/624-snowy-plover-gallery), and these signs continue to be re-printed and used at the Malibu Lagoon seasonal exclosure each year. Our online gallery has garnered over 8,300 web hits since it was posted in the summer of 2010.

Since August 2010, the Snowy Plover exclosure at Dockweiler Beach near LT 47 has proven to be an outstanding resource for education/outreach as well as conservation. However, during the Winter and Spring of 2016 we shifted the location of our field trips to Dockweiler 58, due to construction projects near Dockweiler 47. This new site served equally well logistically, though there were fewer opportunities for students to view plovers. Los Angeles Audubon has also integrated coastal issues, like Snowy Plover conservation, into its education programs at upland sites within the Los Angeles basin. High School students in Los Angeles Audubon's Baldwin Hills Greenhouse Program developed a Snowy 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 Snowy Plover and California Least Tern information table at public school events in 2015 and 2016 that drew hundreds of community members. Through a grant from the Disney Worldwide Conservation Fund in the 2014-2015 and 2015-2016 school years, we were able to expand our field trip and presentation outreach program. Between Fall 2014 and January 2017, we completed 37 in-school presentations and 28 field trips, serving students from 15 schools/youth organizations almost entirely within Los Angeles Unified School District. Through these activities, over 1,900 students learned about Snowy Plover conservation during this time period. See Appendix F for a complete list of all school outreach activities conducted.

Cultivating young conservation professionals

In 2014, Los Angeles Audubon joined Environment for the Americas' network to host 1-2 interns each year as part of their Celebra las Aves: Latinos in Conservation Internship Program. This program supports early career professionals by providing them with paid internship opportunities that offer valuable experience with fieldwork and public outreach. Los Angeles Audubon is currently the only non-profit that is part of the internship network (all others are state or federal agencies), and we are able to provide interns with excellent experience in species monitoring and public outreach in a highly urbanized and demographically diverse context. Between 2014 and 2016, four young professionals completed their internships with us. Of these four, three have been hired either full or part time as Los Angeles Audubon staff to continue

working on Snowy Plover monitoring and outreach tasks, as well as habitat restoration, and Least Tern monitoring.

Creation of public displays

As a first step toward public outreach in 2008, the project team worked with the Dorsey High School Film Production Program to create public service announcement videos in both English and Spanish that addressed Snowy Plover conservation issues in Los Angeles County. These videos are on view to the public at Los Angeles Audubon's YouTube non-profit site (www.youtube.com/losangelesaudubon) and have received over 4,300 views since it was posted in 2008. In addition to being available online, the English-language version of the video was screened in July 2008 at an Audubon Film Fridays event in Debs Park, and students involved in the project received recognition from Speaker of the Assembly Karen Bass.

As mentioned in the School Outreach section 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 and signs can also be seen at the seasonal exclosure at Malibu Lagoon in the spring/summer. During the 2013-2014 and 2014-2015 school years, we collaborated with Los Angeles Unified School District schools to create and display Snowy Plover-themed artwork on campuses. We will continue to collaborate with other organizations to provide venues in which to display interpretive information about Snowy Plover conservation on both a temporary and permanent basis.

At Malibu Lagoon, we have continued to coordinate with California State Parks staff to create a permanent interpretive sign near the beach entry point. As of December 2016, a design has been finalized and sent into production by California State Parks, with plans for installation at the site in 2017.

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 Snowy Plover locations from volunteer and biologist observations and Special Protection Zones, 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 11,000 page views.

Create signage for the winter and breeding season fencing.

The project team secured funding for the creation of signage for the exclosure at Dockweiler 47, and signs were installed in August 2010. In 2016 we replaced missing signage on the exclosure, and vandalism of the metal signs has been minimal since they were first installed in 2010. At Malibu Lagoon, conservation posters created by elementary school students continue to be used, with minimal to no vandalism each year, printed on durable plastic as well as in laminated form.

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 Snowy 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. In 2016, we updated the beach driver handout to reflect information provided in the January 2016 USFWS letter to beach managers (Appendix C). The handout is available for download on the Los Angeles Audubon website.

ORANGE COUNTY OUTREACH

In Orange County (OC) between Fall 2014 and February 2017, team leaders volunteered more than 370 person hours to complete administrative tasks, surveys, volunteer training and appreciation, and outreach. Outreach was aimed at recruitment of surveyors and public awareness of the survey and Snowy Plovers on the beaches of Orange County. The OC Snowy Plover Survey was promoted at every Sea and Sage Audubon General Meeting (9 per year), every 4th Tuesday Conservation Lecture (7 per year), and other activities, workshops and tabling events throughout the year. Sea and Sage Audubon's Science Committee Chair contacts nearby universities and colleges to recruit students to the program and the Facebook Chair posts every survey multiple times. Flyers, posters, and business cards are placed at various venues and email announcements are sent to science/conservation interest lists. Announcements are included in the chapter newsletter, with a circulation of over 3000 members, and on the chapter website. In January 2016, Sea and Sage was invited to promote the OC Survey at a community program in Dana Point. Each year in conjunction with Sea and Sage's "4th Tuesday" Conservation Lecture in May, Sea and Sage Audubon pays tribute to the OC Snowy Plover Survey volunteers and distributes Certificates of Appreciation to volunteers and key personnel assisting in the OC Snowy Plover Survey Project.

Volunteer participation from Orange County in the Snowy Plover monitoring program

From 2013-2017, 111 individuals volunteered to monitor plovers in Orange County, contributing a total of 1,734 hours to the project . Of these volunteers, 51% volunteered for multiple years of the study. Due to multiple targeted outreach presentations, newsletter articles and the use of social media to recruit volunteers for this program, Sea and Sage Audubon's volunteer monitoring base went from 50 in 2013, our first year of the survey, to over 100 in 2017. In preparation for beach wide surveys each year, Orange County conducted 2-hour in-classroom training sessions on the approved monitoring protocol. These training sessions took place in September 2014, 2015 and 2016, in January 2015, and in March 2015 and 2016. Field training was conducted when in-classroom training was not available.

Table 9. Orange County Volunteer Participation 2013-17.

	2013	**2014**	**2015**	**2016**	**2017**
Number of Volunteers Participating	50	144	186	157	41
Number of Volunteer Hours	242	475	494	433	90

Creation and maintenance of a website

Sea and Sage Audubon hosts a Snowy Plover webpage 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 including a list of beach segments with downloadable maps. In the weeks before and after a survey, this site becomes the active place for 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 their data.

Talks

Sea and Sage Audubon developed a 15-minute illustrated outreach and recruitment talk, aimed at adults, which describes the OC survey and provides brief information about the Snowy Plover. This talk was presented on September 10, 2015 at Laguna Hills Audubon, with 48 attendees; and on September 18, 2015 at Sea and Sage Audubon, with 58 attendees.

In 2016 Sea and Sage Audubon expanded the short program into a full-length program, with additional information about the Snowy Plover and the OC Survey. The full-length program was presented at the Huntington Beach Wetlands and Wildlife Care Center on September 8, 2016 with 19 attendees, and at El Dorado Audubon on September 15, 2016, with 33 attendees.

Snowy Plover Themed Field Trips

Sea and Sage Audubon conducted its first Snowy Plover themed field trip for the public on Balboa Peninsula and Huntington State Beach on October 17, 2015. The trip provided information about how and when Snowy Plovers use OC beaches to rest, feed, and breed. Twenty-five people attended, including local Balboa residents and a junior high student collecting information for a school science report. The Snowy Plover field trip to Balboa Peninsula was conducted again in 2016 on October 8, 2016 with 21 attendees.

Sea and Sage conducted its first South County Snowy Plover themed field trip for the public at Salt Creek in Dana Point on February 11, 2017.

Youth Outreach

In the summer of 2015, 24 campers, ages 11 to 17 years, participated in the Snowy Plover youth presentation at Sea and Sage's Marsh Coastal Camp Program, which occurs only in the odd years. The posters made at camp are being used in Sea and Sage Audubon's OC Snowy Plover promotional and outreach materials. The youth program includes 30 minutes interpretive and informative material on biology and status, and a period of hands-on activity creating posters on "How to protect and save." This program has been adapted to present at other opportunities. Sea and Sage Audubon has expanded its networking in order to develop these opportunities.

Sea and Sage Audubon was invited to present the youth program on January 29, 2017, at the Campers Reunion of Sea and Sage’s 2016 Summer Camp. Twenty-five children ages 11 to 17 participated.

Table 10. Orange County Outreach Activities.

OC Outreach Activity	Objective	Occurrence
Develop and present youth outreach program.	Present each year	(1) July 2015 during Sea and Sage Coastal Camp, 24 campers, 11 - 17 year olds. (2) January 2017 during Campers' Reunion of 2016 Summer Camp, 25 attended, ages 11 to 17.
Develop and present Orange County adult program	Present twice each year	(1) 9/10/2015 to Laguna Woods Audubon, 48 attended. (2) 9/18/2015 to Sea and Sage Audubon, 58 attended. (3) 9/8/2016 to Huntington Beach Wetlands and Wildlife Care Center, 19 attended. (4) 9/15/2016 to El Dorado Audubon, 33 attended.
Conduct Orange County plover-themed field trip	Conduct at least once each fall/winter	(1) 3/7/2015 on HSB as practical training, 3 - 5 attendees. (2) 10/17/2015 on Balboa Peninsula and HSB, 25 attended. (3) 10/8/2016 on Balboa Peninsula, 21 attended. (4) 2/11/2017 at Salt Creek, 14 attended.

Recommendations for Future Education and Outreach:

The following recommendations range from sustaining existing programming to 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 monitoring and outreach programs. We have been able to expand our outreach to public schools and interested groups throughout LAC. 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 outreach programs will be conducted. We would like to expand our outreach efforts to include greater networking and collaboration with Audubon chapters in Ventura, Los Angeles, Orange, and San Diego counties.
- 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. Outreach presentations address 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.

- Collaborate with a local college or university to 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 Snowy 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 Snowy Plover. The answers gathered could then be considered in the design and placement of protective measures, including exclosures, 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.
- 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 into 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 exclosures and Snowy Plover roost sites, when possible. This is needed to inform the public about the exclosures and why protecting the Snowy Plover is important.
- Create a media packet for local business and homeowner associations that operate near Snowy Plover beaches. The packet should include a DVD of the public service announcement, as well as resources regarding dogs on the beach and general Snowy Plover conservation awareness.
- Conduct targeted outreach to the dog-owner community and the professional dog-walker community to establish a positive, non-combative way to promote avoidance of known plover areas by on- and off-leash dogs.

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Appendix A: Maps of Snowy Plover Roosts 2012-2016

Figure 1. Zuma Beach Roost Map.

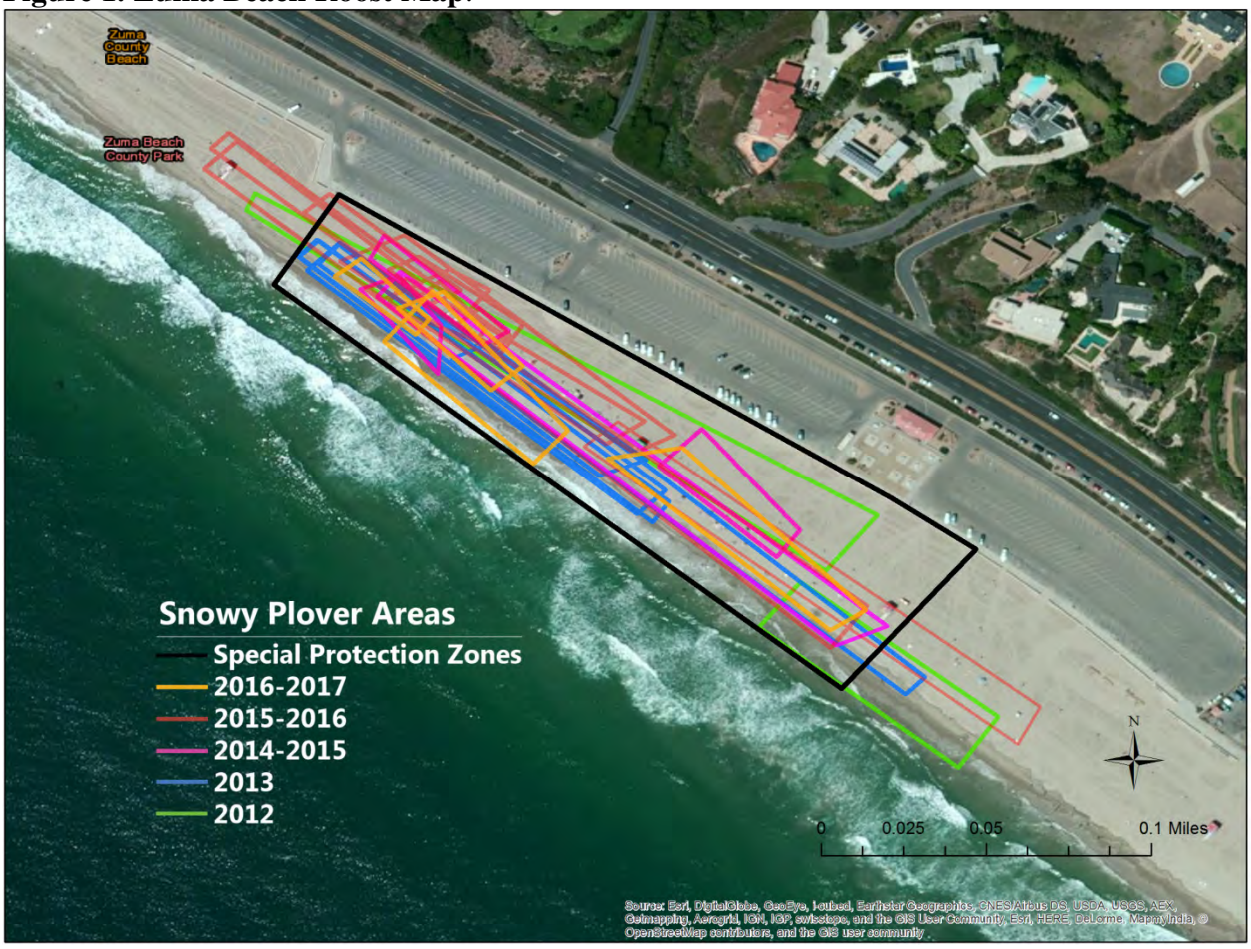


Figure 2. Malibu Beach Roost Map.

Figure 3. Santa Monica Roost Map.

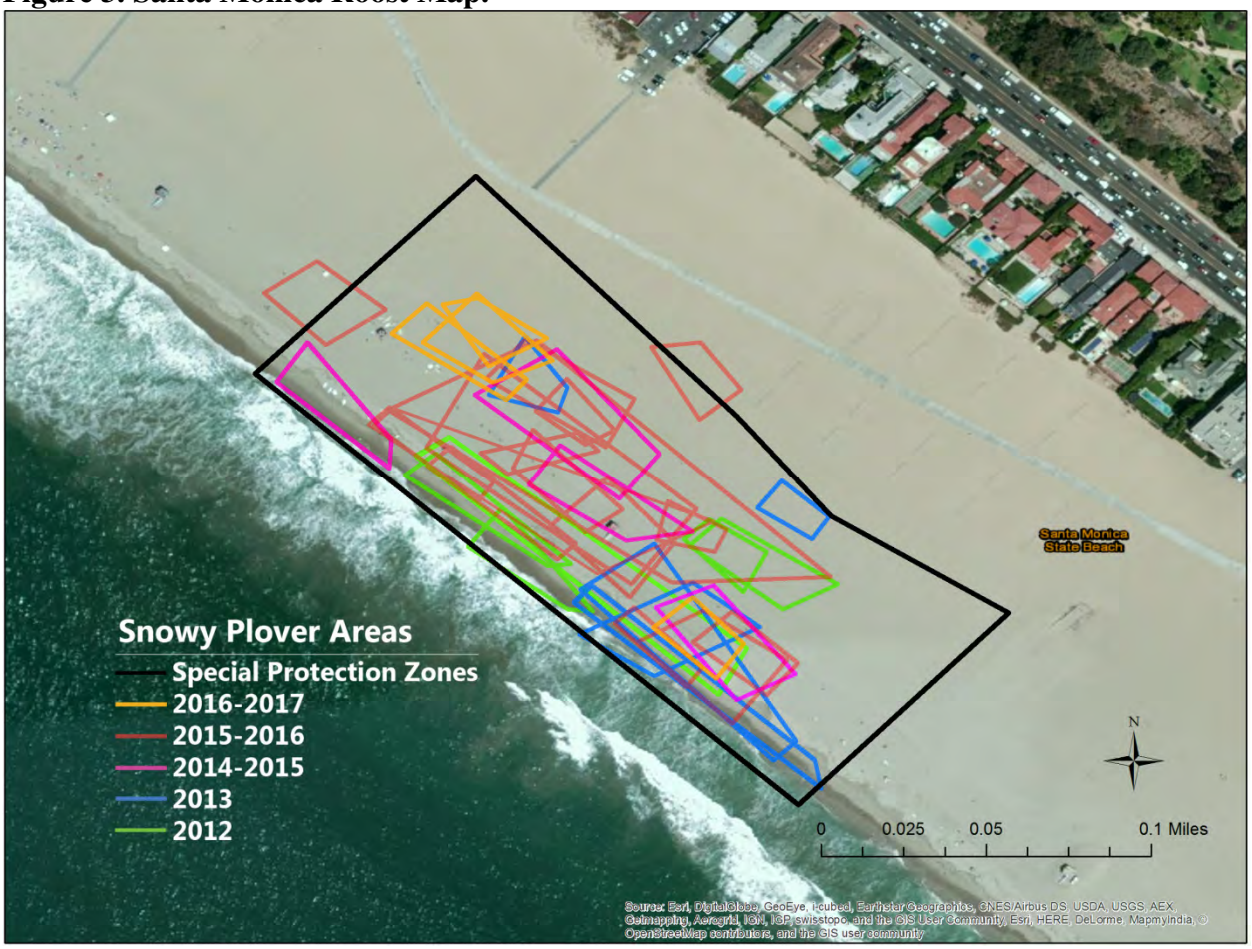


Figure 4. Venice Roost Map

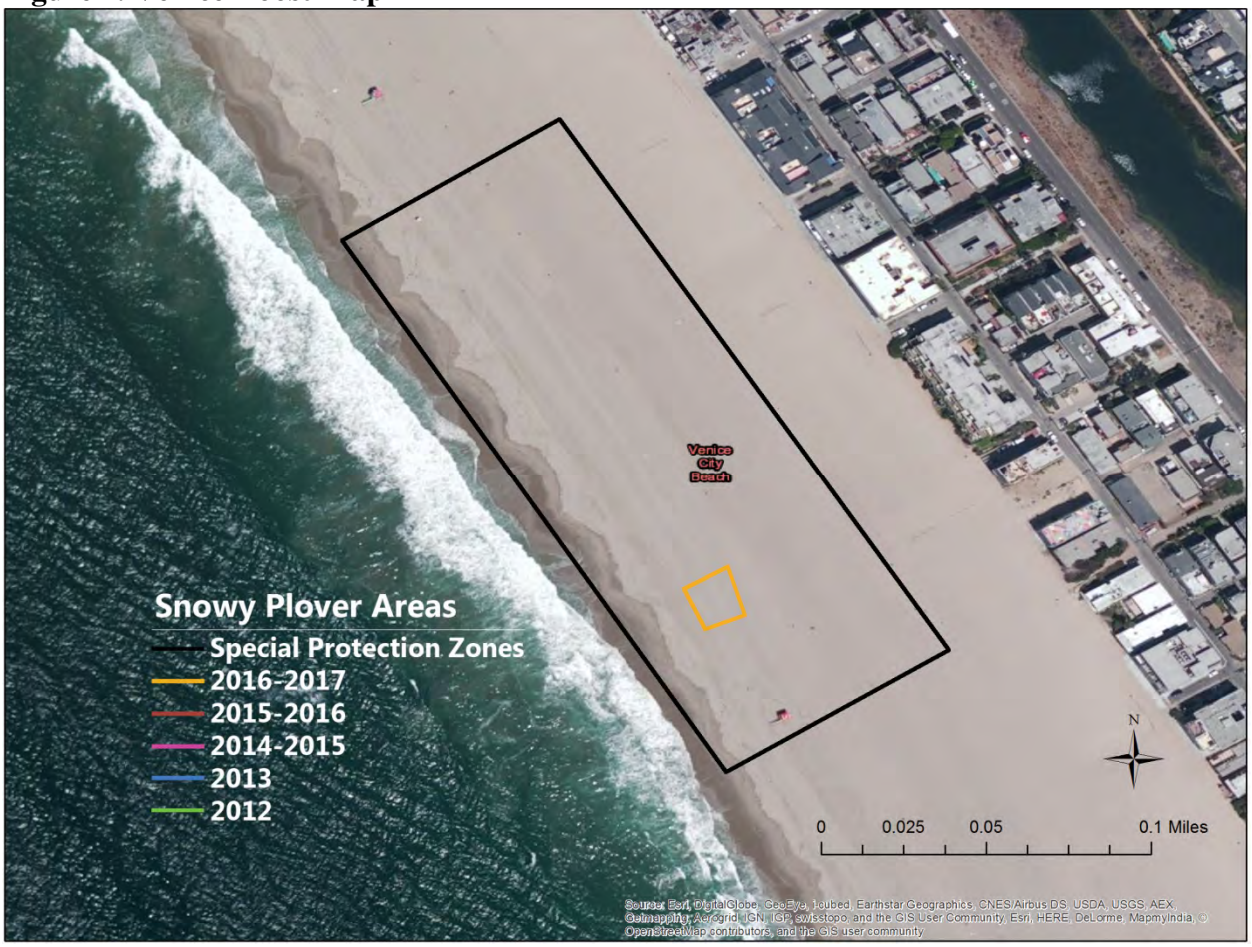


Figure 5. Dockweiler LT 47 Roost Map.

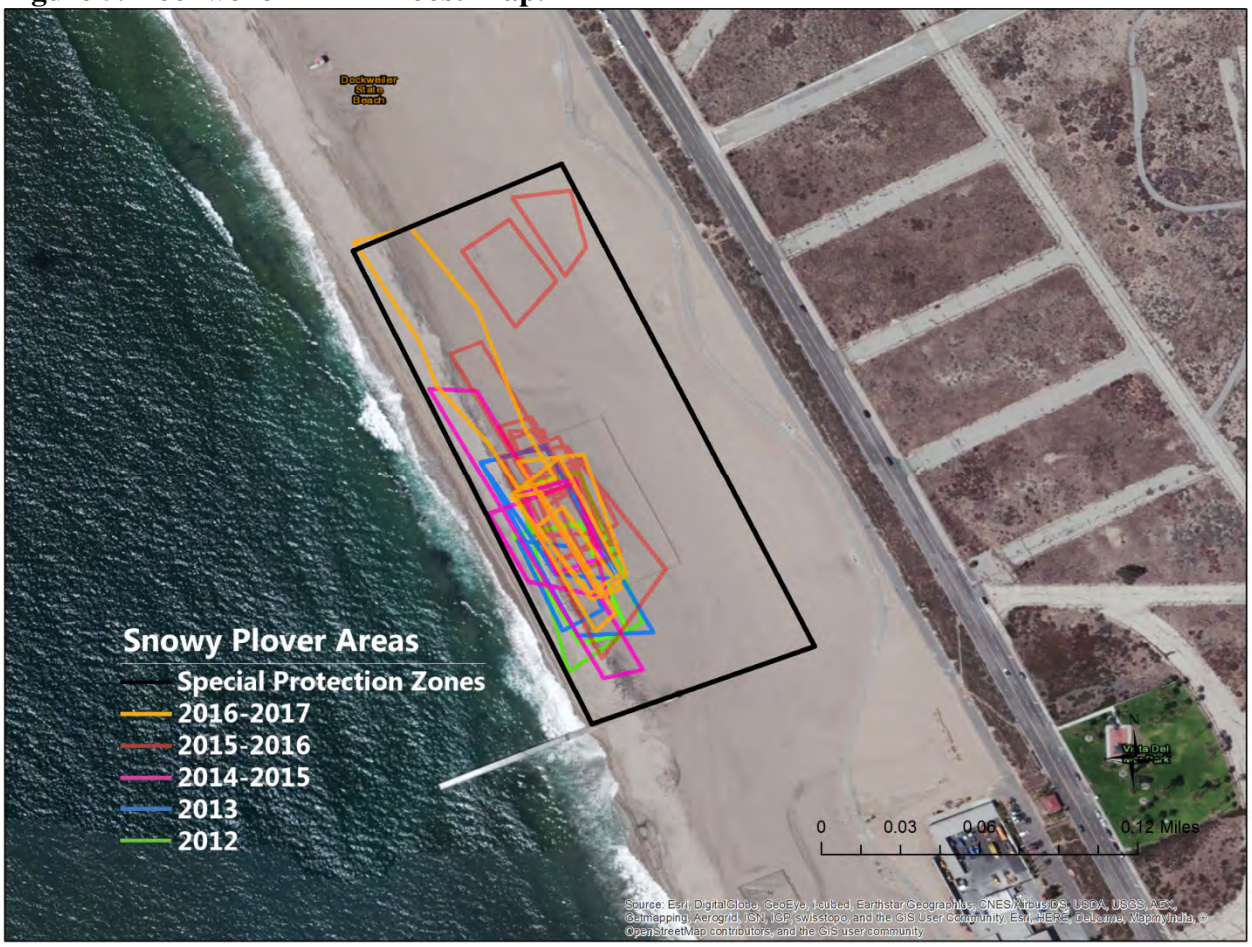


Figure 6. Dockweiler LT 58 Roost Map.

Figure 7. Hermosa Beach Roost Map

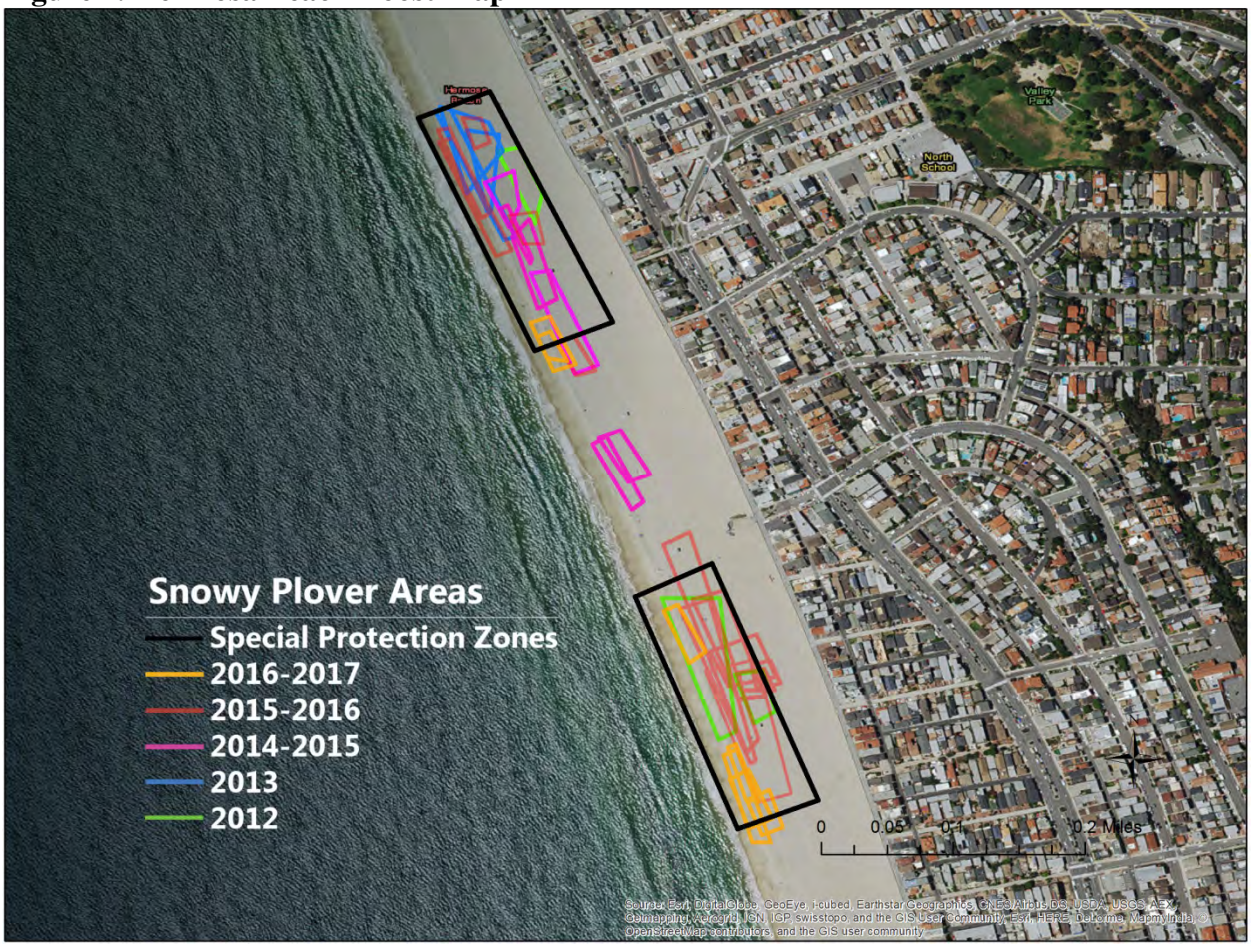


Figure 8. Surfside/Sunset Roost Map.

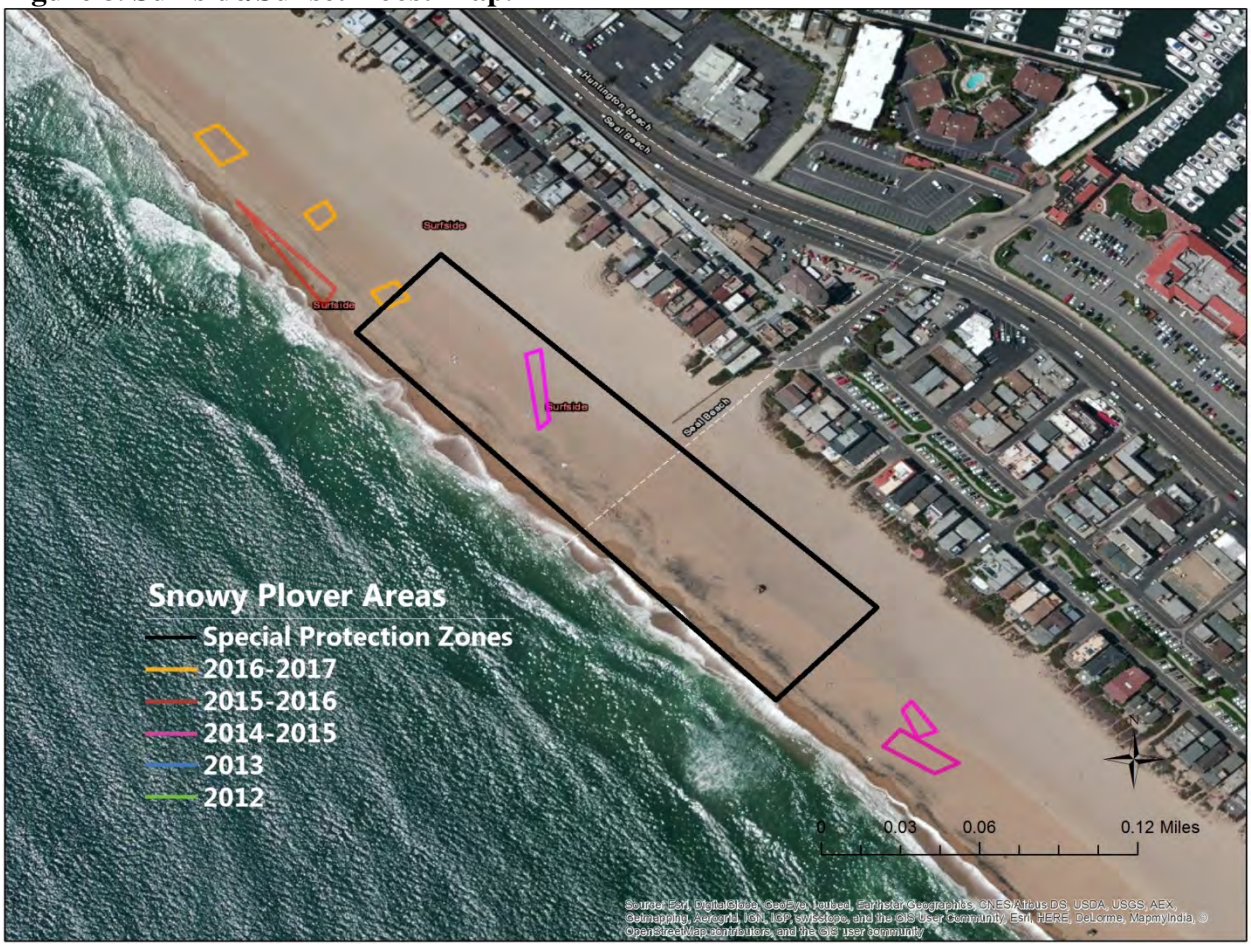


Figure 9. Bolsa Chica State Beach Roost Map.

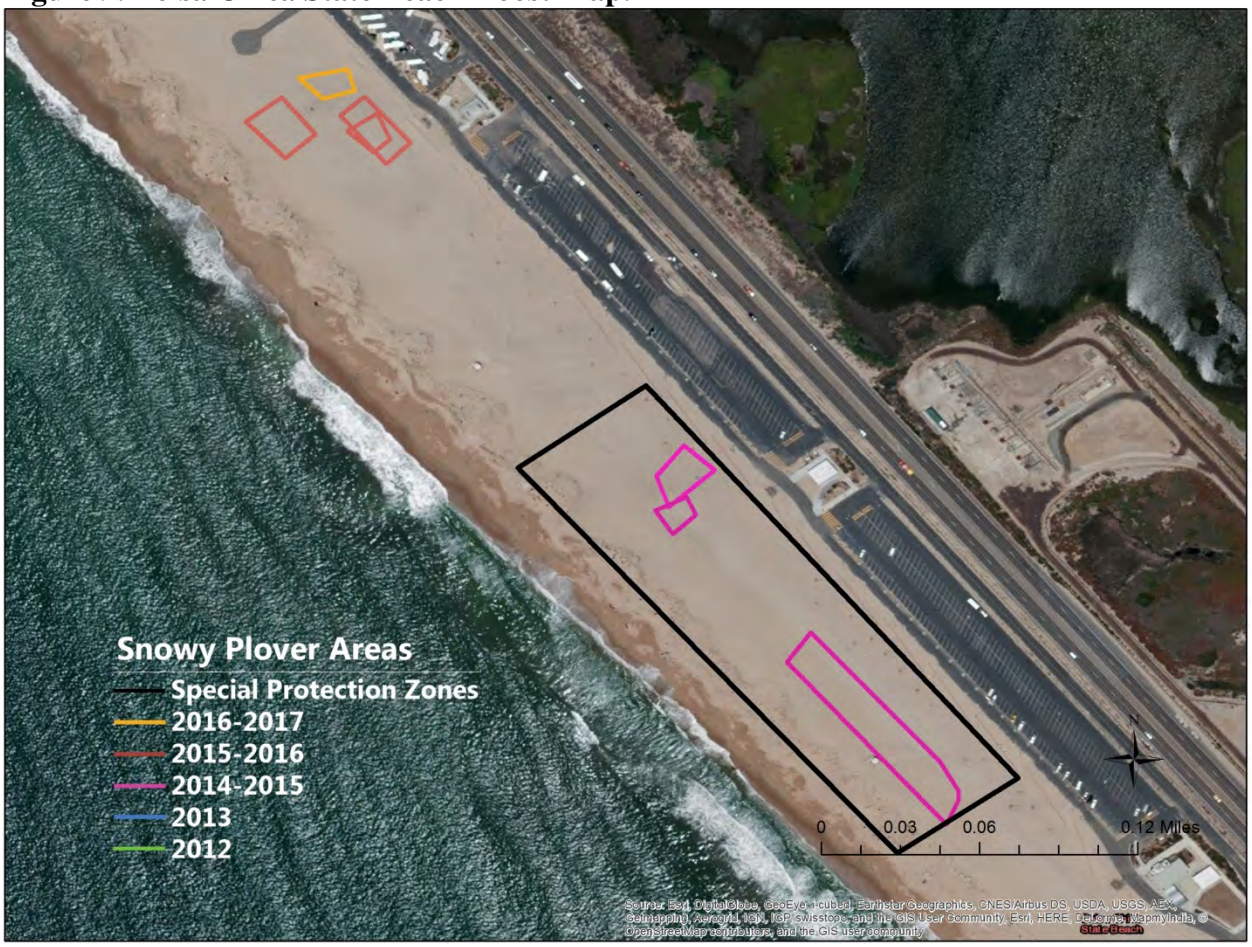


Figure 10. Huntington State Beach Roost Map.

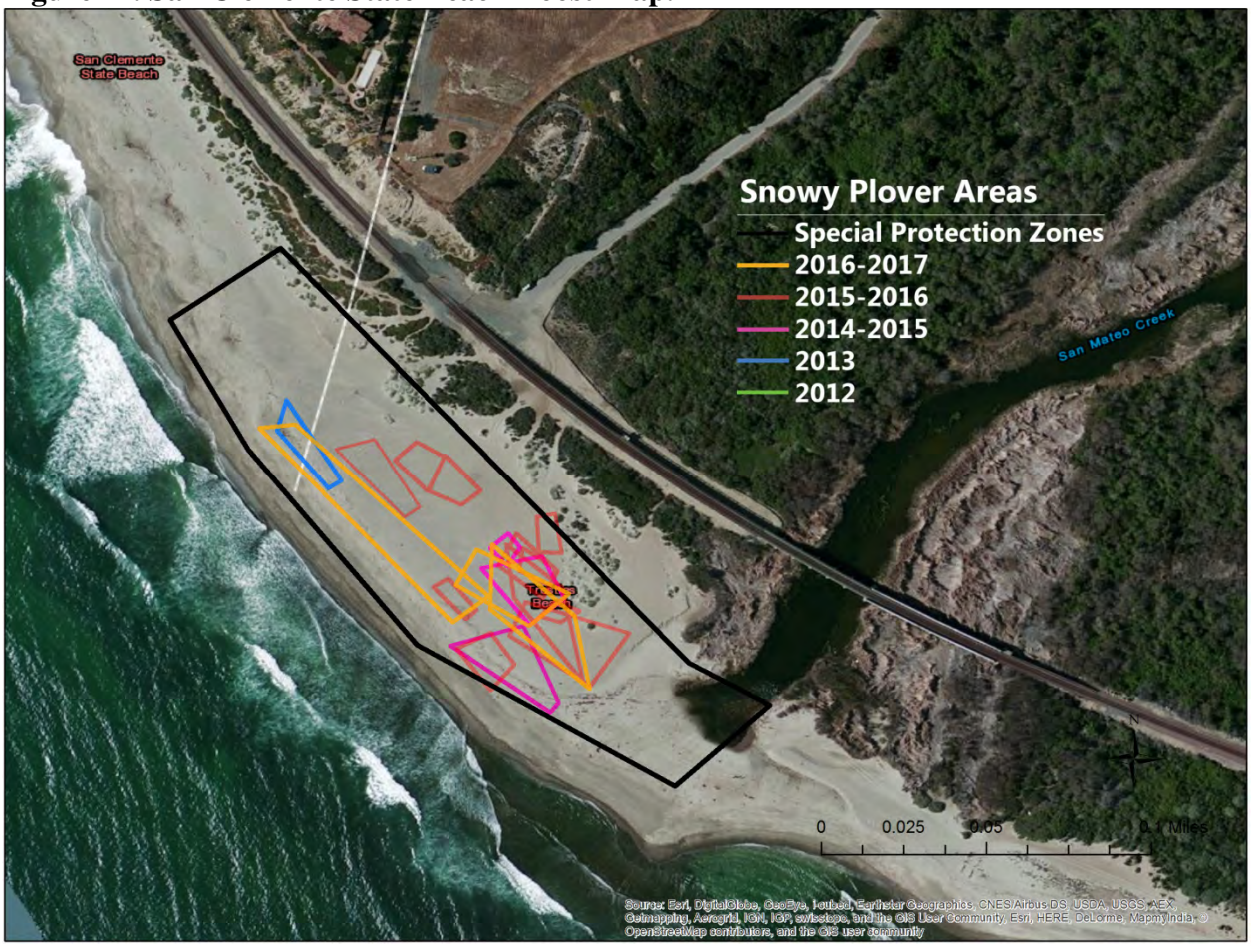
Figure 11a. Balboa Beach Roost Map.

Figure 11b. Balboa Beach Roost Map.

Figure 12. Crystal Cove State Park Roost Map.

Figure 13. Salt Creek Roost Map.

Figure 14. San Clemente State Beach Roost Map.



Appendix B: Photographs

Figure 1. Images from Los Angeles County Beaches (2014-2016).

Photo 1. Berm and volleyball nest in place at the location of the former plover roost at Zuma.

Photo 2. LAC Lifeguard quad at Malibu Lagoon (Surfrider) Beach.

Photo 3. Plover found dead adjacent to vehicle tracks at Santa Monica.

Photo 4. Beach groomer working at the exclosure at Dockweiler State Beach.

Figure 2. Images from Orange County Beaches (2014-2016).

Photos 1 and 2. Photograph and map of the Sundown Music Festival within the plover roosting area at Huntington Beach State Park.

Photos 3 and 4. Off-leash dogs at the Santa Ana River Mouth adjacent to the plover roost at Huntington Beach State Park.

Figure 3. Images from field trips and outreach events in Los Angeles County (2014-2016).

Photo1. Set-up for an in-class presentation at a Los Angeles Unified public school during winter/spring 2016.

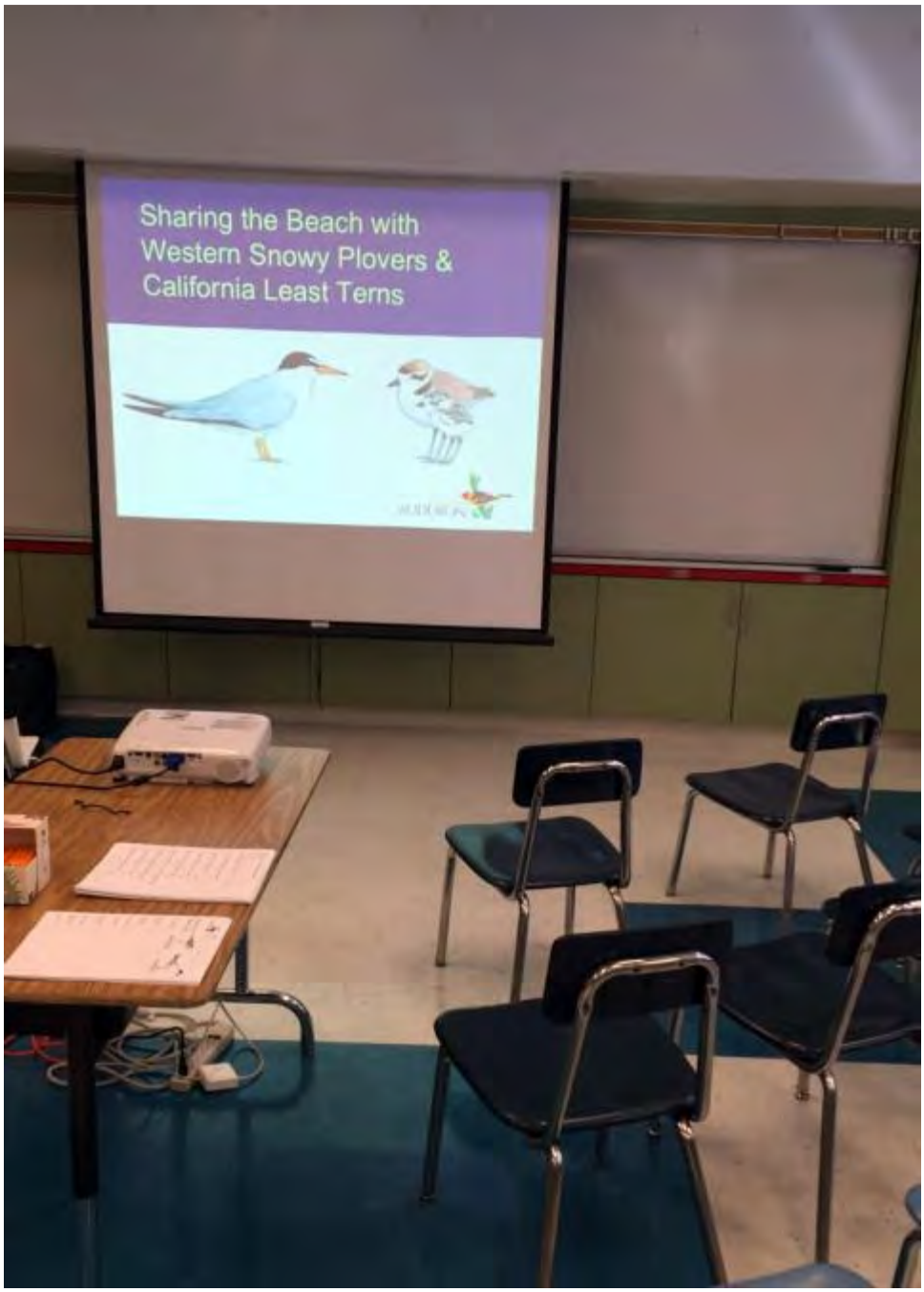


Photo 2. A public school field trip to Dockweiler Beach during winter/spring 2015.

Photo 3. Los Angeles Audubon's outreach table at an eco-fair event during the spring/summer 2016.

Appendix C: USFWS letter January 19, 2016

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
08EVEN00-2015-CPA-0067

January 19, 2016

Jamie King, Environmental Scientist
California Department of Parks and Recreation, Angeles District
1925 Las Virgenes Road
Calabasas, California 91302

Subject: Protective Measures for Western Snowy Plovers on Beaches in Los Angeles County, California

Dear Ms. King:

We, the U.S. Fish and Wildlife Service (Service), are contacting you and other beach administrators and stakeholders who have an interest in western snowy plovers (*Charadrius nivosus nivosus*), recreation, management, and operations on beaches in Los Angeles County. Western snowy plovers are known to winter on beaches in Los Angeles County and have attempted to nest at Surfrider Beach in Malibu. After a series of discussions, meetings, and electronic mail exchanges with beach administrators, stakeholders, and western snowy plover experts, we have developed some measures we recommend to help protect this species on beaches in Los Angeles County and not interfere with continued recreation activities, and beach management operations.

The Service's responsibilities include administering the Endangered Species Act of 1973, as amended (Act), including sections 7, 9, and 10. Section 9 of the Act and its implementing regulations prohibit the taking of any federally listed endangered or threatened species. Section 3(19) of the Act defines take to mean to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Service regulations (50 CFR 17.3) define harm to include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. Harassment is defined by the Service as an intentional or negligent action that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Exemptions to the prohibitions against take in the Act may be obtained through coordination with the Service in two ways. If a project is to be funded, authorized, or carried out by a Federal agency and may affect a listed species, the Federal agency must consult with the Service, pursuant to section 7(a)(2) of the Act. If the proposed project does not involve a Federal agency, but may result in the take of a listed animal species, the project proponent should apply to the Service for an incidental take permit, pursuant to section 10(a)(1)(B) of the Act. To

qualify for the permit, a project proponent would need to submit an application to the Service together with a habitat conservation plan (HCP) that describes, among other things, how the impacts of the proposed taking of federally listed species would be minimized and mitigated and how the plan would be funded. A complete description of the requirements for a HCP can be found at 50 CFR 17.32 or our website (http://www.fws.gov/cno/es).

The Pacific coast population of the western snowy plover was listed as threatened on March 5, 1993 (58 Federal Register (FR) 12864) under the authorities of the Act. Critical habitat for the species, which includes 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), and Hermosa State Beach (Subunit 45D), was designated on June 19, 2012 (77 FR 36728).

Ryan et al. (2014) determined that western snowy plovers in Los Angeles County overwinter at seven primary spots. These overwintering sites are within critical habitat for the subspecies and include locations at Zuma Beach (near Lifeguard Tower 9 and Zuma Lagoon), Malibu Lagoon (Surfrider Beach), Santa Monica Beach, Dockweiler State Beach (near Lifeguard Tower 58), Hermosa Beach, and Cabrillo Beach. Ryan et al. (2014) also reported that western snowy plovers occasionally overwinter at sites at Los Cerrillos State Beach, Pescadero Cove, Don Edwards 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 Los Angeles Harbor.

Western snowy plovers exhibit strong fidelity to overwintering sites, returning to the same beaches every year after nesting elsewhere and migrating. Overwintering habitat is important for western snowy plovers and other migratory shorebirds because the time spent at these sites is when these birds build fat reserves for spring migration and the upcoming breeding season. Overwintering sites also provide connectivity for dispersal between breeding sites. Furthermore, with appropriate management, sites that currently support only wintering western snowy plovers have the potential to attract new nesting western snowy plovers with appropriate management. This has been demonstrated at Coal Oil Point, Santa Barbara County, and Hollywood Beach, Ventura County. Western snowy plovers also made a nesting attempt at Surfrider Beach, Malibu, Los Angeles County, after overwintering there. The importance of overwintering beaches to the western snowy plover tends to be overlooked and discounted when it comes to conservation of the subspecies, with more attention being given to known breeding locations. However, the Service acknowledged the importance of overwintering habitat for the western snowy plover by including such areas in the critical habitat designated for the subspecies in June 19, 2012 (77 FR 36728).

We understand that beaches in Los Angeles County, including the seven aforementioned overwintering sites, experience disturbance from mechanical raking (i.e., beach grooming) for removal of garbage, kelp, and other debris. Dugan et al. (2003) reports that over 160 kilometers of southern California sandy beaches are groomed regularly and that grooming decreases the species richness, abundance, and biomass of wrack-associated invertebrates that are likely important western snowy plover prey resources. Beach grooming also removes favorable nesting habitats and likely destroys nest scrapes and eggs.

Other activities occurring on Los Angeles County beaches that could lead to the disturbance of overwintering western snowy plovers include recreational use, vehicular traffic (e.g., lifeguard patrols), domestic animals (i.e., dogs), and predators attracted to human refuse (i.e., trash). Recreational activities such as 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 increase the presence of vehicles on the beach. Vehicles driven on the beach have struck and killed western snowy plovers, as well as other shorebirds, in Los Angeles County. For example, on January 9, 2007, a western snowy plover was found dead by volunteer monitors on Zuma Beach in a fresh tire track due to a vehicle strike. The only vehicle observed on the beach that morning was a Lifeguard truck conducting routine patrols. On, August 19, 2013, a California State Park monitor witnessed another western snowy plover being struck by a Lifeguard vehicle during routine patrols. In this particular case, the western snowy plover initially survived the strike with a cracked head and was transported to a rehab center in Los Angeles; however, the plover died from the injury. Other instances have also been documented of black-bellied plovers (*Pluvialis squatarola*) being struck by vehicles at Doheny State Beach on March 17, 2008, and November 24, 2009.

The mere presence of dogs on the beach is harmful to western snowy plovers, causing them to flush frequently, unnecessarily expending energy reserves, as well as spending less time foraging (Lafferty 2001). In addition to expending more energy evading dogs and spending less time foraging, there are instances when dogs actually capture and kill or injure western snowy plovers. For example, at Surfside Beach, Orange County, California, a western snowy plover was captured by a dog in September 2009, but was recovered, rehabilitated and released (Ryan and Hamilton 2009). Also at Coal Oil Point, Santa Barbara County, California, one western snowy plover chick was killed by an unleashed dog (Lafferty et al. 2006).

Because monitoring of overwintering western snowy plovers is extremely limited at some locations, if it occurs at all, we believe the impacts to western snowy plovers from beach grooming, recreational activities, vehicular traffic, dogs, and predators attracted to food and trash to be/are much greater than what we observe. Furthermore, the discovery of a dead or injured western snowy plover is unlikely because the bodies of these birds are taken by scavengers or removed by the daily beach grooming activities.

Efforts to protect wintering western snowy plovers on Los Angeles County Beaches should be implemented within 500 feet of the central roost location. The following measures should be implemented from the arrival of the first returning western snowy plovers in July until they depart in April to May each year. Specifically, at Surfrider Beach in Malibu these measures should be implemented year-round for the entirety of California Department of Parks and Recreation (State Parks) property. For all beaches in Los Angeles County, these areas should be referred to as "Special Protection Zones" and managed and maintained differently from adjacent areas of beaches without roosting western snowy plovers.

Recommendations for Special Protection Zones.

Routine Operation of Vehicles and Heavy Machinery

- All drivers of vehicles and machinery that are operated on sections of beach where western snowy plovers occur should receive annual training per a Service approved program to avoid western snowy plovers. Training logs should be kept for all staff. State Parks staff should have successfully completed the Beach Driving Operations Training Course and annual refresher courses.
- Vehicles should avoid operating within Special Protection Zones, with the exception of activities such as essential patrols, trash pick-up and other activities agreed to by wildlife agencies as being essential. Vehicles simply transiting between points should not be allowed within these areas. For Surfrider Beach specifically, the following measures should be implemented: 1) All beach vehicle operation will be limited to emergency response activities (e.g., Code "E" responses; rescue preventions, including boat warnings; urgent law enforcement issues; and emergency medical service calls); and 2) If heavy equipment is needed onsite for emergency activities (boat rescue, structure protection) or other projects consistent with State Park's mission, State Parks resource staff will be contacted for approval prior to accessing the site, and as needed, to provide monitoring for vehicles at all times when onsite.
- 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. (This is not applicable at State Park's section of Surfrider Beach because the entire area is within a Special Protection Zone).
- When essential activities must occur, vehicles should remain below a maximum 10 miles per hour speed limit and if western snowy plovers are encountered, the driver should back up at least 50 feet and/or alter their route to avoid flushing plovers.

Beach Maintenance and Clean up

- Regular sand grooming should be discontinued within Special Protection Zones. This activity both flushes the birds and removes important foraging resources (e.g. surf-cast kelp). These small areas should be cleaned by hand crews, trained in western snowy plover avoidance. If mechanical clean-up is necessary, it should be done in the presence of a qualified western snowy plover monitor who will locate the roosting plovers and ensure that machinery does not flush or disturb them.
- For Surfrider Beach, as agreed to by State Parks and Los Angeles County, sand grooming is not permitted at Surfrider Beach on State Park's property. Wrack is to be left in place and trash removed by hand.

Recreational Activities

- "Refuge Areas" should be created using symbolic fencing or another barrier deemed suitable for this use during periods of high beach use at popular beaches in July, August, and September. These should be erected in a 300-foot diameter (or other configuration suitable for the beach, but roughly 300 feet long) around the traditional center of the plover's roosting

areas on popular beaches such as Zuma, Dockweiler State Beach 58, and Hermosa Beach. Signage should be placed on the barrier such as has been done at Surfrider Beach in Malibu (which used signs made by local school children).

- Large-scale recreational activities such as 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 western snowy plovers.
- Enforcement of existing regulations for off-leash dogs should be increased within the Zones.

Western Snowy Plover Awareness Training

Any staff personnel that operate motorized vehicles on Los Angeles County beaches should be required to attend annual training to increase their awareness of western snowy plovers. This training should include a short instructional tutorial that describes the biology of the western snowy plover, its habitat and life history, its legal status, and the consequences of violating the Act. The tutorial slide show (e.g., power point type presentation) or informational hand-out would be developed by the Service with input from your respective agencies, California Department of Fish and Wildlife, and the Los Angeles Audubon Society. In addition to the tutorial, staff should view a video provided by the Service that demonstrates safe driving techniques on beaches with sensitive wildlife. Staff members should be required to sign a statement acknowledging they have viewed and understand the tutorial and video. The signed statement would be kept on file with the respective agencies in the employee's record.

Although these measures should help reduce the potential for take of western snowy plovers, take, as defined earlier, is still likely to occur. And any take of listed species that would result from activities on your beaches would require either (a) exemption from the prohibitions against take in section 9 of the Act pursuant to section 7 or (b) take authorization pursuant to section 10(a)(1)(B) of the Act. Unless a Federal nexus exists that could cover the entire action area under an interagency consultation pursuant to section 7, we recommend that you seek an incidental take permit through the habitat conservation planning process, pursuant to section 10(a)(1)(B) of the Act.

With your cooperation, we can help conserve the western snowy plover on public beaches while still providing recreational opportunities for tourists and the people of Los Angeles County. We suggest revisiting these recommended measures at least annually to ensure they continue to benefit the western snowy plover on public beaches in Los Angeles County while minimizing the impact on residents and businesses; however, we are available any time to discuss this program.

As a reminder, this implementation of these recommended avoidance measures do not constitute authorization from us to take federally listed species in any manner. In the event that federally listed species are detected anywhere where activities could result in take, you should contact us to discuss any potential effects to listed species and the possible need for other avoidance measures.

If you have any questions regarding the western snowy plover or other federally listed species on public beaches in Los Angeles County, please contact Chris Dellith or Bill Standley of my staff at (805) 644-1766, extensions 227 or 315, respectively.

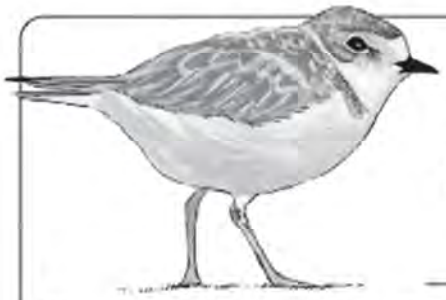
Sincerely,

Stephen P. Henry
Field Supervisor

Identical Letter to:
Fernando Boiteux, Los Angeles County Fire Department
Charlotte Miyamoto, Los Angeles County Beaches and Harbors
Ioannice Lee, City of Los Angeles
Dean Kubani, City of Santa Monica

cc:
Jim Watkins, U.S. Fish and Wildlife Service, Arcata Office
Jonathan Snyder, U.S. Fish and Wildlife Service, Carlsbad Office
Erin Dean, U.S. Fish and Wildlife Service, Law Enforcement Office
Dan Swenson, U.S. Army Corps of Engineers
Nancy Frost, California Department of Fish and Wildlife
Stacey Vigallon, Los Angeles Audubon Society

Appendix D: Updated Beach Driver Training Handout.



Sharing the Beach with SNOWY PLOVERS

Tips for Beach Drivers

Western Snowy Plovers are a Federally Threatened species of shorebird that live on Los Angeles County Beaches almost year-round. They are most abundant in the fall and winter months, and there are several roosting areas where they are most likely to be found (*see maps on reverse side*). The 2016 USFWS letter to beach managers in Los Angeles County recommends that (1) Special Protection Zones be established on roost beaches (within 500ft of central roost locations); and (2) that vehicles should avoid operating within Special Protection Zones, with the exception of activities such as essential patrols, trash pick-up and other activities agreed to by wildlife agencies as being essential.

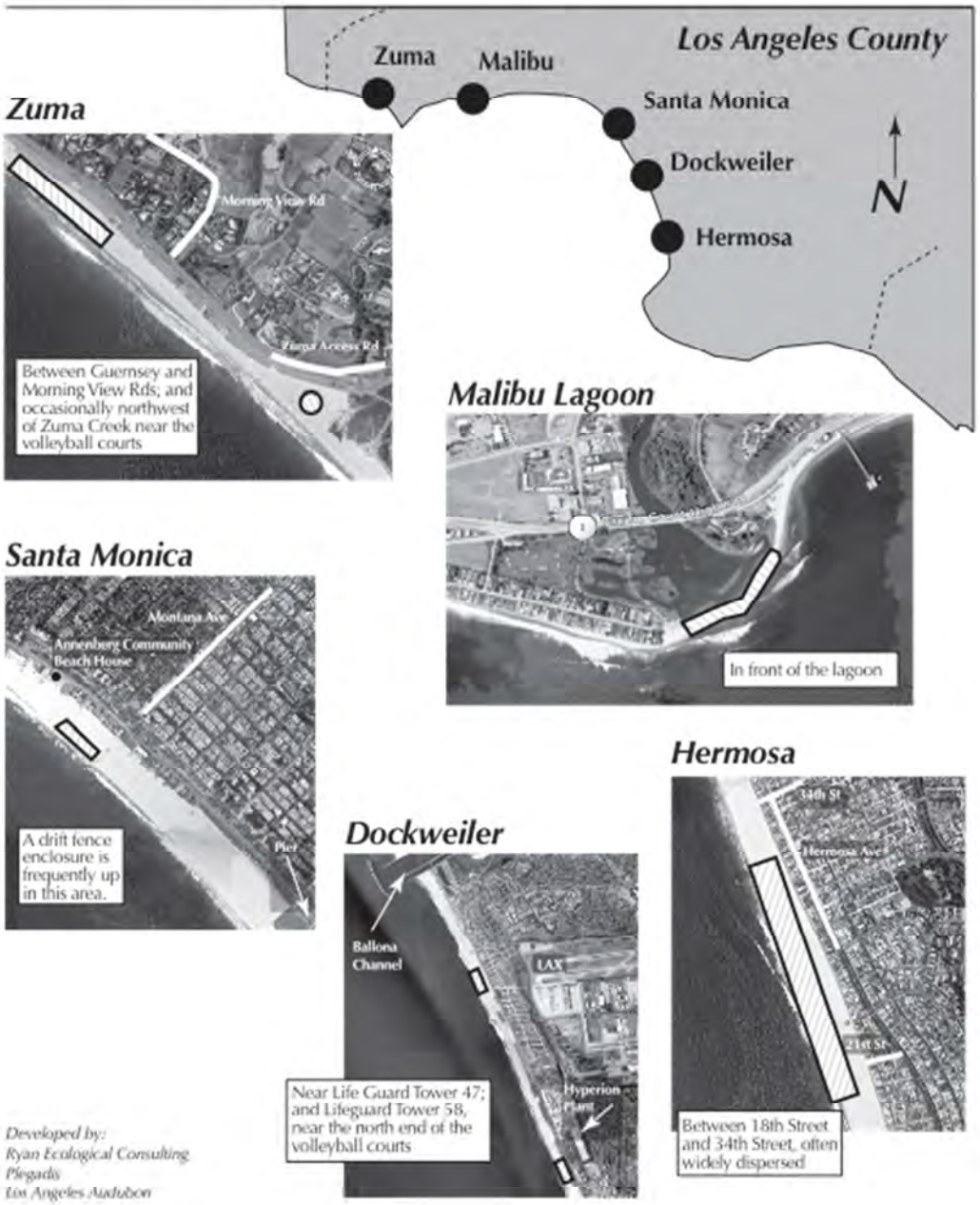
For situations where vehicles will be moving through Special Protection Zones, the following guidelines will help reduce the chance of disturbing or striking a Snowy Plover:

- Maintain a speed of no more than 10 mph. Plovers are sometimes slow to move, and lower speeds reduce the risk of a strike.
- Minimize vehicle use at night or in low-light conditions near known plover roosts.
- When driving in the tracks of other vehicles, watch for plovers. These birds often roost within tire tracks and foot prints.

- If possible, avoid driving near the wrackline because this is where plovers tend to spend much of their time.
- If Snowy Plovers are encountered, the driver should back up at least 50 feet and/or alter their route to avoid flushing plovers.

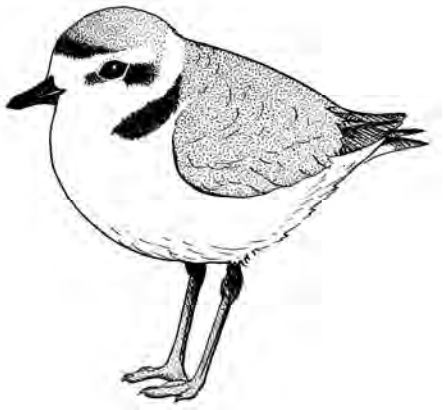
Developed by Ryan Ecological Consulting, Plegadis, and Los Angeles Audubon

Snowy Plover Roosting Areas



Developed by:
Ryan Ecological Consulting
Plegadis
Los Angeles Audubon

Appendix E: Volunteer survey protocol and associated data forms. LAC forms are provided below. OC forms are nearly identical and can be accessed on the SSA website.



LOS ANGELES WESTERN SNOWY PLOVER STUDY GROUP

Western Snowy Plover Survey
Volunteer Survey Protocol 2017

By Thomas Ryan and Stacey Vigallon

[This document is adapted from the "Western Snowy Plover Winter Window Survey Protocol" (Elliott-Smith & Haig 2007a) and Western Snowy Plover Winter Breeding Survey Protocol" (Elliott-Smith & Haig 2007b) and modified based on Ryan et al. (2007) and Ryan et al. (in prep).]

The Pacific Coast population of the Western Snowy Plover (*Charadrius nivosus nivosus*) was listed as threatened in 1993 under the U.S. Endangered Species Act. Since then, population recovery status has been assessed annually through range-wide breeding and winter season window surveys. In 2007, the Santa Monica Bay Audubon, Palos Verdes/South Bay Audubon, and Los Angeles Audubon Chapters, together with local biologists and agency staff (survey coordinators) instituted a program to attempt to determine the winter and breeding status of the Western Snowy Plover in Los Angeles County. The goals are:

1) coordinate the survey effort
2) ensure that participants receive training in bird identification and survey methods
3) ensure that beaches are surveyed consistently from year-to-year
4) coordinate with local beach managers to increase protection and attempt to restore wintering and nesting habitat through modifying existing management techniques
5) produce an annual report for beach managers and coordinate an annual meeting among beach managers to evaluate and improve annual efforts.

The primary purpose of these surveys is to obtain an estimate of the number of wintering and breeding snowy plovers at known current, historic, or potential wintering and breeding sites over a long period and collect banding information. In 2017, we will continue to survey at all beaches four times during the year to determine year-round beach use patterns. Results can then be compared across the population range and between years, to detect trends over time. In 2017, we will continue with studies initiated in 2012 including:

1. **Beach-wide Surveys.** We will coordinate county-wide surveys at all suitable beaches in support of the USFWS winter and breeding season window surveys, and supplement these with two additional periods in the spring and fall. The goal of these *beach-wide surveys* will be to determine the overall status and distribution of the snowy plover in the county during these periods and compare these numbers to data collected similarly in previous years.

2. **Nesting Surveys/Roost Size Study.** Project biologists will be checking the main roosts once per month and then weekly during the nesting season (February 1 and April 30). Surveyors must be specially trained and permitted for the nesting surveys. Project biologists will be surveying roosting areas during each of the months that beach-wide surveys are not conducted. Volunteers are invited to attend to receive additional training and help out.

BEACH-WIDE AND PLOVER ROOSTING BEACH SURVEYS

Beach-wide surveys will follow the same protocol as in 2011-2016. Our schedule will be contingent on USFWS scheduling, but as in previous years we plan to conduct county-wide surveys in January, March, May, and September. The Volunteer Coordinator will send out announcements via email about scheduling and beach assignments.

Project Primary Biologist Contact Information

Tom Ryan - Ryan Ecological Consulting
Email: tryanbio@gmail.com
Phone: (949) 923-8224

Project Volunteer Coordinator Contact Information

Stacey Vigallon - Los Angeles Audubon
Email: svigallon@hotmail.com, tern@laaudubon.org
Mobile phone: (323) 481 4037
Mailing Address: Los Angeles Audubon, P.O. Box 411301, Los Angeles, CA 90041

All beaches with suitable Snowy Plover habitat will be surveyed. We will attempt to assign four volunteers to each of these beaches so that they can be covered throughout the year by the same individuals. Beach assignments will be made by the Los Angeles Audubon Volunteer Coordinator based on volunteer interest, with priority given to those who have previously surveyed a beach, and geographic location of the volunteer. We require that all volunteers have attended a training session or undergo alternative training (see volunteer coordinator).

Volunteer safety is the most important factor. Sites may be difficult to access, particularly during winter high tides, as waves often can sweep over the entire beach, creating dangerous situations. Therefore, surveys should not be attempted if the surveyor's safety is in jeopardy (i.e., difficult passage through a narrow or rocky region during incoming tide). Additionally, being an urban area, surveyors should try to work in teams if possible, and during the daylight hours. Volunteers should not confront anyone engaging in illegal activity on the beach. Instead, volunteers should leave the area and contact local law enforcement when it is safe to do so.

SURVEYOR EDUCATION AND PREPAREDNESS

***Equipment*:** Required equipment includes a good pair of binoculars (suggested magnification at least 8x), waterproof field notebook or clipboard and data sheets, site map, pencil, and timepiece. A spotting scope is optional. A spotting scope and tripod may be helpful in reading bands, but can be heavy and cumbersome when walking in sand, it is your choice. Suggested equipment includes a cell phone, contact list, rain jacket, and rain pants. FRS radios would be very helpful on wide beaches where teams of 3 or more people are surveying. Site maps and survey materials are available for download at *www.losangelesaudubon.org* (click on "Conservation" in the main menu and then navigate to the "Threatened Western Snowy Plover Project" page).

***Qualifications and training*:** Required qualifications for Snowy Plover surveyors are the ability to walk several miles in dry sand, have good vision, and be familiar with identification of Snowy Plovers and other similar species (Semipalmated Plovers, Sanderling, Killdeer). The following suggested training complies with recommendations and regulations set forth in the Western Snowy Plover (*Charadrius nivosus nivosus*) Pacific Coast Population Draft Recovery Plan. Topics to be covered include:

- Biology, ecology, and behavior of Snowy Plovers
- Identification of adult plovers, their young, and their eggs
- Threats to plovers and their habitats
- Survey objectives, protocols, and techniques
- Regulations governing the salvage of carcasses or eggs
- Special conditions of the existing recovery permit
- Other activities (e.g., reading color bands, tracking, predator identification)

It is strongly recommended that surveyors receive field instruction if:

1. They have never previously participated in any type of Snowy Plover survey
2. They do not have extensive field experience distinguishing between Snowy Plovers and other shorebird species (for example: killdeer, semipalmated sandpipers, sanderlings)
3. They have little or no experience around nesting plovers
4. They have no experience reading color bands

SURVEY METHODS

To maximize detection surveys should be conducted during good weather and high visibility. On sunny days, visibility is best early in the morning or close to sunset; visibility may be good at any hour on an overcast day. Cold, foggy, rainy, or excessively windy (15 mph or greater) conditions are not suitable for surveying, however a light drizzle or strong breeze (5-10 mph) is acceptable. Contact your survey coordinator immediately if it appears that survey conditions will prevent you from conducting your survey during the survey window.

All surveys will be conducted on foot. If another method is used contact the volunteer coordinator and specify this on your data sheet. At most sites, a minimum of two surveyors is recommended to complete each survey; one surveyor will suffice at very narrow beaches (less than 50 m wide). Reading band combinations should be attempted after the birds encountered have been tallied and recorded, and only if band-reading does not detract from the accuracy of the bird count. The following methodology should be applied:

1. All beaches should be covered in the same manner - in one pass. There should be one very careful pass to tally the number of birds on each beach segment, as this is the most consistent approach over long periods.

2. Surveyors should walk in unison along the entire length of site as designated on the survey map. One surveyor should walk along the wrackline (high tide line) while the second surveyor walks along the upper beach or base of the foredune (if present). The person surveying the upper beach should always walk ahead of the surveyor at the wrackline (approximately 25 m). If only one person is conducting the survey, walk the wrackline along the survey length and in a zigzag pattern through wider portions of route, to ensure complete coverage.

3. Surveyors should alternate between walking and scanning for Snowy Plovers with binoculars. While walking, surveyors should scan the area 20m ahead and to either side. Every 50m surveyors should stop and scan at least 100m ahead of them with binoculars (distance may be shorter based on site-specific conditions). This way habitat is searched at least twice and from different angles, increasing the chances of detecting birds. If one observer has a spotting scope, they should follow the binocular scan with a scan through the scope as far ahead as possible. If a bird is sighted far ahead, look for distinguishing landmarks that will enable finding its location. Birds may hide as they are approached, making them difficult to see.

4. Surveyors walking the upper beach should watch the ground carefully for plover tracks while walking. Their ability to search is much more constrained than the person's at the wrack line. Consequently, the pace of the survey needs to be slow enough to allow the person surveying the upper beach to watch the ground and make frequent short stops to look ahead for plovers.

5. If there is a very broad area of beach, the person walking the upper beach should walk in a zigzag pattern through that location. Alternatively, two or more observers could walk parallel through the area. If dunes are encountered that are low and/or gently sloping, hummocky areas with little or no vegetation should also be checked for plovers.

6. A one-way pass of the survey route is considered sufficient, and surveyors may either exit the beach at the same access point or at a different access point from the one used to enter

beach.

DATA COLLECTION / DATASHEET INSTRUCTIONS

Data collection must be standardized for all surveys and for all sites. Field data should be collected on a datasheet, and presence of plovers and area covered **must** be marked on a map or aerial photo provided by the survey coordinators. Indicate on a map area of coverage. Data should sent to Los Angeles Audubon **immediately** following the survey. Datasheets and maps can be sent to the Volunteer Coordinator in the following ways: (1) photograph the datasheet and map with their cell phone and then email or text the photos to the Volunteer Coordinator, (2) scan and email the forms, (3) type notes from a field notebook into a Word doc version of the datasheet and then email it, (4) send hard copies of the datasheet and map via US Postal Service to Los Angeles Audubon, P.O. Box 411301, Los Angeles CA, 90041.

The following methodology should be used at all beach segments.

1. At the beginning of the survey the recorder should fill out preliminary portions of the data sheet including: Location (beach name and number), observer information, date, site, start time, preparation time (includes any time spent preparing for or driving to the beach segment), weather, temperature, cloud cover, precipitation, approximate wind direction and speed, and the nearest high and low tide time.

2. While it is best for one member of the team to act as official recorder, all members of the team should have a pencil and data sheet or field notebook so that they can record sex for each bird.

3. Record stop time upon ending your survey.

4. Record total time spent on the beach (this would include your walk back to a vehicle)

Snowy Plover Sightings

1. Upon sighting a group of snowy plovers, first obtain a count of the total number in the group and enter it into the datasheet and the time observed. Then mark the location of the individual/group on the field map using a circle around the area observed and a number to identify the location, enter this number as the Map # on the data sheet. If possible, please record coordinates using a smartphone, transportable navigation system for your car, or a GPS unit.

2. Record information about the location: any nearby landmarks (such as cross streets, lifeguard towers, or buildings), general habitat characteristics, distance from the water/dunes, location within the beach

3. Record band and color band information (as instructed below).

4. Record the sex as male (M), female (F). Age should be recorded as Hatch Year (HY); chick or juvenile, appearing similar to adult but edges of back feathers and wing coverts are pale), or unknown (U). Hatch year birds reach adult status by Jan 1. Unless the surveyor is confident they can make the determination between hatch year or adult status based on plumage, it is not necessary to distinguish adult from hatch year and record on data sheets.

Note: it may not be possible to determine sex and age of bird(s) in winter plumage.

5. If no plovers were observed during the survey, please indicate that on the datasheet.

Section 2: Beach Use & Predator Monitoring

We wish to learn more about the interaction between the Snowy Plovers, recreational activities, and human-influenced predators. We request that you record information on beach use and observations of potential predators during the one pass of your survey. Tally/count each activity in the appropriate box as you observe an individual and sum them at the end of your survey. We recommend that you tally each activity as observed, being careful not to double count, particularly crows and ravens foraging along the beach or joggers with their dog returning the opposite direction.

We also wish to assist beach managers with monitoring for speeding vehicle, which are a known threat to Snowy Plovers. Beach vehicles are limited to 10 mph in non-emergency situations. One easy way to estimate vehicle speed is to observe how far the vehicle travels during a one second interval to do this:

1. Start when the front end of the vehicle passes a fixed object on the beach, such as a trash can or lifeguard tower.
2. Count, "One thousand and one" (takes about one second).
3. If *more* than half of the vehicle passes the object, estimate it as a *fast-moving* vehicle (10 mph or faster). If *less* than half of the vehicle passes the object, estimate it as a *slow-moving* vehicle (less than 10 mph). *[Adapted from U.S. Military Training Exercise]*

If the vehicle is <u>not</u> obviously involved in an emergency situation (light/siren), please record the following information: time, location, vehicle make (i.e. Ford) and model (i.e. F-150) or type of vehicle (van, pick-up, SUV), any markings identifying the company or agency, any identifying numbers, license plate. Please **<u>do not</u>** make any attempt to stop, signal, or confront the driver in any way. Records of speeding vehicles will be reported to beach managers and local law enforcement officials for any needed action.

Record any additional wildlife seen, particularly other potential predators such as owls, foxes, skunks, raccoons, opossums, or rats. If a surveyor is familiar with mammal tracks, predator tracks can also be reported.

Please report the following occurrences **<u>immediately:</u>**

1. Any illegal activity to law enforcement
2. Any illegal activity to the appropriate state or federal agency if the activity is in violation of any state or federal laws concerning protected species (i.e., Migratory Bird Treaty Act, Endangered Species Act)
3. An injured Snowy Plover to a lifeguard or Beaches and Harbors representative, a wildlife rescue agency, <u>and</u> the volunteer coordinator or primary project biologist
4. Snowy Plover eggs or chicks to the volunteer coordinator or primary project biologist

Right after you return home from your survey please report the following to the volunteer coordinator or primary project biologist:

1. If you observe a bird in an area where they have not been seen in recent years. (providing band combinations if known)
2. Snowy Plovers with bands and/or uncertain band status immediately after the survey to

the lead person designated as the one to whom observers report color bands combinations in each survey region. It may be necessary for biologists to schedule a visit to the site to check or re-check bands.

Section 3: Habitat Information

***Habitat information*:** To increase understanding of Snowy Plover winter habitat associations, winter window surveyors should record the specific habitat where plovers are seen and the general beach habitat near plover sightings. Record plover location as: wet sand, wrackline, mid-beach (above wrackline but below the base of foredune), or foredune (at the base of a foredune, on a foredune, or at a break in the foredune). General site information is necessary to compare use and availability, and to evaluate the potential habitat at sites where birds are not detected. Please estimate the percentage of survey beach that is greater than 50m in width (from high tide line to foredune). If all habitats are less than 50 m in width, estimate the maximum beach width. Record general habitat type as: linear beach, estuary mouth, overwash area (break in foredune), restoration plot, or barrier island/peninsula.

COLOR BANDS

Throughout the Snowy Plover's range, all sites have the potential to have color banded birds. Color bands allow biologists to keep track of population numbers, productivity, movement patterns, and survivorship. Aluminum bands, provided by the U.S. Fish and Wildlife Service, are used in addition to plastic bands; both are usually covered with colored tape.

Most birds have two color bands on each lower leg. Both the bands on a leg may be the same or different colors. Birds sometimes lose bands so that they could have only one band on one leg and two on another, or only one band on either leg. Some birds have a single band of two colors on one leg. These are created by wrapping a thin strip of tape that is different in color from the underlying band on the top, bottom, or center of the color band. Thus, a single band could be described as white over red or if the red tape were in the middle as white/red/white (W/R/W).

Colors frequently seen are lime (L, light green), aqua (A, light blue), red (R), yellow (Y), dark blue (B), dark green (G), and white (W). Other colors used on the Pacific Coast but not as frequently seen in Oregon are: orange (O), violet (V), pink (P), brown (N), and black (K). Tape occasionally peels off revealing metallic (silver) band (S).

Color bands are read top down from the belly to the foot of the bird (Figure 1). Colors on the birds left leg are read first, and then the colors on the right leg are read. For example, if a bird has two aqua bands on its right leg and a white band on top of a red band on its left, its combination.

The surveyor(s) may attempt to read bands only after birds at a given location on the survey route have been accurately counted and recorded. When reading color bands, the following methodology should be used:

1. When a plover is sighted at close range, check for color bands and record combination if present before notifying other observers. If a plover is seen at too great a distance for reading color bands, notify other team members immediately by radio, hand signals, voice, or by walking towards them. While keeping track of plover, coordinate with team members and try to approach the bird from different angles. This will increase the likelihood of color bands being visible to at least one observer.

2. Unless the surveyor is very experienced in reading color bands and is able to read a particular combination with confidence, the other surveyor(s) on the team should try to read each birds band combination; this is an important accuracy check. This may be done be using a spotting scope if available, or by approaching birds closely and using binoculars.

3. In certain circumstances, it may be desirable to approach birds in order to read the bands (i.e., make roosting birds stand up). This is more desirable than avoiding the birds and returning to the site a second time to attempt to read bands as this would lead to further disturbance. If it is permissible to approach roosting birds by making them stand, great care must be taken not to cause them to fly ahead of the observer, as it will confound the count going forward.

4. After determining color band combination, carefully walk around birds and continue the survey.

OPTIONAL BIRD SURVEY

If you wish to participate, we would like volunteers who are interested to complete a survey of all birds detected on your beach. In order to do this, we request that you use the data form provided. As with the plover survey, you will survey one pass concurrent with your plover survey.

Live Bird Survey. You will need to identify and count all bird species observed sitting or flying over the beach and sitting or flying over the water within 100m of shore (about 2x the distance from the breaking waves to the shore). For each individual or group encountered, you will record the species, the number observed in each group observed, and whether it was on the beach or ocean. For any rare or unusual species, we request you map the location and write a detailed description of the bird (photographs are even better). This year, we have been asked to encourage volunteers to record information about Heermann's Gulls, in particular the number of adult birds vs. the number of juvenile and sub-adult birds observed. If you decide to take on this added survey challenge, please make sure that you are confident in your ability to distinguish between adult and sub-adult Heermann's Gulls, especially when adults are in non-breeding plumage.

Beachcast Marine Bird and Mammal Survey. For this survey, you will need to bring a digital camera (or use your camera phone), rubber gloves, and a ruler (small, plastic, and cheap! is best). When you encounter a dead bird on the beach, record its location on the map (or GPS coordinates is you have an app on your phone or a separate GPS unit), photograph it from the front and back (using the rubber gloves to turn it over) with the plastic ruler visible in the photo. Note the photograph number on your camera and the map number on the back of your data sheet.

Please note if the bird appears to be oiled, and if so, contact the Volunteer Coordinator. Also, if you find a rare bird species, you may collect it in a Ziploc or heavy duty trash bag and bring it to the Los Angeles County Museum of Natural History. *Be sure to include a slip of paper in the bag or attached to the bag with the date, location, identification, and collectors name*. It will be up to each volunteer to transport collected specimens. You should also note that while it is legal to collect and transport a dead bird to a museum, it is not legal to collect and store or keep dead birds in your possession without proper state and federal permits. ***If you find a dead snowy plover, contact the volunteer coordinator immediately.*** If you find a marine mammal, photograph it from all angles possible and call the Volunteer Coordinator immediately.

EDUCATING THE PUBLIC ABOUT SNOWY PLOVER CONSERVATION

We view your role in this project as two-fold. Volunteers are firstly community-based scientists, gathering important information to help monitor a federally threatened species. Whether they intend to or not, volunteers also serve as impromptu public outreach docents at Snowy Plover habitat. While public outreach may not be your primary interest in the project, you are probably some of the most knowledgeable people on the beach when it comes to the theme of Snowy Plovers. Most beachgoers are completely unaware that they are sharing the beach with wildlife, federally threatened species included. While conducting your surveys, it's not uncommon to be asked by fellow beachgoers what you're doing. This is an excellent opportunity to share some basic information about Snowy Plover conservation, and we're happy to provide you with a small illustrated, laminated "cheat-sheet" to facilitate this. Your interaction with curious beachgoers does not need to be lengthy or elaborate, but the idea is to make sure that volunteers have enough background information to feel confident in answering the public's questions or directing them to where they can find more information.

As a volunteer for this project, you likely place a high value on wildlife and conservation. While conducting your surveys, you will probably encounter behaviors by fellow beachgoers that you may view as harmful or disrespectful to wildlife. We'd like to emphasize that volunteers are community-based scientists and educators - they are **not** the Plover Police. As exasperating as the behavior of some beachgoers can be, our goal is to be a positive force and not a punitive one. Please remain cool, calm, and collected. If you observe illegal behavior, harassment of wildlife, or anything else you deem inappropriate, please do **not** confront the people involved. Alert the appropriate authorities and notify a lifeguard.

If you'd like to get involved in more targeted public outreach activities surrounding Snowy Plover conservation, please contact the volunteer coordinator! There are numerous opportunities to get involved, such as helping with public school field trips to plover habitat and helping to lead beach walks for the public at Dockweiler Youth Center.

ENCOUNTERING MARINE MAMMALS

During the spring and summer months it's not unusual to encounter young marine mammals on the beach, even on some of LA County's most heavily used beaches. Here are some guidelines to follow should you encounter one you think is stranded:

1) Remain at least 50 feet away. The Marine Mammal Protection Act prohibits members of the public from approaching or touching marine mammals. Good intentions may actually be viewed as "harassment" under this law.

2) Alert a lifeguard and/or Beaches & Harbors employee.

3) Call a rescue hotline. The California Wildlife Center hotline can direct your call to the appropriate organization. Their number is **310 458 WILD (9453).**

Seal pups that appear abandoned may actually have a mother out in the open water foraging. If the pup is surrounded by people, the mother may be too intimidated to come back to fetch it, and will wait until people disperse - hence the importance of alerting a lifeguard to problem.

USEFUL RESOURCES

Law Enforcement Phone Numbers

In an emergency situation always first dial 9-1-1.
Los Angeles County Sheriff Malibu/Lost Hills 310-456-6652
Santa Monica Police (310) 458-8466
Los Angeles County Sheriff Marina Del Rey 310-482-6000
Los Angeles Police – West Los Angeles 310-444-0701
Los Angeles Police – Pacific 310-482-6334
City of Hermosa Police (310) 318-0360
City of Manhattan Beach Police (310) 802-5100
City of Long Beach Police (562) 570-3400
Los Angeles County Lifeguards (310) 939-7200

If you find sick or injured wildlife

California Wildlife Center hotline - 310 458 WILD (9453).
IBRRC (International Bird Research & Rescue Center) San Pedro (310) 514-2573
California Wildlife Center, Calabasas 818-222-2658
South Bay Wildlife Rehab 310-378-9921
Marine Mammal Care Center (310) 548-5677

If you see oil or find oiled birds

Oiled Bird Network 1-877-823-6926
California Department of Fish and Game Office of Spill Response 1-800-852-7550

Online Resources

Tide charts to help you plan your survey –
http://www.saltwatertides.com/dynamic.dir/californiasites.html

Great info on Malibu beach access points and parking –
http://www.malibucomplete.com/mc_geography_beaches.php

LA Co Beaches and Harbors Facebook page for frequent updates on events and safety hazards that might impact your survey –
www.facebook.com/lacdbh

There are also numerous applications for smartphones that can help you identify birds, find beach access points, and get GPS coordinates. Feel free to ask fellow volunteers and the Volunteer Coordinator for suggestions!

IDENTIFICATION TIPS FOR SNOWY PLOVERS
By Lucien Plauzoles, Santa Monica Bay Audubon

The most frequently encountered small shorebird species along the beach is the Sanderling. It sometimes shares the same space as the Snowy Plover. Here are some notes on how to differentiate them.

The first field mark on which to focus is the bill; app. 1.5" at the tip on the Sanderling but a stubby 5/8" on the Snowy Plover. The legs of the Sanderling seem longer, the overall "look" of the Sanderling is longer, that of the plover is rounder. Here are some further identifying characteristics.

1. **S**hade, or color. Most of the "peeps" at the shore are Sanderlings. As the fall progresses they lose almost all their brown and reddish breeding plumage feathers and take on a "scaly" gray and white appearance. The plover when not in flight has a uniform color on the back and wings, of a light brown shade, not gray.

2. **S**ounds. Little sound is heard from these birds, but when flushed, Sanderlings emit a (not loud) "kip" sound that is noticeably sharper than the whispered, lisped "kweep" communication of the alarmed plover.

3. **S**tance has as much to do with leg length as with attitude of the body. The plover is chest-heavy, closer to the sand with relatively short legs. The Sanderling runs and browses on stilts—reminiscent of Willets or Godwits. When resting or roosting, Sanderlings often stand on only one foot, tucking the other into belly feathers. The Snowy Plover seeks small depressions in the sand and rests with feathers down on the sand sometimes invisible until an observer is less than 20 feet away.

4. **S**ocializing, or flocking. Simply put, Sanderlings roost, fly, and often feed closely. They roost in often-large (20-80) groups, just three inches away from each other. Snowy Plovers require more personal space, and usually at Santa Monica Beach, roost at least a foot away from each other, never sharing a small depression, and occasionally chasing other Plovers away.

5. **S**nacks, or feeding habits. Snowy Plovers are primarily interested in surface invertebrates and rarely put their relatively short bills into the sand to probe like the Sanderling. Even though they will frequently join Sanderling on the wet sand to feed, they rarely wade in the receding surf and almost never "chase" the foamy waterline. Ask people to picture a sandpiper in their minds and most will imagine a Sanderling, especially their behavior of running in and out with the waves. Snowy Plovers tend to take 5-15 steps and then pause, often with one leg "cocked". Sanderling may run 50-100 feet between stops. On the other hand, the Snowy Plovers often feed in loose groups on the wrack of kelp and sea grasses left on the beach by tide and surf. Sanderlings also feed there, however, less frequently and usually only as occasional individuals.

Western Snowy Plovers and Their Look-Alikes

Western Snowy Plover

Size: 5-7", 13-18cm
Description: A small whitish plover with pale brown upper parts; black legs, slender black bill and small black mark on each side of breast. Black band around neck does not meet at the breast as does band of semipalmated plover. This small sand-colored plover has a perfect camouflage on sandy shores.
Habitat: Flat sandy beaches, salt flats, and sandy areas with little vegetation.
Range: Resident along Pacific Coast from British Columbia to Mexico, and along Gulf Coast from Texas to Florida panhandle.
Nesting: 2 or 3 buff eggs spotted with black in a sandy depression lined with a few shell fragments or bits of grass.
Feeding: Along the coast they take crustaceans and beach flies.

Sanderling

Size: 8", 20cm
Description: Chunky body, short straight black bill, black legs and prominent white wing stripe. Breeding adults have rusty head and neck . Winter birds have gray head and look almost white.
Habitat: Breeds on tundra. Winters are spent on ocean beaches, sandbars, mudflats and lake and river shores.
Range: Breeds from Baffin Island westward to Alaska. Winters from Massachusetts and British Columbia southward to southern South America. Also found in Eurasia.
Nesting: Four olive eggs, often with brown markings, are found in lichen-lined hollow on the ground.
Feeding: Feeds in wash zones on sandy beaches. Follows retreating waves, probing sand for crustaceans, mollusks, and flies.

Semipalmated Plover

Size: 6-8", 15-20cm
Description: A brown-backed plover with white under parts and one complete black breast band. Bill stubby, yellow-orange, with dark tip. Immature has all black bill and brownish breast band. Piping plover similar but much paler above. Larger killdeer has two black breast bands.
Habitat: Breeds on sandy or mossy tundra. During migrations found on beaches, mud flats, shallow pools of salt marsh, and lake shores.
Range: Winters regularly from California south and Carolina south along Gulf Coast; rarely found farther north.
Feeding: Like other plovers, the semi-palmated forages in short bursts. Feeds mainly on small crustaceans and mollusks.

Figure 1. Band colors used on Snowy Plovers from the Monterey Bay Area.

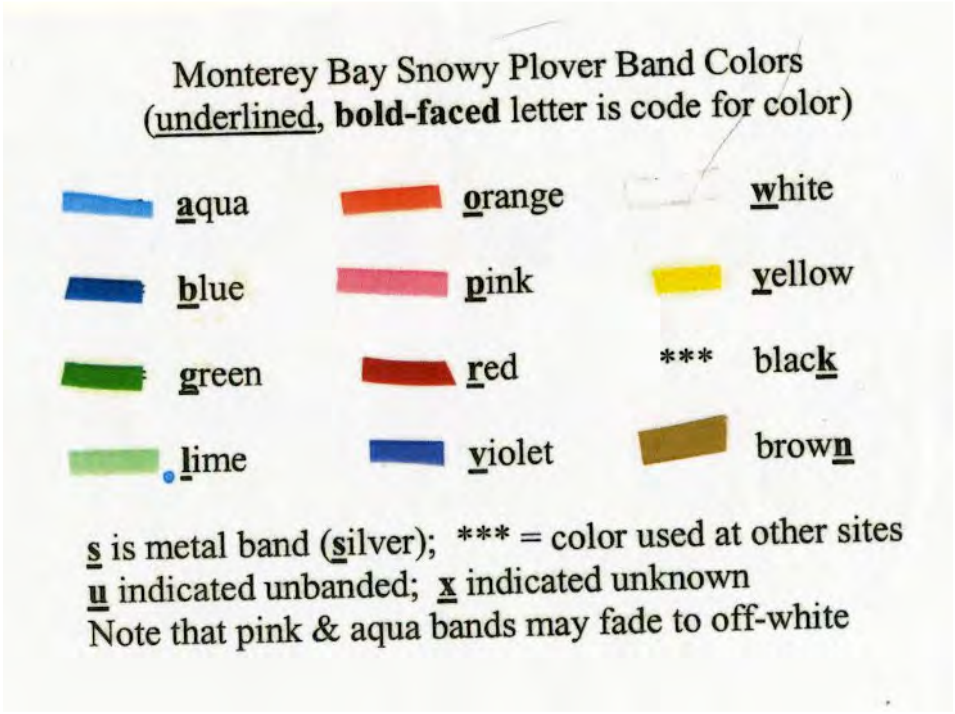
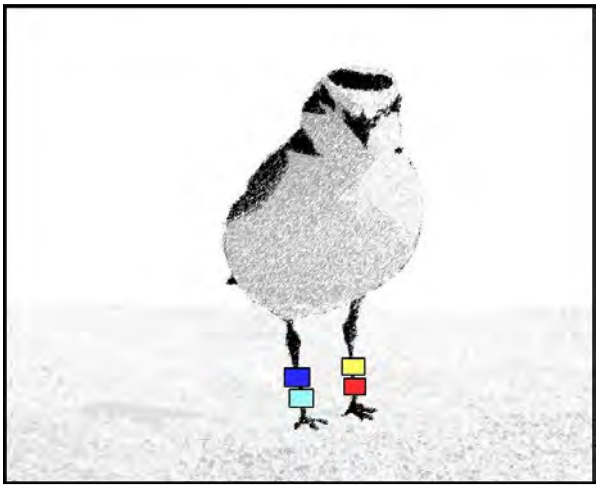


Figure 2. Example of banded Snowy Plover. In this picture, the bird has a yellow band (Y) above a red band (R) on its left leg and a blue band (B) above an aqua band (A) on its right leg. This combination should be recorded as YR: BA



LOS ANGELES COUNTY

Western Snowy Plover Field Survey Form 2017

Page ___of ___

Survey Location _____ Month_____ Day____ Year 2017

Observer Name (s):

_____

_____

Prep Time _____ Survey Start Time _____ Survey Stop Time _____ Total Time at Beach _____

Weather conditions: _____ Temperature:_____ Cloud Cover: _____ (0 = 0%, 1 = 33%, 2 = 66%, 3 = 100%)

Precipitation: _____ (N = None, R = Rain, F = Fog, D = Drizzle) Wind: _____ (mph and direction)

Tides: _____

SECTION 1: SNOWY PLOVER SIGHTINGS:

Number of Snowy Plovers seen? _____Ad: _____Juv: _____M:_____ F:_____

Survey Complete?_____(if no, note area surveyed on map)

# SNPL Seen	Time	Map #	Gen. Habitat & Location[1]	Bands[2]	Sex, Age[3]	Nest,Eggs, Chicks	Behaviors Observed[4]

1 - wet sand, wrackline, mid-beach, foredune; please provide GPS coordinates or nearest cross street if possible

2 - Record band colors for the bird's left leg first, right leg second. Separate the colors on the left leg and right leg with a colon (:). Record colors from the top to bottom for each leg. Read T ↓ B, R ← L if the bird is facing you. Underlined letter is code for color: Aqua Blue Green BlacK BrowN Lime Orange Pink Red Silver Violet White Yellow. Record un-banded birds as X:X. *Examples:* A bird that has no bands on its left leg and one yellow band on its right leg is X:Y. A bird with a left band on top (orange) left bottom (red) and a right band on top (green) right bottom (red) would be OR:GR. A bird with only one band (red) on the left and one band (white) on the right would be R:W.

3 - Male, Female, Unknown, Adult, Juvenile (Young capable of flight), Chick (incapable of flight), Unknown

4 - R = roosting, F = foraging, S = sitting as if on nest, O = other (specify in notes); Nest Status Codes: C/N = copulation and nest construction, I = incubation, H = hatchling, F = fledgling, O = other (specify in notes)

SECTION 2: BEACH USE & PREDATOR MONITORING:

Walking	Jogging	Sitting	Sports	Bicycle	Fires	Fishing	Vehicle	ATV	Equipment
Dog OffL	**Dog OnL**	**Coyote**	**Fox**	**Cat**	**Crow**	**Raven**	**Raptor**	**Horse**	**Other***

*Describe Other:

Speeding Vehicles (time, make & model, decals, license plate, or other markings):

_____

Other wildlife species (especially potential predators):_____

SECTION 3: HABITAT INFORMATION:

Changes from Previous Survey:

Volunteer Coordinator contact information: (323) 481 4057 (call or text), svigallon@hotmail.com
Mailing address: Los Angeles Audubon, P.O. Box 411301, Los Angeles, CA 90041

LOS ANGELES COUNTY

Western Snowy Plover Field Survey Form 2017

Page ___of ___

Percentage of shoreline > 50 m wide____ if 0%, then maximum shoreline width:_____

What general habitat types are present at this site?.

linear beach estuary mouth overwash HRA (habitat restoration area) barrier island/peninsula

Additional habitat notes:_____

Volunteer Coordinator contact information: (323) 481 4037 (call or text), svigallon@hotmail.com
Mailing address: Los Angeles Audubon, P.O. Box 411301, Los Angeles, CA 90041

Appendix F: Complete list of LAAS outreach/education activities July 2014 – Jan 2017.

Outreach and education activities in Los Angeles County conducted from July 2014 through Jan 2017, including presentations, tabling events, meetings, beach walks, and field trips.

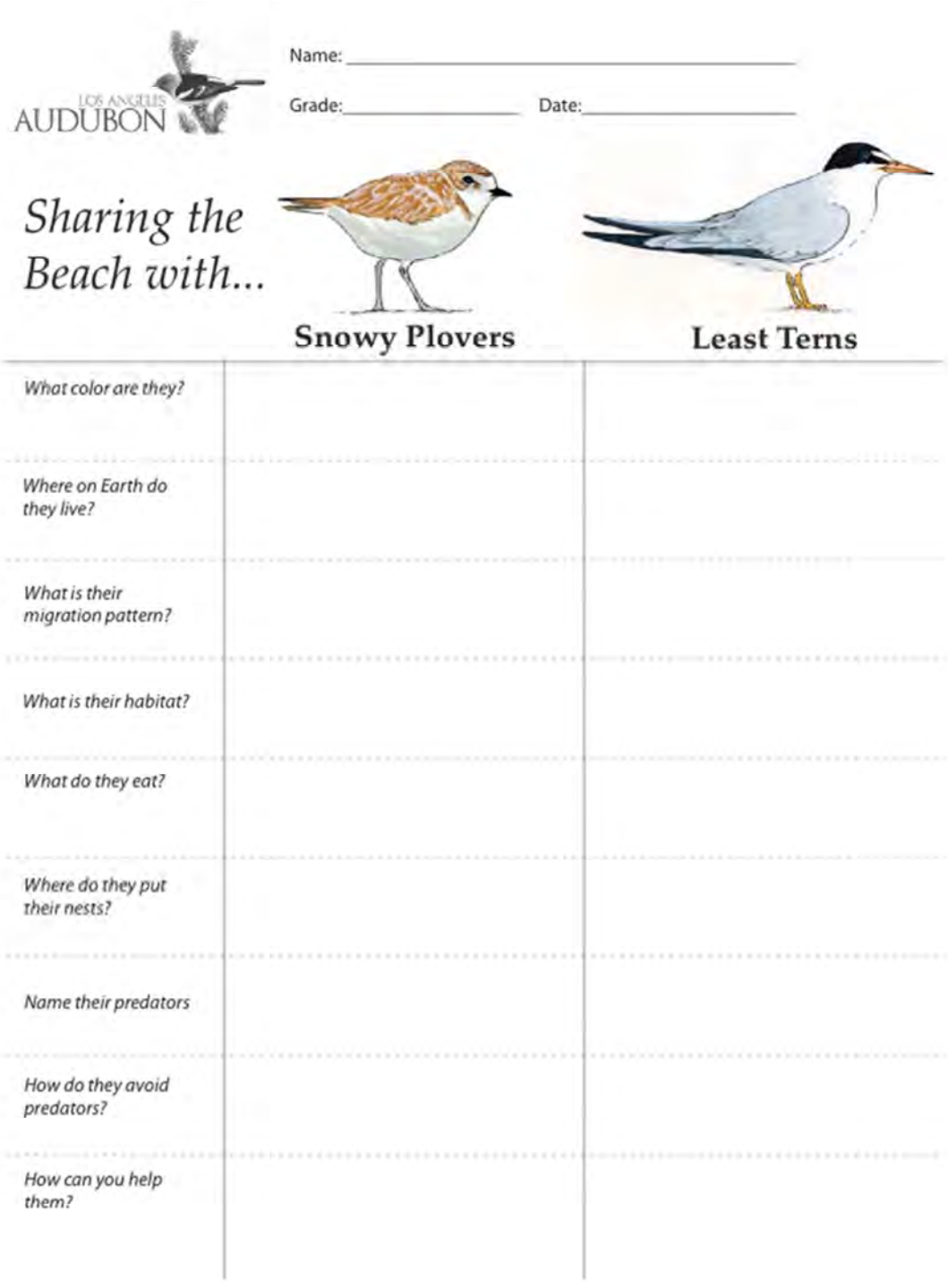
Activity	Date	Location	Demographic	People Reached
Dockweiler Youth Center Beach walks	16-Nov-14 7-Dec-14 11-Jan-15 24-Jan-15 21-Nov-15 13-Dec-15 9-Jan-16 19-Nov-16 4-Dec-16 7-Jan-17	Dockweiler Beach	General public	37
Annenberg Community Beach House Beach walks	28-Dec-14 18-Jan-15 20-Dec-15 24-Jan-16 8-Jan-17 22-Jan-17	Santa Monica Beach	General Public	274
School Field Trips	23-Jan-15 30-Jan-15 5-Feb-15 13-Feb-15 19-Feb-15 21-Feb-15 21-Feb-15 27-Feb-15 15-Jan-16 22-Jan-16 29-Jan-16 5-Feb-16 11-Feb-16 18-Feb-16 19-Feb-16 27-Feb-16 27-Feb-16 3-Mar-16 16-Nov-16 18-Nov-16 30-Nov-16 8-Dec-16 15-Dec-16 3-Jan-17 13-Jan-17	Dockweiler State Beach	School-age youth at the following schools/programs: 186th Street Elementary, Aragon Ave Elementary, Baldwin Hills Greenhouse Program, Charnock Road Elementary, Dorsey High School, Esperanza Elementary, Mar Vista Elementary, Paseo del Rey Natural Science Magnet Elementary, Politi Elementary, San Pascual Elementary, Second Street Elementary, Vermont Ave Elementary	1,356

Activity	Date	Location	Demographic	People Reached
	18-Jan-17 25-Jan-17 27-Jan-17			
Public school Presentations	1-Oct-14 15-Jan-15 22-Jan-15 26-Jan-15 28-Jan-15 29-Jan-15 9-Feb-15 12-Feb-15 19-Feb-15 19-Feb-15 25-Feb-15 26-Mar-15 3-Jun-15 2-Oct-15 13-Jan-16 20-Jan-16 27-Jan-16 1-Feb-16 3-Feb-16 8-Feb-16 17-Feb-16 25-Feb-16 25-Feb-16 29-Feb-16 23-May-16 8-Sep-16 22-Oct-16 1-Nov-16 7-Nov-16 8-Nov-16 5-Dec-16 6-Dec-16 12-Dec-16 9-Jan-17 10-Jan-17 23-Jan-17 24-Jan-17	Mainly Los Angeles Unified School District schools (*most of the same students attended the field trips as well*)	School-age youth at the following schools/programs: 186th Street Elementary, Aragon Ave Elementary, ASE Charter High School, Baldwin Hills Greenhouse Program, Charnock Road Elementary, Dorsey High School, Esperanza Elementary, Incubator School, Katherine Edwards Middle School, Mar Vista Elementary, Paseo del Rey Natural Science Magnet Elementary, Politi Elementary, San Pascual Elementary, Second Street Elementary, Vermont Ave Elementary	1,915
Professional Presentations	3-Feb-15 13-Jan-16 26-Jan-16 31-Aug-16 17-Nov-16 19-Jan-17 2-Feb-17	Beach Ecology Coalition Meeting, Snowy Plover Range-wide Meeting, Snowy Plover Working Group Meeting (LA County), Recovery Unit 6 Meeting	Science professionals; Beach management professionals; Upper division college students	Est. over 350

Activity	Date	Location	Demographic	People Reached
Eco-fairs and other tabling events	18-Apr-15 1-May-15 27/28 June 15 21-Jul-15 12-Mar-16 2-Apr-16 16-Apr-16 21-Apr-16 28-Apr-16 29-Apr-16 7-May-16 19-May-16 21-May-16 25/26 June 16	Cabrillo Aquarium Earth Day, Politi Conservation Art Show, LACo NHM LA Urban Nature Fest, Debs Park Audubon Center Summer Camp, Los Angeles Arboretum Education Fair, Debs Park Audubon Earth Day, LA Air Force Earth Day, West LA College Eco Fair, Bird Day LA (3 simultaneous locations), Santa Monica College Job Fair, Carthay School Science Fair	General public	Estimated at over 2500

Appendix G: Snowy Plover Classroom and Field Trip Materials

Figure 1. Student worksheet that accompanies the in-class presentation



LOS ANGELES AUDUBON

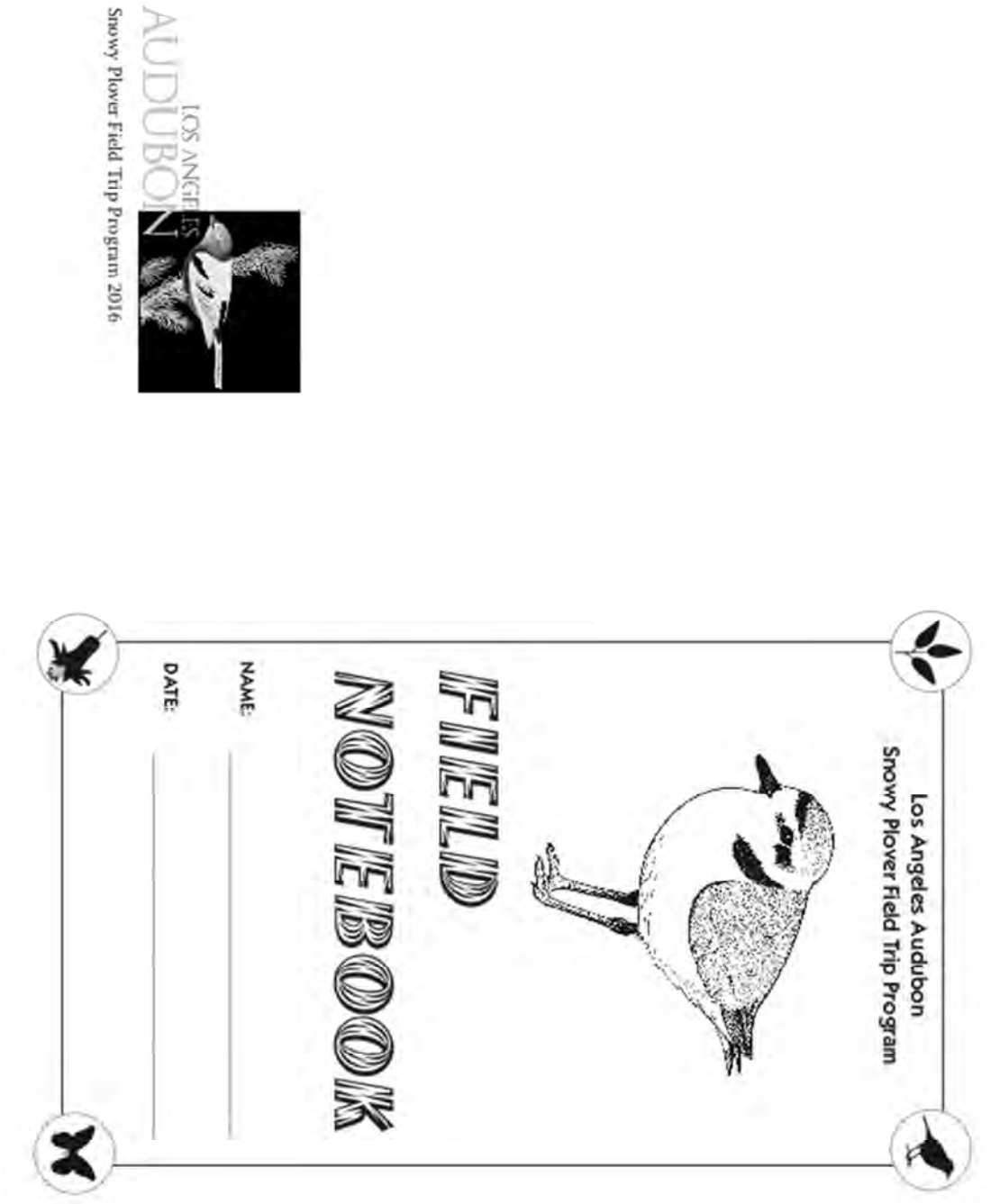
Name: _____

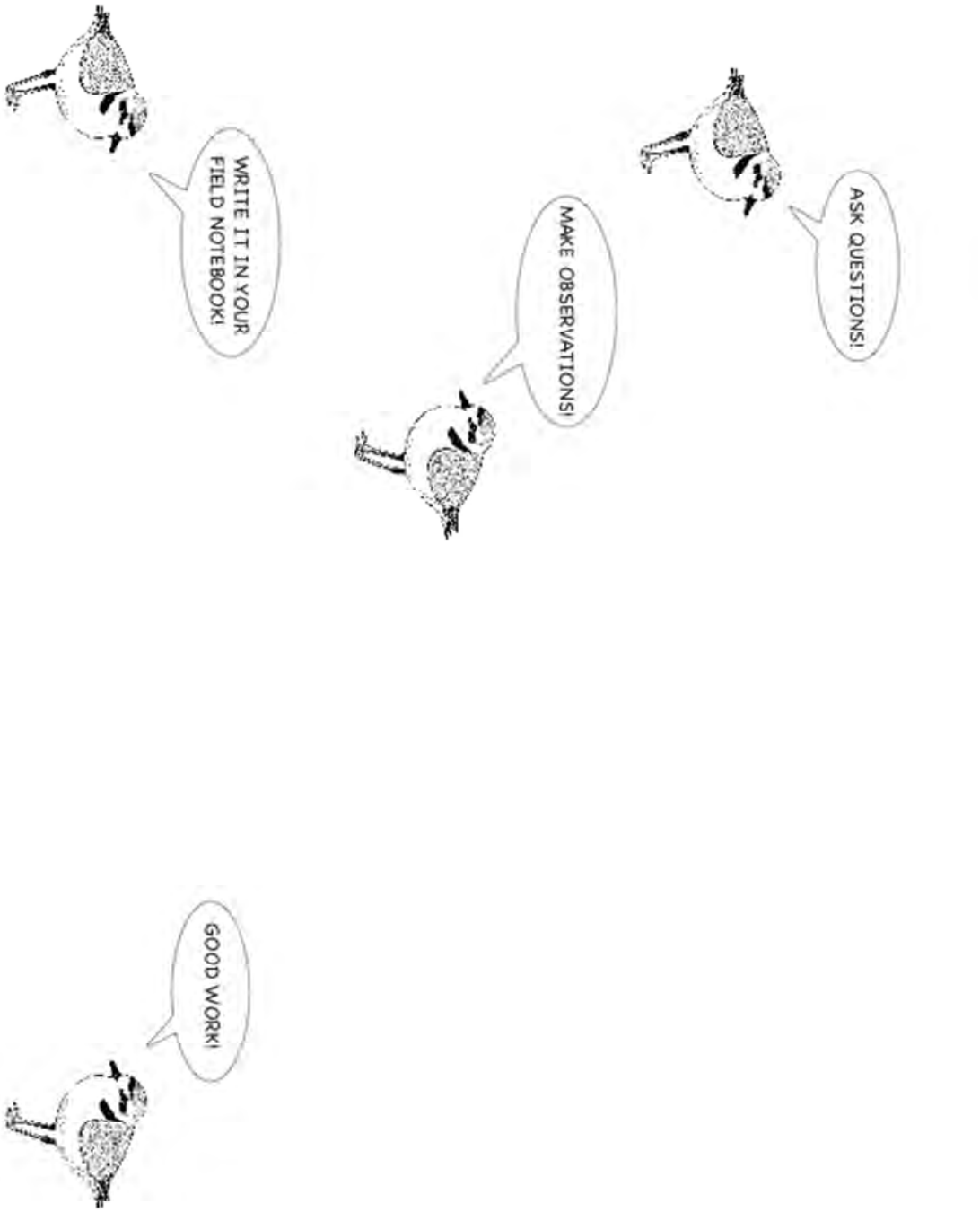
Grade: _____ Date: _____

Sharing the Beach with...

	Snowy Plovers	Least Terns
What color are they?		
Where on Earth do they live?		
What is their migration pattern?		
What is their habitat?		
What do they eat?		
Where do they put their nests?		
Name their predators		
How do they avoid predators?		
How can you help them?		

Figure 2. Student field notebook for use during field trips.




ASK QUESTIONS!
MAKE OBSERVATIONS!
WRITE IT IN YOUR FIELD NOTEBOOK!
GOOD WORK!

IMPORTANT NOTES:

Snowy Plover Habitat Observations

WEATHER:

Clouds:

No clouds | A few clouds | Lots of clouds | Completely overcast

Wind:

No wind | Sort of windy | Really windy

HABITAT (circle all the habitats you see today):

sandy beach | forest | desert | lake | open ocean | sand dunes | wrack (seaweed) | water's edge | shrubs and low trees | marsh | rocky beach | buildings and roads

Snowy Plover Behavior Observations

Did you find Snowy Plovers at the beach today?

yes no

Which HABITATS are Snowy Plovers using today?

dry sand wrackline water's edge

How MANY Snowy Plovers can you count?

What are the Snowy Plover DOING?
(circle all the behaviors you observe)

Standing foraging (looking for food)

sitting in the sand

chasing each other

flying

running away from something

_____

IMPORTANT NOTES:

IMPORTANT NOTES:

Other Beach Observations

Did you see other PEOPLE at the beach today?

YES NO

Did you see other BIRDS at the beach today?

YES NO

Did you see any MAMMALS at the beach today?

YES NO

If YES, what kind of mammals?

Dog

Cat

Coyote

Raccoon

SCIENTIFIC ILLUSTRATION

Find something small and interesting at the beach. First measure it with the ruler on the side of your page. Then, draw it using lots of detail.

SCIENTIFIC ILLUSTRATION

Draw a picture of birds you saw using the beach as habitat.

Figure 3. Student evaluation form used in the field trip program (pre- and post-evaluation forms use the same set of statements).

Snowy Plover Field Trip Student POST-Evaluation Questions

Student Name: _____ Grade_____

Teacher Name: _____

School: _____

Please read each sentence and decide whether it is true, false, or you do not know. Circle the answer that best describes what you think.

1: It is important to share the beach with birds and other wildlife.

True False I don't know

2: Snowy birds nest on the beach, right on the sand.

True False I don't know

3: Everybody should do their best to keep the environment clean.

True False I don't know

4: I do things that help take care of the environment and wildlife.

True False I don't know

5: Some birds have feathers the same color as the sand to help them hide from predators.

True False I don't know

6: Learning is an important part of caring for the environment and wildlife.

True False I don't know

7: I always throw away my garbage in a trashcan or recycle bin.

True False I don't know

8: Kids have power to help care for the environment.

True False I don't know

Figure 4. SSA Plover Handout.

Sea and Sage Audubon Society

Name _____ Date _____

Some things you need to know to Share the Beach with the Western Snowy Plover:

How big is it?

What color is it?

Where does it live?

What does it eat?

Where does it nest?

What are its predators?

How does it avoid predators?

How can we help?

Appendix H: Recommended Best Management Practices for Construction and Maintenance Activities within Special Protection Zones or near Roosting Plovers.

In Appendix C, the USFWS recommends that vehicles should avoid operating within the plover roost Special Protection Zones (see maps in Appendix A), with the exception of activities such as essential patrols, trash pick-up, and other activities agreed to by Wildlife Agencies as being essential. Additionally, there are projects that occur to protect infrastructure such as building berms, opening channels, sand replenishment, coastal armoring, and mechanical removal of large amounts of trash and non-naturally occurring debris following large storm events or when otherwise deemed necessary. For these types of activities, we recommend that the following Best Management Practices (BMP's) be implemented prior to and during their execution.

1. **Pre-project Identification and Protections of Snowy Plover Nesting, Roosting and Foraging Areas.** Agencies that perform the work, as part of their planning should contact the LAAS Snowy Plover Project representative to obtain the latest information on the plover roost(s) that are potentially impacted by their project. They should contact this person to determine where annual Snowy Plovers roosts and nesting areas occur on a particular beach. If possible, a qualified biologist should then survey the proposed work area within 72 hours to determine up-to-date locations of plovers. This should include mapping the extent of the beach used by the Snowy Plovers. Both the results of the current season's survey (August – April) and the preconstruction survey should be combined to map the area that may be used by the plovers during the project's activity.

   The biologist should prepare a map of the roosting/nesting areas that the project staff can then use to determine which project activities may conflict with these sensitive areas. The project staff and the biologist should then create a plan for avoiding sensitive areas. This should include routing materials, storage areas, staging areas, vehicle transit routes, and other project activities (work areas) that must occur on a daily basis around sensitive areas. Sensitive areas should then be marked using symbolic fencing, wood drift fencing, or road cones so that crews and other beach goers avoid these areas.

   All staff that will be working on the beach should then be briefed on the identification and habits of the Snowy Plover. They should be instructed to maintain a speed limit of no more than 10 mph while on the beach, including transit routes, and to remain vigilant, especially when driving in existing vehicle tracks. If a Snowy Plover is found in a work area, the biological monitor should be contacted and cones or other markers placed in that area to prevent harassment of the Snowy Plover(s) until the bird(s) depart or the biological monitor can recommend other protective measures.

2. **Protections during Project Activities.** In cases where sensitive areas can be identified and protected prior to project activities commencing, biological monitoring can be reduced to daily visits to ensure that protective measures are in place, that the Snowy Plovers have not shifted roosting areas, and that the crews are following these directions. Biological monitors would need to be present at all times if crews are working within sensitive areas.

   On days when crews need to work in sensitive areas, biological monitors should be present and positioned so that they can observe both the plovers and the crews. They

should arrive a half-hour prior to the beginning of planned work activities, if this is prior to sunrise, then work activities should be delayed to allow the monitors time to accomplish their tasks. The monitors should survey the proposed work area, and then discuss the planned activities with the supervisor and crews. They should create a plan for accomplishing the work without harassing the plovers. Monitors should then be present during work activities to ensure that the Snowy Plovers are not harassed. In cases where Snowy Plovers are roosting within or move to within 100 ft of active work areas, and all other options have been exhausted, the biological monitors should be allowed to slowly approach the roost and herd the Snowy Plovers out of the proposed work area and into areas that have been previously identified as plover roosts or marked sensitive areas. We propose that, given the amount of harassment that occurs daily on most beaches by dogs, pedestrians, and vehicles, a single flushing by a person on foot would not create any significant added level of harassment. Further, the actions taken to protect the roost would have already significantly reduced the daily level of harassment, offsetting the few occasions that the monitor may need to herd them. Once plovers are clear of the work area, work can begin again.