The Western Snowy Plover

In Los Angeles County, California

Prepared for:
The California Department of Fish and Game
Office of Spill Prevention and Response

Prepared by:
Ryan Ecological Consulting
Los Angeles Audubon
Santa Monica Bay Audubon
Plegadis L.L.C.

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Two hundred and three volunteers contributed 1,681 hours to complete the year-round surveys from 2007-2009, over more than 40 miles of beaches within Los Angeles County.

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ACKNOWLEDGEMENTS

We first wish to thank each of our volunteers who participated in this survey. This study would never have happened without the generous donation of their time and effort. We would like to thank the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game Office of Spill Prevention and Response (CDFG-OSPR) for funding this study, and the National Fish and Wildlife Foundation (NFWF) for managing these funds. We thank Lu Plauzoles, Chuck Almdale and the Santa Monica Bay Audubon Chapter for beginning these surveys and providing a tremendous wealth of data prior to 2007. We thank Francis Bidstrup, Elizabeth Copper, Robert Patton, and Shauna Wolf for their assistance with color-banded birds. We thank Dan Blankenship (CDFG), Lyann Comrack (CDFG), Gjon Hazard (USFWS), Vicki Lake (CDFG), and Nancy Frost (CDFG) for assisting in the study design and execution. We thank Kevin Clark, Ken Corey, Anna Schmidt, Caroline Liberman, Sandra Marquez, Sandy Vissaman, and Katy Kughen of the Carlsbad U.S. Fish and Wildlife Service Office and Chris Delith and Steve Kirkland of the Ventura U.S. Fish and Wildlife Service Office for their assistance with study design, execution, permits, assistance with understanding federal regulations pertaining to plovers. We thank Dan Cooper, Robert Hamilton and Mike San Miguel for their observations and assistance. We thank Kristi Birney for her invaluable assistance in permitting and obtaining permission for the Malibu Lagoon enclosure. We wish to thank Santos Kreimann, Ken Foreman, Wayne Schumaker, Charlotte Miyamoto, and the staff of Los Angeles County Beaches and Harbors, Mike Frazier and the staff of the Los Angeles County Lifeguards, the California Coastal Commission, California State Parks, Dean Kubani, Paul Davis and the staff of the City of Santa Monica and the staff of the City of Hermosa Beach for their hard work in helping to protect the Western Snowy Plover. We thank Dr. John Dorsey of Loyola Marymount University, Dr. Joan Hackeling of Los Angeles Valley College and Santa Monica College, and Dr. Meredith Leonard of Los Angeles Valley College for welcoming us into their classrooms. We also thank all of the participants who attended the Los Angeles County Snowy Plover Working Group and Kimball Garrett and the Natural History Museum of Los Angeles County for hosting those meetings. We thank Ruth Salter for editing previous annual reports.

Recommended Citation:

Ryan, T. P., S. Vigallon, L. Plauzoles, C. Almdale, R. Montijo, and S. Magier. 2010. The Western Snowy Plover in Los Angeles County, California. Prepared for the California Department of Fish and Game, Sacramento, CA. Prepared by Ryan Ecological Consulting, Pasadena, CA. 56 pp + appendices.

MANAGEMENT SUMMARY

We found that in coastal Los Angeles County (LAC), the Snowy Plover annually inhabits seven roosting sites at Zuma LT9/Zuma Lagoon, Malibu Lagoon, Santa Monica, Dockweiler State Beach near Tower 47 (DSB LT47), Dockweiler State Beach near Tower 58 (DSB LT58), Hermosa Beach, and Cabrillo Beach. They occasionally use sites at Leo Carrillo State Beach, Paradise Cove, Dan Blocker County Beach, Big Rock Beach, Will Rogers State Beach, Venice Beach, central Dockweiler State Beach, El Segundo Beach, Manhattan Beach, Redondo Beach and Terminal 400 in LA Harbor. We found that 96% of all detections were at the main roosting sites. Of these, six, Zuma LT9, Malibu Lagoon, Santa Monica, DSB LT47, DSB LT58, and Hermosa Beach consistently support the largest numbers of Snowy Plovers. We suggest that conservation efforts be focused on these six locations which 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 this century (WFVZ, LAC Breeding Bird Atlas, Unpubl. data).

Approximately 196 to 334 Snowy Plovers overwinter in LAC each year. This is approximately 28.5% of wintering Snowy 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 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.

The Snowy Plovers that roost at LAC beaches create large numbers of scrapes, at least throughout the winter and spring months. These scrapes are used as resting areas and provide protection from wind and aid in hiding Snowy Plovers from predators. Scrapes outside of protected enclosures are destroyed on a regular basis by beach grooming, vehicle traffic and pedestrians. If nesting attempts are being made, evidence is likely removed by the above disturbances and egg predators prior to discovery. In other areas, protection of winter roosts has led to establishment of nesting areas (Lafferty et al. 2006). We suggest that this would likely occur in LAC if these areas were protected. This would aid meeting the recovery goals for the Snowy Plover in Recovery Unit 6 (USFWS 2007).

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

We have documented mortality by vehicle strikes and capture by dogs at nearby beaches. We suggest that these may be regular causes of mortality and normally go undocumented due to a

lack of observers and the likelihood that Snowy Plover carcasses are scavenged or removed by beach grooming prior to discovery.

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

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

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

In summary, over the past three years the major accomplishments of the project include:

1. The involvement of over 200 community volunteers and an outreach program that has reached hundreds more.
2. Current, up-to-date knowledge of the location and population status of the Western Snowy Plovers.
3. Knowledge of details of their habits and biology, including migration timing, origins, and age structure.
4. Knowledge of the location and area requirements for adequate roosting space on beaches they currently occupy.
5. Detailed recommendations for the restoration of protected areas for roosting wintering plovers and a plan for steps to be taken if breeding occurs
6. Ongoing outreach to and discussions with local beach management agencies that will allow for greater protection of plovers while performing their vital duties.

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CHAPTER 1: THE STATUS AND DISTRIBUTION OF THE WESTERN SNOWY PLOVER IN LOS ANGELES COUNTY, CALIFORNIA

INTRODUCTION

Prior to1945, the Western Snowy Plover (*Charadrius alexandrinus nivosus*) (Snowy Plover) nested on beaches throughout Los Angeles County (LAC) (Grinnell and Miller 1944, WFVZ unpubl. data). However, increased human use of sandy beaches brought with it disturbance from beachgoers, lifeguards, maintenance staff, introduced predators and sand grooming, reducing the ability of Snowy Plovers to nest on LAC beaches. Since 1949, there have been no documented cases of a Snowy Plover nesting within LAC, although no systematic survey of suitable LAC beaches had been conducted since the 1970s (Gary Page pers. comm.). However, approximately 7% of Snowy Plovers wintering in California occur on LAC beaches (USFWS unpubl. data).

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). The USFWS lists five beaches in LAC as critical habitat for the Snowy Plover (USFWS 2005). These beaches are protected as wintering habitat (USFWS 2005). A Recovery Plan was completed by USFWS in 2007 and LAC is within Recovery Unit 6, whose goals include protecting wintering Snowy Plovers and increasing the breeding population to 500 breeding individuals from the current level of 243 (2005-09 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). 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, Snowy Plovers build roost scrapes throughout the year; these are typically shallower, with no materials placed inside and are often made from scraped-out footprints in the sand.

Historically, Snowy Plovers have nested at Redondo, Ballona (Venice/Marina Del Rey), Los Angeles, and Malibu Beaches (LA Breeding Bird Atlas Data, Unpublished). 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). Despite the lack of documentation since 1949, Snowy Plovers have continued to overwinter on LAC beaches. The Santa Monica Bay Audubon Society (SMBAS) conducted surveys between 2004 and 2006 and found between 260-334 wintering Snowy Plovers (USFWS Unpubl. data, SMBAS Unpubl. data).

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

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 (Appendix B, Chapter 2).

Prior to beginning this study, little was known about the wintering Snowy Plovers in LAC. Surveys by SMBAS provided winter population numbers, and volunteers reported color-band observations. However, managers were unaware of the exact locations of main winter roosts, when they were occupied, and had little information regarding threats. Currently, efforts to manage the Snowy Plover on LAC beaches are minimal. Most wintering Snowy Plovers are afforded no protection from equipment, vehicles, pedestrian traffic and off-leash dogs. Currently, symbolic fencing is placed around the primary roosting area at Malibu from February to May (Appendix C, Photographs 21 and 24); drift fencing at Santa Monica from September to May (Appendix C: Photograph 25); and DSB LT47 was coned off from August 2008 (Appendix C: Photograph 29) until the cones were replaced with fencing in January 2010 (after the last survey covered by this report). The California Coastal Commission and Army Corps of Engineers (ACOE) have required that roosting birds not be disturbed by sand replenishment and berm-building projects. The largest roost at Zuma LT9, as well as roosts at DSB LT58 and Hermosa, are afforded no protection. We suggest that learning more about Snowy Plover populations will allow beach managers and wildlife agency staff to concentrate recovery efforts on these impacts on relatively small areas, maximizing recovery efforts and minimizing disturbance to public use.

Study Goals. This study was designed to provide year-round information on the Snowy Plovers on LAC beaches to determine (1) year-round attendance patterns at the roosting areas identified during the 2007 surveys, (2) the size and location of these roosts, (3) the overall population and distribution in LAC, (4) whether Snowy Plovers are currently attempting to nest, (5) origins and local movement of Snowy Plovers, and (6) 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 Snowy Plovers. We identify and discuss threats that could represent both direct and indirect take, and make recommendations to help beach managers minimize impacts to Snowy Plovers on their beaches. We hope to enable area beach managers to better manage for Snowy 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 Snowy Plovers on LAC beaches.

METHODS

For surveys conducted between 2007 and 2009, volunteers participated in training sessions conducted by REC and LAA staff each year. Staff and volunteers then completed county-wide surveys between January and April in 2007 and in January, March, May and September of 2008 and 2009. More limited roosting beach surveys were conducted on seven beach segments with regular roosting areas (roost surveys) in February, April, early May, July, August, October, November and December in 2008 and 2009. These beaches are Zuma County Beach at Lifeguard Tower 9 (Zuma LT9) & 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) (Appendix B). 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.

For surveys conducted between 2004 and 2006, volunteers were mostly experienced birders who were given instructions similar to those for the 2007 to 2009 surveys. Methods were adapted from the draft recovery plan (USFWS 2001, Appendix J, C. Almdale pers. comm.). These volunteers provided both winter window surveys of all known roosts and monthly surveys at most roosts (U.S. Fish and Wildlife Service (USFWS) unpubl. data, SMBAS unpubl. data).

All volunteers used a consistent survey method adapted from the Western Snowy Plover Winter Window Survey Protocol (Elliott-Smith and Haig 2006) (Appendix E). All Snowy Plover counts were made in a single pass. On broad beaches, surveyors walked alongside each other and/or zigzagged during surveys. Field data were collected on a datasheet, and surveyors marked the presence of Snowy Plovers and the area covered on a map or aerial photograph. Surveyors observed the birds for color bands. These were reported to the PRBO Conservation Science, who then provided information on origin and banding date. Data sheets were submitted to the survey coordinator. Data collected for each survey location included the number, location, and sex of all

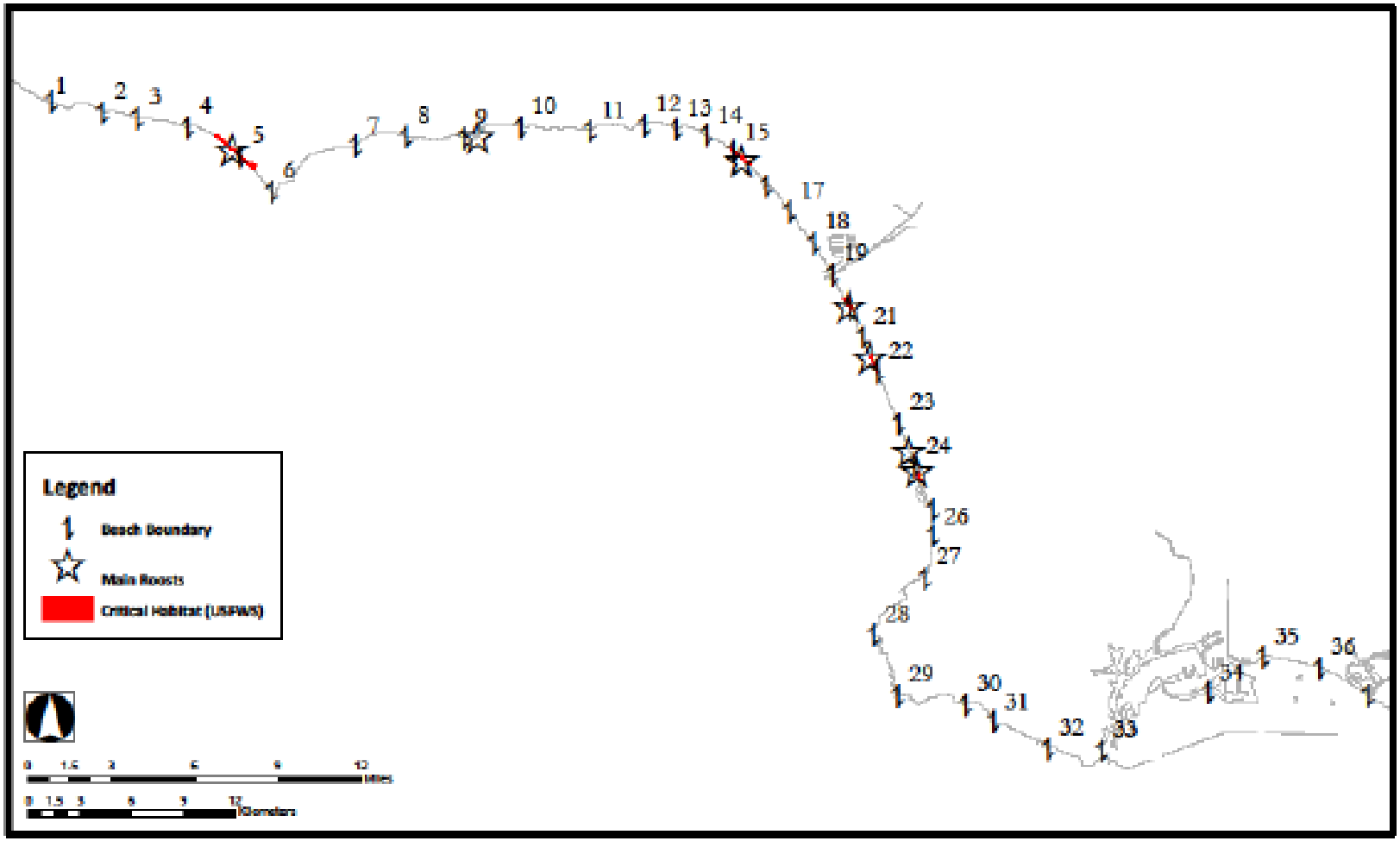
Snowy Plovers, color band combinations, the time and weather conditions of each survey, and a general and specific habitat description of each beach and Snowy Plover sighting (Appendix E). Surveyors also observed and recorded the level of human activity at each beach, such as presence of walkers, joggers, and individuals engaged in other recreational activities, the presence of on- and off-leash dogs, as well as the presence of vehicles and beach grooming equipment. In addition, surveyors recorded the presence of potential predators. During the breeding season surveys, volunteers noted breeding behaviors such as copulation, nest construction, incubation, or signs of agitation such as a broken wing display. All detections of Snowy Plovers and their nests were mapped from volunteer drawings and GPS locations using ArcView and overlaid on aerial photographs of the beaches.

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 Snowy Plovers.

Each fall the project staff held a Snowy Plover Management Workshop where they discussed the prior year's findings and opened a forum for management recommendations. These recommendations were reviewed and included in the annual report. Follow-up actions were then taken and summarized in each year's annual report. 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.

Data was analyzed statistically using Analyze-it ® statistical software (Analyze-it 2009). Population trends among the six years were analyzed only using January through April because surveys were not conducted in other months in 2007. The two surveys conducted in March 2007 were averaged for the analysis. Population trends from 2004 to 2009 were analyzed using only the winter window survey periods in January as these were the only surveys conducted consistently during those years. These data were analyzed using both regression and chi-squared analysis.

Figure 1. Map of Study Locations.



RESULTS & DISCUSSION

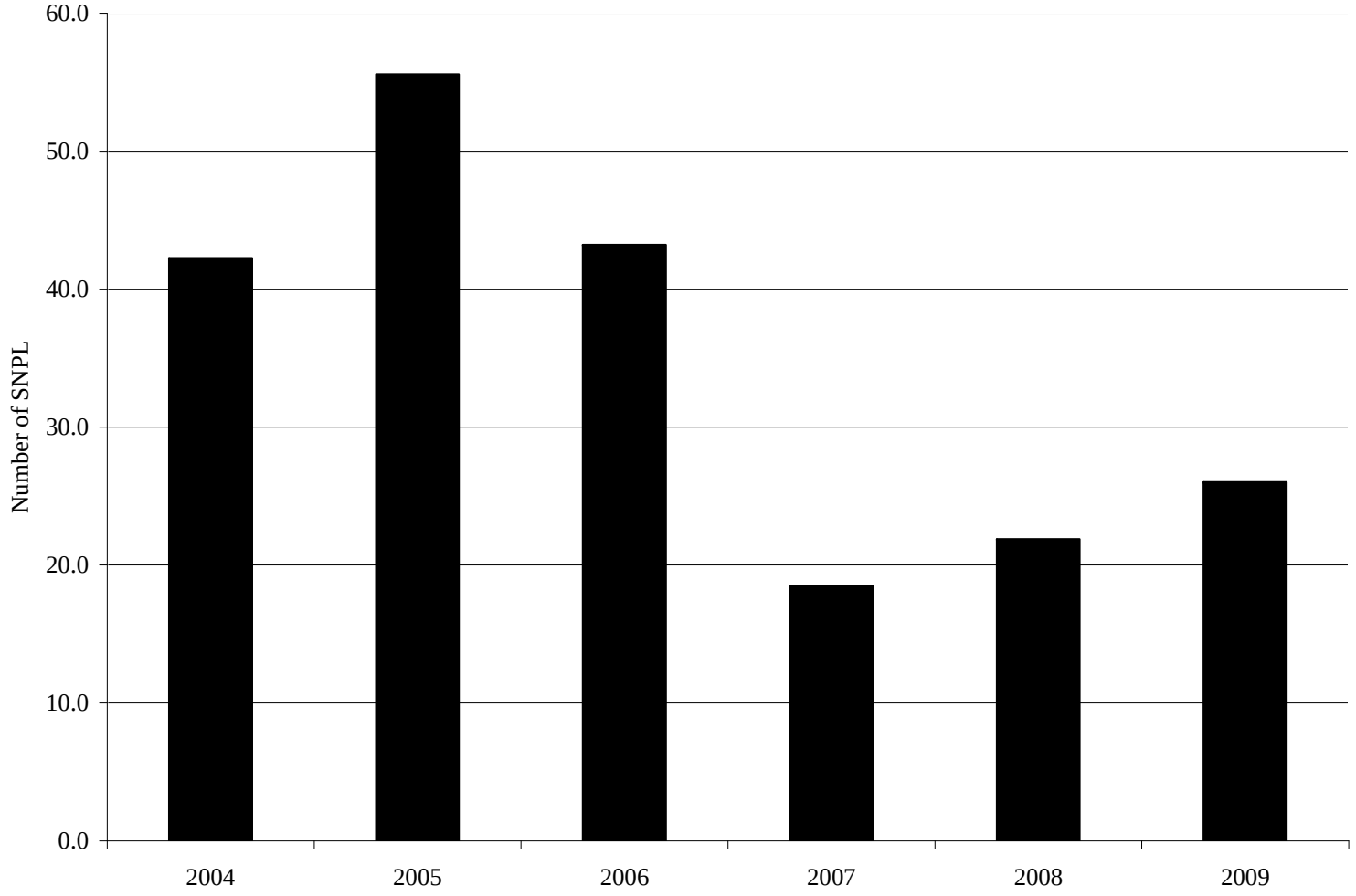


Figure 2. Average number of Snowy Plovers observed at roosts during each survey 2004-09.

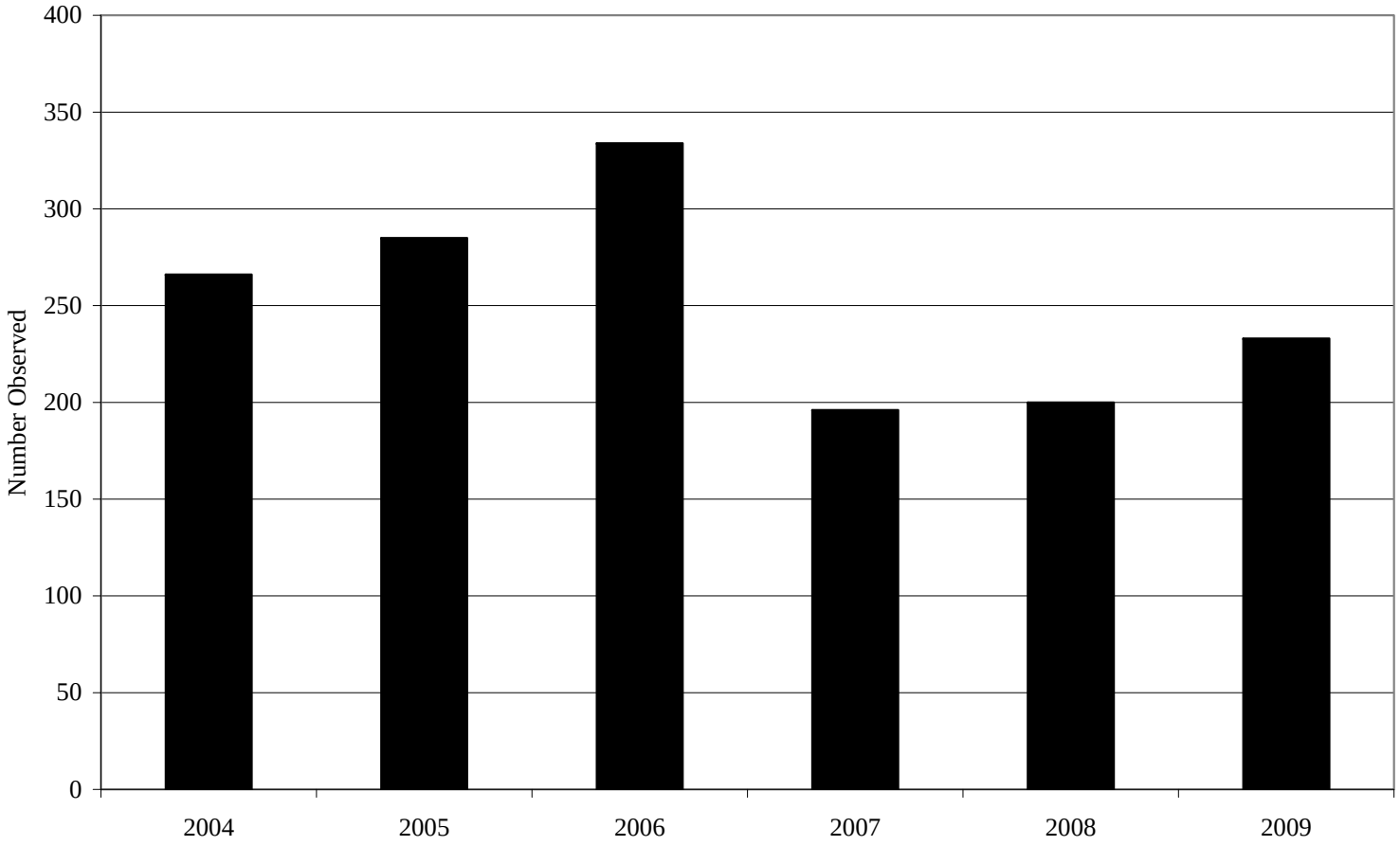


Figure 3. Number of Snowy Plovers present during winter window surveys 2004-09.

Table 1. Snowy Plovers observed at roosts during each survey 2004-2009.

Year	Average Observed	SEM	Total Counted	No Surveys
2004	42.3	7.9	1014	24
2005	55.6	15.5	778	14
2006	43.2	7.8	1426	35
2007	18.5	2.5	1164	63
2008	21.9	2.4	1619	74
2009	26.0	2.9	1868	71

Table 2. Annual Detections of Snowy Plovers during Winter Window Surveys 2004-2009.

Beach	2004	2005	2006	2007	2008	2009
Leo Carrillo State Beach/Nicholas Cyn CB	0	0	0	8	0	0
Zuma Beach	130	133	213	52	32	82
Zuma Beach South	0	0	0	0	48	0
Dume Cove, Paradise Cove, Escondido B.	0	0	0	6	0	0
Dan Blocker CB, Puerco Beach	0	0	0	23	0	0
Malibu Lagoon, Carbon Beach	33	28	12	34	37	36
La Costa B., Las Flores B., Big Rock B.	0	ns	ns	2	0	0
Will Rogers SB North	0	0	ns	2	0	0
Will Rogers SB South	0	0	ns	0	0	1
Santa Monica State Beach North	32	40	42	16	30	40
Venice City Beach North	ns	0	ns	0	0	1
Venice City Beach South	ns	0	ns	2	0	0
Dockweiler Beach North	12	34	23	9	10	20
Dockweiler Beach Central	0	0	0	0	0	4
Dockweiler Beach South	13	0	0	4	11	15
El Segundo & Manhattan Beach	0	0	0	0	3	0
Hermosa Beach North	33	41	36	23	29	26
Hermosa Beach South & King Harbor	0	0	0	8	0	2
Redondo County Beach North	0	0	0	0	0	ns
Point Fermin & Cabrillo Beach	13	9	8	7	0	6
Total Observed	**266**	**285**	**334**	**196**	**200**	**233**
No. of Sites (N)	**7**	**6**	**7**	**14**	**8**	**11**
Average Roost Size	**38.0**	**47.5**	**55.7**	**14.0**	**25.0**	**21.2**
Std. Error	**15.8**	**17.8**	**29.6**	**3.9**	**5.5**	**7.4**

Table 3. Results of X^2 analysis on winter window surveys 2004-2009.

Year	Observed	Expected
2003-04	260 (248.2)	236 (247.8)
2004-05	284 (260.2)	236 (259.8)
2005-06	334 (285.2)	236 (284.8)
2006-07	196 (216.2)	236 (215.8)
2007-08	164 (200.1)	236 (199.9)
2008-09	180 (208.1)	236 (207.9)

Population Status

Wintering populations of Snowy Plovers have declined in LAC during the study period, with the steepest declines between 2005-06 and 2006-07, showing recovery in subsequent years (Figures 2 and 3, Tables 1-3). We use two measures to determine population trends, the average roost size using all roost counts collected in a given year (Figure 2, Table 1), and the counts made during the winter window survey in which all roosts were covered equally in all years (Figure 3, Table 2). The average roost size peaked in 2005, remained high in 2006, and then declined dramatically in 2007, recovering slightly in 2008 and 2009. We observe a 51% decline between 2005 and 2009 (Figure 2, Table 1). The winter window surveys showed a similar trend, peaking in 2006, and then declining in 2007, recovering slightly in 2008 and 2009 (Figure 3, Table 2). We observed a 30% decline between 2006 and 2009. Analysis using Chi Squared (X^2) demonstrates that these observed numbers are significantly different ($X^2 = 46.64$, DF = 5, $p < 0.0001$) and that surveys from 2003-04 to 2005-06 are higher than expected and surveys between 2006-07 and 2008-09 are lower than expected, indicating a declining trend (Table 3). Using these two methods, we demonstrate that there has been a decline in the population of the Snowy Plover in LAC during this study.

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.). In LAC, we note two declines at Zuma LT9, our largest roost, from Fall/Winter to Spring 2005-06, and Fall 2006 and Winter/Spring 2007. There were 162 to 213 (avg. = 184.7) Snowy Plovers counted here between October 2005 and January 2006, falling to 108 to 120 (avg. = 114.0) Snowy Plovers in February and March 2006. The following fall, similar numbers were observed of 103 to 112 (avg. = 106.7) Snowy Plovers from September to November. Again there was a major decline between September to November 2006 and December to March 2007, when only 52 to 75 (avg. = 66.2) Snowy Plovers were counted. Since Spring 2007, they have only recovered slightly as 82 to 107 (avg. = 91.7) Snowy Plovers were observed from January to March 2009. We did not detect declines at other roosts in winter 2005-2006; however, we observed them in Winter 2006-2007. The roost at Santa Monica historically had 30-48 Snowy Plovers declined to 16-19 in the winter 2006-07. At DSB LT 47, 23-27 Snowy Plovers roosting in winter 2005-06, and declined to 9 in winter 2006-07. At Hermosa, 33-41

Snowy Plovers were present, declining to 15-23 Snowy Plovers in winter 2006-07. Subsequently, these roosts appear to have mostly recovered with average roost counts of 40.5 at Santa Monica; 21.0 at DSB LT 47 and 33.7 at Hermosa in winter 2008-09. In summary, over the course of our study, there has been a sustained decline of approximately 50% of Snowy Plovers at Zuma LT9. While a decline was seen at other roosts in 2006-07, they appear to have recovered.

Roost Occupancy

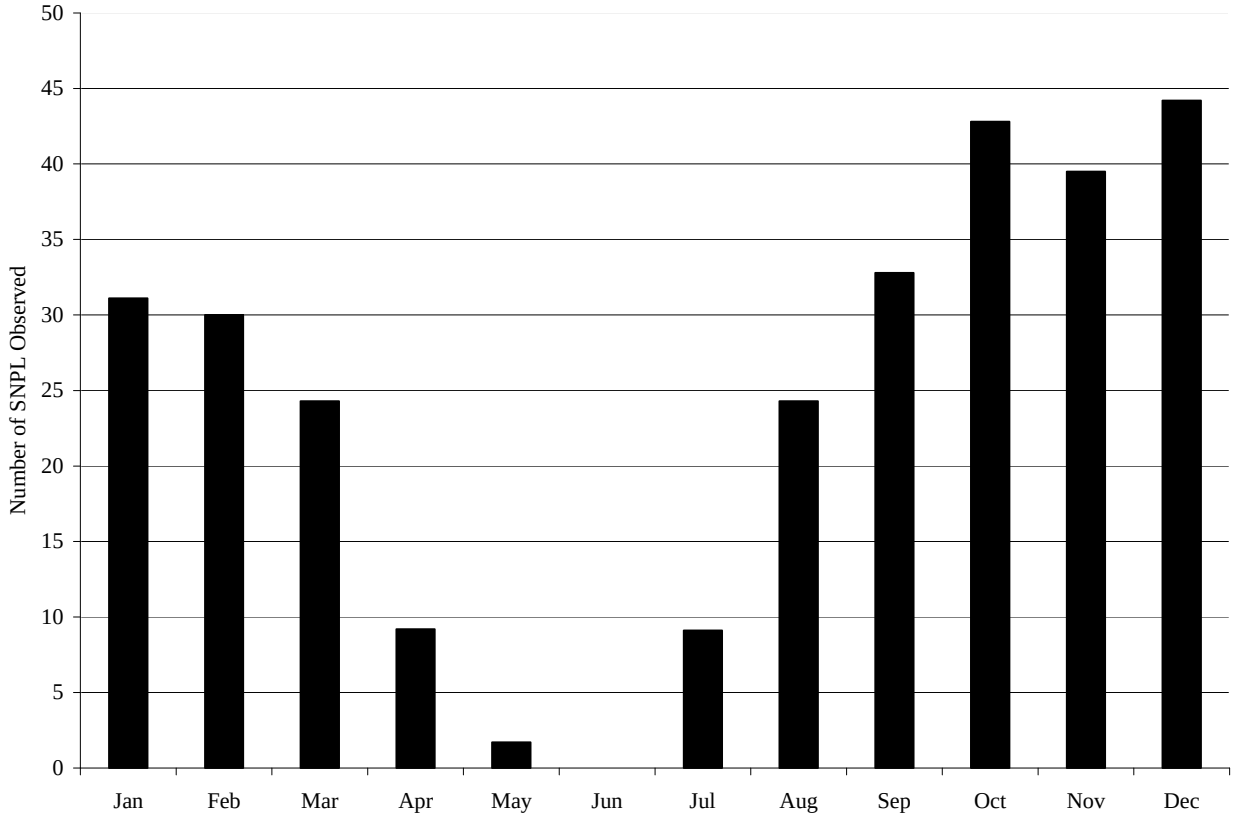


Figure 4. The average number of Snowy Plovers detected at all roost sites during each month of the year (2004-2009).

The Snowy Plover was detected in LAC during all months, except June (Figure 4). 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 (Figure 4). The "wintering" or "non-breeding" population is relatively stable between September and February at between 163 and 254 individuals between 2007 and 2009. We observed a consistent decline in numbers from between October to December and January to March. It is not known if this indicates mortality over the course of the winter at LAC beaches or if Snowy Plovers detected here in the fall and early winter continue moving farther south or begin to return to breeding areas between December and January.

The finding that most Snowy 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. Originally, our recommendations and common practice were to initiate protective measures after Labor Day, but these findings indicate that they should be considered earlier.

Table 4. Monthly detections of snowy plovers at roosts 2004-2009.

Month	Average Obs.	SEM	Total Counted	Frequency	Surveys Observed	No. of Surveys
Jan	31.1	5.59	2054	36.5%	66	181
Feb	30	6	1080	58.1%	36	62
Mar	24.3	6.86	1140	34.8%	47	135
Apr	9.2	1.55	257	45.2%	28	62
May	1.7	0.33	10	7.8%	6	77
Jun	0	0	0	0.0%	0	17
Jul	9.1	1.29	209	71.9%	23	32
Aug	24.3	2.95	778	86.5%	32	37
Sep	32.8	4.64	1215	48.7%	37	76
Oct	42.8	6.3	1539	85.7%	36	42
Nov	39.5	5.36	1463	75.5%	37	49
Dec	44.2	6.56	1635	84.1%	37	44

Distribution

Snowy Plovers were observed on 20 beach segments between 2004 and 2009, however 96% of observations from 2007-09 are from eight main roosting sites at Zuma LT9, Zuma Lagoon, Malibu, Santa Monica, DSB LT47, DSB LT58, Hermosa, and Cabrillo Beach (Table 2, Appendix A & B). They also used small roosts and foraged on beach segments 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, and Redondo Beach (Table 2, Appendix A). No Snowy Plovers were detected, but surveys were conducted at El Sol B., El Pescador B., La Piedra State B., El Matador B., Lechuza B., Dume Cove, Escondido B., Puerco B., Malibu Bluffs SP, Amarillo B, Malibu B., La Costa B., Las Flores B., Las Tunas CB, Topanga CB, Castle Rock B, Santa Monica State Beach South, Redondo CB South & Torrance CB, Portuguese Bend, Alamitos B., Junipero B. Belmont Shore and Peninsula B. 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. Some volunteers did check beaches once below the houses at Malibu Colony, but reported no suitable high-tide roosting habitat existed.

Zuma LT9 (a portion also known as Broad Beach) is the largest roost and supports 41% of the county's population of Snowy Plovers (Table 2, Appendix A, Beach 4). The main roost is located north of Lifeguard Tower 9 (Appendix A, Beach 4). Between January and March 2008, they briefly moved to a secondary roost near the mouth of Zuma Lagoon (Appendix A, Beach 5).

We have detected scrapes at Zuma LT9 between February and April; however no Snowy Plovers remained during May or June. This roost suffered the largest decline between 2006 and 2007 and is the only roost that has not recovered to pre-2007 population levels. There is heavy human use here, vehicles and off-leash dogs frequently flush Snowy Plovers. There is currently no barrier in place indicating the presence of the roost and the roost is open to disturbance. Portions of this beach are within Critical Habitat Subunit CA-20 (USFWS 2005). A Snowy Plover was found struck by a vehicle in January 2007 (see Mortality, below) (Appendix C: Photographs 9-12)

Malibu Lagoon supports 16% of the Snowy Plover population in LAC (Table 2, Appendix A, Beach 9). The main roost is located on the sand spit between the lagoon and the ocean, usually on the west side, but this roost is known to shift during the season, likely due to heavy use of a nearby trail by dogs and the changing shape of the sand spit itself. We found scraped and observed territorial displays between February and April. A pair remained here into May in 2008. In both 2008 and 2009, we placed a symbolic fence enclosure (C. Sandoval pers. comm.) (Appendix C, Photograph 6). In 2008, they roosted within the enclosure from its installation on March 16 until we observed the last pair in May. In 2009, the enclosure was installed on March 3 and they remained within it until between March 10 and 19, when they moved to the east end of the spit (Appendix B, Beach 9), where they remained until departing in late April/early May. The public has responded well to the enclosure: it was not vandalized either year, there were numerous positive comments from beachgoers, and judging by footprints detected during nest monitoring visits, most people respected the boundary (Appendix C, Photograph 21). This beach has moderate use during the winter and is popular with wildlife observers, walkers, joggers, and surfers. Despite prohibitions, off-leash dogs occur here, particularly in the morning before enforcement personnel arrive. Maintenance and lifeguard vehicles regularly drive here. Regular beach grooming does not occur.

Santa Monica supports 8% of the Snowy Plover population in LAC (Table 2, Appendix A, Beach 15). It has an existing winter enclosure that was initiated by Santa Monica's Environmental Programs Division in 2005. This enclosure is maintained by City of Santa Monica Open Space Management and monitored by volunteers from the SMBAS. It was 100 x 600 ft from 2005 to 2007 (Appendix C, Photograph 25), and 100 x 300 ft in 2008 and 2009 (Appendix C, Photograph 26). Most Snowy Plover sightings were within this protected enclosure. However, the Snowy Plovers regularly shift immediately north and south of the enclosed area. In 2008, the City of Santa Monica attempted to create a sub-enclosure 50 ft x 150 ft to protect potential nest scrapes from off-leash dogs and pedestrians, this enclosure was apparently too confining and the Snowy Plovers abandoned the enclosure between March 10 and March 18. We suggest that an enclosure of this size is too small. In 2009, it was used alternatively with a secondary roost site south and up the beach from the enclosure. This may have been in response to regular use by homeless people sleeping overnight within the enclosure. Potential nest scrapes have been detected here between February and April. Overall, the public has responded well to this enclosure: and there has been no vandalism and is generally respected by most beach goers. 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 enclosure. Maintenance and lifeguard vehicles regularly drive around the enclosure. Regular beach grooming occurs around the enclosure year-round and within the

enclosed areas during the months when the fence is removed (~April to September). Portions of this beach are within Critical Habitat Subunit CA 21A (USFWS 2005).

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, Beaches 19-21). There are two primary roosting areas, one on DSB North: near Lifeguard Tower 47 (DSB LT47), and on DSB South between the RV Park and the volleyball courts north of Lifeguard Tower 58 (DSB LT58). These roosts contain approximately 3% and 2% of the Snowy Plover Population in LAC respectively (Table 2, Appendix A & B, Beach 19 & 21). In 2007, a pair of Snowy Plovers remained near DSB LT47 into May and potential nest scrapes have been seen near both roosts between February and May.

Throughout 2008, members of the Project Team met with representatives of the USFWS, California Coastal Commission, and LACBH regarding protections for Snowy Plovers on these beaches. During meetings in August, it was decided that a 100 x 300 ft enclosure, similar to the one in Santa Monica, would be installed in the fall of 2008 within the DSB LT47 roosting area. From August 2008 to January 2010, orange road cones delineated an area beginning 100 ft north of Lifeguard Tower 47 and beach groomers and drivers have mostly avoided it. Originally, this area was 100 ft x 300 ft, in March 2009, the area was accidentally moved north, then extended south to cover the original roost site (within 100 ft of Tower 47) and remained approximately 100 ft x 500 ft long until replacement by temporary fencing in January 2010, when it was returned to 100 x 300 ft. Between August 2008 and December 2010, there was no signage and it was regularly used by joggers and walkers who apparently liked the firmer texture of the ungroomed sand. The cones were stolen, and reportedly used as an impromptu baseball and soccer fields by unaware beachgoers. Several accidental incursions occurred by beach drivers and work crews (Appendix C, Photographs 30-33), including an incident that occurred in March 2009, when a truck tire ran directly over a likely nest scrape (Appendix C, Photographs 34-35). There are a large number of off-leash dogs on this beach and their tracks are regularly observed within the enclosure. Maintenance and lifeguard vehicles regularly drive up the beach from the enclosure. Regular beach grooming occurs around the enclosure year-round. Portions of DSB North and the roost at DSB LT47 are within Critical Habitat Subunit 21B (Appendix A, Beach 19) (USFWS 2005).

Portions of DSB South are within Critical Habitat Subunit 21C, however, the roost at DSB LT58 is not within, but rather lies north, of Critical Habitat (Appendix A, Beach 21) (USFWS 2005). This roost is afforded no protection or signage and is regularly driven through (Appendix C, Photographs 36-39), sometimes at speeds over 10 mph. In March 2009 a black-bellied plover was found dead in vehicle tracks (Appendix C, Photograph 39) and was likely struck and killed by a vehicle. A second black-bellied plover was struck by a vehicle and taken to wildlife rehabilitation (see Mortality, below). This roost needs additional protection and increased driver training.

Construction work began on a new education center near the existing restaurant on DSB South, approximately 250 m south of the DSB LT58 Snowy Plover roosting area. It is not within a Critical Habitat area, but to our knowledge, no monitors were present during construction and no

measures were taken to avoid impacts to Snowy Plovers. We recommend that all such projects near Snowy Plover roosts should have additional protections in the future.

Hermosa Beach supports 8% of the Snowy Plover population in LAC (Table 2, Appendix A & B, Beach 23). The population has declined slightly from 2004-06 to 2007-09 with 33 to 41 individuals counted in 2004-06, and 23-29 individuals counted in 2007-09 (Table 2). The main roosting location is usually between 26th Street and 28th Street, but roosts have been detected from 18th Street and to Longfellow (Appendix A, Beach 23). The Snowy Plovers on this beach tend to move their roosting. This may be in response to regular disturbance: this beach has among the highest human use of any roosting beach in LAC, is regularly groomed, and lifeguard and maintenance vehicles regularly drive on it (Appendix C, Photographs 42-43). Portions of Hermosa Beach are within Critical Habitat Subunit 21D, however the main roosting area is north of it (Appendix A, Beach 23) (USFWS 2005). A potential nest scrape was found here in April 2007; it was protected from vehicle traffic and monitored, but was destroyed by beach goers (see Nesting, below).

Nesting

No nesting was detected at Snowy Plover roosts between 2004 and 2009. 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.

In 2007, biologists detected a potential nest scrape on April 25 at DSB LT58; and a likely nest scrape at Hermosa Beach between April 25 and 28, 2009, neither resulted in an active nest. The nest at Hermosa Beach was protected from vehicle traffic and monitored, however, no visible barrier was placed around it and it was destroyed by beach goers during a heavy use weekend.

In 2008, a male-female pair remained near the DSB LT47 roost until at least May 23. At Malibu between two and nine scrapes were noted between February 7 and March 16; between seven and 18 scrapes were found between February 10 and March 10 at Santa Monica; scrapes were found at DSB LT 47 between February and April 29, these scrapes were removed by beach grooming equipment after each survey.

In 2009 biologists made a greater effort to find evidence of nesting, searching roost sites for nests on a weekly basis. At Zuma surveyors detected an average of 22.3 scrapes (SD = 15.4) on three of seven surveys. At Malibu 11.9 (SD = 14.2) scrapes were detected on 10 of 12 surveys. One nest scrape was found on March 3, 2009. At Santa Monica 33.7 (SD = 42.6) scrapes were detected on seven of nine surveys. At DSB LT47 17.3 (SD = 8.0) scrapes were found on eight of twelve surveys and one nest scrape was detected on March 3, 2009. At DSB LT58, 12.6 (SD = 7.7) scrapes were found on seven of nine surveys. At Hermosa 14.8 (SD = 15.5) scrapes were found on five of eight surveys.

Each year, beach managers were informed of the presence of the scrapes and nest scrapes. Unsuccessful efforts were made to protect the nest scrape at Hermosa in 2007; nest scrapes identified in 2009 were both within protected areas. However, the nest scrape at DSB LT 47 was

run over by a vehicle that entered the coned off area and was then abandoned (Appendix C, Photographs 34 & 35).

Scrapes made at Zuma, DSB LT 58 and Hermosa and scrapes outside the protected areas at Malibu, Santa Monica, and DSB LT47 receive no protection and are regularly removed by sand grooming, run over by vehicles, or trampled by pedestrians. Because of the regular removal of potential nesting scrapes by sand grooming, in many areas this occurs every 24 to 72 hrs, we suggest that it is unlikely that surveys would detect nests with eggs prior to their removal. Therefore, our findings suggest that the presence of Snowy Plovers throughout the early portion of their nesting season, observations of courtship activities, male-female pairs and numerous scrapes suggest that nesting may be occurring, but it is not likely to be detected unless areas are disturbed less frequently or surveys are conducted daily.

Origins and Site Fidelity

Table 5. The origins of color-banded Snowy Plovers observed on LAC beaches 1998-2009.

	Site Observed						
Origin	**Zuma**	**Malibu**	**Santa Monica**	**Dockweiler**	**Hermosa**	**Cabrillo**	**Total**
Oregon			1				1
Humboldt Bay	2	3	1				6
Sunset SB, Santa Cruz					1		1
Pajaro River					1		1
Zmudowski SB	4		2				6
Moss Landing	4			1		1	6
Monterey Bay	1						1
Salinas River NWR	4	1	2		2		9
North Marina SB	1						1
Oceano Dunes	6	3					9
Vandenberg AFB	1		1				2
Coal Oil Point					1		1
Camp Pendleton	4				1		5
San Diego	1						1
Total	28	7	7	1	6	1	50

Of 50 known-origin Snowy Plovers observed on LAC beaches between 1998 and 2009, one was originally banded in Oregon, and 49 within California (Table 5). Of those banded in California, their origins were from coastal nesting sites from San Diego to Humboldt counties (Table 5). The highest numbers came from Oceano Dunes, Salinas River NWR, and Moss Landing, all colonies in central California (Table 5). Based on these observations the Snowy Plovers that overwinter on LAC beaches are mostly from the Pacific Coast Population and arrive here to roost during the non-breeding season from throughout the range of the Pacific Coast Population. Their numbers appear in proportion to banding efforts, therefore we determine that there is no specific breeding

area that is the source for LAC wintering Snowy Plovers, rather they arrive here from throughout their breeding range.

Most observations of color-banded Snowy Plovers were made at Zuma. However, this is expected as Zuma supports approximately 40% of the county population and this colony has among the most complete coverage, along with Malibu and Santa Monica.

We have also noted local movements of these banded individuals. Four individuals were observed both at Zuma and Malibu; one was observed at both Zuma and Santa Monica. We suspect that there is regular movement among some individuals at these three roost sites. We have noted on some surveys when numbers are lower at one of these three locations; they are often higher at one of the others. However, we have not noted any color-banded Snowy Plovers from Zuma to Santa Monica at colonies farther south. We have observed the same individuals returning to the same beach for as many as 6 years.

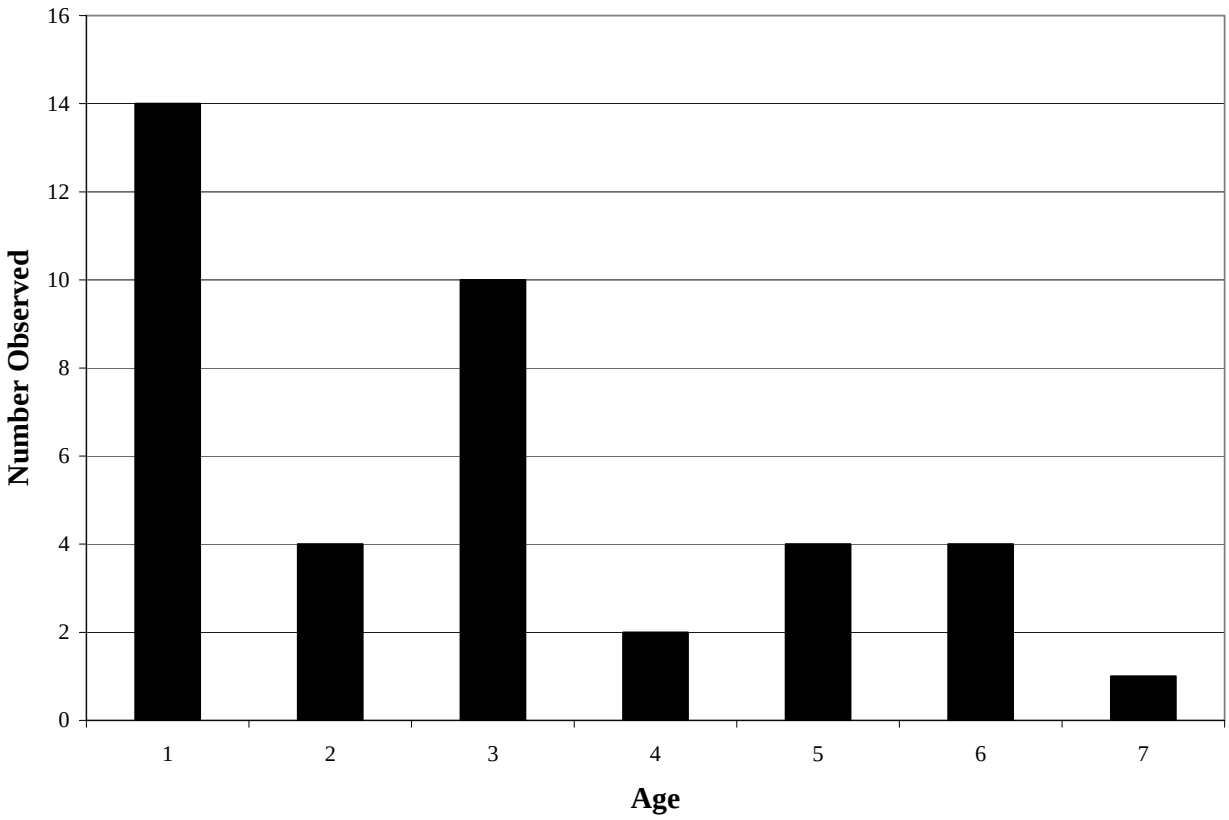


Figure 5. The age structure of color-banded Snowy Plovers on LAC Beaches 1998-2009.

Of the 40 known-age/known-origin color-banded Snowy Plovers the average age was 2.84 years old and the oldest observed was seven years old (Figure 5). This appears normal as Paton (1994) estimated a mean life span of 2.7 years.

Mortality.

During the span of this study, we have documented mortality from vehicle strikes and are aware of a dog capturing a Snowy Plover at Surfside Beach in Orange County. 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 (Appendix C, Photographs 9-12). It appears that vehicle strikes of birds occur somewhat regularly as a black-bellied plovers was also found dead in vehicle tracks at DSB 58 on March 17, 2009 (Appendix C, Photograph 40) and another reported recovered and taken to wildlife rehabilitators by wildlife rescue staff to us on November 24, 2009. Vehicle strikes have also been reported at Oceano Dunes State Vehicular Recreation Area in California where 6 adult Snowy Plovers that were found dead between 2002 and 2008 were probably struck by vehicles (R. Glick in Page et al. 2009). At nearby 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). Also at Coal Oil Point, California, one chick was killed by an unleashed dog (Lafferty et al. 2006).

CONCLUSIONS

We found that in coastal LAC, the Snowy Plover annually inhabits seven roosting sites at Zuma LT9/Zuma Lagoon, Malibu Lagoon, Santa Monica, DSB LT47, DSB LT58, Hermosa Beach, and Cabrillo Beach. They occasionally use sites at Leo Carrillo State Beach, Paradise Cove, Dan Blocker County Beach, Big Rock Beach, Will Rogers State Beach, Venice Beach, central Dockweiler State Beach, El Segundo Beach, Manhattan Beach, Redondo Beach and Terminal 400 in LA Harbor. We found that 96% of all detections were at the main roosting sites. Of these, six, Zuma LT9, Malibu Lagoon, Santa Monica, DSB LT47, DSB LT58, and Hermosa Beach consistently support the largest numbers of Snowy Plovers. We suggest that conservation efforts be focused on these six locations which 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 (Ryan et al In Prep). We found that plovers 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 this century (WFVZ, LAC Breeding Bird Atlas, Unpubl. data).

Approximately 196 to 334 Snowy Plovers overwinter in LAC each year. This is approximately 28.5% of wintering Snowy 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 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.

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

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

We find that LAC is an important non-breeding area for Snowy Plovers from breeding colonies throughout California and Oregon based on observations of color-banded individuals. We suggest that individuals show high site fidelity and have observed individuals returning to LAC to the same beach for as many as six years. 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 of 2.8 years.

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

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

1. a lack of public awareness of the presence of Snowy Plover roosts and a lack of information about how to avoid disturbing the Snowy Plovers while enjoying the beach,
2. lack of training and information on locations of Snowy Plover roosts among staff that drive and operate equipment on the beaches,
3. regular disturbance, removal of foraging resources, and occasional mortality resulting from beach grooming, operation of heavy equipment, and regular vehicular traffic,
4. regular disturbance and occasional mortality from off-leash dogs,
5. beach management practices that remove kelp and associated arthropods,
6. recreational activities and occasional large events that flush Snowy Plovers from roosts and leave large amounts of refuse near roosts,
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 address these threats with specific recommendations in Chapter 3 of this report.

CHAPTER 2: THE PLACEMENT AND SIZE OF ROOST SITES OF WINTERING SNOWY 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). 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, Snowy 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 2005). Prior to 1948, Snowy Plovers commonly nested on LAC beaches (McCormick 1899, WFVZ Unpubl. data); they have not been known to nest in LAC since 1949 (Los Angeles County Breeding Bird Atlas, Unpubl. data). 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).

Snowy plovers occur in LAC from July to May, with the largest populations present between August and April (Chapter 1, 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), with no records in LAC in June (Chapter 1, Figure 4). There are seven distinct roosting areas where they have been found since regular surveys began in 2004 (Appendix B) (Chapter 1). These roosts consist of 2 to 152 individuals aggregated on the upper sandy beach (Chapter 1). At these sites, Snowy 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 Snowy 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 Snowy 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 Snowy Plovers (2007) 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 Snowy Plovers. Information is available on the size of roosts includes the sizes of existing winter enclosures established for them elsewhere in California (C. Sandoval pers. comm.). Most of these enclosures 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. Enclosure sizes have ranged from 300 ft x 100 ft to over 4000 linear feet (Chapter 1, C. Sandoval pers. comm.). In LAC, an irregularly shaped enclosure covering approximately 100 ft x 220 ft using symbolic fencing was placed at Malibu Lagoon in 2008 and 2009. An enclosure using drift fencing has been placed at Santa Monica State Beach annually since 2005. In 2005-2007 it was approximately 100 ft x 600 ft. In 2008 and 2009 it was 100 ft x 300 ft. In 2008, a smaller area, approximately 50 x150 ft, was completely enclosed and the plovers abandoned the enclosure. 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.

As part of on-going efforts to protect wintering Snowy Plovers on LAC beaches, we have recommended several protective measures for roosting areas. These measures include protective enclosures around roost sites, enforcing existing dog regulations, avoidance of roosts by non-emergency vehicles, and public education through docents and signage (Chapter 1). Currently, approximately 24% of the county's Snowy Plovers are afforded some protection by seasonally fenced areas at Santa Monica (Fall-Spring) and Malibu Lagoon (Spring). However, the majority of the wintering population remains unprotected and subject to disturbance and injury. 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 enclosures 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 enclosure 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 Snowy 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 Snowy Plover roosting sites in LAC weekly between February 2 and April 16, 2009 (Appendix B). These sites are located at Zuma State Beach (Zuma) (Appendix B, Beach 4), Malibu State Beach (Malibu) (Appendix B, Beach 9), Santa Monica State Beach (Santa Monica) (Appendix B, Beach 15), Dockweiler State Beach near Lifeguard Tower 47 (DSB LT47) (Appendix B, Beach 19) (Figure 5) and Lifeguard Tower 58 (DSB LT58) (Appendix B, Beach 21), and Hermosa Beach (Hermosa) (Appendix B, Beach 23). 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 Snowy Plovers. The observer then walked around the group of birds with a Trimble GeoXT Global Positioning Satellite (GPS) receiver. The GPS recorded the track of the observer at one-second intervals. This model GPS can record to less than 1 m accuracy. 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 mapped each polygon using ArcMap Global Information System (GIS) software on an aerial map of each beach (Appendix B). We combined different polygons mapped on the same date into one roost site. 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 6). We then calculated the overall average range and standard error for each roost site.

To determine the seasonal use, we measured the total length, width, and area used by all roosting plovers during all visits (Table 7). Total length and width was determined using the most widely separated measurements. Total area was the area covered by all polygons (not a sum of each daily measurement) (Table 7). We then measured the range, average, and standard error for all roost sites.

STUDY AREA

The study area includes six sites along the LAC Coastline, California. The six sites are within beach segments known to support roosting Snowy Plovers during the non-breeding season (Chapter 1) and are listed above. Zuma (Appendix A & B, Beach 4) 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 (Appendix A & B, Beach 9) 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 (Appendix A & B, Beach 9) 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 (Appendix A & B, Beach 19) 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 (Appendix A & B, Beach 21) 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 (Appendix A & B, Beach 23) 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 beach goers 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 & DISCUSSION.

Table 6. Size and dimensions of daily occupancy of Snowy Plover roosts.

Site & Dimension	Avg.	Range	SE	N
Zuma				
Length (m)	81.6	16-257	20.2	12
Width (m)	22.2	8-46	3.3	12
Area (ha)	0.15	0.03-0.55	0.05	12
Malibu				
Length (m)	55.1	31-78	4.3	14
Width (m)	27.5	6-59	3.8	14
Area (ha)	0.14	0.03-0.35	0.03	14
Santa Monica				
Length (m)	54.2	33-111	7.2	10
Width (m)	30.9	19-45	2.5	10
Area (ha)	0.14	0.06-0.25	0.02	10
DSB LT47				
Length (m)	40.2	23-62	3.7	10
Width (m)	24.4	16-38	2.5	10
Area (ha)	0.10	0.05-0.14	0.01	10
DSB LT58				
Length (m)	45.8	22-74	4.9	12
Width (m)	25.8	17-35	1.7	12
Area (ha)	0.11	0.04 – 0.18	0.01	12
Hermosa				
Length (m)	89.0	15 – 247	27.9	9
Width (m)	22.7	17 – 33	1.6	9
Area (ha)	0.17	0.02 – 0.46	0.05	9
All Beaches				
Length (m)	60.4	15-257	5.7	67
Width (m)	25.6	6-59	1.2	67
Area (ha)	0.13	0.02-0.55	0.01	67

Size and Dimensions of Daily Snowy Plover Roosts.

The average size of daily Snowy Plover winter roosts is 60.4 m (198.2 ft) (SE = 5.7 m) long, 25.6 m (84.0 ft) (SE = 1.2 m) wide, and covers an area of 0.133 hectares (ha) (0.33 acres [ac]) (SE = 0.01). The average length of roosts ranged from 40.2 m (131.9 ft) (DSB LT47) to 89.0 m (292.0 ft) (Hermosa). The average width of roosts ranged from 22.2 m (72.8ft) (Zuma) to 30.9 (101.4 ft) (Santa Monica). The area of the average roost ranged from 0.10 ha (0.25ac) (DSB LT47) to 0.17 ha (0.42 ac) (Hermosa).

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 Snowy 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 (Figure 2). When disturbed, the plovers flushed to a secondary area closer to the ocean.

It is more difficult to prescribe a specific cause to seasonal shifts in roost location than daily roost movements. We observed seasonal roost shifts at Zuma, Malibu and Santa Monica (Appendix B, Beaches 4, 9 and 15). In 2008, there was a major relocation of the roost at Zuma from its usual location near lifeguard tower 9 to just north of the lagoon, approximately 1.2 km south (Chapter 1). At Malibu, the roost shifted approximately 120 m northeast between March 10 and 19, 2009 (Appendix B, Beach 9). At Santa Monica, the main roost also shifted 150 m southeast between February 11 and March 19, 2009 and back into the enclosure between March 24 to April 16, 2009 (Appendix B, Beach 15), although some individuals remained at the original roost throughout the season. Both sites have enclosures, but still have significant disturbance issues. The enclosure at Malibu Lagoon is located near the exit of the main trail from the parking lot on a portion of the beach that sees a lot of foot traffic and regular off-leash dog use in the early morning, prior to staff arrival. The plovers moved to a more remote portion of the beach with fewer visitors. The enclosure at Santa Monica had a homeless man who regularly slept in the southeast corner. The enclosure size was also reduced from 100 x 600 ft in 2007 to 100 x 300 ft in 2008. The plovers also largely abandoned it between March 11 and 18, 2008 following the complete enclosure of a 50 ft x 150 ft area where scrapes were found. Some movements may be natural shifts following food resources, protection from wind, or in response to predation.

Characteristics of Non-breeding Season Snowy Plover Roosts.

When each daily roost was overlaid and the boundaries combined, it provides the overall size of the Snowy Plover roost for each site throughout the season. On average, the Snowy Plovers used an area 318.7 m (SE = 59.2) (1,046 ft) long; 75.3 m (SE = 7.4) (247 ft) wide; with an overall area of 0.87 ha (SE +0.09) (2.15ac) (Table 7). Average non-breeding season roosts ranged from 175 m (574 ft) to 536 m (1,759 ft) in length; 59 m (194 ft) to 108 m (354 ft) in width, and covered between 0.58 to 1.16 ha (1.43 to 2.87 ac) (Table 7).

Table 7. Dimensions of total roosting area used between February and April 2009, Los Angeles County, California.

Site	Length (m)	Width (m)	Area (ha)	% of Beach Segment
Zuma	461	73	1.16	0.4%
Malibu	274	108	0.80	2.0%
Santa Monica	245	82	0.87	0.5%
DSB LT47	175	61	0.73	2.0%
DSB LT58	221	59	0.58	2.1%
Hermosa	536	69	1.08	0.4%
Avg.	318.7	75.3	0.87	
SE	59.2	7.4	0.09	
N	6	6	6	
Total	1912		5.22	

Again, we detected regular movements of aggregates of roosting Snowy Plovers within their roosting beaches. At Zuma, the Snowy Plovers remained in an area approximately 25% of the total length of the seasonal roosts when undisturbed, then flushed into a long, narrow aggregation along the top of the beach slope (Appendix B, Beach 4). At Malibu, the Snowy Plover flock initially remained within an enclosed area, again about 30% of the total length, and then re-located expanding the roost (Appendix B, Beach 9). This was likely due to disturbance by off-leash dogs. At Santa Monica, the flock initially used the enclosure, then the majority departed, possibly due to regular human disturbance within the enclosure (Appendix B, Beach 15). At DSB LT47 the flock mostly remained within a 100 x 500 ft coned-off area, although the location of the flock within that area varied (Appendix B, Beach 19). At DSB LT58 they mostly remained within the same area, but were frequently flushed by vehicular traffic (Appendix B, Beach 21). Historically, the Snowy Plover flock at Hermosa Beach in known to occupy a variety of areas (Appendix A & B, Beach 23) (Chapter 1). It is not surprising that it occupied the longest length of beach (Table 7). However, approximately half that length was recorded on one visit. This beach sees among the highest levels of beach use and disturbance on a daily basis. This may account for the wide-ranging movements. We suggest that when you remove these disturbance-related flushings, an adequate area for protecting a roosting flock in LAC is approximately 70 - 75 m wide and 275-320 m long. This generally agrees with other findings by Lafferty (2001b) of 400 m long and our hypothesis of at least 50 m wide and 100 m to 400 m.

CONCLUSIONS AND RECOMMENDATIONS

Based on these findings, we suggest that local beach management agencies consider protecting areas approximately 70-75 m wide and 275-320 m long and approximately 0.9 ha (2.2 ac) between when the plovers return in July and depart in April. We suggest that the placement of a protected area take into consideration the following:

1. The local geographic features. This is especially important at Malibu Lagoon, where the shape and position of the sandy peninsula changes both between and within years.

2. Human beach use patterns. They should attempt to minimize disturbance to beach access, access to lifeguard towers and other fixed structures such as bathrooms and parking lots.
3. Fencing type. We suggest that less invasive fencing materials, such as symbolic fencing, be used in conjunction with signage to inform people of Snowy Plover roosting areas and appropriate behaviors around them.
4. The location occupied by the plovers. The protected area should be somewhat flexible to the area selected by the plovers each year, and able to be moved based on seasonal shifts.
5. Surrounding uses. In areas where off-leash dog use is prevalent, special recreational events with large crowds, construction activities, or use of heavy equipment for beach replenishment is being used managers should consider enlarging the buffer area.
6. Access to foraging resources. Kelp that washes ashore in front of or adjacent to the enclosure should not be removed. Additional studies should be made of foraging resources near protected areas.

Additionally, we suggest than an entire protected area does not require fencing and the exclusion of the public. Beach management personnel may work with local Snowy Plover experts to determine current high roosting use areas and employ symbolic fencing at the most sensitive areas. Secondly, they should educate beach drivers, groomers, dog walkers, and beach goers about the rest of the area. We recommend that throughout the protected areas:

1. Vehicles should avoid driving through plover protected/roosting areas unless there is an emergency situation.
2. Unless there is an emergency, maintain a 10 mph speed limit and remain vigilant.
3. Dog regulations be enforced, first using public education, then applicable law enforcement tools.
4. Beach grooming be avoided unless necessary, and then conducted by hand crews, or with a biological monitor present.
5. Drivers of vehicles and machinery be trained in Snowy Plover avoidance.
6. Signage be placed at public access points explaining the need for protections.
7. A docent program be implemented to help explain the need for protections and to provide viewing opportunities of the plovers for the public.

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 1,912 m, 1.9 km (6,273 ft/1.19 miles) or approximately 1.6% of the linear coastline and 3.4 % of broad, sandy beaches in LAC. In terms of total area covered, the Snowy Plover roosts cover 5.22 ha (12.9 ac) 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. RECOMMENDATIONS FOR THE CONSERVATION OF THE WESTERN SNOWY PLOVER AND RESTORATION OF ITS HABITAT ON LOS ANGELES COUNTY BEACHES.

INTRODUCTION

As detailed in Chapter 1, the Snowy Plover was a common nesting species of LAC beaches in the early 1900's. As coastal development increased, their habitat was altered, foraging resources removed, and they were increasingly disturbed by human-related activities on the sandy beaches. The last known nest was documented in 1949 and while there are indications that occasional nesting may occur undetected, without adequate protections, these nests are likely to fail due to regular beach grooming, off-leash dogs, non-native and native predators attracted to the beach in atypical numbers by human activities and waste, removal of foraging habitat (kelp & related arthropods) and trampling by beachgoers unaware of their presence.

Currently, a substantial portion of the Pacific Coast population of Snowy Plovers spends the non-breeding season roosting and foraging on LAC Beaches (Chapter 1). The USFWS has provided protection for these birds through the designation of the population as Threatened (USFWS 1993), designation of Critical Habitat (USFWS 2005) and the creation of a Recovery Plan (USFWS 2007). The CDFG just reaffirmed their need for protective status by naming them a California Bird Species of Special Concern (Shuford and Gardali 2008). Despite its listed status, the Snowy Plover has continued to struggle since 2004 in California: the population has fluctuated between 3205 and 4522 wintering individuals, with a declining trend since 2006 (USFWS Unpubl. data). Similarly, the number of breeding individuals in California has declined since 2005 despite protections of designated critical habitat and a recovery plan. Locally, within Recovery Unit 6 (LA, Orange and San Diego Counties), wintering numbers have remained relatively stable since 2004, declining steeply from 2006 to 2008, but showing recovery in 2009. Number of breeding individuals has also remained stable at 200-300 individuals in most years. However, this is well below the recovery goal of 500 breeding individuals.

Under the existing lack of Snowy Plover management, there are no known breeding individuals and the wintering population has shown a 41% decline since 2006. Despite increased awareness by beach managers, we have continued to detect likely vehicle strikes on other bird species and regular, chronic disturbances from beach grooming equipment, berm construction projects, sand replenishment projects, maintenance projects, construction projects, lifeguard and service vehicles, off-leash dogs, native and non-native predators, and pedestrians; removal of roosting and nesting scrapes that provide protection from the elements and predators; flushing of resting plovers; as well as the regular removal of foraging resources by beach grooming equipment. We suggest that many of these threats are in violation of State and Federal Laws protecting the plovers, but through changes in public education and management practices impacts could be avoided or minimized.

Our goal here is to discuss existing protections and current threats to the plovers and to make recommendations for minimizing those threats through education of the public and agency staff and changes in beach management practices. We also acknowledge that these beaches are important recreational and economic resources. Our ultimate goal is to obtain protection for the Snowy Plover while avoiding impacts to the recreational resources of the general public. We

suggest that through protections for plovers there will be an umbrella effect on other sandy beach wildlife. We hope this will increase the enjoyment and recreational opportunities for the public by improving opportunities to view wildlife close to our urban areas.

REGULATORY ISSUES

Federal Laws

The Snowy Plover is protected by the Federal Endangered Species Act. Section 9 of the Endangered Species Act of 1973, as amended, prohibits any person subject to the jurisdiction of the United States from taking (i.e., harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting) listed wildlife species. “Harm” is a significant habitat modification or degradation that results in the killing or injury of wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. “Harassment” is the intentional or negligent act or omission 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. The Snowy Plover is also protected by the Migratory Bird Treaty Act, which prevents the destruction of nests, eggs, chicks or adults.

State Laws.

The Snowy Plover is considered a Bird Species of Special Concern and its protection is given a high priority. Impacts must be considered in any evaluation in support of California Environmental Quality Act (CEQA) documents. It is provided protections under several sections of California Code of Regulations and California Fish and Game Code. The California Code of Regulations, Title 14, Ch.1, Section 251.1 (CA Code T14. C1. S251.1) states,”. … no person shall harass, herd or drive any game or nongame bird or mammal or furbearing mammal. For the purposes of this section, harass is defined as an intentional act which disrupts an animal's normal behavior patterns, which includes, but is not limited to, breeding, feeding or sheltering. This section does not apply to a landowner or tenant who drives or herds birds or mammals for the purpose of preventing damage to private or public property, including aquaculture and agriculture crops.” Their nests and nest scrapes are protected by nest protections pursuant to Fish and Game Code 3503, which prevents the destruction of the nest, eggs or chicks of protected species.

Critical Habitat.

Currently, the USFWS lists five beaches in Los Angeles County as critical habitat for the Snowy Plover (USFWS 2005). Critical Habitat refers to specific areas within the greater geographic area occupied by a species, at the time it is listed in accordance with the ESA, which contain physical or biological features essential to the conservation of the species and may require special management consideration or protection. Specific areas outside the geographic area occupied by a species at the time it is listed, but which are determined to be essential for the conservation of the species, are also considered critical habitat. The final critical habitat designations (see Definitions) by USFWS (2005) indicated that projects or management activities that cause, induce, or increase disturbance on beaches could impact the Western Snowy Plover. Such

activities include recreation, beach cleaning, and shoreline erosion control projects. They include portions of Zuma, Santa Monica, Dockweiler and Hermosa Beaches. The main plover roosts (see Chapter 1) are located within areas designated as Critical Habitat at Zuma, Santa Monica, and DSB LT47. These beaches are also protected as wintering habitat (USFWS 2005). Roosts at Malibu, DSB LT58, Hermosa Beach, and Cabrillo Beach are not within areas designated as Critical Habitat.

Recovery Plan.

The Western Snowy Plover (Charadrius alexandrinus nivosus) Pacific Coast Population Recovery Plan (Recovery Plan) was produced by the USFWS (2007), the goals of the plan were: (1) maintain 3,000 breeding adults, with a goal of 500 breeding adults in Los Angeles, Orange, and San Diego Counties, combined; (2) monitor and research site-specific threats to Snowy Plover populations in order to create site-specific management plans; (3) maintain an average of at least one fledged chick per male in the last five years prior to delisting; and (4) develop and implement mechanisms to assure long-term protection and management of breeding, wintering, and migration areas in order to maintain the subpopulation sizes and average productivity specified above (USFWS 2007). Appendix J of the proposed recovery plan (USFWS 2001) was the basis for the monitoring methods used in this project.

The Recovery Plan (2007) provides recovery actions that need to be taken in order to recover and ultimately delist the Snowy Plover. We suggest that the following recovery actions provided by the USFWS are among the most important to the protection and recovery within LAC:

- Prevent disturbance of breeding and wintering western Snowy Plovers by people and animals (Sec. 2.3, pg 167).
- Implement and enforce pet restrictions (Sec. 2.3.2, pg 171).
- Annually review existing recreational activities at breeding and wintering sites listed in Appendix C and develop and implement plans to prevent disturbance from disruptive recreational activities where western Snowy Plovers are present (Sec. 2.3.3, pg 172).
- Prevent disturbance, mortality, and habitat degradation by prohibiting or restricting off-road vehicles, including beach-raking machines (Sec. 2.3.5, pg 173).
- Determine enforcement needs for western Snowy Plover breeding and wintering sites and provide sufficient wardens, agents or officers to enforce protective measures in breeding and wintering habitat (Sec. 2.3.8.1, pg 175)
- Prevent excessive predation for western Snowy Plovers (Sec. 2.4, pg 178)
- Manage litter and garbage and its removal to minimize attracting predators on western Snowy Plover habitat (Sec 2.4.1, pg 179)
- Develop and implement habitat conservation plans or other management plans for western Snowy Plovers breeding and wintering sites owned or managed by local governments and private landowners (Sec 3.4, pg 192).
- Undertake public information and education programs (Sec 5, pg 204).

Within RU-6, the plan states that the Snowy Plovers have lost significant habitat through development and recreational use and, as a result, their populations have dispersed. It was suggested that the management of some practices, such as beach raking, could allow for additional habitat within the unit. We concur that the heavily impacted beaches of Orange and

Los Angeles Counties provide large areas of unused potential nesting habitat and the plovers' use of these beaches are the most likely way to meet this goal.

Despite the protections provided by state and federal laws and designation of critical habitat, there are significant regulatory concerns over many activities that are currently allowed by the beach management agencies and that their continuation may constitute harassment and have the potential for take in violation of State Regulations and Federal Laws, including the Federal Endangered Species Act.

CURRENT PRIMARY THREATS

As the results of field observations, literature review, and meetings with regulatory agencies, local beach management agencies, conservation groups, regional experts, we have identified several main threats to the Snowy Plover of LAC beaches.

Lack of Public Awareness.

During the course of surveys, project biologists and volunteers had numerous informal interactions with employees of different agencies that work and drive on the beach and members of the general public. Many agency employees were aware that Snowy Plovers were present, but often confused them with the similar Sanderling (*Calidris alba*). There were several knowledgeable lifeguards and LABH employees who kept close track of the flocks, but most commented to us that they wanted the roosts marked so that they could avoid driving through them. Most commented that they wanted to do the right thing, but even after three years of the program they still did not have sufficient information about their location or how to minimize their impacts to the Snowy Plover.

Most members of the general public were completely unaware of the presence of the Threatened Snowy Plover on the beach. During most interactions, the public took an interest in learning more about the birds. Most dog owners who were running their dogs on the beach were completely unaware that there were sensitive birds in the area and reacted positively when approached. Most were aware that there are leash laws and that they were not supposed to have their dogs on the beach, much less off-leash.

Sand Grooming/Beach Raking.

For many years, LABH operators have groomed/raked occupied roosts, flushing plovers, removing roosting and nesting scrapes, and removing the kelp and arthropods on which the plovers forage. This has been observed at roosts at Zuma, Santa Monica, Dockweiler and Hermosa Beaches. Other researchers have concluded that even if human activity was low, that grooming activities completely preclude the possibility of successful Western Snowy Plover nesting (Powell 1996).

We suggest that this activity may violate the Federal Endangered Species Act in that it removes their primary food source, arthropods that break down kelp from the beach, making this resource unavailable to the plovers. We suggest that this may constitute "harm" to the Snowy Plover under the Federal Endangered Species Act (see definition below). In the case of the closely

related piping plover on the east coast, the USFWS guidelines (http://www.fws.gov/northeast/pipingplover/recguide.html) (guidelines) for the species state, “Vehicles may also significantly degrade piping plover habitat or disrupt normal behavior patterns. They may harm or harass [piping] plovers by crushing wrack into the sand and making it unavailable as cover or a foraging substrate, by creating ruts that may trap or impede movements of chicks, and by preventing plovers from using habitat that is otherwise suitable (MacIvor 1990, Strauss 1990, Hoopes et al. 1992, Goldin 1993)." We suggest that the outright removal of wrack also makes it unavailable as cover or foraging substrate.

Additionally, driving the plovers from their primary roosting area forces them to fly and/or run from areas where they have hidden. 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 birds of prey. Among the species noted by our observers as occurring on beaches in LAC are the Cooper’s hawk (*Accipiter cooperii*), peregrine falcon (*Falco peregrinus*), American kestrel (*Falco sparverius*), wintering sharp-shinned hawk (*Accipiter striatus*), and wintering Merlin (*Falco columbarius*). We suggest that this may constitute “harm” to the Snowy Plover under the Federal Endangered Species Act.

Finally, the equipment itself has the potential for striking an adult Snowy Plover and removing any eggs that they may attempt to lay. We suggest that this may constitute “take” under the Federal Endangered Species Act (see definition below). Again, the USFWS guidelines state, “In Massachusetts and New York, biologists documented 14 incidents in which 18 chicks and 2 adults were killed by vehicles between 1989 and 1993 (Melvin et al. 1994)."

The USFWS recovery plan (USFWS 2007) specifically states that, “the indiscriminate nature of mechanized beach-cleaning adversely affects western Snowy Plovers and their habitat.” Among the dangers noted in the Recovery Plan are crushing of eggs and chicks, prolonged disturbance by noise, removal of feeding habitat, reduced availability of food, alteration of topography, removal of objects associated with nesting, and removal of vegetation.

We suggest that this may also violate CA Code T14. C1. S251.1. The Snowy Plovers are known to return to the same locations on the same beaches each year, where they create scrapes that provide shelter, and forage on arthropods associated with kelp and dune vegetation. We suggest beach grooming may be considered to regularly harass these plovers and drive them from created shelters under a variety of conditions, including in the presence of predators such as raptors and dogs. It also removes foraging materials from these known areas of Snowy Plover occupancy. We suggest that these actions disrupt the Snowy Plovers normal behavior patterns of feeding and sheltering at these sites.

Vehicles Driving on Beaches

Observers have reported vehicles driving through plover roosts at speeds that they estimate to be above the standard policy of 10 mph. Aside from being a violation of stated policy and a danger to the public, beach driving at excessive speeds increases the likelihood of striking a Snowy Plover, or other bird protected by state and federal laws (including most shorebirds and gulls). We documented conclusively that a Snowy Plover was struck and killed on Zuma Beach in

January 2007. We found a black-bellied plover dead in a vehicle track on March 17, 2009 and received a report of another black-bellied plover struck by a vehicle and taken to wildlife rehabilitators (Chapter 1). Six plovers have been struck at Oceano Dunes by vehicles between 2002 and 2008 (Page et al. 2009). In addition to vehicle strikes, vehicles operated on the beach cause similar disturbance as beach grooming vehicles noted above. However, most vehicles observed on the beach are pick-up trucks and SUV. These vehicles are smaller, faster, and quieter than the large tractors used to pull beach-cleaning equipment. They have a greater likelihood of striking a plover. They also flush Snowy Plovers from roosting areas, destroy roosting and nesting scrapes, and crush and remove foraging resources as discussed above. As such, they may also be likely to violate the same federal and state laws as discussed above.

Temporary Beach Construction Projects.

A variety of temporary construction projects including building protective berms, beach replenishment and building new structures occur on Los Angeles County Beaches regularly. Heavy equipment and related construction vehicles used as part of these projects create many of the same potential impacts as the on-going beach maintenance and driving (see above). Additionally, the effects of moving sand and burying kelp and wrack is likely detrimental to the Snowy Plover's foraging resources. The impacts of the importation of sand dredged from nearby channels and offshore locations on foraging resources and as a substrate (color, texture, etc.) is poorly known. It is not known if berm creation may increase the potential for predation by blocking the view of Snowy Plovers and creating high points from which avian predators could hunt. As part of these projects, both the Army Corps of Engineers and the California Coastal Commission have required that the Snowy Plovers not be impacted and have requested monitors to ensure this is followed. However, monitors have reported that while project-related personnel have successfully avoided Snowy Plovers, they regularly observe vehicles, beach grooming equipment, off-leash dogs and joggers flushing the Snowy Plovers that they are monitoring (D. Cooper and R. Hamilton pers. comm.).

Dogs

Off leash dogs were a common observation on most beaches, particularly early in the morning before and in the evening after lifeguard patrols had taken place. They were also common throughout the day and we frequently observed police patrols and lifeguard patrols ignoring them. Dogs have the ability to capture and injure or kill Snowy Plovers. An off-leash dog captured a Snowy Plover in August 2009 at nearby Surfside Beach in nearby Orange County (Ryan and Hamilton 2009). Fast running dogs are capable of capturing and killing Snowy Plovers. Dogs also have sensitive noses and are capable of finding and destroying eggs of any nesting birds. Most beaches in LAC prohibit dogs, but enforcement agencies rarely enforce these rules, and these regulations are commonly ignored by the public. Most members of the public do not realize that their animals are a threat to Snowy Plovers, or that Snowy Plovers are present on the beaches. We suggest that public education, coupled with increased enforcement would help.

Predators

There are a variety of potential predators of the Snowy Plover that occur on LAC beaches. Some are not native to the area, such as feral dogs, feral cats, and red fox. Others are native, but occur in atypically large numbers, or are not normally found on sandy beaches, but are drawn here by human refuse, structures, or other human activities. These include American crow, common raven, gulls, raccoon, striped skunk, and opossum. Other predators, including birds of prey, are native predators that likely preyed on Snowy Plovers in similar numbers to which they occur now, but flushing of plovers could make them more vulnerable to these natural predators. Snowy Plovers would be particularly vulnerable to these predators if they were to nest on LAC beaches.

Recreational and Public Events.

Occasionally, large public events are held on beaches at or near plover roosts. This happened at Zuma in 2009 during a fundraiser for the Special Olympics. Large numbers of people at or immediately adjacent to a Snowy Plover roost would likely cause at least the temporary abandonment of the roost and increase exposure to predators. These events also would likely increase the number of support vehicles patrolling the area and necessitate clean-up, likely involving heavy equipment.

RECOMMENDATIONS

We suggest if the following recommendations were implemented, the goal of protecting the current wintering populations would be accomplished. An additional benefit maybe the return of breeding Snowy Plovers as was seen at Coal Oil Point when similar recommendations were adopted.

General Roost Protection

Based on findings in this report (Chapter 2) and Lafferty (2001) we suggest that local beach management agencies consider protecting areas approximately 70-75 m wide and 275-320 m long and approximately 0.9 ha (2.2 ac) between when the Snowy Plovers return in July and depart in April. We suggest that the placement of a protected area take into consideration the following:

1. The local geographic features. This is especially important at Malibu Lagoon, where the shape and position of the sandy peninsula changes both between and within years.
2. Human beach use patterns. They should attempt to minimize disturbance to beach access, access to lifeguard towers and other fixed structures such as bathrooms and parking lots.
3. Fencing type. We suggest that less invasive fencings such as symbolic fencing, be used in conjunction with signage to inform people of Snowy Plover roosting areas and appropriate behaviors around them.
4. The location occupied by the Snowy Plovers. The protected area should be somewhat flexible to the area selected by the Snowy Plovers each year, and able to be moved based on seasonal shifts.
5. Surrounding uses. In areas where off-leash dog use is prevalent, special recreational events with large crowds, construction activities, or use of heavy equipment for beach replenishment is being used managers should consider enlarging the buffer area.

6. Access to foraging resources. Kelp that washes ashore in front of or adjacent to the enclosure should not be removed. Additional studies should be made of foraging resources near protected areas.

Additionally, we suggest than an entire protected area does not require fencing and the exclusion of the public. Beach management personnel may work with local Snowy Plover experts to determine current high roosting use areas and employ symbolic fencing at the most sensitive areas, then educate beach drivers, groomers, dog walkers, and beach goers about the rest of the area. We recommend that throughout the protected areas:

1. Vehicles should avoid driving through plover protected/roosting areas unless there is an emergency situation.
2. Unless there is an emergency, maintain a 10 mph speed limit and remain vigilant.
3. Dog regulations be enforced, first using public education, then applicable law enforcement tools.
4. Beach grooming be avoided unless necessary, if necessary within the protected area, it be conducted by hand crews, or with a biological monitor present. When conducted using tractors and heavy machinery, they should follow recommendations made in "Temporary Construction Projects," below.
5. Drivers of vehicles and machinery are trained in Snowy Plover avoidance.
6. Signage is placed at public access points explaining the need for protections.
7. A docent program be implemented to help explain the need for protections and to provide viewing opportunities of the Snowy Plovers for the public.

When deployed, we recommend that fencing around the most sensitive areas be at least 30 m wide and 90 m long and placed within an overall protected area. We recommend the use of symbolic fencing because it is inexpensive, easy to put up and take down, easy to repair, and easy to move. It should be placed around an area most frequently used by the flock when they are not disturbed; this may change during the course of the non-breeding season and should be monitored regularly to ensure it is placed correctly. We recommend that it include signage placed at regular intervals to explain about the Snowy Plovers and the need for fencing to the public.

Lack of Public Awareness

We recommend the creation of a docent program that educates the general public using beaches where the six largest roosts occur. They should be able to provide information to the general public, aid in the public's enjoyment of the Snowy Plovers, and answer questions about the Snowy Plovers. These docents may also provide educational programs at beach facilities including education centers, aquariums, campgrounds, and private clubs, as well as for homeowners associations, local schools, and community groups. We recommend the use of the existing website to provide information on the Snowy Plovers.

Sand Grooming/Beach Raking.

Several of the problems associated with beach grooming, such as removal of roosting and foraging scrapes and flushing of plovers, would be remedied by following the General Roost Protective Measures described above. As part of regular beach maintenance and daily grooming large amounts of natural kelp are removed along with trash. It has been documented that removal of kelp removes the associated arthropods that provide food for Snowy Plovers and is associated with lower numbers of Snowy Plovers (Dugan et al. 2003). We recommend that with the exception of unusually large storm events, that kelp not be removed from the protected areas described above, and preferably areas where Snowy Plovers have been documented (Appendix A) and maintain as large a buffer around them as is practical. We still do not have complete information on foraging times and locations of the Snowy Plovers on LAC beaches (see Future Research and Monitoring Needs, below). Pending the outcome of that study, we may modify this recommendation to include other foraging areas. We further suggest that beach management agencies review the need for beach grooming and review the frequency that it needs to occur at all beaches in LAC. We recommend reducing the frequency and using hand-crews when possible.

Vehicles Driving on Beaches

We recommend that all drivers operating vehicles on the beach be provided with training that includes the location of Snowy Plover roosts and minimization measures when they are in the vicinity of those roosts. They should also be provided with the flier in Appendix D showing locations of roosts and reminders of minimization measures. Roosts should be clearly marked and include educational signage together with barriers or symbolic fencing around the plovers' main roosting areas. Within these protected areas, vehicles should not be driven unless absolutely necessary. Near roosts/protected areas, vehicle speed should be limited to 10 mph in non-emergency situations and drivers should either drive inland, avoiding the roost/protected area, or in the case of patrols that need to remain at the water's edge, they should remain within the tracks of previous vehicles, moving at a slow speed and watching for Snowy Plovers within those tracks. Ideally, roosting areas should be marked with signage, enclosures or some other means to alert drivers.

Temporary Beach Construction Projects

As part of recent projects permitting agencies have required avoidance of roosting and feeding Snowy Plovers by work crews and equipment and the presence of a qualified monitor to ensure that crews are aware of the presence of Snowy Plovers and avoidance measures are followed. This appears to be effective. We recommend the following procedures be followed.

Pre-project Identification and Protections of Snowy Plover Nesting, Roosting and Foraging Areas. Project biologists and agency staff should contact our project staff in advance of planned projects to determine where annual Snowy Plovers roosts occur on a particular beach. If possible, they should then survey the proposed work area several times during the prior nesting season and wintering season to determine up-to-date locations of plovers. This should include mapping the extent of the beach used by the Snowy Plovers on each visit. They should then visit the site on 3–5 days prior to work activities to determine the location of roosting locations. For projects with

less lead time, or emergency situations, they should try to do just the latter, or, at minimum, visit the project site the day or morning before work begins.

They 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 protected areas. The project staff and the biologist should then create a plan for avoiding protected areas. This should include routing pipelines, storage areas, staging areas, vehicle transit routes, and other project activities that must occur on a daily basis around protected areas. Protected areas should then be marked using symbolic fencing, wood drift fencing, or silt fencing 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.

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

On days when crews need to work in protected areas, biological monitors should be present. 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 in 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. 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.

Dogs

There are existing laws that prohibit dogs on the beach. Currently, these are rarely enforced and mostly ignored. We recommend that a greater effort be made to minimize the potential for disturbance and predation near known roosts. We suggest initially focusing efforts at the six main roosting areas. We recommend that agencies work with LA Audubon docents to educate

the local homeowners, campers, and other beach goers about the plovers and existing dog regulations. They should also contact the local homeowners' associations and dog groups to provide educational information. We recommend providing them with the locations of off-leash dog parks in their area and partnering with them to support off-leash dog parks in areas away from sensitive wildlife resources. If this is unsuccessful in reducing the daily harassment of the Snowy Plovers at a particular beach, a regular effort to cite dog owners that ignore existing regulations near regular Snowy Plover roosting sites. Additionally, areas designated for off-leash dogs should only be considered in locations as far from Snowy Plover roosting areas as possible or in areas unsuitable for Snowy Plovers.

Predators

We recommend that efforts be made on the beach and adjacent communities to reduce refuse and food available to predators. These efforts should include covers for trashcans on the beach and in adjacent communities; educational efforts in the local communities to cover trashcans and keep pet food inside; and if needed, predator control near roosting areas. If nests are detected, they should be protected from the large numbers of American Crow and Common Raven using enclosures that should be deployed upon detection. Feral cat feeding stations near Snowy Plover roosts should be removed and sterilized cats should not be released in the vicinity of roosting areas. Efforts should be made to avoid frequent flushing of plovers from their roosting areas.

Recreational Events

Recreational events that attract large crowds regularly occur on beaches with Snowy Plover roosts. We recommend that the agencies that provide permits for these events consult the maps provided in this report (Appendix A). If large events are planned at or near known roost sites, we recommend that permitting staff work with the event sponsor to look for an alternative location. If that is not possible, they should provide as large a buffer as possible with temporary markers (cones, symbolic fencing, etc.) between the event and the roost. For large events, a qualified monitor should be present to assist event staff in avoiding impacts to the Snowy Plovers. These are also good opportunities for public education and volunteer docents could work with the monitor and event staff to provide information to the participants and spectators.

Management Plan

We recommend the creation of a Snowy Plover Management Plan for Los Angeles County. Both the project team and the Working Group recommend that the USFWS begin discussion with the Project Team and beach management agencies to create a Los Angeles County Snowy Plover Management Plan. This plan should contain elements to protect existing winter roosting areas, including adjacent foraging resources, as well as make provisions for potential nesting. It should provide a) beach managers with detailed information on the location of Snowy Plover roosts and nests; b) general recommendations for avoiding harming or taking Snowy Plovers, their nests, eggs, or chicks; c) specific Best Management Procedures (BMP's) for regular maintenance and patrol activities near each roost/nesting areas; d) outline an ongoing monitoring and management program for the roosting and nesting Snowy Plovers; and e) provide specific goals for the recovery of the Snowy Plover in the LAC portion of Recovery Unit 6. As part of this process,

on-going beach maintenance activities in suitable Snowy Plover habitat should be reviewed and alternatives investigated; additional protections for the Snowy Plover should also be reviewed. In addition, the Plan should provide for protections from incidental take by maintenance and recreational activities. We recommend that interested elements meet as soon as possible to begin outlining this plan.

Communication among Agencies

We recommend at least biannual meetings among conservation groups, researchers, wildlife agencies and beach management agencies to address Snowy Plover issues, work on a management plan and update efforts made to minimize impacts to Snowy Plovers. We recommend a field visit to the roosts each year for new agency staff. In addition, we recommend the continuation of the annual Los Angeles County Snowy Plover Management Meeting among all interested groups.

Future Research and Monitoring Needs

Little is known about many aspects of the biology of the wintering Snowy Plovers in LAC. Among questions that need to be answered with additional research are:

- Where and when are they foraging, and what are their main prey items?
- What are the main sources of disturbance, what are their reactions to difference disturbances, at what distance, for how long are they disturbed, does it lead to mortality?
- Are they nesting or attempting to nest in LAC?
- What other wildlife resources occur on LAC beaches, and how could they benefit from protections provided to the Snowy Plover?

In addition to these research questions, we suggest that there is value in on-going monitoring. Regionally, the USFWS conducts both winter and breeding window surveys within the range of the Pacific Coast population. These should be continued. In addition, regular monitoring of main roosts at key times in the fall, winter and spring will continue to provide tools for monitoring the local population and detecting any positive or negative responses to the implementation of these recommendations, and well as, detecting events that may lead to population increases or decreases.

Nest searching and protection

We recommend that permitted biologists search areas where Snowy Plovers are detected during countywide surveys in February - May for signs of nesting Snowy Plovers. If detected, nests should be monitored weekly and, if needed, additional protective fencing should be provided under the supervision of CDFG and USFWS. The permitted biologists should work closely with beach managers and agency staff to protect and monitor nests. If a nest is discovered in an area where disturbance or predation are a problem, a nest exclosure consisting of 2-inch x 4-inch welded wire mesh, forming a cube 20 inches on a side (Photograph 6), may be anchored over the nest and left in place until the eggs hatch and young depart the nest (Fancher et al. 2005).

CHAPTER 4. EDUCATION & OUTREACH.

INTRODUCTION

Public awareness of and support for Snowy Plover conservation in Los Angeles County is essential to species recovery. During both the 2007 and 2008 meetings of the Los Angeles County Snowy Plover Working Group a large part of the dialogue centered on how to combat lack of public awareness. Over the course of this 3-year study the project team has taken a varied approach to addressing the concerns and recommendations about education and outreach.

Volunteer participation in the Snowy Plover monitoring program

From 2007-2009, 203 individuals volunteered to monitor plovers in Los Angeles County, contributing a total of 1,681 hours to the project (Table 8). Of these volunteers, 42 (21%) volunteered for multiple years of the study. The surge in volunteers we experienced in 2008 and 2009 was a direct result of targeted public outreach and education.

Table 8. Number of volunteers participating in Snowy Plover monitoring and volunteer hours contributed, 2007-2009.

	2007	**2008**	**2009**
Number of Volunteers	37	74	158
Number of volunteer Hours	430	569	682

Formal Docent Program

The project team secured funding in 2008 to develop a Snowy Plover docent program, and brochures aimed at the general public have been created (Appendix F). The project team is currently working with LACBH to obtain permits to conduct a formalized docent program on county beaches, specifically at known roost sites with seasonal enclosures. Through outreach activities, we have worked to establish community connections that will provide volunteers for both data collection and docent activities. Binoculars and docent materials (Appendix G) have been purchased in anticipation of a permitted docent program and have already been used in the newly established school outreach program (see below). In addition, the project team has initiated collaboration with Heal The Bay in an effort to integrate Snowy Plover conservation into a broader ecological context for a wider audience.

School Outreach Program

For the purposes of education regarding plover conservation and to draw new volunteers to the monitoring and docent programs, the project team conducted considerable outreach to colleges and universities in 2008 and 2009 (Table 9). In particular, we worked closely with professors from Los Angeles Valley and Santa Monica Colleges to do a series of classroom presentations followed by opportunities for students to volunteer as monitors with the direct guidance of a project biologist. As a result, over 500 students attended Snowy Plover conservation presentations and over 80 students from these colleges as well as UCLA, Pepperdine University, Pomona College, Loyola Marymount University, California State University Dominguez Hills, Girl Scouts, Urban Semillas, and Dorsey High School have served as plover monitors. In late

2009, the project team established a connection with UCLA's Center for Community Learning, and select students are slated to receive university credit for serving as monitors and docents during the Winter 2010 Quarter.

In addition to colleges and universities, the project team has also initiated relationships with local public schools, and we have developed classroom and fieldtrip materials (Appendix H) adhering to California State Science Education Standards. In August of 2009, we worked with teachers attending a professional development session at Marina del Rey Middle School to give them background on Snowy Plover conservation and describe ways that their classes could get involved in monitoring activities. The project team is currently working with the Resource Conservation District of the Santa Monica Mountains and the Dockweiler Youth Center to integrate our educational materials into their existing youth programs. We are also exploring multidisciplinary ways to engage young, inner-city students in plover conservation. In late 2009 we secured funding for a Snowy Plover art contest scheduled for spring 2010: 60-70 inner-city Los Angeles students from Leo Politi and Weemes Elementary Schools will learn about plovers in the classroom, visit plover habitat, and then create artwork pertaining to plover conservation. Artwork will be judged by Dorsey High School students, and top designs will be used as signs at plover enclosures.

Table 9. Outreach and education events conducted in 2008 and 2009, including presentations and opportunities for groups to participate in plover surveys led by a project biologist.

Activity	Date	Location	Demographic	No. Attending
Classroom presentations	3 Mar 2008	Dorsey High School	Inner-city high school students	12
	17 Sept 2008	Loyola Marymount University	University students	30
	24 Sept 2008	Los Angeles Valley College	College students	80
	19 Feb 2009	Los Angeles Valley College	College students	110
	20 Feb 2009	Santa Monica College	College students	70
	18 Aug 2009	Marina del Rey Middle School	Public school teachers	15
	14 Oct 2009	Santa Monica College	College students	70
	15 Oct 2009	Los Angeles Valley College	College students	140
Biologist-led plover survey	12 Oct 2008	Dockweiler North	College students	7
	16 Nov 2008	Santa Monica North	College and inner-city high school students	20
	7 Dec 2008	Dockweiler North	College students	12
	7 Mar 2009	Dockweiler North	College students	18
	8 Mar 2009	Dockweiler Central	College students	12

Activity	Date	Location	Demographic	No. Attending
	5 Apr 2009	Malibu Lagoon	College students	16
	17 May 2009	Zuma	College students	22
	18 Oct 2009	Zuma	College students	6
	14 Nov 2009	Zuma	College students	39
	21 Nov 2009	Venice South	College students, Girl Scouts	40
	12 Dec 2009	Malibu Lagoon	College students	38

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 1,000 views since July 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 California Assembly Karen Bass.

We have also developed a Snowy Plover conservation poster (Appendix I) for use in both classrooms and for public display. As a next step, the project team hopes to work with parks, businesses, and public aquaria in the future to create public displays.

Creation and maintenance of a website

Los Angeles Audubon currently hosts a Snowy Plover website within its general website (laaudubon.org). Volunteer materials, annual reports, updates, and maps of plover locations from volunteer observations are available to the public and management agencies.

Create signage for the winter and breeding season fencing.

The project team secured funding for the creation of signage for the enclosure at Dockweiler North. Signs have been printed, and we hope to install them in 2010 once permits have been approved through LACBH.

Create and implement a beach driver-training program.

The project team created an informational handout (Appendix D) to be provided to all lifeguards and included in their training program. It covers information about identifying, detecting and avoiding Snowy Plovers and provides maps to the plover roosting areas. This was also provided to LACBH for inclusion in their training program. The project team has offered to provide presentations to both groups upon request.

Recommendations for future education and outreach:

- Work towards sustainability in docent and outreach programs. Of course expansion to public schools and interested groups throughout Los Angeles County is an ultimate goal. However, the project team feels that it is extremely important that the immediate goal of the next two years be to first establish a solid, consistent training program for volunteers and develop strong, sustainable relationships with the agencies charged with managing sites where the docent program will be conducted.
- Create a questionnaire for beachgoers at sites in need of additional protections. Questionnaires should be provided to both local residents and tourists during both the winter "off season" and "peak use" summer months, inquiring about feelings on sharing the beach with plovers, types of beach use, what part of the beach is used by the public and when (time of day and time of year), and preferences for different types and placement of protections for the plover. The answers gathered should then be considered in the design and placement of protective measures, including enclosures. The project team believes that to develop a public survey with genuine scientific credence it will be important to partner with a university graduate program, such as the Bren School at U.C. Santa Barbara, to design and implement the questionnaire.
- Continue to establish organizational partnerships. In Los Angeles County, 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 Cal Parks, the Annenberg Community Beach House, the Dockweiler Youth Center, local aquaria, and Heal The Bay to develop public displays and events will help integrate Snowy Plover conservation outreach into a broader ecological context, give it a wider audience, and provide greater funding opportunities.
- Continue to establish academic partnerships. The project team should continue to find ways to integrate undergraduate students from local colleges and universities in community-based science and docent programs. In addition, securing funding to attract graduate students to the project would be an excellent way to expand the ecological and sociological aspects of the study while maintaining the core efforts of monitoring and outreach.
- Create a more interlinked volunteer community. Plover monitoring is typically not a group activity, and volunteers may go an entire year without meeting other volunteers face-to-face. Several volunteers have mentioned that they feel isolated from what's going on elsewhere along the county coastline. The project team should consider exploring ways, perhaps via the Los Angeles Audubon website, of making participants feel more connected.
- Continue to improve signage and place signage near enclosures and plover roost sites. This is needed to inform the public about the enclosures and why protecting the Snowy Plover is important.
- Create a media packet for local business and homeowner associations that operate near plover beaches. The packet should include a dvd of the public service announcement as well as resources regarding dogs on the beach and general plover conservation awareness.

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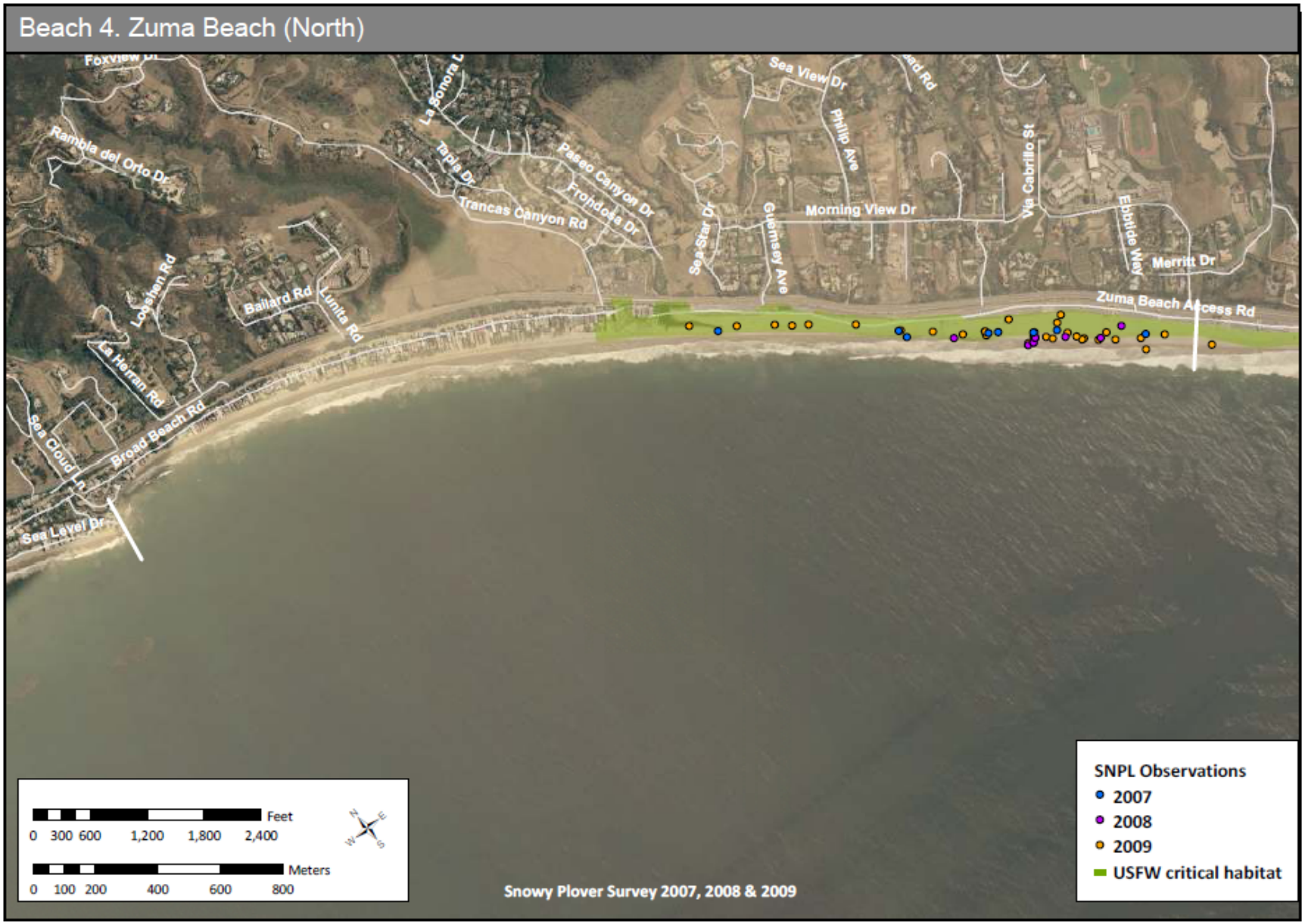
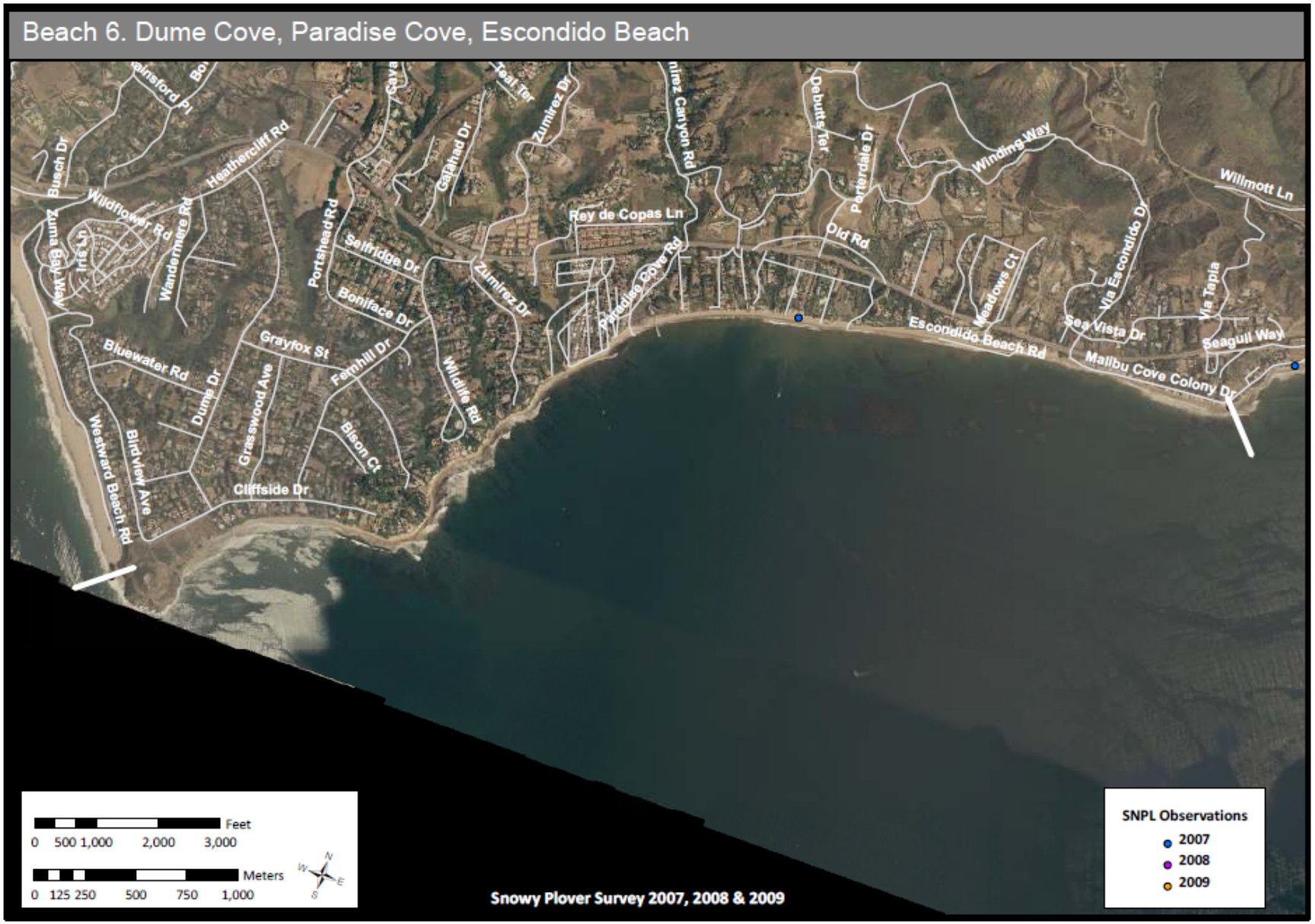
Appendix A: Maps of Snowy Plover Observations

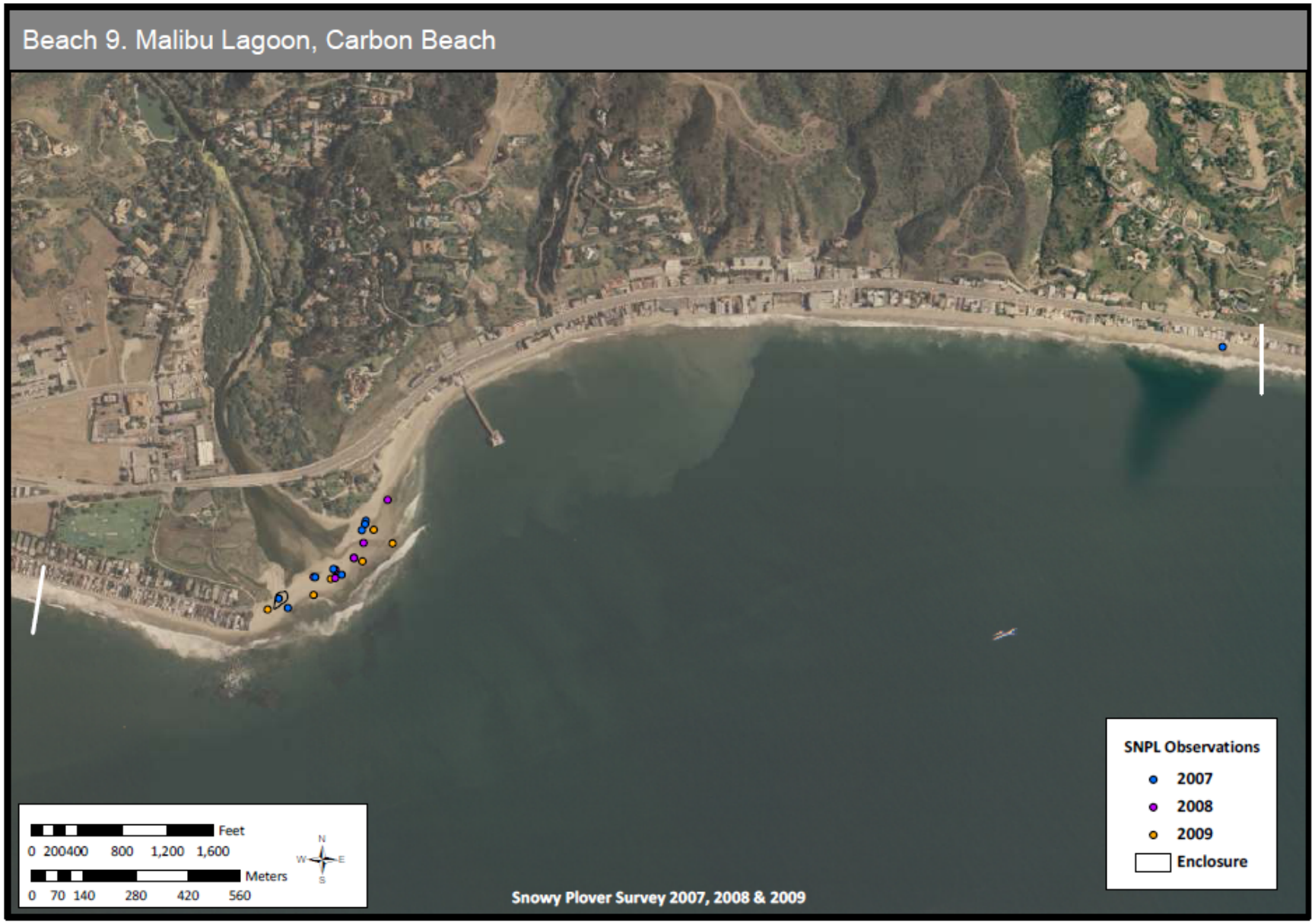

Beach 1. Leo Carillo State Beach/ Nicholas Canyon County Beach
Yellow
Yellow Hill Rd
Pacific Coast Hwy
Beach Access Rd
Nicholas Beach Rd
Feet
0 200 400 800 1,200
Meters
0 50 100 200 300 400
N
W
E
S
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009

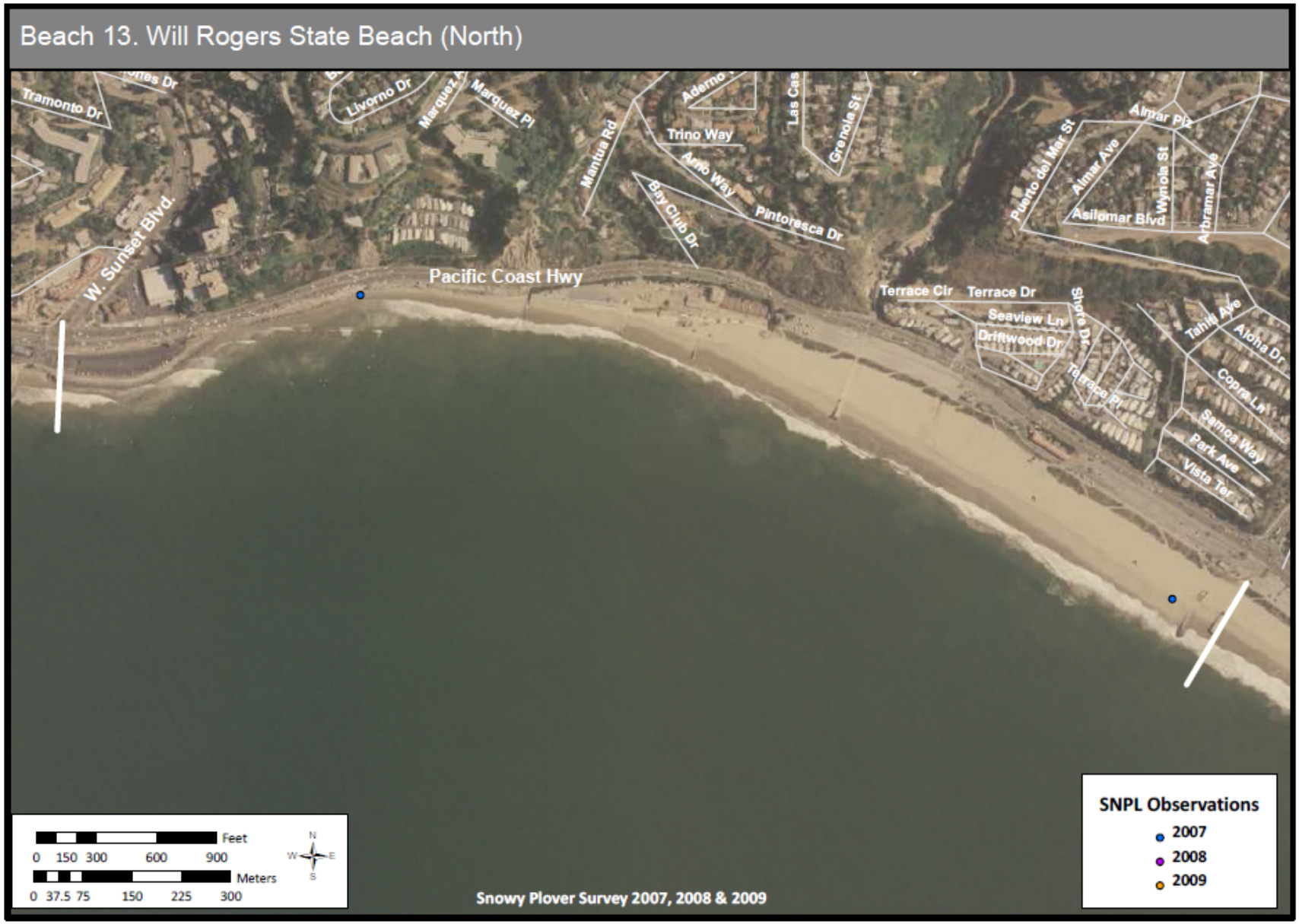

Beach 4. Zuma Beach (North)
Foxview Dr
La Sonora Dr
Rambla del Orto Dr
Tapia Dr
Paseo Canyon Dr
Trancas Canyon Rd
Frohdora Dr
Sea View Dr
Phillip Ave
Via Cabrillo St
Sea Star Dr
Guernsey Ave
Morning View Dr
Ebbtide Way
Merritt Dr
Zuma Beach Access Rd
Lobejien Rd
Ballard Rd
Lunita Rd
La Herran Rd
Broad Beach Rd
Sea Cloud Dr
Sea Level Dr
Feet
0 300 600 1,200 1,800 2,400
Meters
0 100 200 400 600 800
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009
USFW critical habitat

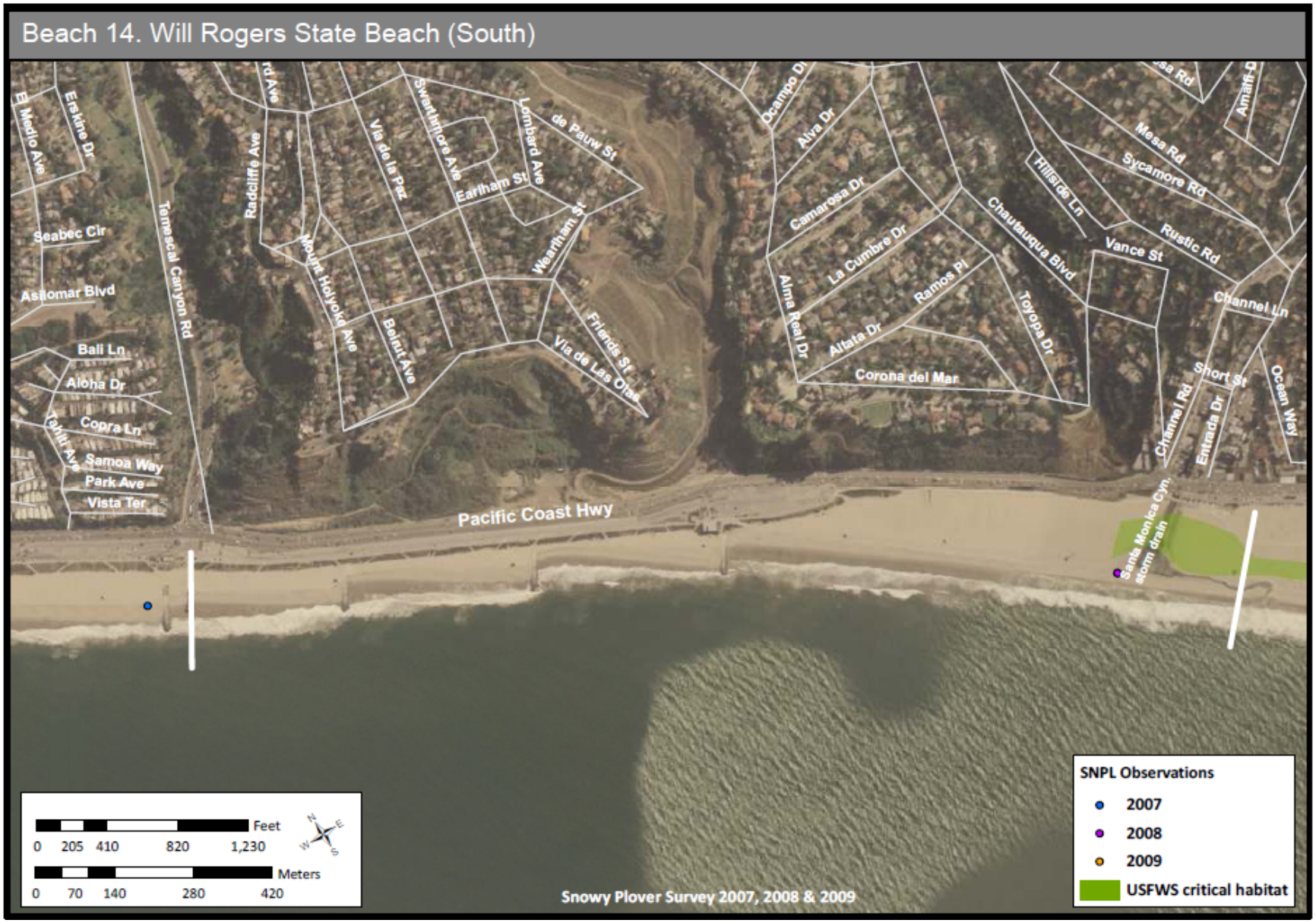

Beach 5. Zuma Beach (South)
Busch Dr
Baden Pl
Merritt Dr
Zuma Access Rd
Zuma Beach Access Rd
Zuma Bay Way
Wildflower
Sea Daisy
Iris Ln
Metate Ln
Shearwater Ln
Bluewater
Birdview Ave
Seaiion Pl
Cliffside Dr
Westward Beach Rd
Feet
0 235 470 940 1,410 1,880
Meters
0 75 150 300 450 600
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009
USFWS critical habitat


Beach 6. Dume Cove, Paradise Cove, Escondido Beach
Busch Dr
Wildflower Rd
Heathercliff Rd
Wandermere Rd
Iris Ln
Portshead Rd
Selfridge Dr
Boniface Dr
Grayfox St
Fernhill Dr
Bluewater Rd
Dume Dr
Grasswood Ave
Bison Ct
Wildlife Rd
Zumirez Dr
Rey de Copas Ln
Paradise Cove Rd
Old Rd
Meadows Ct
Escondido Beach Rd
Via Escondido Dr
Via Tapia
Sea Vista Dr
Seagull Way
Malibu Cove Colony Dr
Willmott Ln
Winding Way
Westward Beach Rd
Bird View Ave
Cliffside Dr
Feet
0 500 1,000 2,000 3,000
Meters
0 125 250 500 750 1,000
N
W
E
S
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009

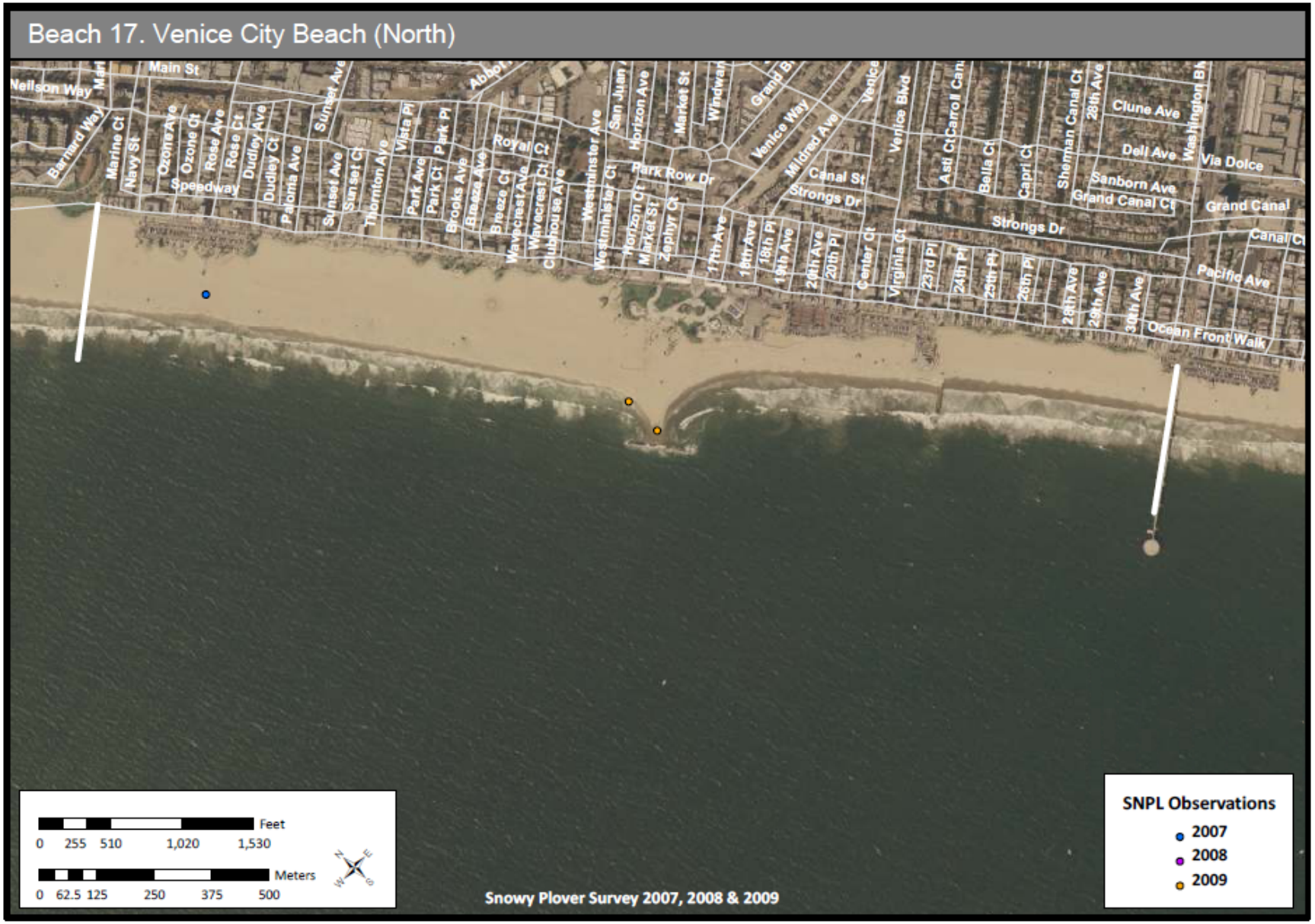

Beach 7. Dan Blocker County Beach, Puerco Beach
Solstice Canyon Rd
Willmott Ln
Corral Canyon Rd
Pacific Coast Hwy
Bayshore Dr
Malibu Rd
Seagull Way
Latigo Shore Dr
Feet
0 255 510 1,020 1,530
Meters
0 65 130 260 390 520
N
W E
S
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009

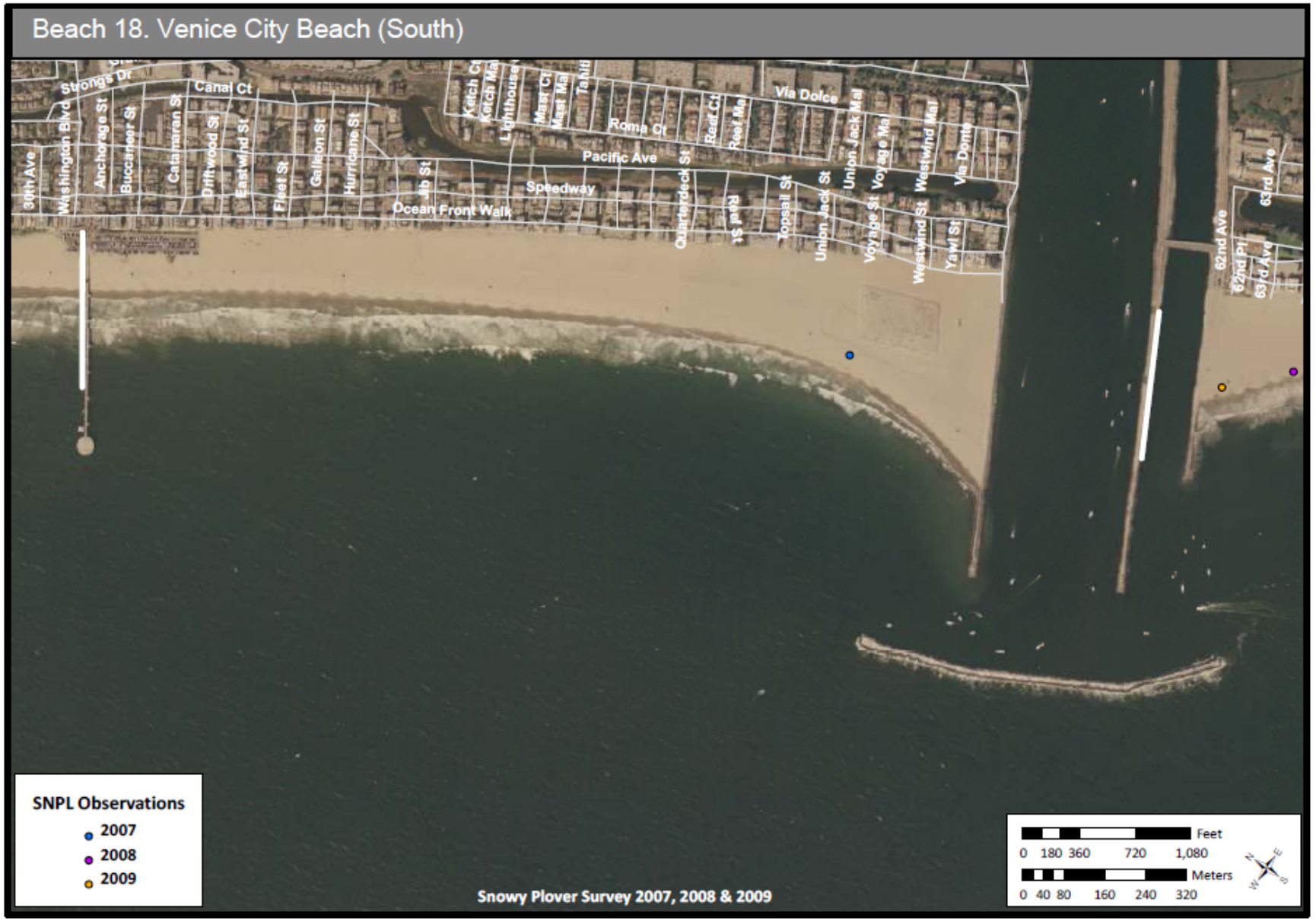

Beach 9. Malibu Lagoon, Carbon Beach
Feet
0 200400 800 1,200 1,600
Meters
0 70 140 280 420 560
N
W
E
S
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009
Enclosure


Beach 13. Will Rogers State Beach (North)
Tramonto Dr
Livorno Dr
Marquez Pl
Mantua Rd
Trino Way
Amo Way
Bay Club Dr
Pintoresca Dr
Las Casas
Grenola St
Puerto del Mar St
Almar Ave
Almar Plz
Wynola St
Asilomar Blvd
Arbramar Ave
W. Sunset Blvd.
Pacific Coast Hwy
Terrace Cir
Terrace Dr
Seaview Ln
Driftwood Dr
Shore Dr
Terrace Pl
Tahiti Ave
Aloha Dr
Copra Ln
Samoa Way
Park Ave
Vista Ter
Feet
0 150 300 600 900
Meters
0 37.5 75 150 225 300
N
W E
S
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009

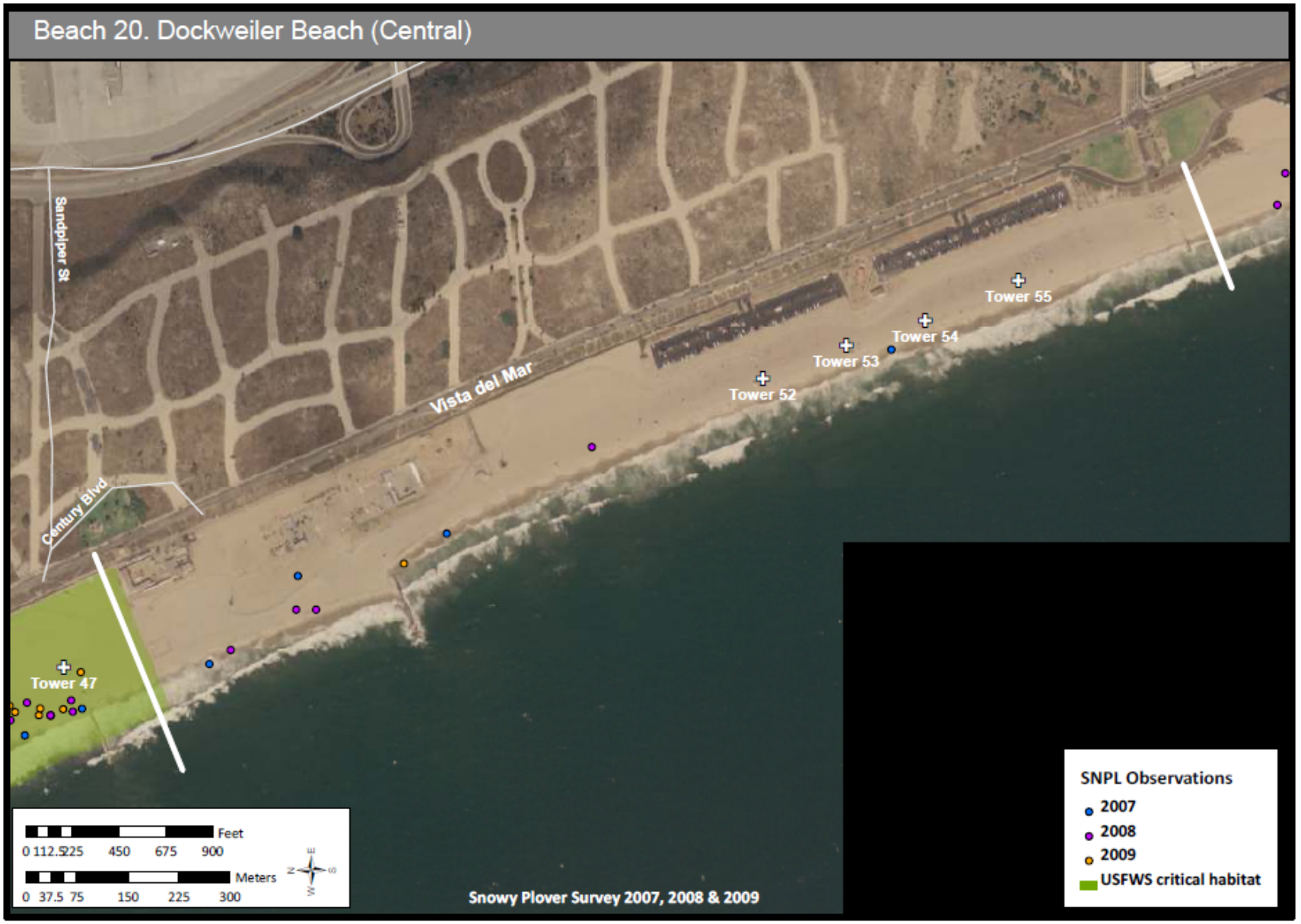

Beach 14. Will Rogers State Beach (South)
El Medio Ave
Erskine Dr
Seabec Cir
Asilomar Blvd
Bali Ln
Aloha Dr
Copra Ln
Tahiti Ave
Samoa Way
Park Ave
Vista Ter
Temescal Canyon Rd
Radcliffe Ave
Mount Holyoke Ave
Beirut Ave
Via de la Paz
Swarthmore Ave
Earlham St
Lombard Ave
de Pauw St
Wearham St
Friends St
Via de Las Olas
Ocampo Dr
Aliva Dr
Camarosa Dr
La Cumbre Dr
Alma Real Dr
Ramos Pl
Altata Dr
Toyopa Dr
Corona del Mar
Chautauqua Blvd
Hillside Ln
Vance St
Mesa Rd
Sycamore Rd
Rustic Rd
Channel Ln
Short St
Channel Rd
Entrada Dr
Ocean Way
Pacific Coast Hwy
Santa Monica Cyn. storm drain
Feet
0 205 410 820 1,230
Meters
0 70 140 280 420
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009
USFWS critical habitat

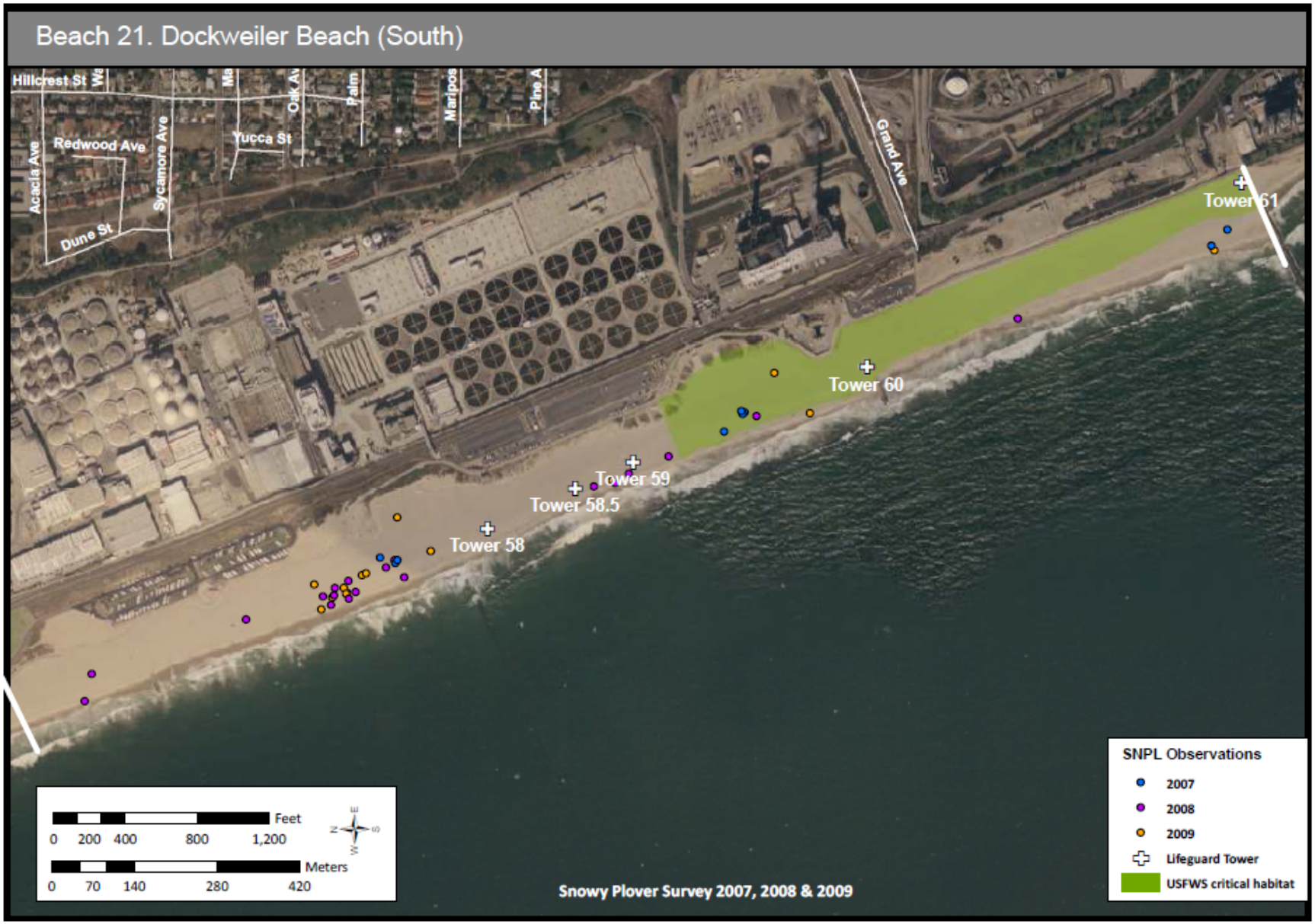

Beach 15. Santa Monica State Beach (North)
Amalfi Dr
Channel Rd
Sage Ln
Entrada Dr
Adelaide Dr
San Vicente Blvd
Georgina Ave
Marguerita Ave
Alta Ave
Palisades Ave
Montana Ave
Idaho Ave
5th St
4th St
3rd St
2nd St
California Ave
Washington Ave
Wilshire Blvd
Arizona Ave
Broadway
Olympic B
Main St
Ocean Ave
Channel Ln
Short St
Ocean Way
Mabery Rd
The Promenade
Colorado Ave
Moss Ave
Appian Way
Sepview Ter
Feet
0 225 450 900 1,350 1,800
Meters
0 75 150 300 450 600
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009
Enclosure
USFWS critical habitat

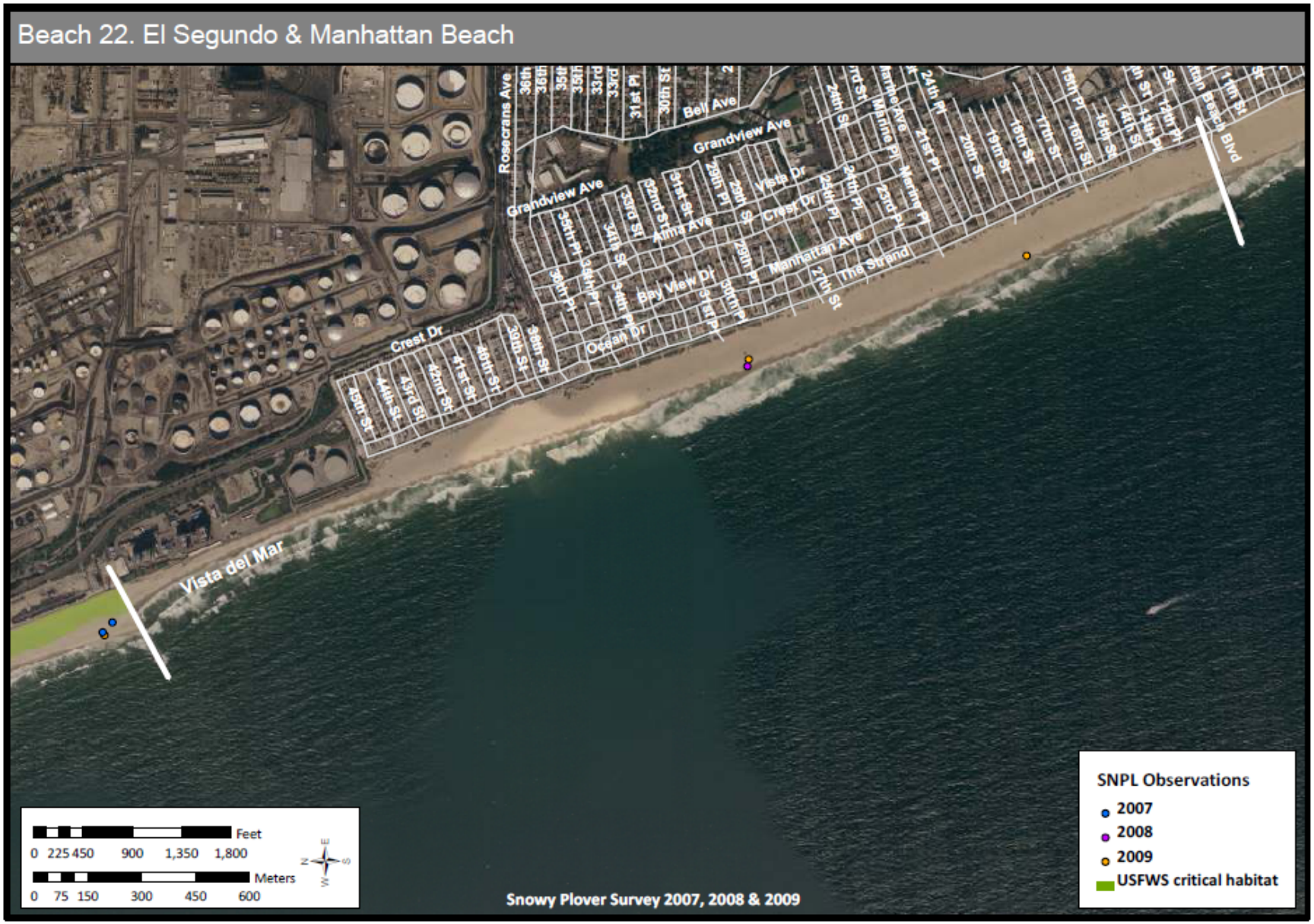

Beach 17. Venice City Beach (North)
Main St
Neilson Way
Barnard Way
Marine Ct
Navy St
Ozone Ave
Ozone Ct
Rose Ave
Rose Ct
Dudley Ave
Dudley Ct
Paloma Ave
Sunset Ave
Sunset Ct
Thornton Ave
Vista Pl
Park Ave
Park Ct
Park Pl
Brooks Ave
Breeze Ave
Breeze Ct
Royal Ct
Wavecrest Ave
Wavecrest Ct
Clubhouse Ave
Westminster Ave
Westminster Ct
San Juan Ave
Horizon Ave
Horizon Ct
Market St
Zephyr Ct
Park Row Dr
Windward
Grand Blvd
Venice Way
Mildred Ave
Venice
Venice Blvd
Canal St
Strongs Dr
Asst Ct
Carroll Canal
Bella Ct
Capri Ct
Sherman Canal Ct
28th Ave
Clune Ave
Dell Ave
Washington Blvd
Via Dolce
Sanborn Ave
Grand Canal Ct
Grand Canal
Canal Ct
Pacific Ave
Ocean Front Walk
17th Ave
18th Ave
18th Pl
19th Ave
20th Pl
24th Ave
Center Ct
Virginia Ct
23rd Pl
24th Pl
25th Pl
26th Pl
28th Ave
29th Ave
30th Ave
Feet
0 255 510 1,020 1,530
Meters
0 62.5 125 250 375 500
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009

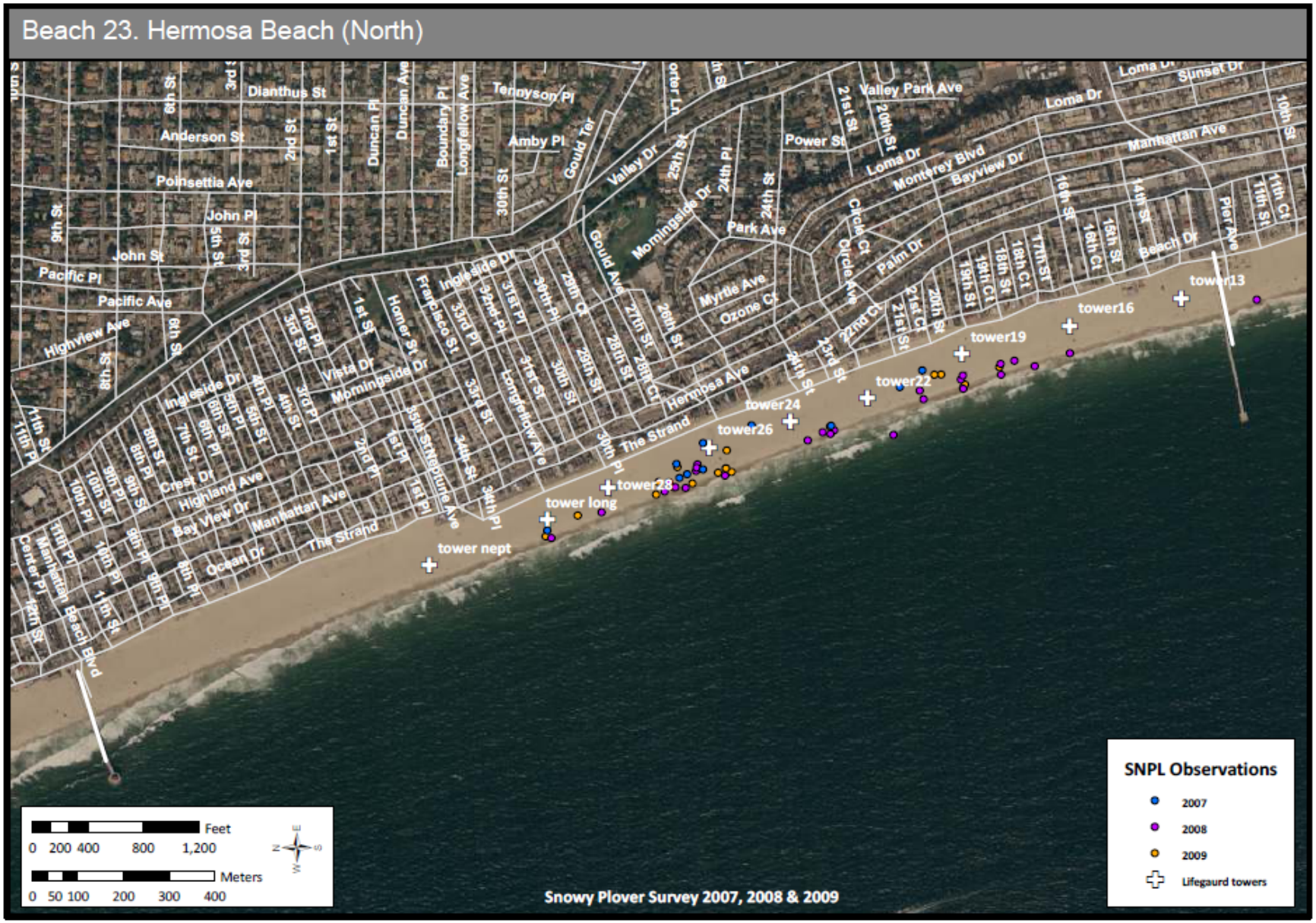

Beach 18. Venice City Beach (South)
Strongs Dr
Canal Ct
Via Dolce
Pacific Ave
Speedway
Ocean Front Walk
Roma Ct
Washington Blvd
Anchorage St
Buccaneer St
Catamaran St
Driftwood St
Eastwind St
Fleet St
Galleon St
Hurricane St
Jib St
Quarterdeck St
Topsail St
Union Jack St
Voyage St
Westwind St
Yawl St
Via Donte
62nd Ave
62nd Pl
63rd Ave
63rd Ave
30th Ave
SNPL Observations
2007
2008
2009
Snowy Plover Survey 2007, 2008 & 2009
Feet
0 180 360 720 1,080
Meters
0 40 80 160 240 320


Beach 19. Dockweiler Beach (North)
Billowvista
Rees
Delgany
Zitola Ter
Sunridge Walk
Campbell St
Talbert St
Redlands St
Trask Ave
Caborca Dr
Pershing Dr
Earldom Ave
Manchester Ave
Sunridge St
Barbour St
Rindge Ave
Rees St
Fowling St
Vista del Mar Ln
Redlands St
Waterview St
Napoleon St
Tower 47
Tower 46
Tower 45
Culver Pl
Culver Blvd
Trolleyway St
Surf St
Vista del Mar
Esplanade St
68th Ave
Argonaut St
Convoy St
Pacific Ave
Back Bay Pl
62nd Ave
Speedway
Tower 41
Feet
0 205 410 820 1,230
Meters
0 50 100 200 300 400
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009
Enclosure
USFWS critical habitat
lifegaurd tower
lt 47 pole


Beach 20. Dockweiler Beach (Central)
Sandpiper St
Century Blvd
Vista del Mar
Tower 47
Tower 52
Tower 53
Tower 54
Tower 55
Feet
0 112.5 225 450 675 900
Meters
0 37.5 75 150 225 300
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009
USFWS critical habitat


Beach 21. Dockweiler Beach (South)
Hillcrest St
Redwood Ave
Sycamore Ave
Yucca St
Palm
Dune St
Grand Ave
Tower 61
Tower 60
Tower 59
Tower 58.5
Tower 58
Feet
0 200 400 800 1,200
Meters
0 70 140 280 420
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009
Lifeguard Tower
USFWS critical habitat


Beach 22. El Segundo & Manhattan Beach
Rosecrans Ave
Bell Ave
Grandview Ave
Vista Dr
Crest Dr
Manhattan Ave
The Strand
Bay View Dr
Ocean Dr
Vista del Mar
Manhattan Beach Blvd
Feet
0 225 450 900 1,350 1,800
Meters
0 75 150 300 450 600
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009
USFWS critical habitat


Beach 23. Hermosa Beach (North)
Dianthus St
Anderson St
Poinsettia Ave
John Pl
John St
Pacific Pl
Pacific Ave
Highview Ave
Ingleside Dr
Vista Dr
Momingside Dr
Crest Dr
Highland Ave
Bay View Dr
Manhattan Ave
The Strand
Ocean Dr
Manhattan Beach Blvd
Tennyson Pl
Amby Pl
Gould Ter
Valley Dr
Gould Ave
Park Ave
Myrtle Ave
Ozone Ct
Hermosa Ave
Longfellow Ave
Power St
Valley Park Ave
Loma Dr
Monterey Blvd
Bayview Dr
Manhattan Ave
Sunset Dr
Palm Dr
Circle Ct
Circle Ave
Beach Dr
Pier Ave
tower13
tower16
tower19
tower22
tower24
tower26
tower28
tower long
tower nept
Feet
0 200 400 800 1,200
Meters
0 50 100 200 300 400
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009
Lifegaurd towers


Beach 24. Hermosa Beach (South) & King Harbor
Aviation Blvd
Montgomery Dr
10th St
9th St
8th Pl
8th St
7th St
Pine St
Ocean View Ave
1st St
Gertruda Ave
Elena Ave
Broadway
The Village
Torrance Blvd
Harbor Dr
Pacific Ave
Herondo St
1st Pl
2nd St
3rd St
4th St
5th St
6th St
7th St
11th St
10th St
Ardmore Ave
Valley Dr
Cacique St
Hill St
Bard St
Cypress Ave
Loma Dr
Culper Ct
11th Pl
Sunset Dr
Monterey Blvd
Manhattan Ave
Bayview Dr
Palm Dr
Hermosa Ave
The Strand
1st Ct
Lyndon St
Harbor Dr
Hopkins Way
Yacht Club Way
Marina Way
Portofino Way
Pier Ave
Beach Dr
12th Ct
11th Ct
10th Ct
9th Ct
8th Ct
7th Ct
6th Ct
Feet
0 187.5 375 750 1,125 1,500
Meters
0 62.5 125 250 375 500
N
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Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009
USFWS critical habitat


Beach 32: Point Fermin & Cabrillo Beach
Paseo del Mar
Weymouth Ave
Jacksdale St
Averill Ave
Dolphin St
Patton Ave
Silvius Ave
Walker Ave
Barbara St
Leland St
Ameleia St
Spring St
Main St
Dik Rd
Leavenworth Dr
Emily St
Meyler St
Parker St
Cabrillo Ave
Roxbury St
Orc Rd
Nco Rd
Leary Mirfann Rd
Peck Ave
Gaffey St
South Carolina St
Korekhoff Ave
Denison Ave
Hamilton Pl
Meyler Rd
Officers Rd
Shoshonean Rd
Bluff Pl
Stephen M White Dr
Pacific Ave
Shepard St
Miner St
A St
Titan Dr
Atlas Dr
Hamilton Ave
Walker Ave
24th St
25th St
26th St
26th Pl
27th St
27th Pl
27th Dr
28th St
28th Pl
29th St
29th Pl
30th St
31st St
31st Ct
32nd St
33rd St
34th St
35th St
36th St
37th St
38th St
39th St
40th St
Feet
0 300 600 1,200 1,800
Meters
0 100 200 400 600
N
W
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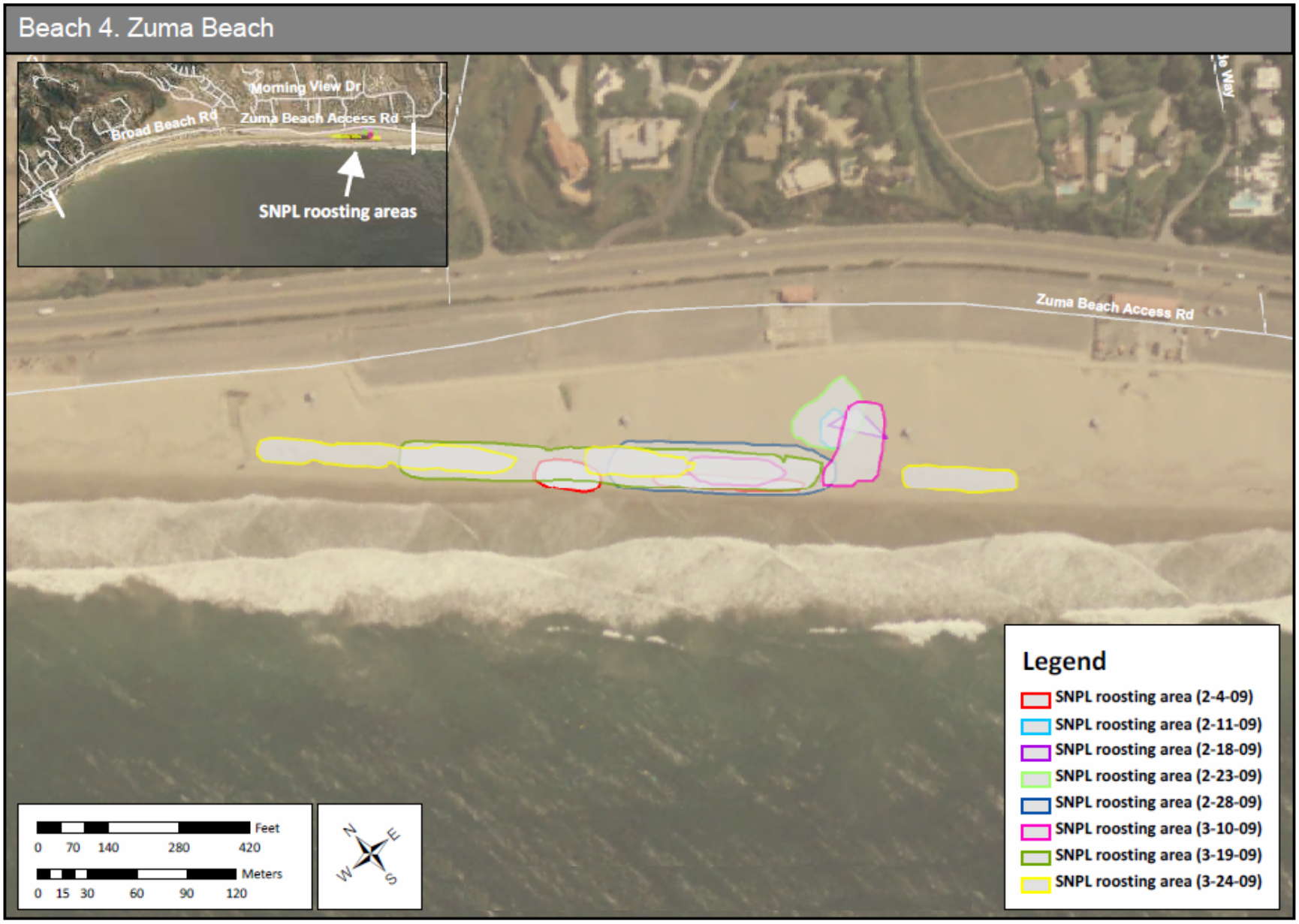
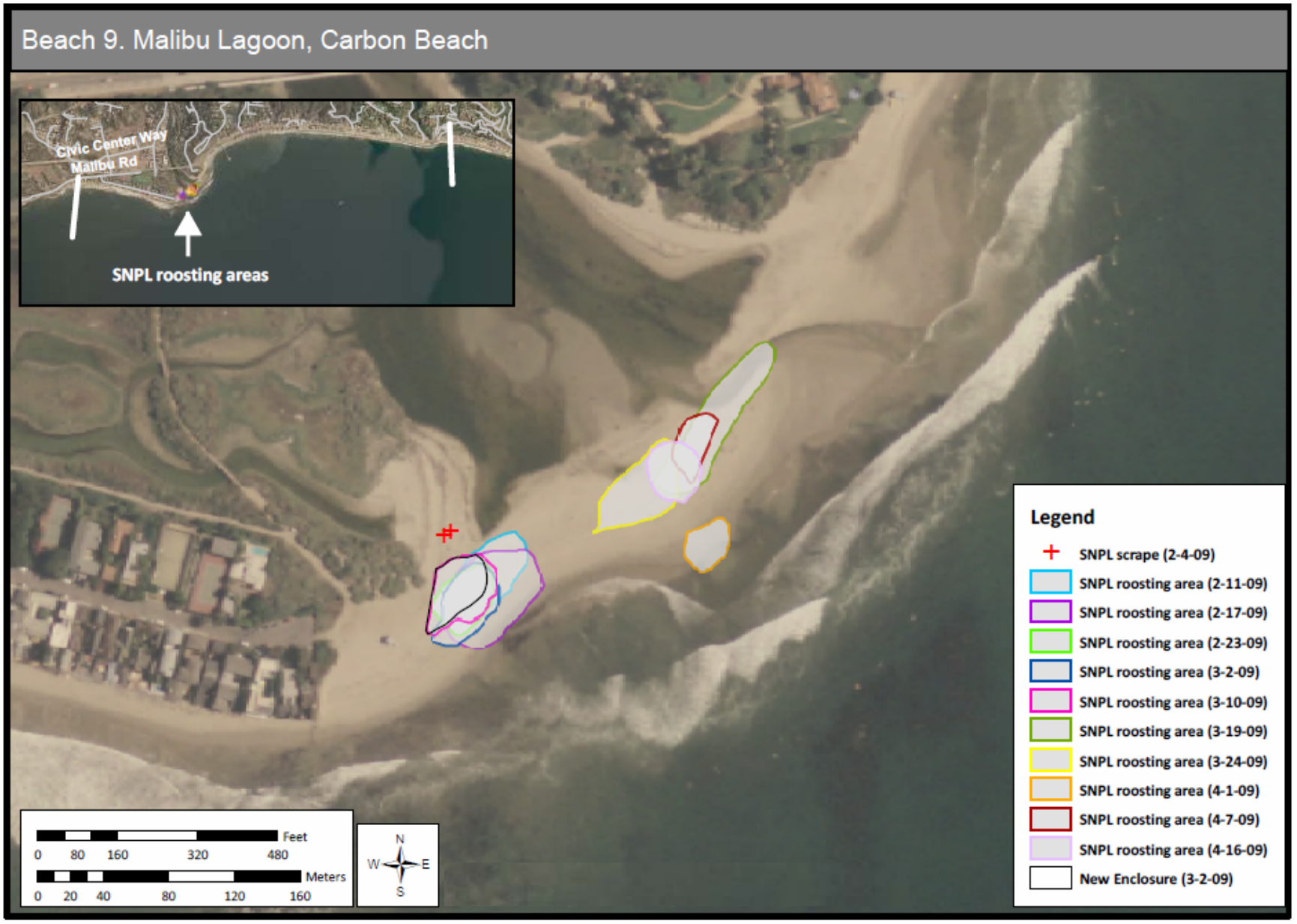
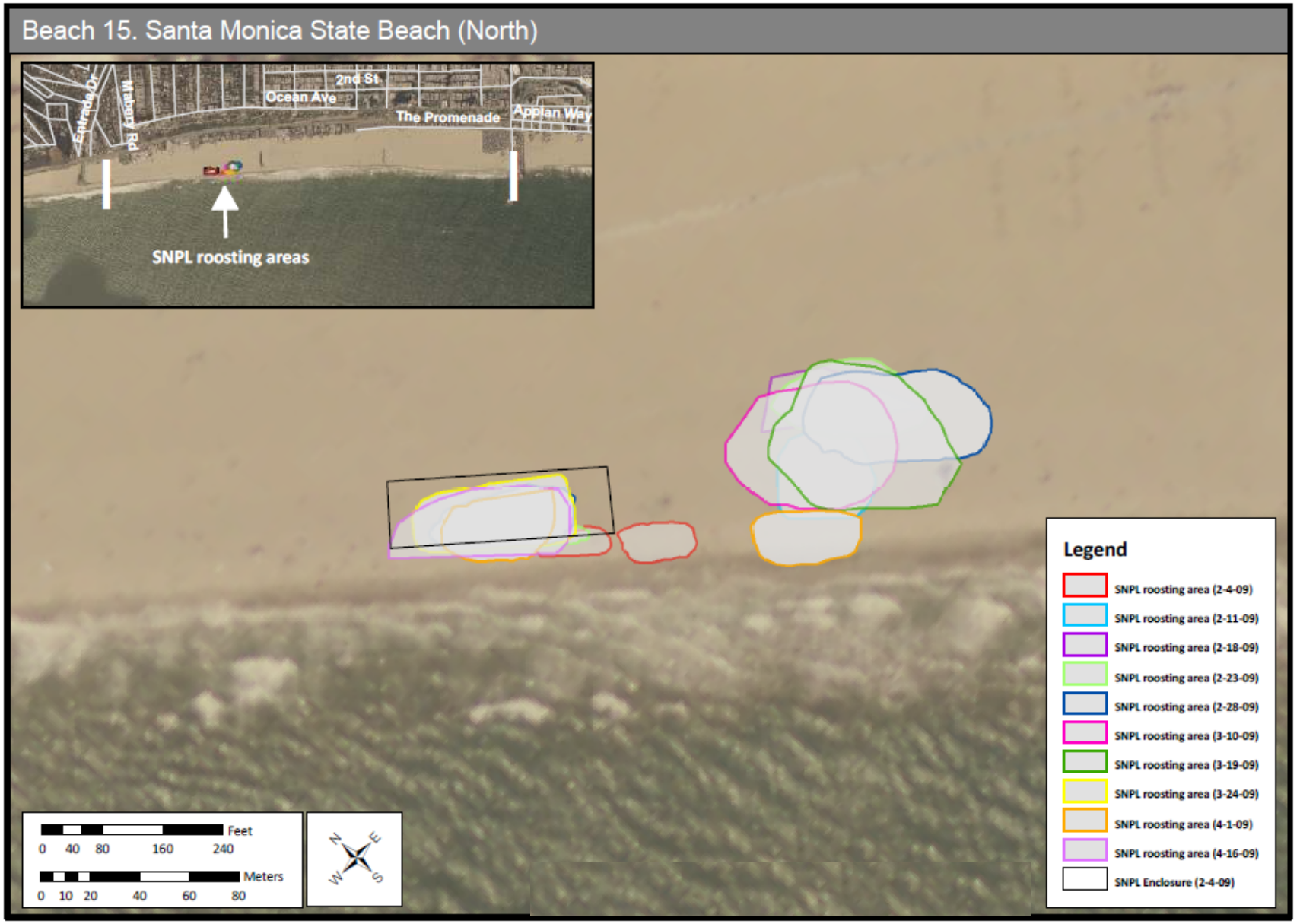
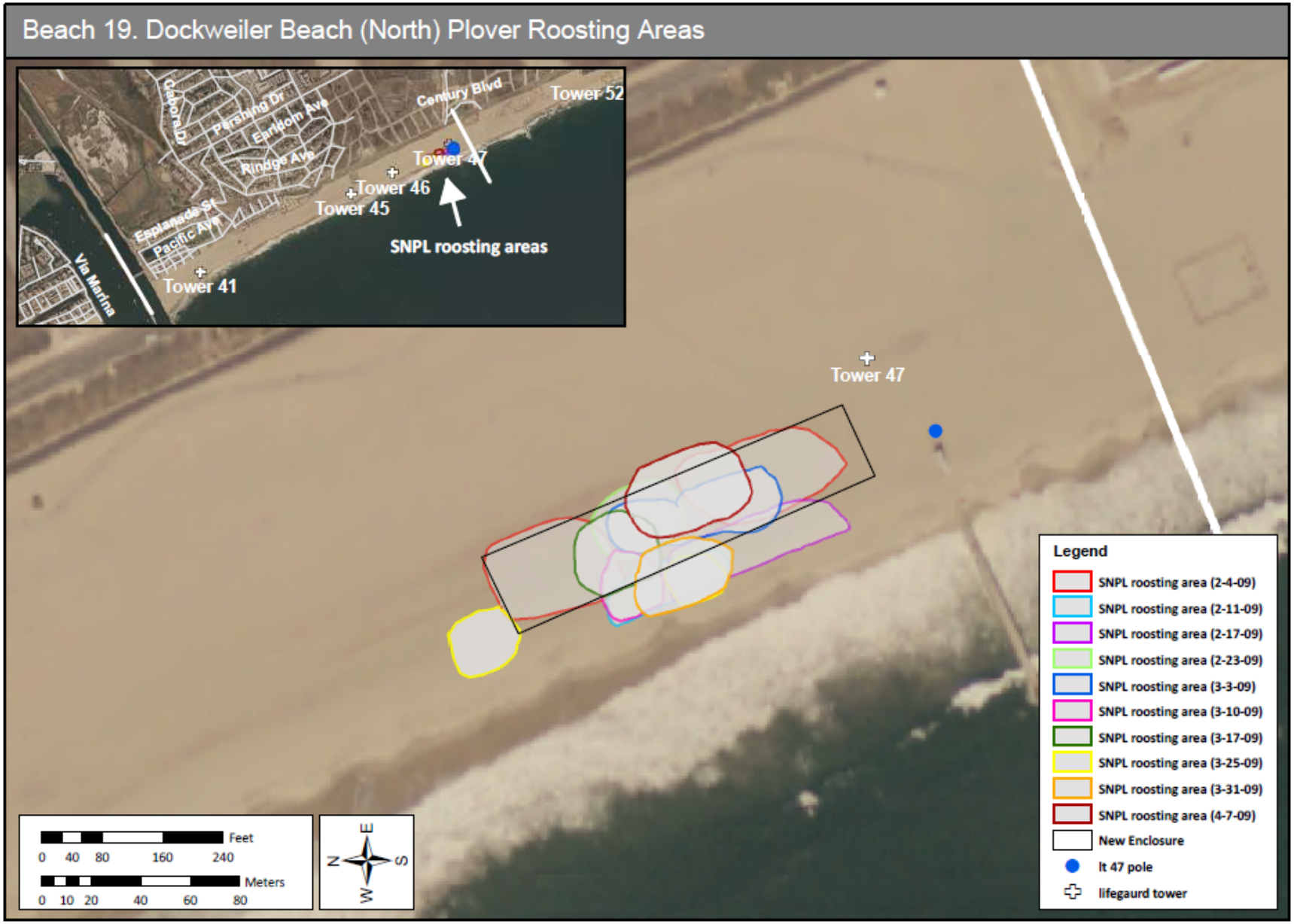
Snowy Plover Survey 2007, 2008 & 2009
SNPL Observations
2007
2008
2009

Appendix B:
Plover Roost Survey Maps

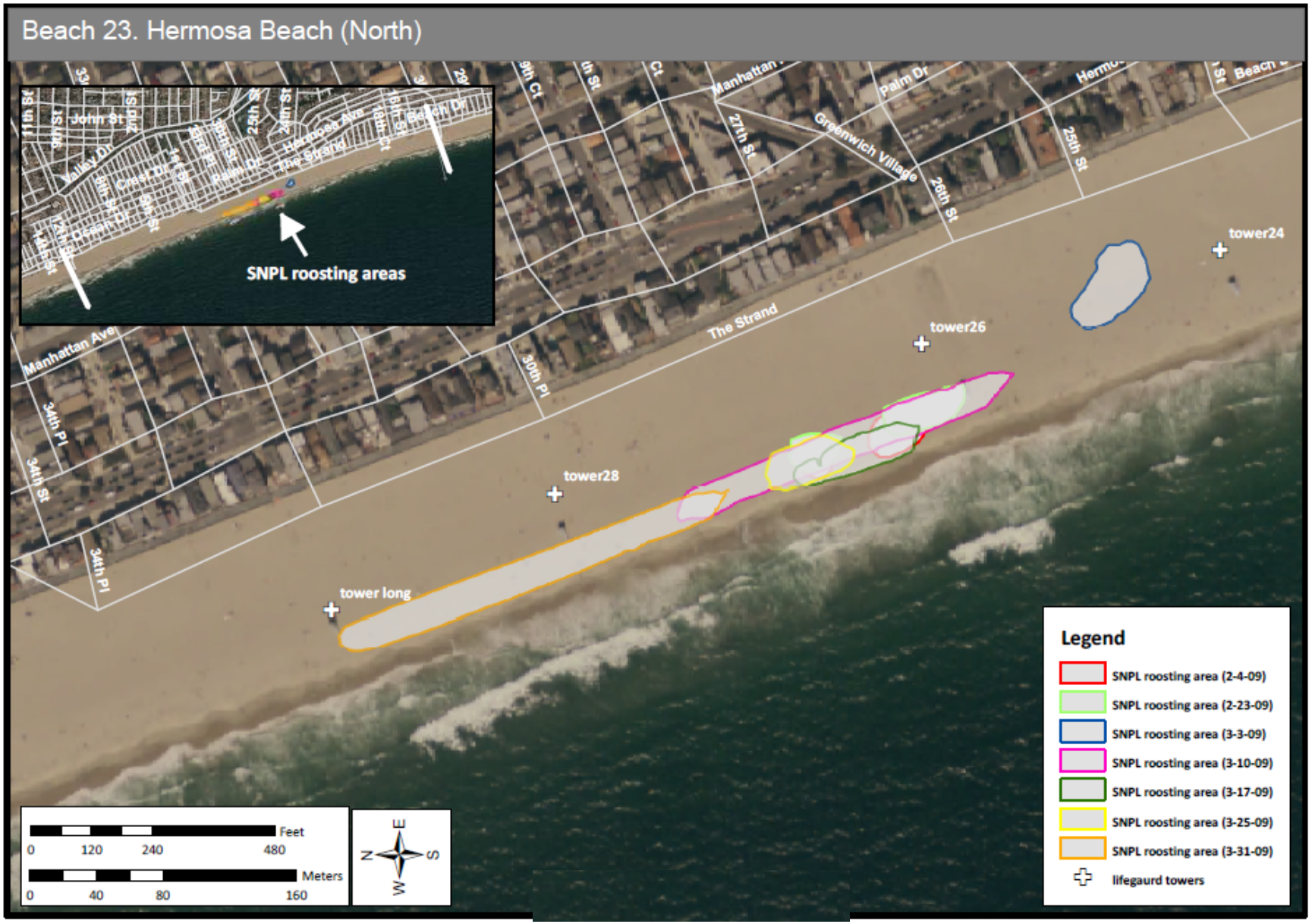

Beach 4. Zuma Beach
Morning View Dr
Broad Beach Rd
Zuma Beach Access Rd
SNPL roosting areas
Zuma Beach Access Rd
Legend
SNPL roosting area (2-4-09)
SNPL roosting area (2-11-09)
SNPL roosting area (2-18-09)
SNPL roosting area (2-23-09)
SNPL roosting area (2-28-09)
SNPL roosting area (3-10-09)
SNPL roosting area (3-19-09)
SNPL roosting area (3-24-09)
Feet
0 70 140 280 420
Meters
0 15 30 60 90 120
N
E
S
W


Beach 9. Malibu Lagoon, Carbon Beach
Civic Center Way
Malibu Rd
SNPL roosting areas
Legend
SNPL scrape (2-4-09)
SNPL roosting area (2-11-09)
SNPL roosting area (2-17-09)
SNPL roosting area (2-23-09)
SNPL roosting area (3-2-09)
SNPL roosting area (3-10-09)
SNPL roosting area (3-19-09)
SNPL roosting area (3-24-09)
SNPL roosting area (4-1-09)
SNPL roosting area (4-7-09)
SNPL roosting area (4-16-09)
New Enclosure (3-2-09)
Feet
0 80 160 320 480
Meters
0 20 40 80 120 160
N
W E
S


Beach 15. Santa Monica State Beach (North)
Entrada Dr
Mabery Rd
Ocean Ave
2nd St
The Promenade
Appian Way
SNPL roosting areas
Legend
SNPL roosting area (2-4-09)
SNPL roosting area (2-11-09)
SNPL roosting area (2-18-09)
SNPL roosting area (2-23-09)
SNPL roosting area (2-28-09)
SNPL roosting area (3-10-09)
SNPL roosting area (3-19-09)
SNPL roosting area (3-24-09)
SNPL roosting area (4-1-09)
SNPL roosting area (4-16-09)
SNPL Enclosure (2-4-09)
Feet
0 40 80 160 240
Meters
0 10 20 40 60 80
N
E
S
W


Beach 19. Dockweiler Beach (North) Plover Roosting Areas
Century Blvd
Tower 52
Tower 47
Tower 46
Tower 45
Tower 41
SNPL roosting areas
Via Marina
Esplanade St
Pacific Ave
Ridge Ave
Earldom Ave
Pershing Dr
Gabora Dr
Tower 47
Legend
SNPL roosting area (2-4-09)
SNPL roosting area (2-11-09)
SNPL roosting area (2-17-09)
SNPL roosting area (2-23-09)
SNPL roosting area (3-3-09)
SNPL roosting area (3-10-09)
SNPL roosting area (3-17-09)
SNPL roosting area (3-25-09)
SNPL roosting area (3-31-09)
SNPL roosting area (4-7-09)
New Enclosure
lt 47 pole
lifegaurd tower
Feet
0 40 80 160 240
Meters
0 10 20 40 60 80
N
E
S
W


Beach 21. Dockweiler Beach (South)
Dune St
Tower 61
Tower 60
Tower 58.5
Tower 59
Tower 58
SNPL roosting areas
Tower 58
Legend
SNPL roosting area (2-4-09)
SNPL roosting area (2-10-09)
SNPL roosting area (2-17-09)
SNPL roosting area (2-23-09)
SNPL roosting area (3-3-09)
SNPL roosting area (3-10-09)
SNPL roosting area (3-17-09)
SNPL roosting area (3-25-09)
SNPL roosting area (3-31-09)
Lifeguard Tower
Feet
0 50 100 200 300
Meters
0 12.5 25 50 75 100
N E S W


Beach 23. Hermosa Beach (North)
SNPL roosting areas
The Strand
Manhattan Ave
Greenwich Village
Palm Dr
27th St
26th St
25th St
30th Pl
34th Pl
34th St
tower24
tower26
tower28
tower long
Legend
SNPL roosting area (2-4-09)
SNPL roosting area (2-23-09)
SNPL roosting area (3-3-09)
SNPL roosting area (3-10-09)
SNPL roosting area (3-17-09)
SNPL roosting area (3-25-09)
SNPL roosting area (3-31-09)
lifegaurd towers
Feet
0 120 240 480
Meters
0 40 80 160
N E S W

Appendix C: Photographs

Section 1: General Photographs

Photograph 1. Beach Grooming.

Photograph 2. Groomed Beach.

Photograph 3. Snowy Plover standing in vehicle track.

Photograph 4. Beachcast kelp and sand flies.

Photograph 5. Nest exclosure design used at Bolsa Chica Reserve (Photo credit: Jack Fancher).

Photograph 6. Symbolic Fencing using metal poles, eyelets, and rope (Photo credit: Christina Sandoval).

Photograph 7. Volunteer Training at Santa Monica.

Photograph 8. Tarball on the Belmont Peninsula, Long Beach.

Section 2: Photographs taken at Zuma Beach

Photograph 9. Zuma Beach near Tower 9 1-9-07. Volunteers conducting the USFWS window survey observe a dead plover in vehicle tracks (see box).

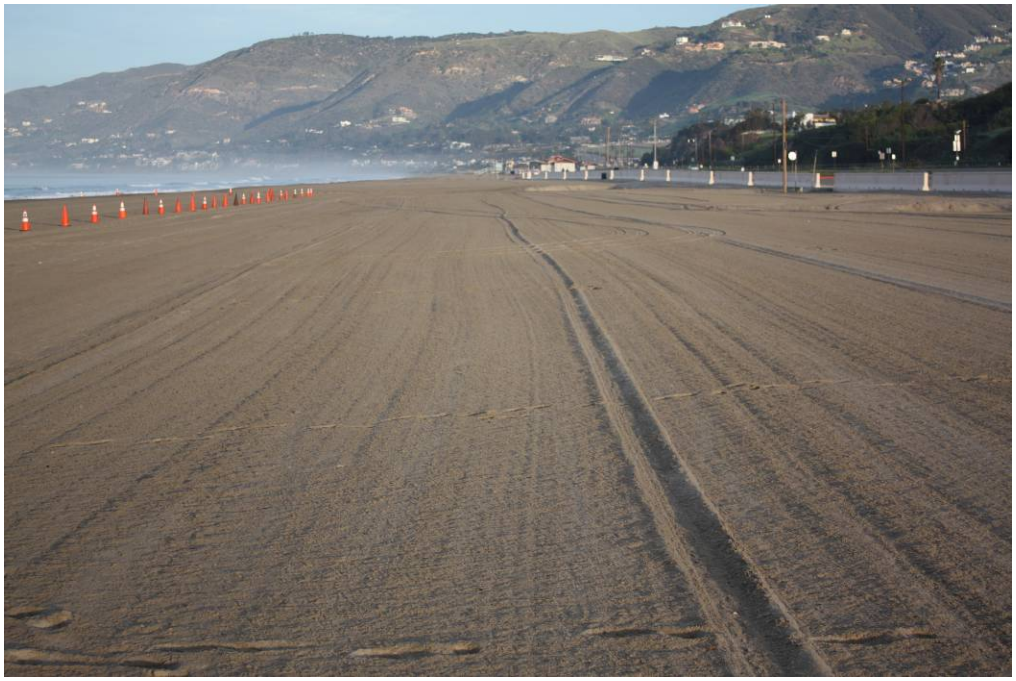
Photograph 10. Zuma Beach near Tower 9 1-9-07. Volunteer removing dead plover from the vehicle tracks.

Photograph 11. Zuma Beach near Tower 9 1-9-07. Close-up of dead plover, note feathers ground into vehicle track.

Photograph 12. Zuma Beach near Tower 9 1-9-07. Volunteers alert lifeguard truck on the beach of what occurred. Volunteers noted that this vehicle was the only one on the beach when they found the plover.

Photograph 13. Zuma Beach north of Lifeguard Tower 9, 2-24-09. Snowy plover roost occupied by 76 roosting plovers at 7:28 am on 2-24-09.

Photograph 14. Zuma Beach north of Lifeguard Tower 9, 2-24-09. Photograph showing the high density of roost scrapes observed at the roost adjacent to the lifeguard tower 9 on 2-24-09.



Photograph 15. Zuma Beach north of Lifeguard Tower 9, 2-28-09. Freshly groomed beach where the plover roost had formerly been. (note: taken near the spot shown in Photograph 13)

Photograph 16. Zuma Beach north of Lifeguard Tower 9, 2-28-09. Beach groomer working before dawn at Lifeguard Tower 9.

Photograph 17. Zuma Beach north of Lifeguard Tower 9, 2-28-09. Freshly groomed beach where the plover roost had formerly been.

Photograph 18. Sand replenishment project south of LT 9.

Photograph 19. Cones placed around plover roost north of LT 9 by LACBH staff during a special event to protect plovers.

Section 3: Malibu Lagoon

Photograph 20. Volunteer installing symbolic fencing at Malibu Lagoon in 2008.

Photograph 21. Symbolic fencing enclosure and signage at Malibu Lagoon in 2008.

Photograph 22. Nest scrape at Malibu Lagoon in 2009.

Photograph 23. Volunteers installing symbolic fencing and signage at Malibu Lagoon in 2008.

Photograph 24. Symbolic fencing at Malibu Lagoon in 2009.

Section 4: Santa Monica Enclosure and Vicinity.

Photograph 25. The Enclosure at Santa Monica in 2007 (~100 x 600 ft).

Photograph 26. Complete Enclosure of the Scrapes at Santa Monica in 2008 (~50 x 150 ft).

Photograph 27. Santa Monica, 2-4-09. Heavy equipment working immediately adjacent to the enclosure within an area later occupied by roosting plovers.

Photograph 28. Santa Monica, 2-24-09. Snowy plovers roosting on upper beach adjacent to the Lifeguard Tower outside of the enclosed area.

Section 5: Dockweiler State Beach, north of Lifeguard Tower 47.

Photograph 29. Cones placed around roost at Dockweiler Beach in 2008.

Photograph 30. Dockweiler State Beach, north of Lifeguard Tower 47, 2-4-09. Vehicle tracks within active plover roost inside the coned area.

Photograph 31. Dockweiler State Beach, north of Lifeguard Tower 47, 2-4-09. Vehicle tracks and two plovers to the left of the tracks in the distance (note: not the white piece of trash in the foreground) within coned area.

Photograph 32. Dockweiler State Beach, north of Lifeguard Tower 47, 2-4-09. Note the scrape in the center with workman's boot prints, and tire tracks surrounding it on three sides.

Photograph 33. Dockweiler State Beach, north of Lifeguard Tower 47, 2-4-09. Shows a beach groomer/raker track going through the middle of the coned off area.

Photograph 34. Dockweiler State Beach, north of Lifeguard Tower. A nest scrape with footprint halo within the coned area on 3-3-2009.

Photograph 35. Dockweiler State Beach, north of Lifeguard Tower. Photo shows truck tracks passing directly over the nest scrape shown in Photograph 34 within the coned area prior to 3-10-2009 (note the small patch of sea rocket is the same as in Photograph 34.

Section 6: Dockweiler State Beach, north of Tower 58

Photograph 36. Nest scrape between tire tracks at Dockweiler (Volleyball Court Roost) 4-29-2008.

Photograph 37. Dockweiler State Beach, north of Tower 58, 11-17-08. Plover roosting area regularly driven over by vehicles.

Photograph 38. Dockweiler State Beach, north of Tower 58, 11-17-08. Plovers regularly sit in tire ruts.

Photograph 39. Dockweiler State Beach, north of Tower 58, 2-17-09. Shows tire tracks through plover roost in the foreground and recently moved sand, including onto the wet sand within reach of the waves in the background.

Photograph 40. Dockweiler SB, north of LT 58, 3-17-09. Dead black-bellied plover sitting within vehicle tracks, scavenged after being killed by corvids. It appears that this bird was struck by a vehicle. Specimen deposited at LACMNH.

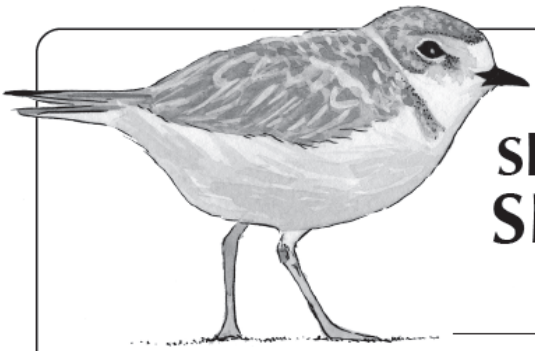
Section 7: Hermosa Beach, 26th Street Lifeguard Tower

Photograph 41. Snowy Plover nest scrape at Hermosa Beach North in 2007.

Photograph 42. Hermosa Beach 2-3-09. Plovers roosting immediately seaward of driven and groomed beach.

Photograph 43. Hermosa Beach 2-3-09. Roosting scrapes immediately adjacent to vehicle tire track.

Appendix D: Beach Driver Training Handout



Sharing the Beach with SNOWY PLOVERS

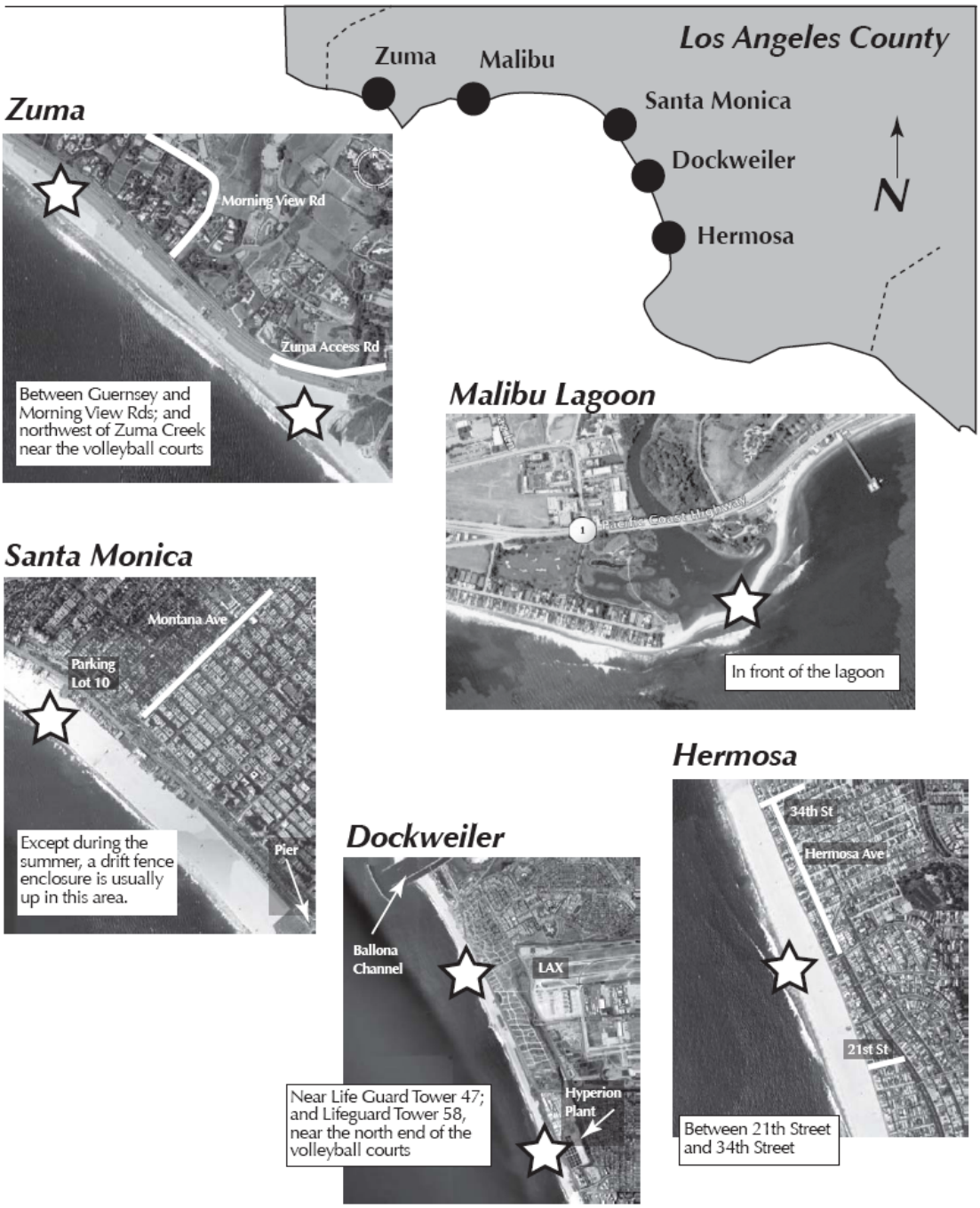
Tips for Beach Drivers

Snowy Plovers are a Federally Threatened species of shorebird live on the Los Angeles County Beaches. The largest numbers are here in the fall and winter months. There are several roosting areas where they are most likely to be found. Following a few simple guidelines will help reduce the chance of disturbing or striking a roosting snowy plover. When safe to do so, the following measures can help avoid collisions with plovers:

- 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 maintain a low speed and watch for plovers that often roost within those tracks.

- If possible, avoid driving on the berm-line because this is where plovers feed.
- If possible, drive around known roosting areas (*see maps on reverse*).

Snowy Plover Roosting Areas



Appendix E: Volunteer Manual & Data Sheet

LOS ANGELES WESTERN SNOWY PLOVER STUDY GROUP

WESTERN SNOWY PLOVER SURVEY: VOLUNTEER SURVEY PROTOCOL 2009

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 alexandrinus 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 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 to:

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 2009, we will continue to survey throughout the year to attempt 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 2009, we will integrate three studies into the monitoring effort. First 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.

In both 2007 and 2008 we found high winter roost fidelity at seven beach segments. These "plover roosting beaches" will be monitored monthly throughout the year. They will use the same protocol as the beach-wide surveys.

Our 2007 and 2008 surveys have shown eleven plover roosting areas. We will be checking these areas weekly between February 1 and April 30. Surveyors must be specially trained and permitted for these surveys.

BEACH-WIDE AND PLOVER ROOSTING BEACH SURVEYS

Both surveys will follow the same protocol and be combined on months where they overlap (example the January, March, May, and September surveys at Santa Monica SB North will be included in both data sets). Our proposed schedule (depending on USFWS) is as follows:

Training Sessions:

Session 1: Saturday, January 4th at Santa Monica Beach Enclosure (meet at Lot 10A North, Santa Monica at 8 -10 am)
Session 2: Saturday, February 28th (meet at Lot 10A North, Santa Monica at 8-10 am)
Session 3: TBA if needed in Fall

Beach-wide Survey Dates:

Winter: January 4-10, 2009
Early Breeding Season: March 7-13, 2009
Late Breeding Season: May 4-10, 2009 (TBA officially by USFWS)
Fall: September 12-18, 2009

Monthly Surveys at Priority One Beaches Only:

January 4-10, 2009
February 6-12, 2009
March 7-13, 2009
Apr 5-11, 2009
May 4-10, 2009 beach-wide (dependent on USFWS window)
June 2-8, 2009
July 17-23, 2009
August 14-21, 2009
September 12-18, 2009 beach-wide
October 12-19, 2009
November 13-19, 2009
December 11-17, 2009

Volunteers assigned to priority one beaches will be asked to conduct 12 monthly surveys in 2008. 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. Volunteers assigned to other beaches will

be requested to survey those beaches during the beach-wide survey dates only. Beach assignments will be made by Los Angeles Audubon volunteer coordinators based on volunteer interest, with priority given to those who have previously surveyed a beach, volunteer interest, and geographic location of the volunteer. We require that all volunteers attend the training session or undergo alternative training (see volunteer coordinator)

Volunteer safety is the most important factor, sites may be difficult to access, and particularly during winter high tides as waves often can sweep over the entire beach create 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, during the daylight hours. Anyone observed engaged in illegal activity on the beach should not be confronted by volunteers. Instead, they should leave the areas 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 8x and aperture 40 mm.), 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. Optional equipment includes a global positioning devise (GPS unit). FRS radios would be very helpful on wide beaches where teams of 3 or more people are surveying.

***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 alexandrinus nivosus*) Pacific Coast Population Draft Recovery Plan. Which is being provided during the January 4th and February 28th training sessions, 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 (for example: 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 had 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, or,
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 late evening; 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 20 m ahead and to either side. Every 50 m surveyors should stop and scan at least 100 m 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/DATA SHEET 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, the volunteer should mail or fax a copy of their original data sheet and map to the survey coordinators.

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 & stop time, total time spent at the beach segment, preparation time (includes any time spent preparing for or driving to and from 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 must have a pencil and data sheet or field notebook so that they can record sex for each bird.

SECTION 1: 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. Then record 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. Record coordinates if a GPS unit is available

2. Record information about the location (nearby landmarks such as lifeguard towers, cross streets, or buildings). Record the 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), 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. Record stop time upon leaving the beach.

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 an 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 not obviously involved in an emergency situation (light/siren), record the time, location, vehicle make (i.e. Ford) and model (i.e. F-150) or type of vehicle (van, pick-up, SUV), record any markings identifying the company or agency and any identifying numbers, record the license plate. Record this information on the data sheet and submit to the volunteer coordinator, please **do not** make any attempt to stop, signal or confront the vehicle or its driver in any way. These will be reported to beach managers and local law enforcement official 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.

Report immediately (providing band combinations if known): 1) any illegal activity to law enforcement; or 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).

Report to the survey coordinators immediately after the survey if you see a bird that appears injured or if you observe a bird in an area where they have not been seen in recent years. Report birds 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. This should be the most knowledgeable person about the likely band combinations that could be seen and the importance of the particular combinations should they be reported. It may be necessary to reschedule 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). Record general habitat type as: linear beach, estuary mouth, overwash area (break in foredune), restoration plot, or barrier island/peninsula.

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 50 m in width (from high tide line to foredune). If all habitats are less than 50 m in width, estimate the maximum beach width. Record the general types of beach habitat found at the survey site (as described above).

COLOR BANDS

Throughout the plovers 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 would be: white, red, aqua, aqua. This combination would be recorded WR: AA.

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 direction.

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 100 m 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).

Beachcast Marine Bird and Mammal Survey. For this survey, you will need to bring a digital camera, 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 if you have one), 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.

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

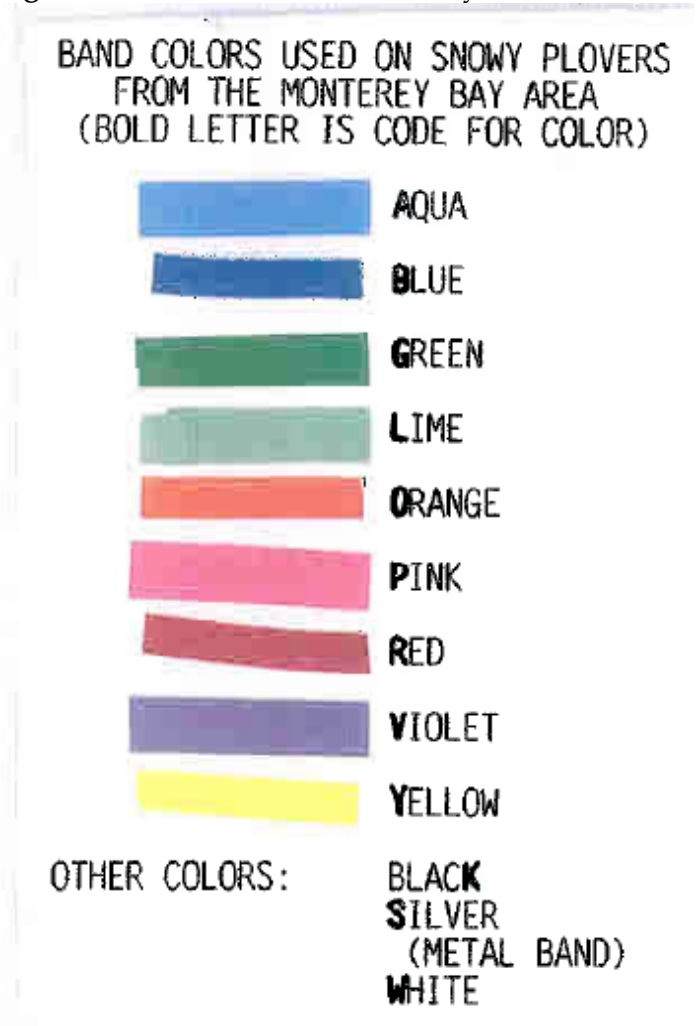
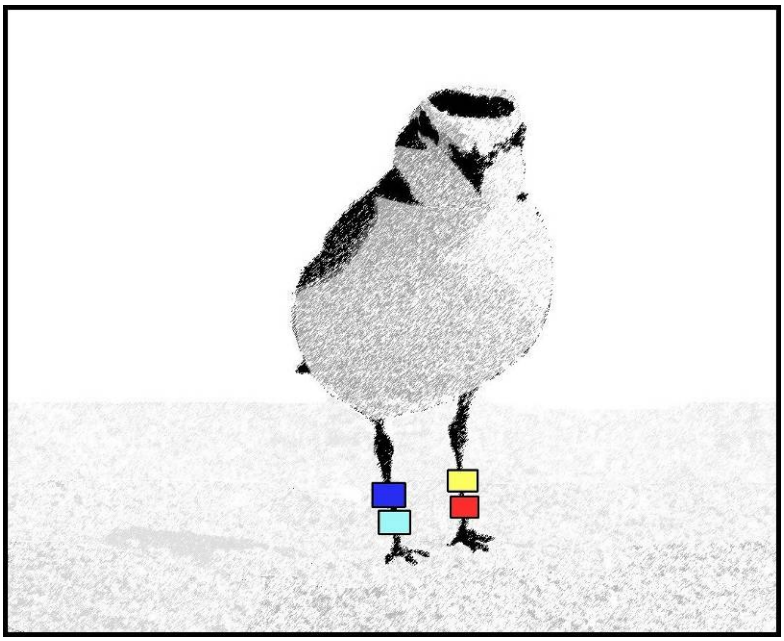


Figure 2. Example of banded Snowy Plover. In this picture, the bird has a yellow band (Y) above a red band (R) on its left leg and a blue band (B) above an aqua band (A) on its right leg. This combination should be recorded as YR: BA.



Notes on identifying Western Snowy Plovers in winter roosting habitat

Lucien Plauzoles Santa Monica Bay Audubon LucienPlauzoles@aol.com

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 eastward 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.

LOS ANGELES COUNTY

Western Snowy Plover Field Survey Form 2009

Page __of __

Survey Location _____ Month_____ Day____ Year 2009

Observer Name (s): _____

Start Time ____Stop Time ____Total Time_____Prep Time_____Weather conditions: _____

Temperature:_____Cloud Cover: _____Precipitation: _____Wind: (mph)_____(direction)_____

Tides: _____ **Cloud Cover: 0 = 0%, 1 = 33%, 2 = 66%, 3 = 100%** **Precipitation: N = None, R = Rain, F = Fog, D = Drizzle**

SECTION 1: SNOWY PLOVER SIGHTINGS:

Number of Snowy Plovers seen?_____Ad: Juv: M: F: Survey Complete?____(if no, circle area surveyed on map)

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

[1] **Wet sand, wrackline, mid-beach, foredune, Linear beach, estuary mouth, overwash, HRA (habitat restoration area), barrier island/peninsula**
Behavior Codes: 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**

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

Describe Other:

Other wildlife species detected (especially potential predators):_____

SECTION 3: HABITAT INFORMATION:

Changes from Previous Survey:

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

What general habitat types[2] are present at this site?____.

Recording band combos: Record 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.
Sex: Male, Female, Unknown **Age:** Adult, Juvenile (Young capable of flight), Chick (incapable of flight), Unknown

Appendix F: Snowy Plover Outreach Handout

Sharing the beach with...

SNOWY PLOVERS

What is a Snowy Plover?

The Western Snowy Plover is a small, sand-colored bird that lives on beaches throughout Los Angeles County. They rely on their color to conceal them from predators, and will often sit in footprints and tire tracks, becoming nearly invisible to beach-goers (and beach drivers). Plovers spend much of their time foraging amid piles of washed-up kelp, eating the small invertebrates that help to decompose the seaweed. They nest from March to September, placing their eggs directly on the sand in shallow scrapes smaller than human footprints. Their eggs and chicks are also well-camouflaged, easily blending in with their sandy surroundings.

Why are we concerned about them?

Western Snowy Plovers used to nest on beaches throughout Los Angeles County, but removal of their food source by frequent beach grooming, and disturbance from development and recreation greatly impacted their ability to keep nesting in these areas. Though our beaches are still important wintering grounds, there have been no recorded nests in Los Angeles County since the late 1940s. Plovers have faced similar challenges along other parts of the California coast, and today the Pacific coast population of the Western Snowy Plover is listed as a Federally Threatened Species.

How can I share the beach?

There are several simple things you can do to help plovers. To prevent attracting potential predators to the beach, always throw your trash away in a designated bin. Follow leash laws when you take your dog to the beach. Try walking or jogging along the wet sand, since plovers most often use areas just above the wet sand. And finally, support efforts to protect plovers on your beaches.

For more information on how to get involved, visit Los Angeles Audubon online.

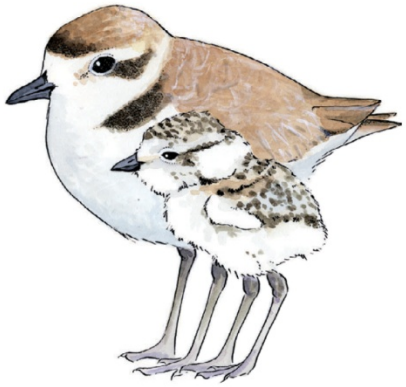
www.laaudubon.org

LOS ANGELES AUDUBON | SANTA MONICA BAY AUDUBON SOCIETY | PALOS VERDES/ SOUTH BAY AUDUBON SOCIETY

Front side

Working together to help protect Snowy Plovers in Los Angeles County

- US Fish and Wildlife Service
- California Department of Fish and Game
- CDFG Office of Spill Prevention and Response
- Los Angeles County Department of Beaches and Harbors
- California State Parks
- National Fish and Wildlife Foundation
- California Coastal Commission
- Audubon California
- Los Angeles Audubon
- Santa Monica Bay Audubon Society
- Palos Verdes/South Bay Audubon
- Ryan Ecological Consulting
- Plegadis



For more information on how to get involved, visit Los Angeles Audubon online.

www.laaudubon.org

Back side

Appendix G: Snowy Plover Docent Illustrated Fact Sheet

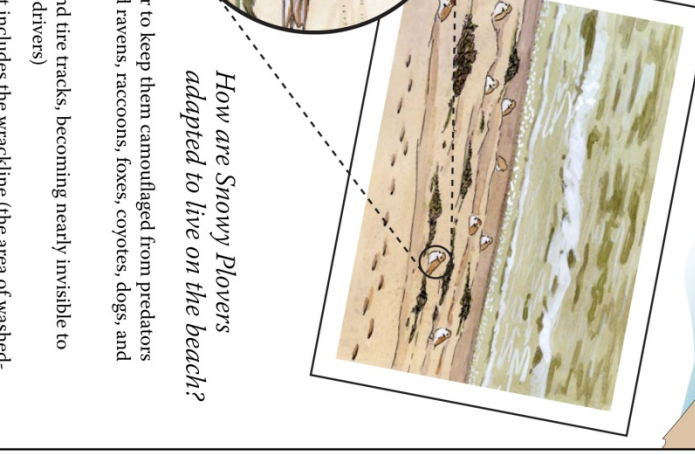
FRONT

SNOWY PLOVERS

Docent Cheat Sheet!

- Lives on sandy beaches of the west coast
- Pacific Coast population listed as a Federally Threatened Species
- Disturbance from development and recreation greatly impact their ability to nest here

Where can I see Snowy Plovers?



How are Snowy Plovers adapted to live on the beach?

- Rely on their sandy color to keep them camouflaged from predators (birds of prey, crows and ravens, raccoons, foxes, coyotes, dogs, and cats)
- Often sit in footprints and tire tracks, becoming nearly invisible to beach-goers (and beach drivers)
- Important plover habitat includes the wrackline (the area of washed-up kelp and algae along the beach) for foraging as well as the stretch of dry sand above the wrackline for roosting and nesting
- Snowy plovers typically like to roost together in a loose flock.

LOS ANGELES AUDUBON
www.laaudubon.org

BACK

SNOWY PLOVERS

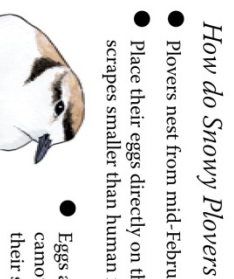
Docent Cheat Sheet!

What do Snowy Plovers eat?

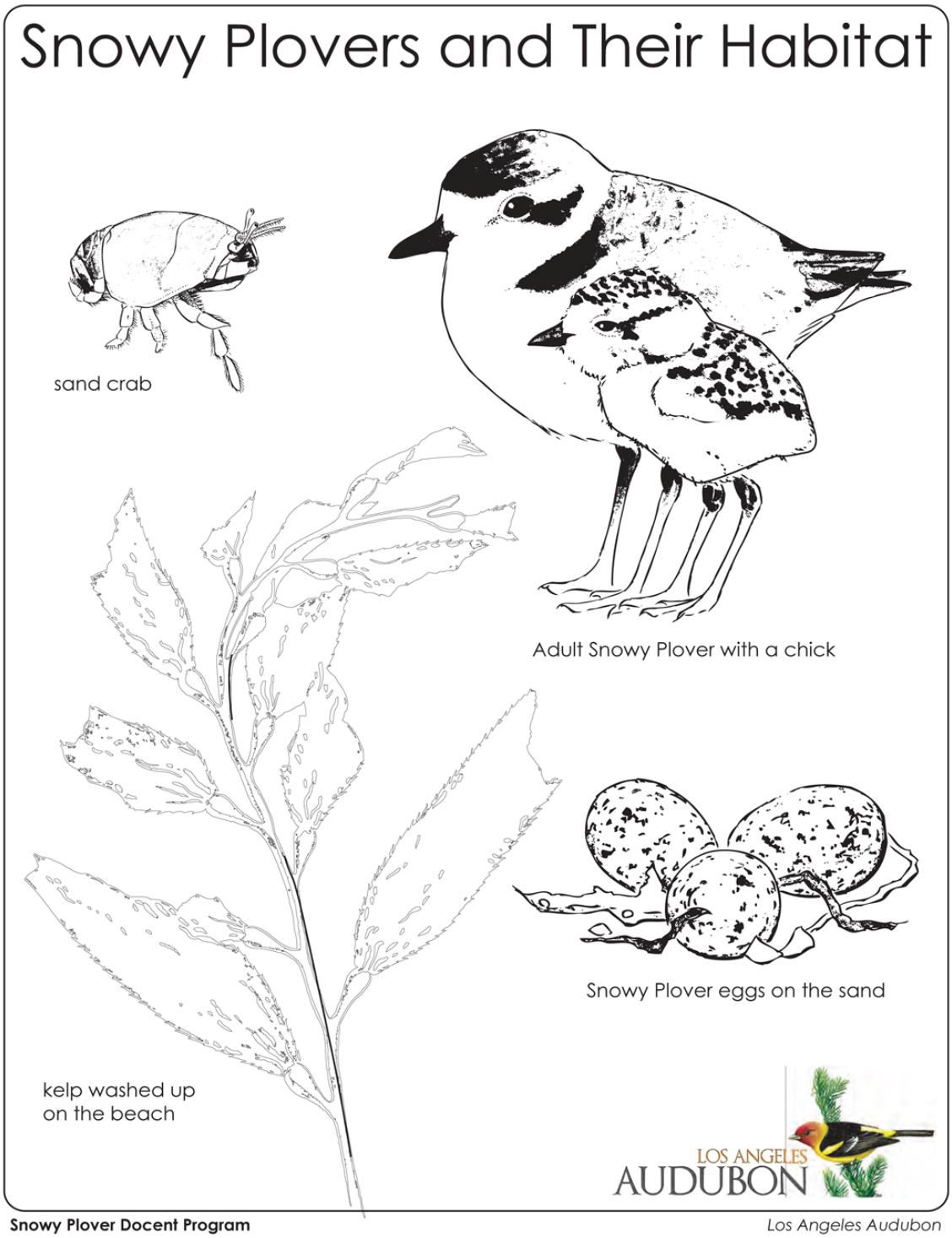
- Plovers forage amid piles of washed-up algae, seagrass, and kelp (called "wrack")
- Plovers are actually predators, hunting and eating the small invertebrates that feed on the wrack and occupy the wet sand between the wrack and the water's edge
- Creatures such as beach hoppers and beach flies are vitally important links in this ecosystem because they help decompose the wrack by eating it
- Sand crabs are burrowers, digging in the wet sand and using their antennae to filter out food particles as waves wash over them
- These creatures in turn are consumed by other wildlife species, thereby helping to recycle nutrients back into the food chain

How do Snowy Plovers raise their young?

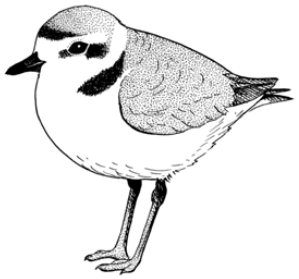
- Plovers nest from mid-February to September
- Place their eggs directly on the sand in shallow scrapes smaller than human footprints
- Eggs and chicks are also well-camouflaged, easily blending in with their sandy surroundings
- Both male and female plovers help to incubate the eggs
- Within just a few hours of hatching chicks run around and forage with their parents

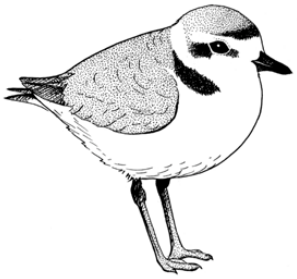


Appendix H: Snowy Plover Classroom and Field Trip Materials



Snowy Plover Crossword Puzzle





Down

1) The movement of individuals and even whole populations

3) the area along a shoreline that is repeatedly covered and uncovered by ocean tides

5) An individual who is eaten by another

6) An educated guess that might be true and is testable by observation and experimentation

7) An organism that consumes other organisms

Across

2) The area on the beach where the seaweed is cast up by the tide

4) The variety of life in an area

8) a trait that allows an organism to better survive in its environment

9) Place where a microorganism, plant or animal lives

10) Hills made of sand

Snowy Plover Docent Program *Los Angeles Audubon*

Snowy Plover Word Search

c l o w e r i n g b o o m y i d a t a l z
r m i g r a t e l u n v a s o r k a q u e
i w b i h w h y o n s i n h n e u d s n l
c r o v g l e w m d n n g a g e h o x n o
k a j u v i n o p f e k e b r u m b l e f
l c s d e d u n e s q s r i f l i c k j o
y k k w e n q a r s q u z t i c k l e i r
i n t i f o u w a t e r b a h a n t y b a
m e x n a p i s t r c f o t g p e d o u g
f l u g a p p i a r y z f f e k a n a z e
t i n s s t e k l e t m e d q i r l o f v

Use the sentectes to help you find the hidden words above:

Some birds **migrate** by flying to warmer climates during the winter.

Deer **forage** by eating the leaves off branches.

Scientists collect **data** when they conduct experiments.

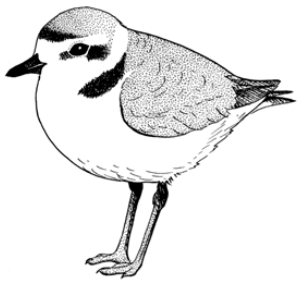
Dunes are hills made of sand.

A place that provides an animal with food, water, and shelter is called a **habitat**.

Wrack is seaweed cast up on the sand by the ocean tides.

Water is important to all life on Earth.

Most birds travel by using their **wings**.



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Useful Vocabulary

adaptation – a trait that allows an organism to better survive in its environment
example: A bird's wings are an adaptation that allow it to fly.

aquatic - living in the water
example: Fish are *aquatic* animals

biodiversity – the variety of life in an area
example: All the different types of plants, animals, and microorganisms that live in the Baldwin Hills make up the area's *biodiversity*.

data – observations and measurements that can be used to help answer a question
example: Measuring the length of different fish might give you *data* on how big a fish can grow.

dunes - hills made of sand
example: We saw many different plants growing on the *dunes* by the ocean.

dispersal – the movement of animals away from each other
example: When school is done for the day, all the students *disperse*.

flyway – a route usually followed by migrating birds

forage – to search for and eat food
example: When a deer eats leaves off a plant, it is *foraging*.

habitat - place where a microorganism, plant or animal lives
example: Your neighborhood is your *habitat* because it provides you with food, water, and shelter.

hypothesis – an educated guess that might be true and is testable by observation and experimentation
example: If your *hypothesis* is that only 5 cookies will fit in a jar, then you would need to do an experiment to prove that you are right.

intertidal zone - the area along a shoreline that is repeatedly covered and uncovered by ocean tides.
example: You can find a variety of birds and invertebrates using the *intertidal zone* to find food.

introduced – any plant or animal that was brought to an area by humans
example: Ice plant was *introduced* to the coast of California.

invertebrate – an animal lacking a backbone
example: butterfly, squid, snail

migration – the movement of individuals and even whole populations
example: Many birds *migrate* south in the winter.

native – originating, grown, or produced in a particular region
example: The California quail is *native* to the state of California.

observation - to watch carefully, especially with attention to details or behavior
example: When you watch a bird to see what it eats and what kind of tree it likes to perch in, you have made an *observation*.

organism – any individual living thing
example: a beetle, a hawk, or a tree

population – a group of living things
example: Everyone at your school makes up a *population* of students.

predator – an organism that consumes other organisms
example: A wolf is a *predator* that eats rabbits.

prey – an individual who is eaten by another
example: A rabbit might be *prey* to a wolf.

terrestrial – living on the ground
example: Dogs and cats are *terrestrial*.

vegetation - plant life or total plant cover
example: trees, shrubs, and flowering plants

vertebrate – an animal that has a backbone
example: dog, bird, human, mouse

wrack - seaweed cast up on the sand by the ocean tides
example: Kelp is a kind of seaweed found in *wrack*.

wrackline - the area on the beach where the seaweed is cast up by the tide
example: I saw several birds foraging along the *wrackline*.

LOS ANGELES
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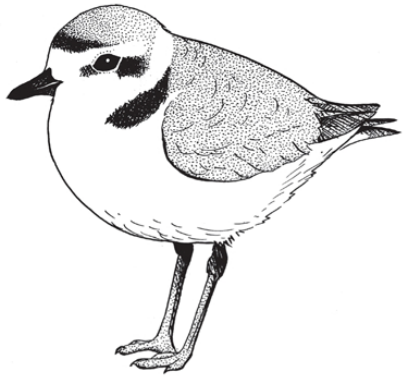
Snowy Plover Docent Program

Los Angeles Audubon
Snowy Plover Docent Program



FIELD NOTEBOOK

NAME: _____

DATE: _____

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

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

lagoon

open ocean

water's edge

wrack (seaweed)

marsh

shrubs and low trees

rocky beach

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

Draw a picture of some of the wrack (seaweed) you find during your visit.

SCIENTIFIC ILLUSTRATION

Draw a picture of plovers in their habitat.

Appendix I: Snowy Plover Conservation Poster

Actual size - 18" x 24"