NESTING OF THE CALIFORNIA LEAST TERN AND WESTERN SNOWY PLOVER AT OCEANO DUNES STATE VEHICULAR RECREATION AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA 2017 SEASON

Prepared for
California Department of Fish and Wildlife
United States Fish and Wildlife Service

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Oceano Dunes District

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Cover photos from 2017 season nest cameras used at Oceano Dunes SVRA. Snowy plover nests depredated by common raven on 17 May (top) and by striped skunk on 12 July (bottom).

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SUMMARY

Staff of Oceano Dunes State Vehicular Recreation Area (Oceano Dunes SVRA, ODSVRA) and Point Blue Conservation Science (Point Blue) monitored breeding California least terns (*Sternula antillarum browni*) (least tern, tern) and western snowy plovers (*Charadrius nivosus nivosus*) (snowy plover, plover) at ODSVRA, San Luis Obispo County, California, in 2017.

Least tern
In contrast to the previous 10 years, the 2017 least tern breeding season was characterized by very low productivity, with by far the lowest nest hatching rate, chick fledging rate, number of juveniles produced, and number of juveniles fledged per pair. Observations indicated that a large majority of chicks were lost when very young. Significant factors that can contribute to high mortality of very young chicks include predation and inadequate food supply. For the 2017 season at ODSVRA there is insufficient information to assess food availability. It is suspected that predation by striped skunk of both eggs and young chicks was a factor in the poor season.

There were an estimated 42-47 breeding pairs, similar to both 2016 (47-48 pairs) and the 10-year average (42-47 pairs) for the period 2007-16. There were 52 known nesting attempts, all from known locations and within the large seasonally fenced exclosure in the southern portion of the vehicle riding area. Of the 34 nests with known fate, 22 hatched for a nest hatching rate of 64.7%, substantially lower than the average of 88% during the previous 10 years. Twelve nests failed due to abandoned pre-term (5), abandoned unknown if pre- or post-term (1), depredated by skunk (5), and unknown cause (1). Eighteen nests had unknown fate (not known if hatched or failed) and this occurred during a period of high skunk activity in the exclosure and documented loss of tern and plover nests to skunk.

Thirty-nine chicks hatched and of these 25 were color-banded to individual. Only seven chicks (five banded, two unbanded) are known to have fledged (seen when 21 days old or older), for a very low fledging rate of 17.9% and an estimated 0.15-0.17 chicks fledged per pair. This compares poorly with the previous 10-year period that averaged a 78% chick fledging rate, 1.23-1.29 chicks fledged per pair, and 54 juveniles produced per year.

Mortality was documented for two adults, a desiccated partial carcass approximately 250 feet east of the seasonal exclosure, and a desiccated complete carcass inside the seasonal exclosure (13-year-old bird banded as a chick at ODSVRA in 2004).

Snowy plover
Snowy plovers had a successful breeding season in 2017, in part due to improved chick survival in the second half of the season.

There was a minimum of 183 breeding snowy plovers (93 males and 90 females), compared to 209 in 2016, a decrease of 12.4%. Ninety-three banded birds were documented as breeding, and the banding history was known for 89 of these birds. Of the known origin birds 83.1% (74/89) were banded as chicks and fledged from ODSVRA. There were 281 known nesting attempts, including eight identified only by detection of brood (unknown nest location). Of the 273 nests from known locations, 195 (71.4%) were in the southern riding area seasonal exclosure, 77 (28.2%) in North and South Oso Flaco and one (0.4%) in the Arroyo Grande Creek area. Of the 238 nests with known location and fate, 145 hatched for a nest hatching rate of 60.9%, lower than the previous 15-year average of 75%. Ninety-three nests failed, attributed to the following causes: abandoned pre-term (10); abandoned post-term (3); abandoned unknown pre- or post-term (5); abandoned, suspected due to wind (3); overwashed by tide or rising creek (3); unknown cause (26); unidentified predator (9); gull (2); common raven (10); coyote (2); avian predator (2); and striped

skunk (18). Twenty-four of 32 nests with unknown fate had fates occurring during a period of high skunk predation, while the remaining eight nests had fates occurring during a period of high raven predation.

Of the 378 hatching chicks, 252 were color-banded to brood with 47.6% (120/252) fledging, and the fate of the 126 unbanded chicks is believed known with 42.9% (54/126) fledging. A total of 174 chicks fledged (seen when 28 days old or older) for a fledging rate of 46.0%. One chick fledged per breeding male is the estimated number needed to prevent the population of snowy plovers from declining and productivity of 1.2 chicks fledged per male should provide for moderate population growth (assuming approximately 75% annual adult survival and 50% juvenile survival) (U.S. Fish and Wildlife Service 2007). In 2017, an estimated 1.87 chicks fledged per breeding male at ODSVRA. For the 16-year period 2002-17, average productivity was 1.49 chicks fledged per breeding male.

INTRODUCTION

Oceano Dunes SVRA, located in southern coastal San Luis Obispo County, California, is a popular park with high attendance and was visited by nearly 1.4 million people in 2016 for a variety of recreational opportunities, including driving vehicles on the beach and dunes.[1] In 2016, an estimated 352,127 street-legal vehicles and 94,726 off-highway vehicles were driven on the shoreline and dunes in the designated riding area of the park.[2]

Within ODSVRA there is extensive breeding habitat for two special-status ground-nesting birds, the state and federally endangered California least tern and the federally threatened Pacific coast population of the western snowy plover. Monitoring of the least tern and snowy plover at ODSVRA during the breeding season began in 1991 and 1992, respectively. Least terns are present at ODSVRA only during the breeding season, migrating to wintering areas well south of California. The snowy plover population at the park is comprised partly of birds present year-round and partly of migrant birds present only during the breeding or wintering season.

This report summarizes the results of the 2017 nesting season for least terns and snowy plovers at ODSVRA. Maps in figures and appendices use aerial imagery taken in 2014 by the National Agriculture Imagery Program, unless otherwise noted.

State park staff conducts monitoring activities at ODSVRA under U.S. Fish and Wildlife Service (USFWS) permit 10(a)(1)(A) TE-815214-9 and California Department of Fish and Wildlife (CDFW) Scientific Collecting Permits. Predator removal activities are conducted under USFWS Depredation Permit MB25976A-0. Point Blue conducts monitoring and banding activities under USFWS permit 10(a)(1)(A) TE-807078-17, Federal U.S. Geological Survey Bird Banding Laboratory Banding Permit 09316, CDFW Scientific Collecting Permit SC-9591, and a CDFW Memorandum of Understanding.

[1] ODSVRA 2016 Annual Attendance figures (source ODSVRA)
[2] ODSVRA 2016 Monthly Carrying Capacity Summaries (source ODSVRA)

SITE DESCRIPTION

ODSVRA is part of the 18-mile-long Guadalupe-Nipomo Dunes complex. The Oceano Dunes District, California Department of Parks and Recreation, manages approximately 4,900 acres with approximately 9.1 miles of ocean shoreline on the western edge. On the northern border of the park is the city of Pismo Beach. Located to the east of the park are Phillips 66 Refinery, the cities of Grover Beach and Oceano, and private lands that consist of dunes, coastal scrub, and agricultural fields. The southern border of the park abuts the Guadalupe-Nipomo Dunes National Wildlife Refuge (NWR). Inside the park, dunes that are open to vehicles extend inland in some areas for over one mile. Eight numbered marker posts, located approximately 0.5 miles apart, are located along the coastal strand of the riding area to orient park visitors and staff. Street-legal vehicles are allowed throughout the riding area. Off-highway vehicles, as well as overnight camping, are allowed along the beach and dunes south of marker post 2 (approximately one mile south of Pier Avenue). In the southern portion of ODSVRA is Oso Flaco Lake area (Oso Flaco) with a shoreline of approximately 1.7 miles. Pedestrians are allowed at Oso Flaco but it is closed to camping, equestrian, dog, and vehicle use. The beach at Oso Flaco west of the foredunes is narrower than in the riding area.

The following are descriptions of sites and terms as used in this report (Figure 1, Figure 2).

ODSVRA: All areas that are administered by the Oceano Dunes District, including the Oceano Dunes SVRA, Pismo State Beach, Pismo Dunes Natural Preserve (Dunes Preserve), Pismo Lake, and Oso Flaco Lake area. Management of the Dunes Preserve and Pismo State Beach was transferred to the Oceano Dunes District in December 2004. The Pismo Lake property was acquired from the California Department of Fish and Wildlife in 2007 and is currently closed to the public. ODSVRA provided tern and plover monitoring for the Dunes Preserve prior to 2004 and continues to do so. Pedestrian and equestrian use is permitted in the Dunes Preserve, but vehicles and dogs are not allowed.

Riding area: The area within ODSVRA that is open to recreational vehicles. This area changes in size based on seasonal restrictions. Street-legal vehicles are allowed along approximately 5.3 miles of beach, from the Grand Avenue park entrance south to the southern boundary of the riding area (approximately 0.4 miles south of marker post 8). Off-highway vehicles are only allowed south of marker post 2.

Open riding area: The area within ODSVRA open to recreational vehicle use during the nesting season. Fencing designates the eastern perimeter of the open riding area, however this fence is not maintained as predator fencing and coyotes and other mammals can easily move through this fencing (Figure 1).

Southern Exclosure: A single contiguous area within the southern portion of the riding area that is fenced and closed to entry during the breeding season to protect nesting terns and plovers. The adjoining shoreline is also part of the Southern Exclosure and is closed to public entry during the nesting season. From 2001 to 2004, the amount of seasonally protected nesting habitat in the riding area periodically increased in size. Subsequent to 2004 there has been no increase in size of this protected area. The area of the Southern Exclosure (including the area at and above the high tide line on the closed shoreline) for 2017 was approximately 300 acres, compared to a range of 271-301 acres (and an average of 290 acres) between 2004 and 2016. Although the basic configuration of the Southern Exclosure has remained consistent since 2004, changes in dune topography and public safety issues impact the placement of the east fence, resulting in small variations in acreage from year to year. Individually identified areas (Figure 2) within the Southern Exclosure include the following:

> *6 exclosure*: The area from marker post 6 to marker post 7, (approximately 0.5 miles of shoreline and approximately 60 acres), first incorporated into the Southern Exclosure for a full season in

2004. Vegetation within the exclosure is overall very sparse with limited areas of vegetated hummocks.

7 exclosure: The area from marker post 7 to the south side of 7.5 revegetation area (approximately 0.4 miles of shoreline and approximately 60 acres). Habitat includes extensive areas of bare sand, limited areas of vegetated hummocks, limited areas of organic surface debris (shells, driftwood, dried algal wrack), and moderate to heavy vegetation in the small 7.5 revegetation area located within the 7 exclosure.

8 exclosure: The area from the south side of the 7.5 revegetation area to the North Oso Flaco fencing south of marker post 8 (approximately 0.5 miles of shoreline and approximately 85 acres). Habitat includes extensive areas of bare sand, limited areas of vegetated hummocks, and limited areas of organic surface debris (shells, driftwood, and algal wrack).

Boneyard exclosure: The area east of the North Oso Flaco dunes. Habitat is primarily bare sand and active sand dunes. This inland area does not have a shoreline component and is approximately 95 acres. A portion of the west side (approximately 15.5 acres) has been closed year-round since 2005 due to the presence of a cultural resource area. Portions of this area have developed small vegetated hummocks. Straw bales, placed within the protected cultural area in 2004, to build up sand to cover and protect cultural resources, persist. The east fence is not maintained as predator fencing due to the rapidly shifting open sand dunes in the area. Instead, beginning in 2003, a two-inch by four-inch mesh interior fence (six-foot-tall predator fencing) has bisected Boneyard exclosure during the nesting season, resulting in 45 acres in the western portion (contiguous with 6, 7, and 8 exclosures) and 49 acres in the eastern portion.

Oso Flaco: The shoreline and dunes in ODSVRA located south of the riding area. The approximately 1.7 miles of beach length is narrow in width, and the dunes are typically heavily vegetated, relative to the riding area. The area is part of the Oso Flaco Lake area, open to pedestrian use but closed to vehicles. Beginning in 2006, an additional 0.4 miles of shoreline at the southern end of the park were included in the ODSVRA (a survey conducted by the Guadalupe-Nipomo Dunes NWR in 2005 determined this area was part of ODSVRA and not the NWR, as was previously thought). For purposes of discussion in this report, Oso Flaco is divided into North Oso Flaco and South Oso Flaco (Figure 2).

North Oso Flaco: The area extending south from 8 exclosure to the pedestrian boardwalk access trail to the Oso Flaco shoreline (approximately 0.5 miles of shoreline and approximately 68 acres). Beginning in 2002, the upper beach and dunes were closed to pedestrians during the nesting season with symbolic fencing. Since 2005, the North Oso Flaco area has been part of the seasonal exclosure and managed in a similar manner; predator fencing has replaced symbolic fencing and the shoreline has been closed to the public during the nesting season. A portion of the North Oso Flaco fence along the boardwalk is left in place year around, however it is only maintained for predators during the nesting season (labeled as Permanent predator fence in Appendix C.9).

South Oso Flaco: Extends from the boardwalk to the ODSVRA southern boundary (approximately 1.2 miles shoreline length). Oso Flaco Lake drains through Oso Flaco Creek and the mouth of this creek is within the northern portion of South Oso Flaco. The shoreline is open to the public and symbolic fencing and signage have been used since 2002 to designate the seasonally closed upper beach and dune habitat. Snowy plover nests found in this area typically receive individual nest exclosures.

Pipeline revegetation area: Located adjacent to the east side of 8 exclosure. The area is heavily vegetated. Fencing designates the perimeter of revegetation area adjacent to the open riding area, however this fence is not maintained as predator fencing (Figure C.7 in Appendix C).

Other revegetation areas mentioned in this report: Maidenform revegetation area is located adjacent to the east side of Boneyard exclosure and the open riding area, Eucalyptus revegetation area is located 840 feet east of 6 exclosure, North Eucalyptus revegetation area is located 1,000 feet east of 6 exclosure, and Humpback revegetation area is 720 feet east of 7 exclosure. The areas are heavily vegetated. Fencing designates the perimeter of revegetation areas in the open riding area, however this fence is not maintained as predator fencing.

Arroyo Grande Creek: Seasonally flows into the Pacific Ocean approximately two miles north of the Southern Exclosure. The associated lagoon is variably located east of the area near marker post 1 and north of marker post 2. The upper creek area and lagoon are closed to vehicle use year-round to protect sensitive aquatic habitat. Pedestrian and equestrian entry is prohibited during the nesting season and permitted during the nonbreeding season. Posts and signs delineate the closed area during the nonbreeding season; symbolic rope fence is added during the nesting season.

Carpenter Creek: Seasonally flows into the Pacific Ocean approximately 4.5 miles north of the Southern Exclosure. No vehicles are allowed in the area as it is approximately 0.4 miles north of the riding area. The area receives a high level of pedestrian use.

Pismo Creek lagoon: Seasonally flows into the Pacific Ocean approximately 4.8 miles north of the Southern Exclosure. Standing water persists all year, with low vegetated hummocks west of the lagoon and tall vegetated dunes and housing to the east. No vehicles are allowed in the area as it is approximately 0.75 miles north of the riding area. The area receives a high level of pedestrian use. Only a small portion of the lagoon is part of state park property.

MONITORING AND MANAGEMENT ACTIONS

MONITORING

Daily monitoring occurs from 1 March–30 September. At a minimum, ODSVRA maintains three monitors during morning and early afternoon hours. As the season progresses, monitoring increases to include the late afternoon and early evening hours. Monitoring involves walking to assess or find new nests as well as scanning for nests and broods from parked vehicles (a proven and effective blind). Monitoring occurs in a manner to minimize disturbance or adverse effects to adult birds, nests, and chicks.

Open riding area

Monitoring of the open riding area by vehicle occurs daily along defined transects, as any nests initiated or chicks in this area require immediate protection from recreational activities. Areas along transects with plover activity indicating potential nesting interest (scraping or copulating) are checked more thoroughly on foot and with increased frequency using binoculars or spotting scope. When staff finds chicks in the open riding area, the chicks are slowly directed back into the protected Southern Exclosure using, as appropriate, measures that include the following: vehicle traffic flow is diverted or regulated to allow safe movement of the brood; threats such as gulls or other predators within the travel corridor are flushed away for safety of brood movement; assistance is obtained as necessary from ODSVRA patrol staff; and signs and/or symbolic fencing is erected to provide a safe passage until the brood reaches the protected exclosure. Staff continues to monitor chicks to confirm they do not move back into the open riding area.

Breeding least terns and snowy plovers

Finding and monitoring nests: The least tern and snowy plover management program documents size of breeding populations and attempts to find, monitor, and determine all tern and plover nest and chick fates. Staff checks most nests daily and conducts regular nest searches using binoculars and spotting scopes from parked vehicles outside of the seasonal fencing. Additional nest searches are conducted on foot. Staff maps nest locations using a Global Positioning System (GPS). Egg-laying dates provide estimates for least tern and snowy plover clutch hatching dates; for nests found at full clutch, floating the eggs (snowy plovers only) provides an estimate.

Estimated initiation date: Initiation dates are estimated using multiple methods that include: timing of egg-laying sequence; floating eggs for plover nests; or when hatch date is known, using average length of time for nests to hatch and backdating to nest initiation. Initiation dates for nests with egg-laying sequence unknown, eggs not floated, or nest not hatching cannot be estimated.

Nest fates:
The following categorizes nest fates used in this report:

> *Hatch*: Nest hatched at least one egg. Nesting attempts known only by detection of brood are referred to as "unknown location nests" and egg numbers from such nests are minimums derived from the number of chicks first observed. A nest is called a split hatch when hatching of all chicks in the brood may have occurred over more than one day.
>
> *Abandoned pre-term*: Nest abandoned prior to the expected hatch date; causes may include, but are not limited to, disturbance or adult mortality.
>
> *Abandoned, suspected due to wind*: Nest abandoned pre-term during periods of high wind, with eggs typically found almost or completely buried.

Beginning in 2010, the category of "abandoned, suspected due to wind" was added to nest fates. Prior to this, nests lost where wind may have been the cause were included in the broader category of "abandoned pre-term." For the 2010 report, least tern nests in the abandoned pre-term category for the previous eight years were reviewed and a limited number were reassigned to the category of abandoned, suspected due to wind. Tables in this report include the reassigned tern nest fates for years prior to 2010.

Abandoned post-term: Nest abandoned after the expected hatch date, and includes nests with nonviable eggs.

Abandoned, unknown if pre- or post-term: Nest abandoned, but unknown if pre- or post-term.

Depredated: Nest lost to a predator. If possible, staff identifies the predator to species or group (mammalian, avian), or describes the nest as lost to an unidentified predator.

Flooded, Overwashed by tide: Nest overwashed by tide, or flooded by a shifting creek or expanding lagoon.

Failed to unknown cause: Nests that disappeared before expected hatch date with cause of failure undetermined.

Unknown fate: Nests where eggs disappear around the estimated hatch date but not enough evidence exists to determine whether they hatched or failed, or nests that have insufficient information to estimate an initiation date. To decrease disturbance to chicks, access to nests with nearby young tern and plover broods is limited, and may result in nests with unknown fate.

Banding chicks: In 2017, least tern chicks received a single size 1A blank aluminum band (covered with green over yellow vinyl tape) on the left leg, and a size 1A numbered aluminum federal band on the right leg. Color tape placed on the federal band creates color band combinations unique to each individual chick. Weighing chicks occurs immediately prior to banding, typically at one to three days old.

Banding of plover chicks was inconsistent prior to 2001. Since 2002, the goal has been to band all chicks to brood, with all chicks within one brood given the same color band combination. Since 2010, some ODSVRA band combinations on birds that may be alive have been reused due to the limited number of combinations available. Therefore, the age of adult plovers with certain ODSVRA band combinations is sometimes unknown. Some chicks are left unbanded in areas with nearby young tern and plover broods to reduce disturbance to chicks. The fates of unbanded chicks are tracked with intense monitoring of broods. In some instances the associated male or sibling chicks may be color-banded.

Assignment of broods to nests: Most chicks are banded at the nest. Chicks found outside of the immediate nest area can often be assigned to a specific hatched nest as one or both of the parents are color-banded. For some broods with unbanded adults the brood location and age of chicks allow nest determination. However, circumstances can occur with several nearby nests hatching at the same time (chicks confirmed from distance with spotting scope) and banding at the nests is not possible. The resulting broods, with chicks the same age, may appear on the same section of shore and it is not possible to assign each brood to a specific nest. Such broods are referred to as "unassigned broods."

Chick monitoring: Chick observations are recorded during daily monitoring activities. In addition, focused searching for broods occurs multiple times each week from vehicle surveys on the shoreline of the Southern

Exclosure and Oso Flaco. Staff records band combinations, chick numbers, adults present, location and direction of movement, and any interaction or aggression with nearby broods.

Fledging success: At ODSVRA, juvenile terns can be widely dispersed over a large area. Monitoring efforts directed specifically for terns are needed in estimating the number of juveniles produced as well as identifying threats to survival. Tern chicks surviving to 21 days or older are considered fledged (21 days after the hatch date, which counts as day zero). Tracking of juvenile terns occurs on park property (in the Southern Exclosure, at Oso Flaco Lake, Pismo Creek lagoon, and roosting areas such as south of Pier Avenue) and at nearby sites.

The fledgling tern counting method varied among years as follows: single day high counts for 1991-97, and 2000-01; a single day high count at Oso Flaco Lake for 1998; count method for 1999 unknown; and three-week interval day count conducted from 2002-04 (chicks banded to site 2003-04). In 2005, chicks were color-banded to brood and since 2006 most chicks were color-banded to individual, resulting in more accurate documentation of fledge rate than previous methods. Earlier estimates prior to banding to individual may represent substantial undercounts or overcounts.

Plover chicks surviving to 28 days or older from the time of hatch are considered fledged (28 days after the hatch date, which counts as day zero). Prior to 2001, monitoring in Oso Flaco and Pismo Dunes Natural Preserve was intermittent, and fledgling information was not obtained.

Measures describing breeding success:
The following categorizes measures describing breeding success used in this report:

> *Hatch rate:* Total number of hatching known location and fate nests divided by total number of nests with known location and fate.
>
> *Percentage chicks fledging*: Total number of chicks fledging divided by total number of chicks (includes chicks fledged from unknown location nests).
>
> *Number of chicks fledging per nest*: Total number of chicks fledging divided by total number of nests.
>
> *Productivity*: Number of least tern fledglings per breeding pair (consistent with the annual statewide California least tern report produced by CDFW). Number of snowy plover fledglings per breeding male (consistent with USFWS Pacific coast western snowy plover recovery plan).

Banded adults: Documenting banded least terns and snowy plover adults can provide detailed information on history of birds including: origins, age, breeding status, and movement between sites. Staff attempts to record all band combinations of adult least terns and snowy plovers.

Number of breeding adults: For least terns the number of breeding pairs is represented as a range. The estimated minimum number of pairs is equal to the maximum number of concurrently active nests and broods. The estimated maximum number of pairs is equal to the minimum number of pairs plus one-half of the value of the minimum number of pairs subtracted from the total number of nests. (This assumes nests in addition to those accounted for by the minimum number of pairs are equally divided between renesting pairs and new pairs.):

Max. no. pairs = min. no. pairs + [(total no. nests - min. no. pairs) / 2]

Banding least tern chicks to brood in 2005, and to individual since 2006, provides for increased accuracy in counting the number of active broods on a given date. From 1991 to 2001, the estimated number of breeding pairs was not always reported or was based only on the number of concurrent nests. These reports were reviewed in 2005, looking at both nests and the limited brood information. For some years this resulted in identifying an increase in the minimum number of pairs and this revised information has been provided in annual reports since 2005.

Individually banded snowy plover adults provide the most accurate means to identify breeding population size but currently at ODSVRA too few adults are banded to rely solely on this method. A minimum number of breeding females is derived from the maximum number of nests active on the same day plus any additional nests hatching one day before or initiated one day after this date. A minimum number of breeding males is estimated from the highest same day count of active nests and broods (males typically raise the chicks; males with broods three weeks of age or older are not included if they could be associated with a new nest) and number of nests initiated the day after the high count. Beginning in 2009, numbers of color-banded adults confirmed breeding are compiled, and any number of this group that could not be accounted for on the same day high count, including nests or broods with unknown adults, are added to the same day high count for the appropriate sex.

ODSVRA also participates in the annual U.S. Pacific coast snowy plover breeding season window survey coordinated by USFWS.

Least tern night roost: During the breeding season terns may assemble in a night roost. Monitors record the night roost location and total numbers of individuals present as the terns arrive at dusk. Night vision goggles are available and used for this task, but they have a limited range for distance viewing. There are occasions when terns are not seen, but are heard vocalizing as they arrive to roost after it is too dark to see. Counts are considered a minimum due to the inherent limited visibility of the night roost. It is typically too dark to distinguish between adults and juveniles.

Least tern use of freshwater lakes: Freshwater lakes can provide a source of prey fish in addition to the near-shore ocean. Periodically surveying nearby small freshwater lakes documents tern use and gives a better understanding of local food resources. An important component of this monitoring is to determine if lakes provide additional appropriately-sized fish to feed chicks (chicks require fish small enough that they can be swallowed whole). Observations of adults in flight provide information about the direction of foraging sources and, occasionally, fish size.

Wind speed monitoring

Beginning in 2011, ODSVRA monitors wind speed from a tower (S1 tower) located approximately 375 feet east of 6 exclosure, with anemometers at two, seven and 10 meters high. Another tower (Site 20 tower) located approximately 0.47 miles east of marker post 6 provided additional wind speed information in 2017. In 2010-11, a portable anemometer with data logger (from WindLog Rainwise, Inc.) was placed in the breeding habitat. Before 2010, wind speeds were periodically measured by handheld weather gauges (Kestrel 2000 Weather Meter by Kestrel Meters).

Predator activity

Monitoring predator activities: Park staff and contractors (Bloom Biological Inc., U.S. Department of Agriculture [USDA] Wildlife Services, and Point Blue) collect information on predator presence at ODSVRA from February through September. From direct observation of mammalian and avian predators or their sign (e.g., tracks, scats, regurgitated pellets, prey remains, depredated nests), monitors record species, type of sign, behavior, duration of observation, direction of travel, and characteristics that may identify an individual. Summarizing these observations by count of days detected, location of animal

sighting or sign, and observation duration allows for comparison across years. For additional details, see section titled Predators and predator management on page 41.

Gull monitoring: Gulls may depredate snowy plover and least tern eggs, chicks, and juveniles. Gulls are of particular concern because they can be a subsidized predator attracted to food resources associated with human activity. Gull numbers are counted at the trash dumpster area near marker post 2 daily in addition to general predator monitoring.

Nonbreeding season monitoring of snowy plovers

Beginning in 2009, more consistent weekly surveys for snowy plovers occurs during the months of October through February. During these surveys staff divides the shoreline into the following five sections, listed from north to south:

1) approximately 0.5 miles north of Pismo Pier to Grand Avenue (pedestrian use only, no vehicle use allowed);
2) Grand Avenue south to marker post 2 (street-legal vehicles and day use only, no camping);
3) marker post 2 south to marker post 6 (street-legal vehicles, off-highway vehicles, and camping allowed year-round);
4) marker post 6 south to the southern shoreline riding area boundary (shore and portion of upper beach closed to public use during 1 March to 30 September and open to all activities during the rest of the year); and
5) Oso Flaco (southern shoreline riding area boundary to ODSVRA's southern boundary with pedestrian use only and portion of shore and upper beach closed to pedestrian use 1 March to 30 September).

ODSVRA also participates in the annual U.S. Pacific coast snowy plover winter window survey coordinated by USFWS.

Investigation of least tern and snowy plover carcasses

As directed by CDFW, ODSVRA sends fresh carcasses of least terns to an approved facility for necropsy. This is primarily the CDFW Office of Spill Prevention and Response, Marine Wildlife Veterinary Care and Research Center, Santa Cruz, California (CDFW OSPR). If CDFW OSPR is unavailable, carcasses are sent to UC Davis California Animal Health and Food Safety Laboratory System, Davis, California. Fresh carcasses must be immediately refrigerated and then sent by overnight delivery service within one day to preserve the integrity of tissues to be tested to determine cause of death. As of the beginning of the 2017 season, under directions from USFWS, all snowy plover carcasses are placed in a freezer and a necropsy is later performed if USFWS determines it necessary.

MANAGEMENT ACTIONS

ODSVRA manages for least terns and snowy plovers to optimize breeding success and reduce the potential for take. To reduce visitor disturbance to breeding birds, ODSVRA installs fence around seasonally closed areas to visitors and posts signage. Staff augments existing habitat with branches, woodchips, and wrack (surf-cast kelp). An active predator management program reduces disturbance and depredation by mammalian and avian predators.

Informational signage and enforcement of regulations
Interpretive panels and signs are placed at public access points, at bathrooms, on A-frame placards near winter flocks, and in areas identifying closed areas, which serve to increase public awareness of threats to nesting terns and plovers. The public can access a low wattage radio station with a repeated recording of park information, including information about protection of sensitive species. Park ranger staff enforce park regulations enacted to protect terns and plovers.

Seasonal closure and fencing
Every year from 1 March through 30 September, ODSVRA closes least tern and snowy plover breeding habitat to vehicle and pedestrian use with wire mesh or symbolic fencing. The wire fencing of the seasonal exclosure (see details below), provides a higher level of protection when compared to symbolic fencing, composed of rope with signs, to keep visitors from entering sensitive areas. When nesting occurs outside of the seasonal exclosure, staff may choose an alternative wire exclosure type with consideration for the species, topography, proximity to recreational activities, predator threats, and duration of disturbance to the area during exclosure construction. The seasonal exclosure and large single nest exclosures are collectively referred to as seasonal fencing in this report.

ODSVRA uses the following exclosure types:

Seasonal exclosure protected area (contiguous predator fencing of Southern Exclosure and North Oso Flaco): ODSVRA fences this approximately 350-acre area during the nesting season to limit vehicle and human trespass into protected nesting and brood-rearing habitat. Wire fencing five feet high (bottom eight inches buried) with two-inch by four-inch mesh discourages coyote (*Canis latrans*) entry. Beginning in 2006, an additional layer of fence material was attached to overlap the top of the fence, increasing fence height above the surface to approximately six feet as a further deterrent to coyotes. Staff attaches bird barrier spikes to the wood posts in an effort to discourage perching by avian predators. Tall posts with large stop signs extend into the intertidal area at marker post 6 and the south end of North Oso Flaco. Rope with additional signage extends between the shoreline posts to clearly designate a closed shoreline to visitors.

Symbolic fencing (South Oso Flaco): Symbolically fencing approximately 1.2 miles of nesting and brood-rearing habitat in South Oso Flaco identifies the closure area (lower shore remains open to public). Nests in this area typically receive some type of individual nest exclosure.

Large single nest exclosure: Staff installs a large circular single nest exclosure with height of five feet (bottom eight inches buried) around any least tern or snowy plover nest found in the open riding area. The minimum nest exclosure diameter size is 656 feet (200 meters) for tern nests and 200 feet for plover nests. (Prior to 2016 the minimum size for tern single nests exclosures was 200 feet in diameter.) Single nest exclosures of differing sizes may also be used to protect snowy plover nests in areas where vehicles are not permitted (Oso Flaco, Southern Exclosure shoreline, Arroyo Grande Creek area, and areas north of Grand Avenue).

10-foot by 10-foot exclosure, circular exclosure, and mini-exclosure: Staff selectively uses a small circular or one of two small square nest exclosures (made of two-inch by four-inch wire) around snowy plover nests

inside or outside of seasonal fencing for protection from predators, including roosting gull flocks. Staff uses different exclosures based on a variety of factors including, but not limited to, weather, topography, predator threats, and proximity of young broods.

The 10-foot by 10-foot exclosure (available for use since 2003) and seven-foot-diameter circular exclosure (available for use since 2012) are built with five-foot-high sides and the bottom eight inches buried when outside of the seasonal exclosure protected area. Plastic netting, 1/2-inch by 1/2-inch mesh, is added to the top to protect against avian and climbing mammalian predators.

Mini-exclosures (used since 2010) are three feet by three feet by three feet with a wire mesh top, staked into the ground, and buried four to eight inches when appropriate. Of the three types, mini-exclosures take the least amount of time and staff to install.

Bumpout: A nest in the Southern Exclosure located close to the east or north fence requires temporary additional fencing extending into the open riding area to allow an adequate buffer between recreational activities and the nest. This type of extended fence is termed "bumpout." Least tern nests within 328 feet (100 meters) of the open riding area and snowy plover nests within 100 feet of the open riding area receive a bumpout. (Prior to 2016, the minimum distance of bumpouts for tern nests was 100 feet.) Staff extends bumpouts when recreational activities continue to cause disturbance to nesting birds. ODSVRA maintains a safe vehicle corridor adjacent to the east fence and any bumpouts. Nests on the shoreline that are close to the west fence may be exclosed by two-inch by four-inch mesh fencing extending from the Southern Exclosure fence; this type of single nest exclosure is also given the term "bumpout".

Habitat enhancement

Following the nesting season, and for the five-month period October through February, camping, street-legal vehicles, and off-highway vehicles use portions of the Southern Exclosure. This recreational use results in large areas of flattened terrain and barren sand with very limited scattered natural debris and vegetation.

Each year, staff place material in 6, 7, and 8 exclosures to offer more areas of disruptive cover for terns and plovers, providing shelter from wind and blowing sand, reducing exposure to predators, and augmenting potential nesting substrate. Beginning in February or March, and prior to nest initiation, natural materials such as driftwood, woodchips, and wrack are added to the exclosures and shoreline areas, to enhance habitat features. No habitat enhancement occurs within 100 feet of the fence that borders the open riding area to discourage nesting near recreation that may cause disturbance to breeding birds.

Wrack and talitrids: Results from studies conducted by Drs. Jenny Dugan and Mark Page, researchers from the Marine Science Institute at the University of California Santa Barbara, suggest that the seven-month seasonal closure (March through September) is not a sufficient period of time for invertebrates to effectively recover species diversity and abundance on the Southern Exclosure shoreline following five months of recreational vehicle use.

ODSVRA collects wrack in the open riding area and disperses it in the Southern Exclosure. Collection and distribution is done by hand and moved using a truck and trailer. In addition to providing cover, wrack on the shoreline provides a food resource supporting invertebrates, which in turn are prey for plover chicks, juveniles, and adults. Talitrids (commonly called beach hoppers) are collected from outside the vehicle use area north of Grand Avenue and occasionally from South Oso Flaco; care is taken to not deplete talitrid numbers from collection sites. Staff inoculates the wrack addition areas of the Southern Exclosure shoreline with talitrids in order to establish a breeding population, thus increasing the food resources available for plover chicks and juveniles during the breeding months.

Woodchips, branches and driftwood: Staff adds woodchips to supplement the existing assorted debris that snowy plovers often choose as nesting substrate. Woodchips are spread in patches of less than a quarter-acre in size in the 6, 7, and 8 exclosures in areas of barren sand and over thinning woodchip patches remaining from the previous years. ODSVRA heavy equipment assists in loading woodchips to be distributed.

Staff distributes cut branches and driftwood in patches from the mid-portion of 6 and 7 exclosures to the west fence and upper shoreline west of the exclosure. Staff collects the branches and driftwood from the exclosures at the end of each season and stores them for use in the following season.

Predator management

In addition to preventative measures such as fencing, individual nest exclosures, and cover provided by habitat enhancement, ODSVRA park staff and contractors monitor predator activity to assess impacts on breeding terns and plovers (as discussed in Monitoring). Staff removes animal carcasses (which attract scavengers) in or adjacent to nesting and brood-rearing habitat and harass predators to flush them from sensitive areas. Hazing techniques used include approaching an avian predator on foot or by vehicle, waving arms and making noise, or firing a bird whistler. A bird whistler is a handheld launcher that fires a projectile 250 to 300 feet that makes a loud whistling sound, hazing predatory birds without harming them. Firing the bird whistler may, in some situations, be less disruptive to plovers and terns compared to approaching an avian predator on foot in the breeding habitat. When additional options for managing predators are needed, selective live-trapping and relocation of avian predators is conducted by Bloom Biological, Inc. and lethal removal of mammalian and avian predators is conducted by USDA Wildlife Services (see section titled Predators and predator management on page 41 for additional information).

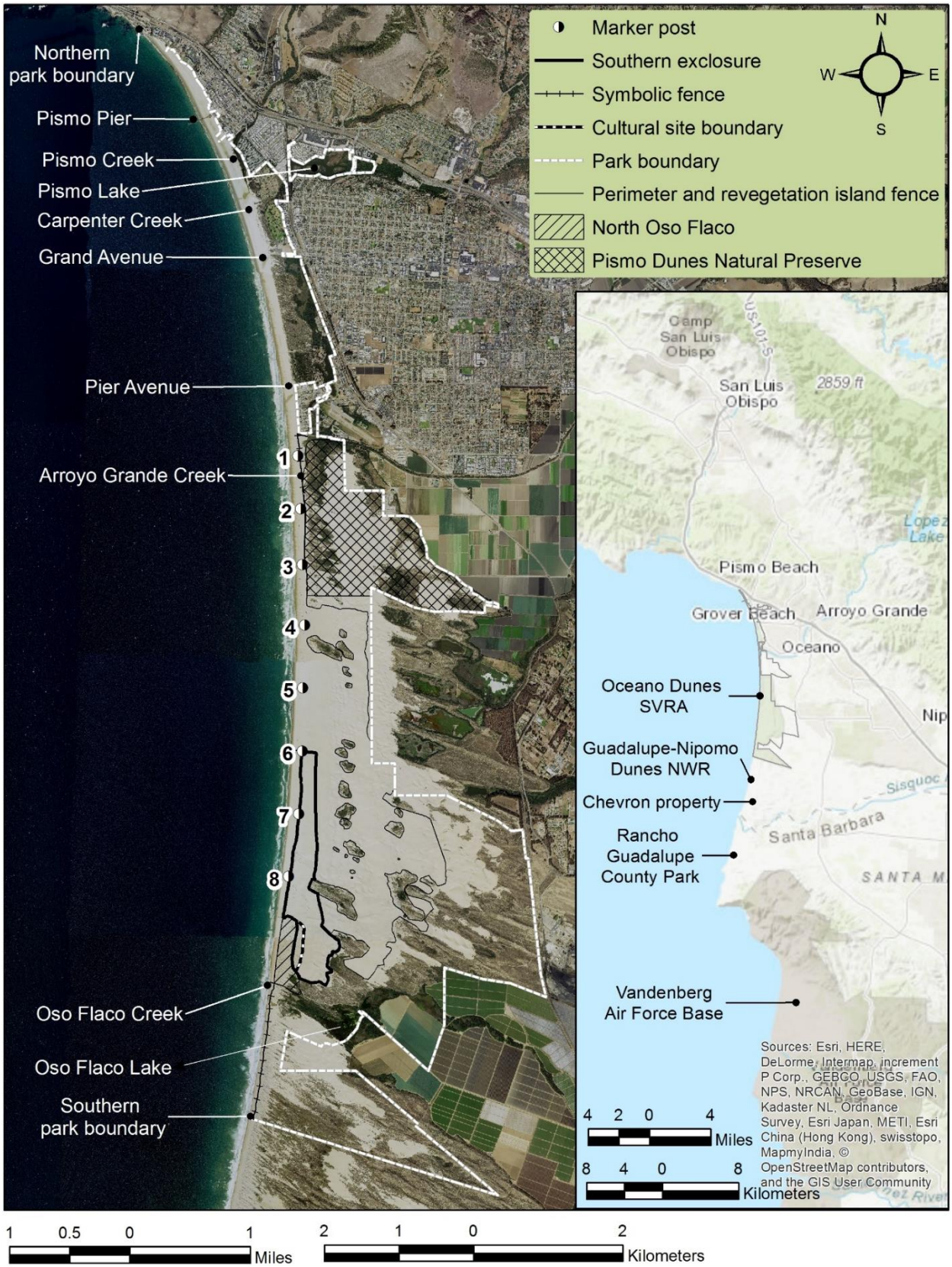


Figure 1. ODSVRA site map.

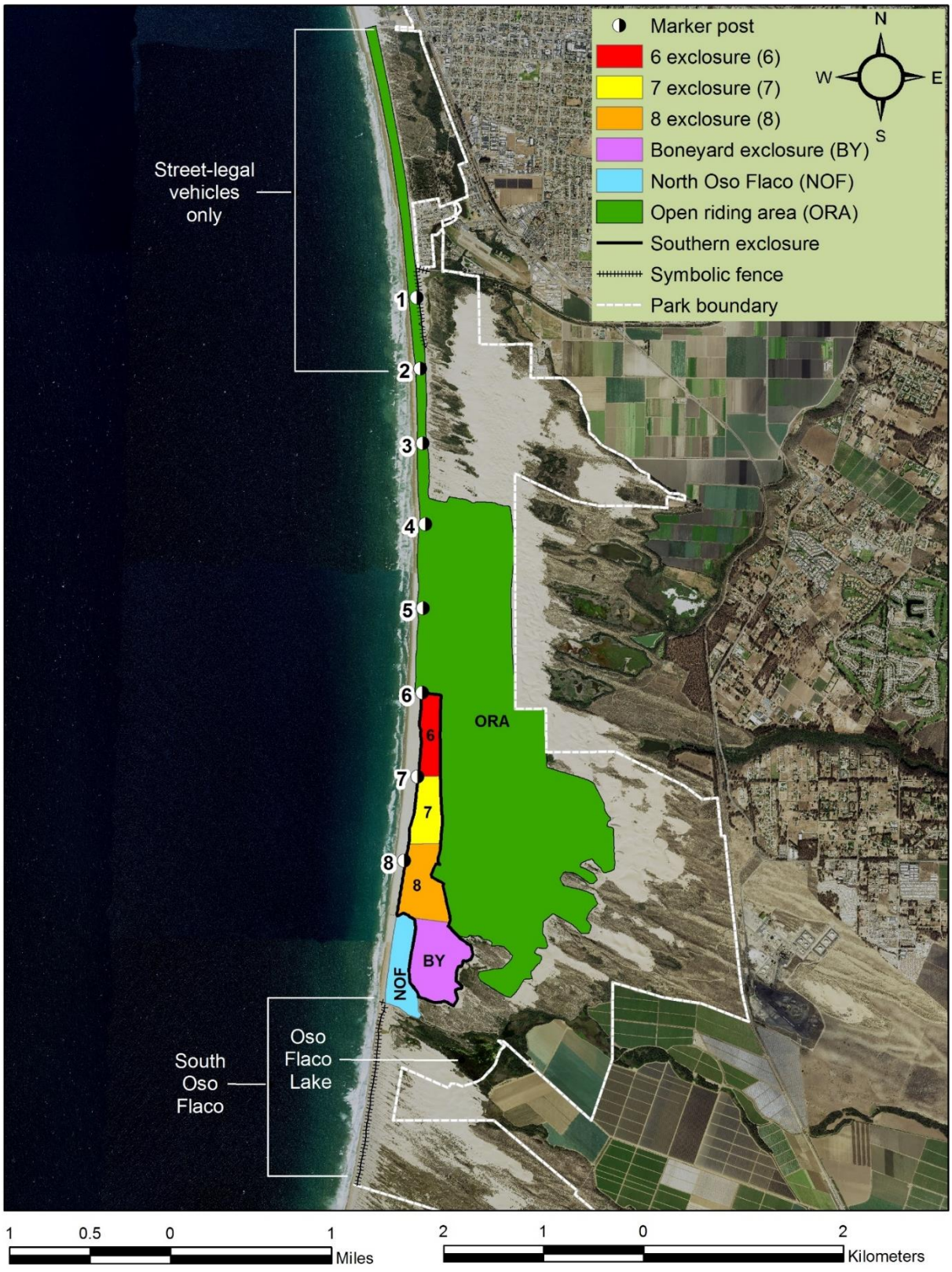


Figure 2. ODSVRA Southern Exclosure and Oso Flaco seasonally protected areas for breeding California least terns and snowy plovers in 2017.

RESULTS AND DISCUSSION

CALIFORNIA LEAST TERN

Number of breeding pairs

In 2017, least terns were first heard at ODSVRA on 1 May flying over the exclosure, with five seen flying over the exclosure on 2 May, and from this date onward terns were seen or heard daily. Terns were last seen on 29 August with one adult on 7 exclosure shoreline and an unbanded adult in South Oso Flaco. During the previous 15 years, first sightings occurred between 8 April and 15 May (median=6 May) and last sightings occurred between 10 August and 28 September (median=30 August). To determine the minimum number of breeding pairs ODSVRA uses the single day high count of concurrent nests and broods (see Monitoring and Management actions section for additional information on determining number of breeding adults). In 2017, there was a known minimum of 42 breeding pairs and an estimated maximum of 47 pairs. This is lower than the 47-48 pairs in 2016 but similar to the average of 41-44 pairs (range=23-60) for the 12-year period 2005-16 (Table 1, Figure 3).

Number, clutch size, and distribution of nests

There was a total of 52 nests with the first nest initiated approximately 24 May and the last 30 June (Appendix A). During the 15-year period 2002-16, there was an average of 48 nests per year (range=22-79) with initiation dates for first nests ranging from 16 May to 8 June (median=31 May). In 2017, the number of nests and broods active at the same time was 42 on 16 June. Of the 33 nests with known complete clutch size four had one egg, 28 had two eggs, and one had three eggs, with an average clutch size of 1.91 eggs. This compares to an average of 1.89 for 2005-16 (range=1.55-2.05), and a reported statewide average of 1.67 from 2007–16 (range=1.60-1.82) (Marschalek 2008-12; Frost 2013-17). All of the 52 nesting attempts were from known clutches. Of the 52 nests, 26 were located in 6 exclosure (50%), and 26 in 7 exclosure (50%) (Figure 4).

Clutch hatching rate

Of the 52 nests, 22 hatched, 18 had unknown fate, five were abandoned pre-term, one was abandoned (unknown if pre- or post-term), one failed (unknown cause), and five were depredated by skunk (Table 2). The clutch hatching rate for nests with known fate was 64.7% (22/34). This compares to an average hatching rate of 85% (range=66-98%) for known fate nests during the period 2005-16 (Table 1). The hatching rate of known fate nests was 57.9% (11/19) in 6 exclosure, and 73.3% (11/15) in 7 exclosure. Eighteen chicks hatched from a minimum of 40 eggs in 6 exclosure, and 21 chicks hatched from a minimum of 42 eggs in 7 exclosure.

Table 1. Nesting success of California least terns at ODSVRA from 1991-2017.

Percent nests hatched calculated using number of nests with known fate. Percent chicks fledged and juveniles fledged per nest may include fledglings from unknown nest locations detected only by brood presence, but these are few. Chicks were banded to site in 2003 and 2004. In 2005, chicks were first banded to brood and from 2006-17, chicks were banded to individual.

Year	Estimated no. breeding pairs	No. nests (no. known fate)	No. hatched nests	Percent known fate nests hatched	No. chicks	Percent chicks fledged	No. juveniles	Juveniles fledged per nest	Estimated no. juveniles fledged per pair
1991	4-5	6 (6)	2	33	4	50	2	0.33	0.40-0.50
1992	3-4	4 (4)	1	25	2	50	1	0.25	0.25-0.33
1993	0	0	0	0	0	0	0	0	0
1994	2	2 (2)	0	0	0	0	0	0	0
1995	1	1 (1)	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0
1997	16-19	21 (10)	3	30	6	67	4	0.19	0.21-0.25
1998	33-37	40 (32)	26	81	40	60	24	0.60	0.65-0.73
1999	28-31	34 (30)	21	70	38	45	17	0.50	0.55-0.61
2000	4-5	5 (5)	4	80	8	50	4	0.80	0.80-1.00
2001	12-15	18 (18)	13	72	22	55	12	0.67	0.80-1.00
2002	20-21	22 (19)	15	79	27	37	10	0.45	0.48-0.50
2003	53-66	79 (77)	60	78	101	37	37	0.47	0.56-0.70
2004	47-55	63 (60)	44	73	69	36	25	0.40	0.45-0.53
2005	47-53	59 (59)	39	66	66	30	20	0.34	0.38-0.43
2006	31-35	38 (38)	28	74	45	80	36	0.95	1.03-1.16
2007	54-60	66 (66)	51	77	90	78	70	1.06	1.17-1.30
2008	55-56	56 (56)	50	89	99	71	70	1.25	1.25-1.27
2009	25-26	26 (26)	23	88	43	77	33	1.27	1.27-1.32
2010	23	23 (23)	20	87	35	83	29	1.26	1.26
2011	33-34	35 (35)	31	89	55	91	50	1.43	1.47-1.52
2012	41-44	46 (40)	33	83	52	81	42	0.91	0.95-1.02
2013	48-53	57 (52)	45	87	85	66	56	0.98	1.06-1.17
2014	47-48	49 (46)	42	91	76	76	58	1.18	1.21-1.23
2015	44-49	54 (54)	48	89	84	82	69	1.28	1.41-1.57
2016	47-48	49 (47)	46	98	78	76	59	1.20	1.23-1.26
2017	42-47	52 (34)	22	65	39	18	7	0.13	0.15-0.17

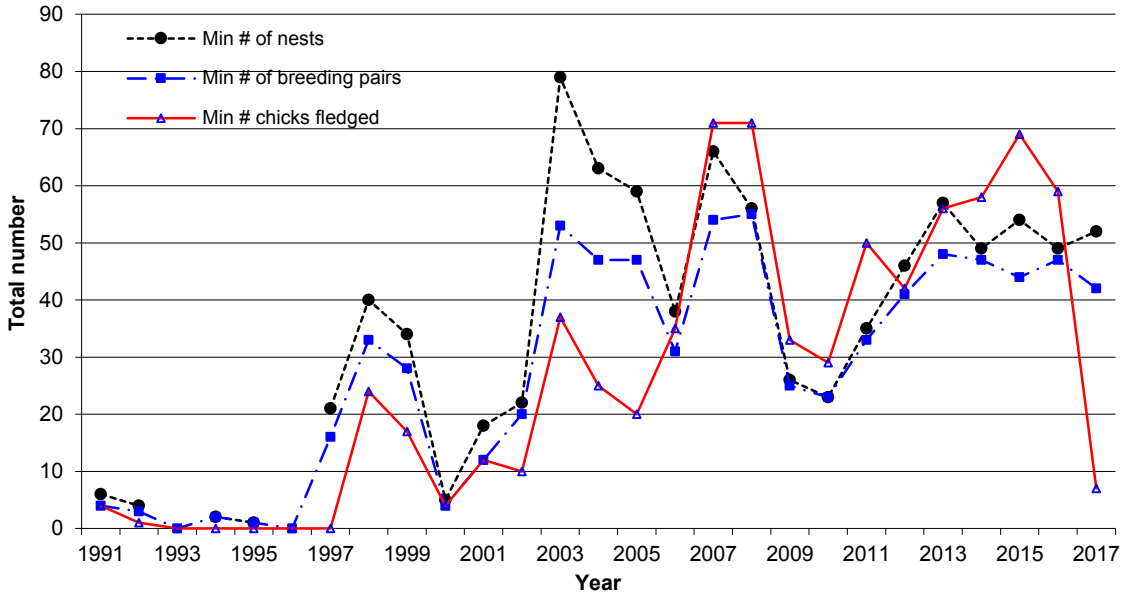


Figure 3. Number of California least tern nests, pairs, and fledglings at ODSVRA from 1991-2017.

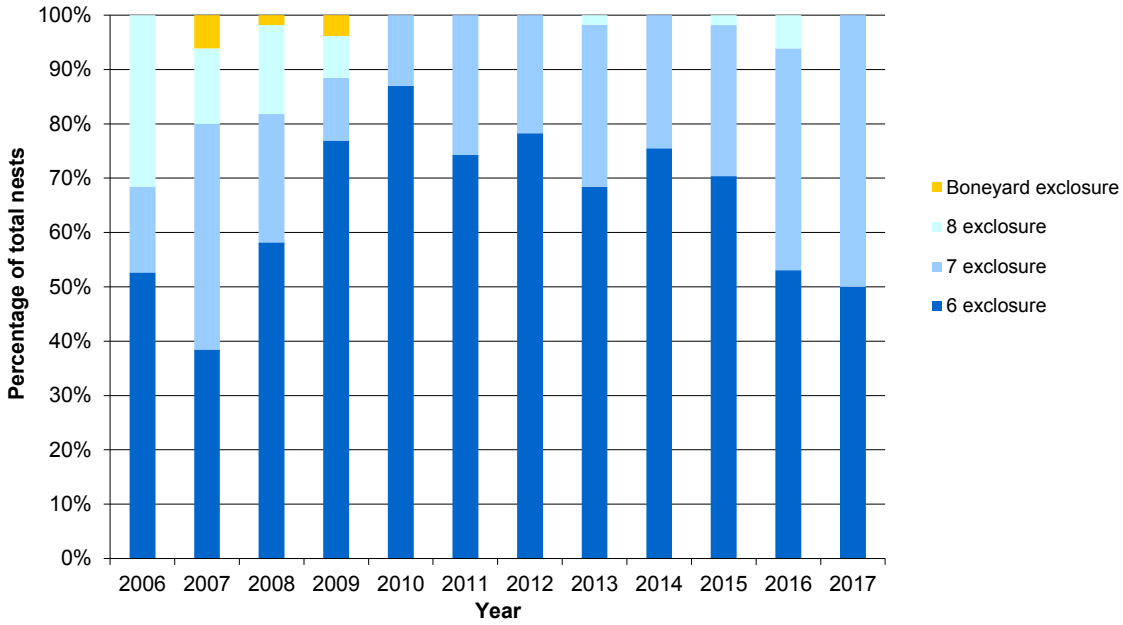


Figure 4. Distribution of least tern nests as a percent of total nests at ODSVRA from 2006-17.

Table 2. Causes of California least tern nest loss at ODSVRA from 2002-17.
Ab. = Abandoned

Year	Ab. pre-term	Ab. post-term	Ab., susp. wind	Ab., unknown if pre- or post-term	Failed, cause unknown	Skunk	Coyote	Gull	Opossum	Raccoon	Unknown predator	Chick dies in egg at hatch	Total no. failed nests
2002	1	1					2						4
2003	6	3					1				2		12
2004	9	1					2				1		13
2005	7	3		4	4						1	1	20
2006	5	3		1							1		10
2007	1	4	4		6								15
2008	3	2						1					6
2009	1	1		1									3
2010		1			1				1				3
2011	2	2											4
2012	1	2		3	1								7
2013	2			2	1		1		1				7
2014	1	1		1	1								4
2015	1	1		1	2					1			6
2016				1									1
2017	5			1	1	5							12
Total 2002-17	**45 (35.4%)**	**25 (19.7%)**	**4 (3.1%)**	**15 (11.8%)**	**17 (13.4%)**	**5 (3.9%)**	**6 (4.7%)**	**1 (0.8%)**	**2 (1.6%)**	**1 (0.8%)**	**5 (3.9%)**	**1 (0.8%)**	**127**

Chick fledging rate, juveniles produced per pair, and juvenile length of stay on-site
Of the 39 known hatching chicks, 25 were banded with a unique color combination and 14 remained unbanded. When seen at 21 days old or older chicks were considered fledged. The fledging rate for banded chicks was 20.0% (5/25) and 14.3% (2/14) for unbanded chicks. For all known chicks produced in 2017 only seven of 39 reached fledging age for a very low fledging rate of 17.9% (Appendix A). This fledging rate compares to an average of 78% (range=66-91%) during the previous 11-year period 2006-16 when most chicks were banded to individual. In 2017, none of the 17 two-chick broods fledged both chicks. This compares to an average of 63% (range=43-86%) of 185 two-chick broods fledging both chicks during the previous 11-year period 2006-16. In 2017, the estimated number of fledglings produced per pair was exceptionally low, ranging from 0.15-0.17. This is well below the average of 1.21-1.28 for the previous 11 years (range=0.95-1.57) and below recent averages for all of California (Table 1). Estimated statewide fledging rates for each year are reported as a range and averaged 0.27-0.39 fledglings per pair for the 12-year period 2005-16 (highest estimates in 2014 with range=0.37-0.68) (Marschalek 2006-12; Frost 2013-17).

From 2010-16, there have been six known occurrences of a least tern chick moving east of the exclosure into the open riding area (two in 2010, by the same chick on the same day; one in 2011; two in 2013; and one in 2015). These chicks were monitored and directed back into the exclosure. In 2017, there were no known such occurrences.

Of the current or recent breeding sites in San Luis Obispo and Santa Barbara counties, only ODSVRA bands chicks. Marking least tern chicks with individual color band combinations has increased the ability to detect juveniles at ODSVRA and provides greater accuracy in documenting fledging rate than the three-

week count method[3]. For the six-year period 2006-11, the three-week count method at ODSVRA consistently underestimated the minimum known number of juveniles produced each year, identifying an average of 49.0% (range=38.0-66.7%) of the known minimum number (see CDPR 2011 for greater details). ODSVRA relies on color band resighting data to derive a more accurate fledging rate and did not conduct three-week counts in 2012-17.

Color banding chicks to brood in 2005 and to individual since 2006 has also provided information on juvenile length of stay at ODSVRA. In 2017, 20% (1/5) of the color-banded juveniles tracked were documented remaining at ODSVRA for 21 days or longer post-fledging. Over the 12-year period 2006-17, 518 color-banded fledglings were tracked at ODSVRA with 30.7% (159/518) remaining 21 days or longer (Table 3, Figure 5).

Table 3. Number of days that color-banded California least tern juveniles hatched at ODSVRA continued to be seen on-site after reaching fledge age (21 days old) during the 12-year period, 2006-17.

During this period, 518 color-banded fledglings (21 days old or older) were tracked at ODSVRA (sightings outside the park are not included). Numbers in parentheses are percentages of all banded fledglings for the year.

Year	0-6 days post-fledge	7-13 days post-fledge	14-20 days post-fledge	21-27 days post-fledge	28-34 days post-fledge	>35 days post-fledge
2006	4 (12%)	5 (15%)	9 (26%)	14 (41%)	2 (6%)	0 (0%)
2007	9 (14%)	13 (20%)	15 (23%)	18 (28%)	9 (14%)	1 (2%)
2008	13 (19%)	28 (41%)	16 (24%)	11 (16%)	0 (0%)	0 (0%)
2009	3 (10%)	14 (48%)	8 (28%)	3 (10%)	1 (3%)	0 (0%)
2010	3 (11%)	4 (14%)	13 (46%)	7 (25%)	1 (4%)	0 (0%)
2011	2 (4%)	5 (10%)	9 (18%)	31 (63%)	2 (4%)	0 (0%)
2012	3 (9%)	7 (20%)	11 (31%)	12 (34%)	2 (6%)	0 (0%)
2013	5 (10%)	12 (24%)	24 (47%)	10 (20%)	0 (0%)	0 (0%)
2014	2 (5%)	7 (17%)	18 (43%)	14 (33%)	1 (2%)	0 (0%)
2015	12 (21%)	10 (18%)	21 (38%)	10 (18%)	1 (2%)	2 (4%)
2016	22 (39%)	9 (16%)	19 (34%)	5 (9%)	1 (2%)	0 (0%)
2017	0 (0%)	3 (60%)	1 (20%)	1 (20%)	0 (0%)	0 (0%)
TOTAL 2006-17	78 (15%)	117 (23%)	164 (32%)	136 (26%)	20 (4%)	3 (1%)

[3] High counts of juveniles that are seen on dates at intervals of three weeks are added together (Marschalek 2007). This is based on the assumption that juveniles typically depart the colony with their parents within two to three weeks of fledging (at 21 days old) and that any juveniles seen are not from other sites.

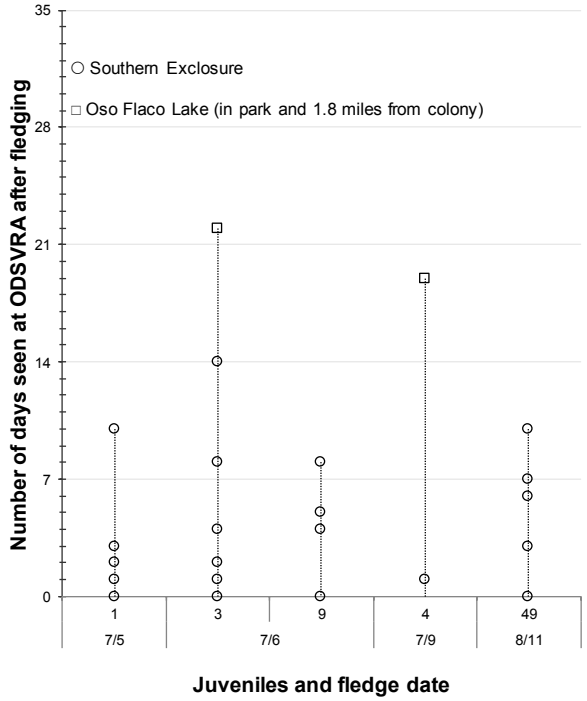


Figure 5. Number of days California least tern juveniles that hatched at ODSVRA in 2017 continued to be seen on-site after reaching fledge age (21 days old).
The horizontal axis provides the nest number from which each fledgling hatched and the date it fledged. All juveniles included in graph were color-banded to individual.

Mortality (other than eggs)
There was a minimum of two documented tern mortalities (other than eggs) at ODSVRA during the 2017 breeding season: partial remains of an unbanded adult found mostly buried in the open riding area east of 7 exclosure and an adult carcass with a federal band on the right leg found in the middle of 6 exclosure, which was a 13-year-old bird banded as a chick at ODSVRA in 2004. Both carcasses were very desiccated and not suitable for necropsy. Although not documented, predation of young chicks by striped skunk is suspected (see Predators and predator management section on page 41, Notes section, Appendix G).

Least tern use of nearby small freshwater lakes
At ODSVRA nearshore ocean waters are the primary source of prey fish for the tern colony. In 2017, foraging activity over the ocean was observed throughout the season, however, adults observed returning with fish to feed chicks and juveniles was much reduced from previous years. During the chick-rearing period small fish may also be taken from freshwater sources. Over the past 11 years nearby small freshwater lakes observed with more than incidental tern activity in one or more years include: Oso Flaco Lake (located on park property approximately 1.8 miles south of the middle of tern colony), Dune Lakes (approximately 1.5 miles to east), and Cypress Ridge Lake (approximately 3.2 miles to east).

In 2017, 12 surveys at Oso Flaco, averaging 53 minutes in length, were conducted by park resource staff between 10 June and 19 August; number of terns seen averaged 4.5 birds (range=0-12, high count 22 July). This compares to 2016 with an average of six birds over 18 surveys between 13 May and 25 August (range=0-15, high count on 24 August). In 2017, limited sightings of adult terns were observed foraging, roosting, feeding juveniles, and flying with fish in the direction of the tern colony. To collect additional information on least tern presence at Oso Flaco Lake, accounts of birder visits from March through

September posted to the eBird website were reviewed (eBird 2017). Least terns were reported on 30 days between 5 May–11 August (average number=4, range=1-10, high count on 11 and 14 July). Color-banded terns seen by resource staff or confirmed with photographs by birders included two juveniles (one additional unbanded juvenile seen) and three adults. All banded birds were confirmed to have been banded at ODSVRA as chicks.

While no surveys were conducted at Dune Lakes in 2017 (primarily on private property with no access), the Southern Exclosure where the tern colony is located is monitored daily. The number of adult terns flying toward or returning from east of the colony (in the direction of the Dune Lakes and Cypress Ridge Lake) was very limited compared to some previous years, and their use in 2017 appeared minimal. There were no least tern sightings at Cypress Ridge Lake in 2017 when visited twice by park staff for less than 30 minutes each visit, and no reports were received from any other sources looking for least tern activity. Least terns were first documented foraging at Cypress Ridge Lake in 2007 and had moderate levels of foraging documented through 2010 and minimal levels in 2012-13, but have not been reported there since. Monitoring of Cypress Ridge Lake was limited in 2014-2016 to reports from a resident living on the lake familiar with least terns.

Banded adult least terns at ODSVRA

Recording color combinations is more difficult for adult least terns than snowy plovers as the behavior of the terns provides fewer opportunities for observations. In 2017, there was a minimum of 52 banded adults documented at ODSVRA, based on observations with a spotting scope. Fifty-one of these birds were identified as banded at this site as chicks (banding began in 2003). Origins of one banded bird could not be determined as it only had a federal aluminum band without tape. Breeding was documented for a minimum of 20 banded adults and this is likely a substantial underestimate (Appendix A). At least 12 of the 20 were banded as chicks at ODSVRA; the other eight were banded but the complete color combinations could not be confirmed (Table D.1 in Appendix D). Over the last eight years there has been only one confirmed sighting of a banded tern from another site. This was an adult (S:A/O) seen 28 July–11 August 2011 that was banded at the U.S. Navy North Island Maintenance and Training Facility in San Diego Bay, San Diego County, California.

Least terns typically first breed at three years old, with some breeding documented by two-year-old birds (Massey and Atwood 1981). A total of eight two-year-old banded terns have been documented as breeding at ODSVRA in 2012-17 (two in 2012, three in 2013, two in 2014, and one in 2016). In 2005, a two-year-old tern banded as a chick at ODSVRA was documented breeding at Vandenberg Air Force Base, approximately 22 miles south of the park. The oldest confirmed breeding adults at ODSVRA in 2017 were four birds that were all seven years old (W/B:R/Y, W/B:W, W/B:W/A, and W/B:W/G, all banded as chicks at ODSVRA in 2010).

Night roost

During the breeding season, adult least terns not engaged in incubation or chick care may assemble in a communal night roost and are often joined by fledglings later in the breeding season. Reduced exposure to disturbance from predators is likely an important factor in the selection of a night roost location. There can be a high degree of site fidelity, both within a breeding season and between years, with birds continuing to roost in the same location. Surveys of the night roost were conducted on 75 days between 1 May and 30 August in 2017. The night roost was initially located in the same area of northern 6 exclosure used since 2004, the year when 6 exclosure first became available as protected habitat for a complete season. However, as in 2016, the night roost appeared to shift to areas in southern 6 exclosure and mid-7 exclosure, and was often not located during surveys. Counts at the night roost are minimums, as some or all birds would often arrive after it was too dark to count individuals. In 2017, there was a high count of 57 birds at the night roost on 23 June (Figure 6). This compares to an average night roost high count of 60 (range=35-95) from

2007-16. Both adults and juveniles were seen but it typically was too dark to distinguish plumage and age class.

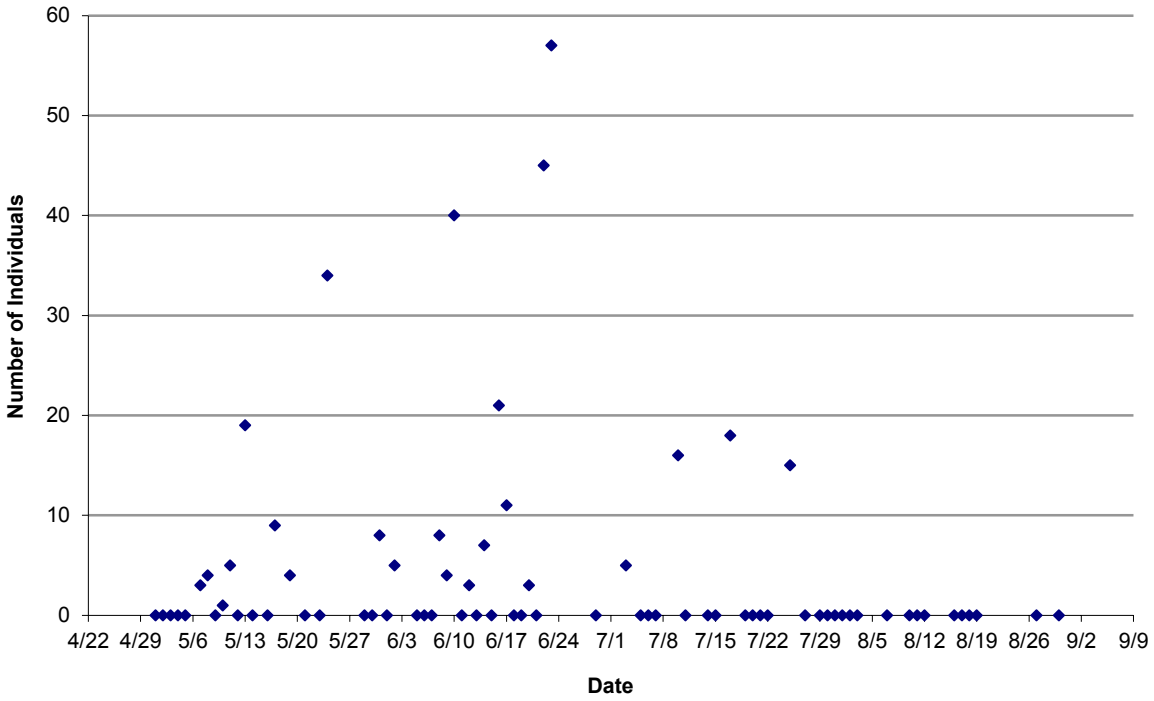


Figure 6. Number of California least terns counted at the ODSVRA night roost in 2017.
First survey on 1 May and roost first detected on 7 May.

Importance of ODSVRA least tern breeding colony

The ODSVRA least tern breeding colony has benefited from the increased level of protection and management actions provided since 2002. The colony is important in meeting statewide recovery goals as loss of breeding habitat has resulted in a fragmented population distribution and a limited number of remaining breeding sites (USFWS 1985, 2006). On a regional level, there are very few active breeding sites along the central coast of California and none remain between ODSVRA and San Francisco Bay. Within San Luis Obispo and Santa Barbara counties, there are four least tern colony sites with annual or intermittent use, all sites have management providing protective measures and monitoring. ODSVRA is the only site in San Luis Obispo County. Rancho Guadalupe Dunes County Park (RGDCP), Vandenberg Air Force Base (VAFB), and Coal Oil Point Reserve (COPR) are in Santa Barbara County and approximately 7, 22, and 85 miles south of the ODSVRA colony, respectively. For this regional population, ODSVRA has become an important source of productivity. During the period 2004-17, ODSVRA produced a minimum of 624 juvenile terns while RGDCP, VAFB, and COPR combined produced an estimated 223 juveniles (Table 4, Table 5).

Table 4. California least tern reproductive success reported for current or recent breeding sites in San Luis Obispo and Santa Barbara counties from 2005-17.

Note that chicks are not banded at Rancho Guadalupe Dunes County Park (RGDCP), Vandenberg Air Force Base (VAFB), and Coal Oil Point Reserve (COPR). Sources: RGDCP (pers. comm. staff), VAFB (pers. comm. Dan Robinette for all years), and COPR (pers. comm. staff).

Year	Site	No. pairs (est. for ODSVRA)	No. nests	No. nests hatching	No. chicks	No. juveniles	No. juveniles per total no. nest	No. juveniles per pair (est. for ODSVRA)
2005	ODSVRA	47-53	59	39	66	20	0.34	0.38-0.43
	RGDCP	4	4	0	0	0	0.00	0.00
	VAFB	44	44	18	32	1	0.02	0.02
	COPR	0	0	0	0	0	0.00	0.00
2006	ODSVRA	31-35	38	28	45	36	0.95	1.04-1.16
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB[1]	2	2	0	0	0	0.00	0.00
	COPR	5	5	4	7	7	1.40	1.40
2007	ODSVRA	54-60	66	51	90	70	1.06	1.17-1.3
	RGDCP	1	1	1	1	1	1.00	1.00
	VAFB	18	18	13	20	16	0.89	0.89
	COPR	4	6	2	4	0	0.00	0.00
2008	ODSVRA	55-56	56	50	99	70	1.25	1.26-1.27
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	18	18	17	32-33	19	1.06	1.06
	COPR	1	1	0	0	0	0.00	0.00
2009	ODSVRA	25-26	26	23	43	33	1.27	1.29-1.32
	RGDCP	2-3	3	2	3	3	1.00	1.00-1.50
	VAFB	30	31	28	56	37	1.19	1.23
	COPR	0	0	0	0	0	0.00	0.00
2010	ODSVRA	23	23	20	35	29	1.26	1.26
	RGDCP	1	1	1	2	2	2.00	2.00
	VAFB	33	34	29	57	29	0.85	0.88
	COPR	0	0	0	0	0	0.00	0.00
2011	ODSVRA	33-34	35	31	55	50	1.43	1.47-1.52
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	32	32	19	36	4	0.13	0.13
	COPR	1	1	0	0	0	0.00	0.00
2012	ODSVRA	41-44	46	33	52	42	0.91	0.97-1.02
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	18	18	12	21	10	0.56	0.56
	COPR	0	0	0	0	0	0.00	0.00
2013	ODSVRA	48-53	57	45	85	56	0.98	1.07-1.17
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	15	15	15	25	19	1.27	1.27
	COPR	0	0	0	0	0	0.00	0.00
2014	ODSVRA	47-48	49	42	76	58	1.18	1.21-1.23
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	17	21	15	30	20	0.95	1.18
	COPR	0	0	0	0	0	0.00	0.00
2015	ODSVRA	44-49	54	48	84	69	1.28	1.41-1.57
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	22	22	22	45	29	1.32	1.32
	COPR	0	0	0	0	0	0.00	0.00
2016	ODSVRA	47-48	49	46	78	59	1.20	1.23-1.26
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	25	27	21	38	18	0.67	0.72
	COPR	0	0	0	0	0	0.00	0.00
2017	ODSVRA	42-47	52	22	39	7	0.13	0.15-0.17
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	27	28	23	41	8	0.29	0.30
	COPR	0	0	0	0	0	0.00	0.00

[1] Minimum counts of adult terns at the VAFB colony site were 60 and 40 in 2004 and 2006, respectively, but nesting was limited.

Table 5. Number of reported breeding least tern pairs and juveniles produced at ODSVRA and the combined sites of Rancho Guadalupe Dunes County Park (RGDCP), Vandenberg Air Force Base (VAFB), and Coal Oil Point Reserve (COPR) from 2004-17.

During this period, almost all tern chicks were banded at ODSVRA and observation of color-banded individuals was an important means to document juvenile production. Banding does not occur at the other sites and other methods are used to estimate number of juveniles produced.

	ODSVRA			RGDCP, VAFB, and COPR combined	
Year	Est. no. breeding pairs	No. juveniles		No. breeding pairs	No. juveniles
2004	47-55	25		15	0
2005	47-53	20		48	1
2006	31-35	36		7	7
2007	54-60	70		23	17
2008	55-56	70		19	19
2009	25-26	33		32-33	40
2010	23	29		34	31
2011	33-34	50		33	4
2012	41-44	42		18	10
2013	48-53	56		15	19
2014	47-48	58		17	20
2015	44-49	69		22	29
2016	47-48	59		25	18
2017	42-47	7		27	8
Total juveniles produced		624			223

WESTERN SNOWY PLOVER

Number of breeding adults

In the absence of a population of individually banded snowy plover adults, which provides the most accurate means to identify breeding population size, ODSVRA uses a method that includes examining the single day high count of concurrent nests (for females) and concurrent nests and broods (for males) (see Monitoring and Management Actions section for additional information on determining number of breeding adults). In 2017, there was a minimum of 183 breeding adults (93 males and 90 females). This is a decrease of 12.4% from the minimum number of 209 breeding adults in 2016 and compares to a range of 95-226 adults (average=161) for the eight-year period 2008-15. The average minimum number of breeding adults for the last five years (2013-17) is 197, increasing slightly to 199 for the last three years (Table 6, Figure 7).

Beginning in 2005, the USFWS has coordinated a rangewide window survey count of the U.S. Pacific coast breeding population of the snowy plover between the last week of May and first week of June. In 2017, the survey at ODSVRA counted 174 adult plovers (85 males, 74 females, and 15 of unknown sex), 95% of the minimum number documented for the entire season by known breeding activity. In 12 of the 13 years from 2005-17, the window survey count at ODSVRA was lower than the minimum number of breeding birds (54-95% of minimum number). It was higher (107%) than the minimum number in 2008. For the entire 13-year period the window survey count averaged 79% of the known minimum number of breeding adults for the season (Table 7).

Table 6. Number of snowy plover breeding adults, breeding males, fledglings, and chicks fledging per breeding male for the 16-year period 2002-17.

Year	Min. no. breeding adults	Min. no. breeding males	No. fledglings	No. fledglings per breeding male[1]
2002	32	18	35	1.94
2003	84	52	107	2.06
2004	121	67	66	0.99
2005	116	65	82	1.26
2006	107	58	17	0.29
2007	79	47	66	1.40
2008	95	54	72	1.33
2009	114	66	81	1.23
2010	137	78	103	1.32
2011	160	94	152	1.62
2012	190	105	96	0.91
2013	163	92	187	2.03
2014	226	120	196	1.63
2015	205	113	277	2.45
2016	209	110	157	1.43
2017	183	93	174	1.87
Average for 16-year period 2002-17	**139**	**77**	**117**	**1.49**
Average for 5-year period 2013-17	**197**	**106**	**198**	**1.88**
Average for 3-year period 2015-17	**199**	**105**	**203**	**1.92**

[1]Number of fledglings per breeding male will be overestimated if the number of breeding males is undercounted.

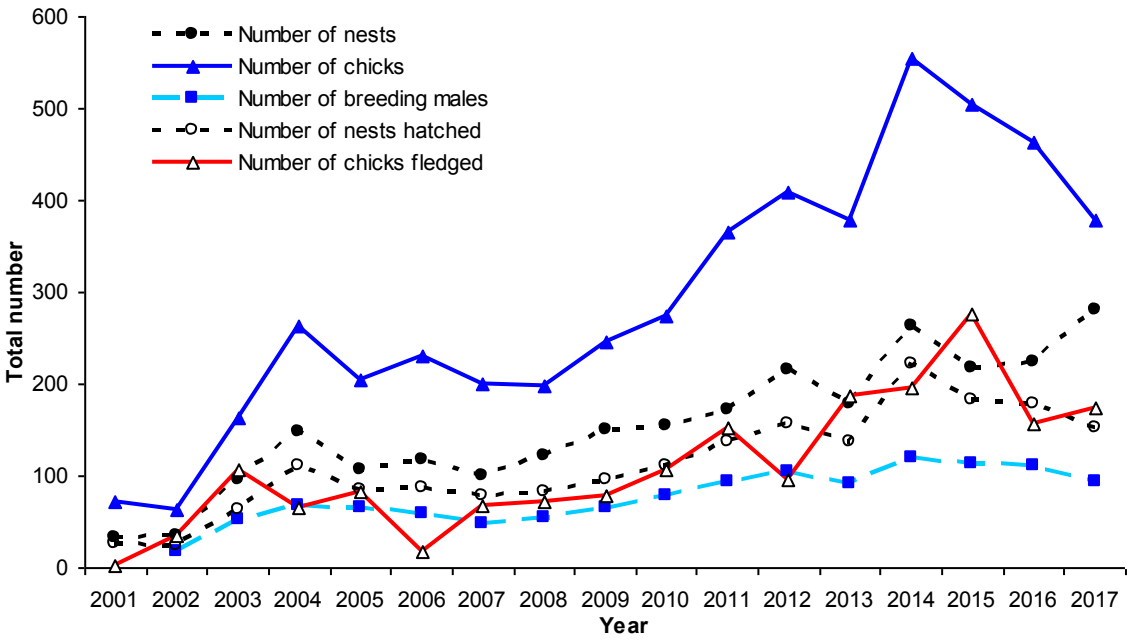


Figure 7. Number of snowy plover breeding males, nests, nests hatched, chicks, and chicks fledged at ODSVRA from 2001-17.

Prior to 2001, monitoring in Oso Flaco and Pismo Dunes Natural Preserve was intermittent and fledgling information was not obtained.

Table 7. Number of adult snowy plovers counted on USFWS breeding season window surveys versus calculated minimum number of breeding adults at ODSVRA from 2005-17.

Year	Calculated minimum number of breeding adults	Summer breeding window survey numbers	Breeding window numbers/ calculated minimum numbers
2005	116	92	79%
2006	107	87	81%
2007	79	60	76%
2008	95	102	107%
2009	114	98	86%
2010	137	74	54%
2011	160	112	70%
2012	190	145	76%
2013	163	94	58%
2014	226	180	80%
2015	205	180	88%
2016	209	160	77%
2017	183	174	95%

Number and distribution of nests

There were 281 known nesting attempts, including eight identified only by detection of brood (unknown nest location), initiated between 16 March–11 July. Of the 273 nests from known locations 195 (71.4%) were in the Southern Exclosure, 20 (7.3%) in North Oso Flaco, 57 (20.9%) in South Oso Flaco and one (0.4%) in Arroyo Grande Creek area. More specifically for the Southern Exclosure, there were 73 nests in 6 exclosure, 53 in 7 exclosure, 53 in 8 exclosure, and 16 in Boneyard exclosure (Appendix C). The

maximum number of known location nests active at one time was 89 on 10 May, with the highest number in 6 exclosure (29 nests) (Table 8, Table 9, Table E.1 in Appendix E).

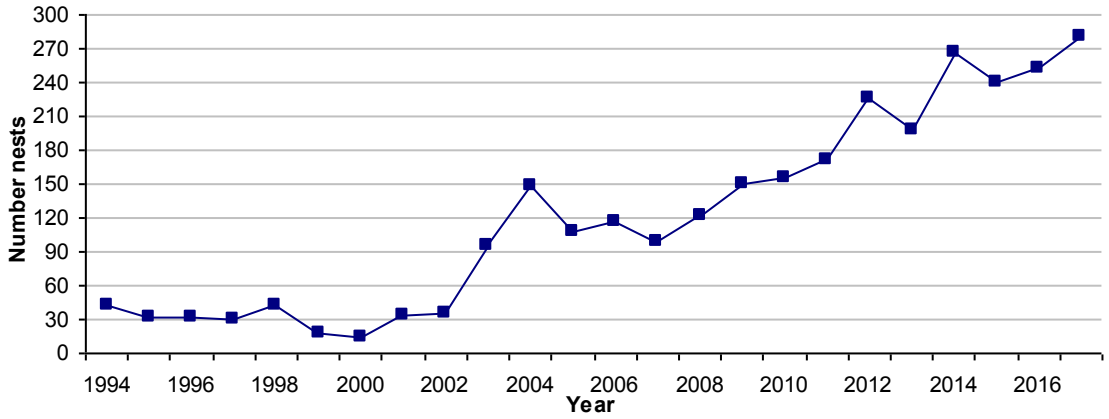


Figure 8. Number of snowy plover nests at ODSVRA from 1994-2017.

Table 8. Snowy plover nest distribution and success at ODSVRA in 2017.
Excludes eight nests known only from detection of broods.

Location	No. nests (no. known location and fate)	No. eggs laid	No. nests hatching	Percent known location and fate nests hatching
6 exclosure	73 (62)	197	50	80.6
7 exclosure	53 (44)	139	35	79.5
8 exclosure	53 (44)	136	19	43.2
BY exclosure	16 (15)	43	3	20.0
TOTAL SOUTHERN EXCLOSURE	**195 (165)**	**515**	**107**	**64.8**
North Oso Flaco	20 (17)	54	8	47.1
South Oso Flaco	57 (55)	153	30	54.5
TOTAL OSO FLACO	**77 (72)**	**207**	**38**	**52.8**
Arroyo Grande Creek area	**1 (1)**	**1**	**0**	**0.0**

Table 9. Nesting success of snowy plovers at ODSVRA from 2001-17.

Number of eggs from nests with unknown location is a minimum number derived from number of chicks seen. A more detailed table of nesting success for 2001-17 is included as Table E.1 in Appendix E. Percent hatching is calculated using known location hatched nests divided by total known location and fate nests. Number of fledglings per nest is number of known fate chicks fledged divided by total number of nests.

na = not available

Year	No. nests (no. known location and fate)	Min. no. eggs	Ave. clutch size (no. nests known location and complete clutch size)	No. nests hatching (no. known location)	Percent hatching	No. chicks (no. known fate)	No. known fate chicks fledged (percent fledged)	No. fledglings per nest
2001	33 (30)	na	na	26 (26)	86.7	71 (71)	3 (4.2)	0.09
2002	35 (35)	99	na	25 (25)	71.4	62 (62)	35 (56.5)	1.00
2003	95 (93)	254	na	63 (62)	67.7	162 (159)	108 (67.9)	1.14
2004	147 (140)	415	2.87 (141)	110 (105)	75.0	263 (263)	66 (25.1)	0.45
2005	107 (103)	290	2.86 (96)	84 (80)	77.7	204 (204)	82 (40.2)	0.77
2006	117 (114)	336	2.89 (115)	87 (87)	76.3	230 (230)	17 (7.4)	0.15
2007	99 (91)	290	2.93 (89)	78 (70)	76.9	200 (198)	66 (33.0)	0.67
2008	121 (119)	341	2.85 (116)	83 (81)	68.1	197 (197)	72 (36.5)	0.60
2009	150 (147)	418	2.85 (144)	95 (94)	63.9	245 (245)	81 (33.1)	0.54
2010	155 (150)	431	2.88 (146)	111 (109)	72.7	275 (275)	107 (38.9)	0.69
2011	172 (160)	487	2.88 (159)	138 (131)	81.9	365 (365)	152 (41.6)	0.88
2012	216 (203)	603	2.94 (200)	157 (152)	74.9	386 (386)	96 (25.0)	0.44
2013	178 (167)	502	2.93 (162)	138 (130)	77.8	343 (343)	200 (58.3)	1.12
2014	262 (239)	725	2.86 (243)	222 (206)	86.2	547 (547)	196 (35.8)	0.75
2015	217 (195)	612	2.92 (192)	182 (167)	85.6	494 (494)	277 (56.1)	1.28
2016	223 (193)	613	2.89 (188)	179 (165)	85.5	462 (462)	157 (34.0)	0.70
2017	281 (238)	738	2.88 (228)	153 (145)	60.9	378 (378)	174 (46.0)	0.62

Average clutch size, clutch loss and nest hatching rate

There were 281 identified nesting attempts, including eight known only by brood, and of these 153 hatched (Table 9, Figure 8, Figure 9). For 228 nests with known complete clutch size (and excluding nesting attempts known only by brood) the average number of eggs was 2.88. This compares to the average of 2.89 eggs per clutch (range=2.85-2.94) for the 13-year period 2004-16. Excluding 43 nests (35 with unknown fate and eight detected by brood only), the clutch hatching rate was 60.9% (145/238). This compares to an average of 75.0% (range=63.9-86.2%) from 2002-16 (Table 9). The nest hatching rate in 2017 was higher in the Southern Exclosure (64.8%) than in Oso Flaco (52.8%), as has been the case in 14 of the previous 16 years (Table E.1 and Figure E.1 in Appendix E). Ninety-three nests were known to fail, with losses attributed to abandoned pre-term (10); abandoned post-term (3); abandoned unknown pre- or post-term (5); abandoned, suspected wind (3); cause unknown (26); unidentified predator (9); striped skunk (*Memphitis memphitis*) (18); raven (10); coyote (2); gull (2); avian (2); flooded by creek and tide (1); and overwashed by tide (2) (Table 10 and Table 11).

Table 10. Attributed causes of snowy plover nest loss at specific locations at ODSVRA in 2017.
Does not include one nest at Arroyo Grande Creek area flooded by creek and tide.

Area	Abandoned pre-term	Abandoned post-term	Abandoned unknown pre- or post-term	Abandoned, suspected wind	Overwashed by tide	Failed, cause unknown	Unidentified predator	Avian predator	Coyote	Raven	Skunk	Gull
Southern Exclosure												
6 exclosure	2	1	0	0	0	5	0	0	0		4	0
7 exclosure	1	2	0	0	0	1	2	0	0		2	1
8 exclosure	1	0	1	1	0	3	6	2	0	4	6	1
Boneyard exclosure	1	0	2	0	0	2	1	0	1	2	3	0
TOTAL SOUTHERN EXCLOSURE	**5**	**3**	**3**	**1**	**0**	**11**	**9**	**2**	**1**	**6**	**15**	**2**
Oso Flaco												
North Oso Flaco	1	0	1	0	0	4	0	0	0		3	0
South Oso Flaco	4	0	1	2	2	11	0	0	1	4	0	0
TOTAL OSO FLACO	**5**	**0**	**2**	**2**	**2**	**15**	**0**	**0**	**1**	**4**	**3**	**0**
ODSVRA TOTAL	**10**	**3**	**5**	**3**	**2**	**26**	**9**	**2**	**2**	**10**	**18**	**2**

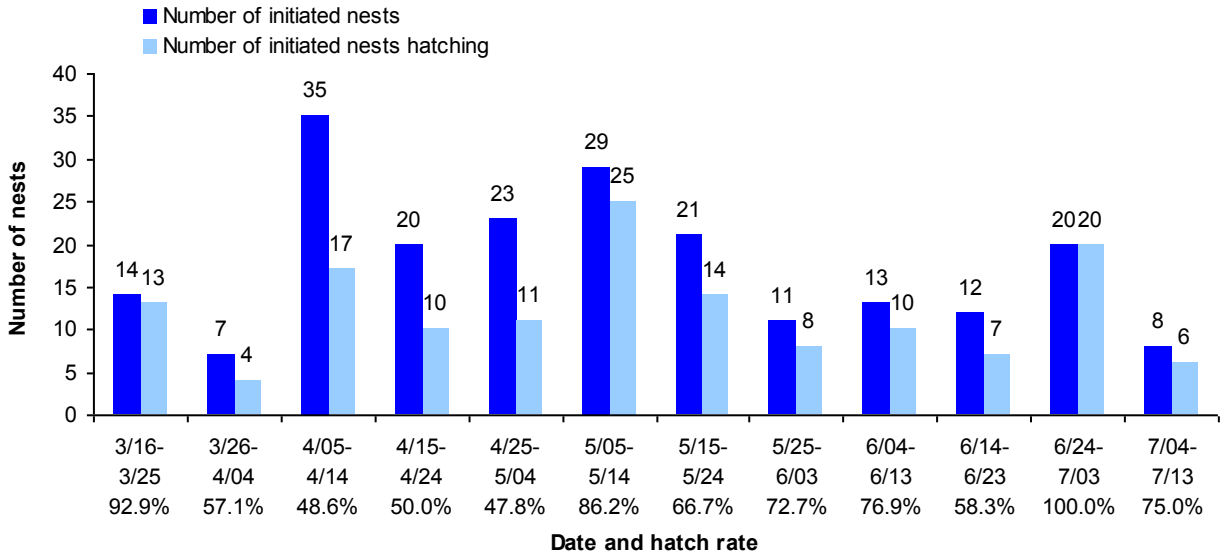


Figure 9. Number of known location and known fate snowy plover nests with known initiation date (n=213) initiated per 10-day period and number known to hatch at ODSVRA in 2017.

Table 11. Attributed causes of snowy plover nest loss in Southern Exclosure and Oso Flaco at ODSVRA from 2002-17.

Flooded nests include nests overwashed by tide and nests flooded by creek and tide. The percentage of total loss for each cause is shown for the 16-year period 2002-17. Prior to 2010, nest abandonment suspected due to wind was included with nests abandoned pre-term; these causes of nest loss are shown separately for 2010-17. So. Excl. = Southern Exclosure.

Year	Area	Abandoned pre-term	Abandoned post-term	Abandoned, suspected wind	Abandoned unknown pre- or post-term	Failed, cause unknown	Unidentified predator	Avian predator	Gull	Corvid	Raven	Northern harrier	Peregrine falcon	Coyote	Raccoon	Skunk	Flooded	Total
	So. Excl.				6	1								1				**8**
2002	Oso Flaco				2													**2**
	So. Excl.	17	2				3				1							**23**
2003	Oso Flaco	2				1	1				4							**8**
	So. Excl.	12				7	2				2			1				**24**
2004	Oso Flaco	4				2	3										1	**10**
	So. Excl.	9	3			7												**19**
2005	Oso Flaco	2	1				1											**4**
	So. Excl.	5	4			2	1		3					4				**19**
2006	Oso Flaco				1		1		3								2	**7**
	So. Excl.	4	1			9					1							**15**
2007	Oso Flaco	2				2					1			1				**6**
	So. Excl.	10			3	2	2	5	1			2					1	**26**
2008	Oso Flaco	3			1			4	1			1					2	**12**
	So. Excl.	9	1			3	5	16	2			1					1	**38**
2009	Oso Flaco	4				2	1	5								1	1	**14**
	So. Excl.	5	2	9			4	6									2	**28**
2010	Oso Flaco	1		2				2							1	2	1	**9**
	So. Excl.	6	3	1	1	2	1	5		3								**22**
2011	Oso Flaco						2			2					1	2		**7**
	So. Excl.	11	1	6	3	3	3	5		3		5	1	1			1	**43**
2012	Oso Flaco	3	1	1														**5**
	So. Excl.	5	5	15		3	1											**29**
2013	Oso Flaco	3	2	2					1									**8**
	So. Excl.	13	1		4	2											1	**21**
2014	Oso Flaco	6		1	1		1							1			1	**11**
	So. Excl.	11	1	1	4	2		2			1						2	**24**
2015	Oso Flaco	1				1	1				3							**6**
	So. Excl.	5	7	2	2	3										1		**20**
2016	Oso Flaco	4				1	1		1								1	**8**
	So. Excl.	5	3	1	3	11	9	2	2		6			1		15		**58**
2017	Oso Flaco	5		2	2	15					4			1		3	2	**34**
2002-17 Total failed nests	So. Excl.	**127** 30.5%	**34** 8.2%	**35** 8.4%	**26** 6.2%	**57** 13.7%	**31** 7.4%	**41** 9.8%	**8** 1.9%	**6** 1.4%	**11** 2.6%	**8** 1.9%	**1** 0.2%	**8** 1.9%	**0** 0.0%	**16** 3.8%	**8** 1.9%	**417**
	Oso Flaco	**40** 26.5%	**4** 2.6%	**8** 5.3%	**7** 4.6%	**24** 15.9%	**12** 7.9%	**11** 7.3%	**6** 4.0%	**2** 1.3%	**12** 7.9%	**1** 0.7%	**0** 0.0%	**3** 2.0%	**2** 1.3%	**8** 5.3%	**11** 7.3%	**151**
2002-17 Grand Total So. Excl. and Oso Flaco		**167** 29.4%	**38** 6.7%	**43** 7.6%	**33** 5.8%	**81** 14.3%	**43** 7.6%	**52** 9.2%	**14** 2.5%	**8** 1.4%	**23** 4.0%	**9** 1.6%	**1** 0.2%	**11** 1.9%	**2** 0.4%	**24** 4.2%	**19** 3.3%	**568**

Chick fledging rate

Of the 378 snowy plover chicks hatched, 252 were banded and the fate of 126 unbanded chicks is believed known (54 fledged) (Appendix B). The primary reason chicks remained unbanded was their close proximity to young plover broods (and to a lesser degree tern broods) and the need to avoid undue disturbance, resulting in 98 unbanded chicks. In addition, a number of very young unbanded chicks were lost prior to any banding opportunity. Unbanded chicks were tracked by a combination of the following: chicks with a banded adult, with banded sibling(s), and a concentrated monitoring effort to locate all broods and determine number and size of chicks. In the absence of a high percentage of chicks being banded at ODSVRA, it would not be possible to obtain accurate chick survival and fledging rates. Between 24 May and 28 August, six unbanded broods (15 chicks) were observed on the shore and were from a category of hatched known location nests (listed as UNK1-6 in Appendix B) whose chicks were not banded while at the nest. Although these broods could not be assigned to a specific nest and exclosure, all chicks were tracked and fledglings are included in totals. Additionally, there were eight unbanded broods (15 chicks) observed on the shore from hatched nests of unknown location. One of the eight broods was subsequently banded. The fledging rate for banded chicks was 47.6% (120/252) and 42.9% (54/126) for unbanded chicks. The fledging rate for all chicks combined was 46.0% (174/378). This compares to 34.0% in 2016 and an average rate of 39.3% (range=7.4-67.9%) for the 15-year period 2002-16 (Table 9, Table E.1 in Appendix E) (CDPR 2007-16).

In 11 of 15 years during the period 2003-17, the fledging rate of chicks hatching in the early season (prior to 20 June) has been higher, by an average of 20 percentage points, than chicks hatching in the late season (20 June or later). (See 2012 report for how early versus late season was determined.) In 2017, the early season had a significantly lower chick fledging rate (37%) compared to the late season (59%) (Figure 10, Figure 11, Figure 12).

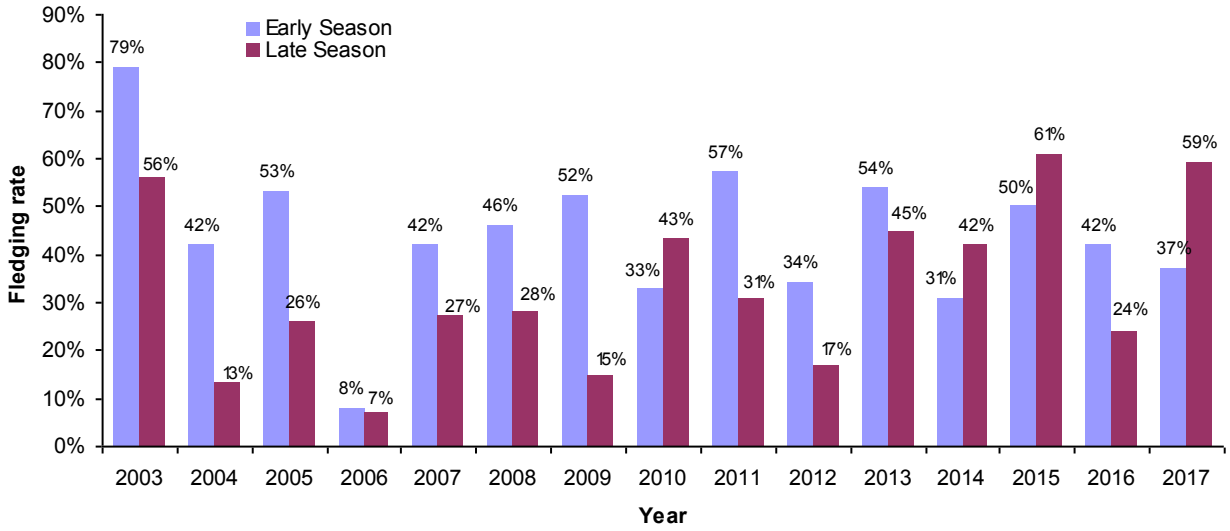


Figure 10. Fledging rate of chicks hatching in early season (prior to 20 June) and late season (20 June or later) at ODSVRA from 2003-17.

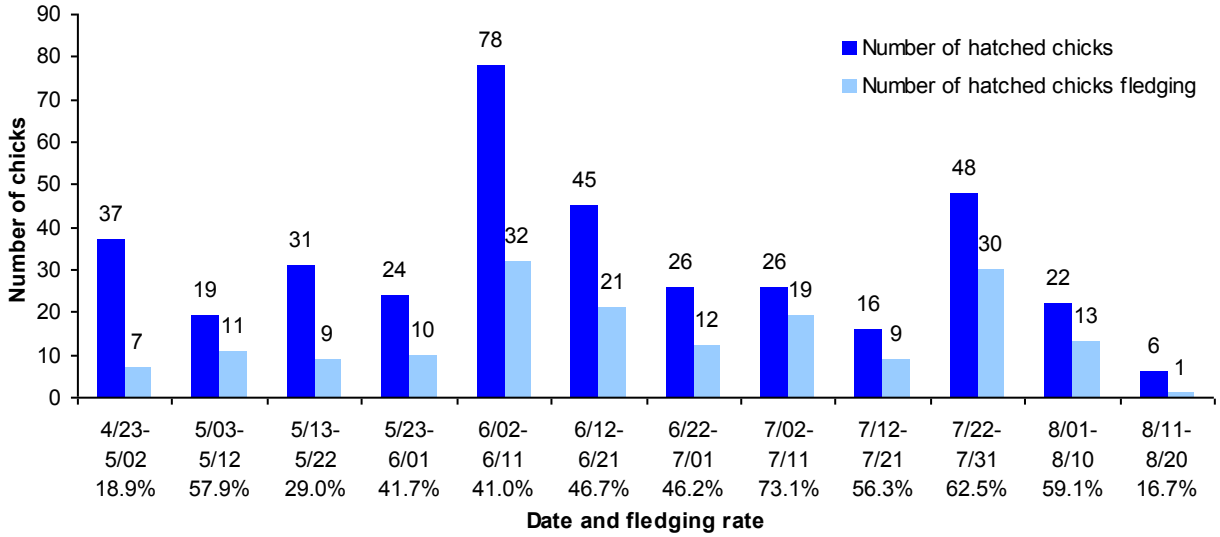


Figure 11. Number of snowy plover chicks hatching per 10-day period and number subsequently fledging at ODSVRA in 2017.

Includes all chicks with known fate (378). For broods that either originated from unknown location (15 chicks from eight broods) or were not assigned to a specific nest (15 chicks from six broods) a hatch date was estimated based on chick size.

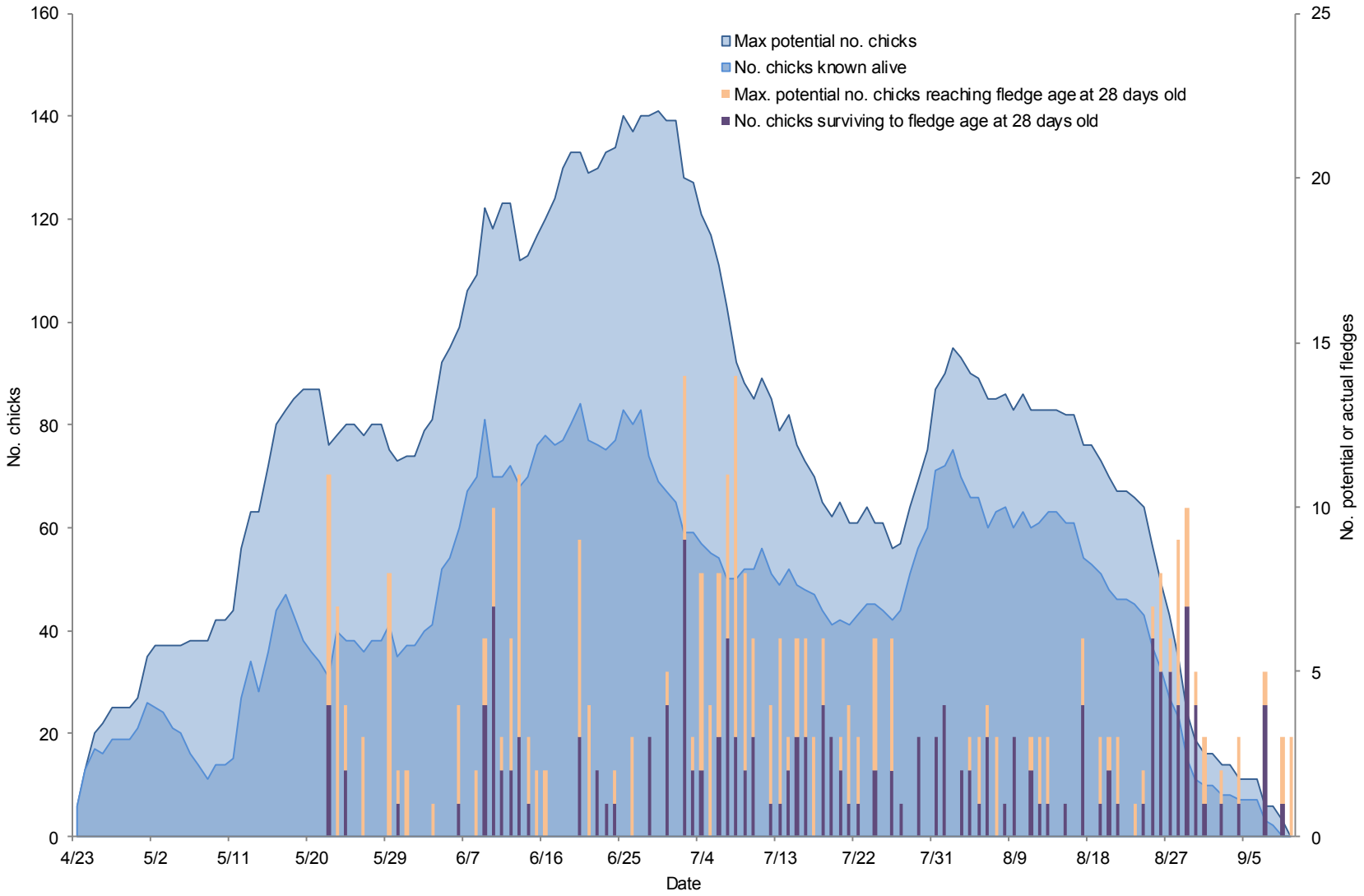


Figure 12. Chick survival and fledge rate from 23 April to 10 September at ODSVRA in 2017.

Of the total of 378 chicks hatching, 373 closely tracked chicks are represented in this figure. Number chicks known alive calculated using date of last sighting during regular surveys of all chicks. No. = number

Brood movement and age of chick loss

At ODSVRA most snowy plover broods are initially led from the nest by the parent(s) to the nearest shore to forage, and the close proximity of quality shoreline habitat for raising chicks can benefit productivity, as mortality rates are typically highest for very young chicks. In 2009-17, the majority (65-82%) of tracked broods were not known to move beyond the individual beach section (6, 7, and 8 exclosures, North Oso Flaco, and South Oso Flaco) nearest to where they hatched. (Note that the disproportionate loss of very young chicks increases the observed proportion of broods remaining in the area where hatched, as the entire brood may be lost before movement outside of that area occurs.) In 2017, 93 of 124 fledglings were from broods remaining in the same general shoreline area adjacent to where hatched (excluded are 50 fledglings from unbanded broods).

Sites south of ODSVRA and within the contiguous dune complex also manage and monitor snowy plovers. In addition, on a limited number of days park resource staff monitored the adjoining Guadalupe-Nipomo Dunes NWR to search for ODSVRA broods. Only three banded broods from ODSVRA were seen being raised 50 to 1,320 feet south of the park boundary, all on the adjoining Guadalupe-Nipomo Dunes NWR (four of nine chicks fledged).

Of 264 carefully tracked chicks (252 banded and 12 unbanded chicks with banded siblings) from known location nests, 139 were believed lost. Chick loss in 2017 was highest for very young chicks (0-4 days of age), accounting for 44.6% of total loss (Figure 13). This is below the average of 50% loss (range=38%-64%) from 2009-16 (CDPR 2016). For 146 chicks reaching 16 days of age in 2017, the fledge rate was 85% (124/146). This is greater than the average of 80% (range=71-93%) for the previous eight-year period 2009-16 and is less than the results from a six-year (1977-82) study at Monterey Bay in Monterey County, California, that found at least 93% of the 124 chicks reaching 16 days of age fledged (Warriner et al. 1986).

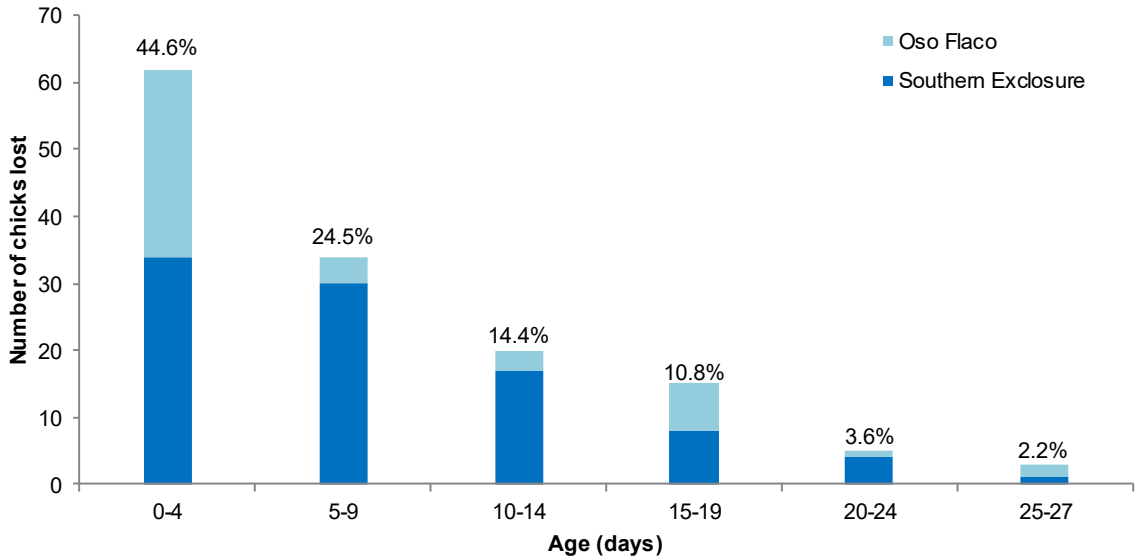


Figure 13. Loss of snowy plover chicks by age and location last seen in the Southern Exclosure and Oso Flaco at ODSVRA in 2017.

Number and percentage of total chicks lost shown for each age group. There were 264 chicks included in the analysis; 139 of these were lost. Data excludes broods that could not clearly be identified and tracked individually.

Productivity measured by number of fledglings produced per adult male
Based on a population viability analysis in the 2007 USFWS Pacific coast western snowy plover recovery plan, a rate of 1.0 fledglings produced per male is believed necessary to prevent population decline with 1.2 fledglings per male allowing for moderate population growth (assuming approximately 75% annual adult survival and 50% juvenile survival) (USFWS 2007). In 2017, the number of chicks fledging per male was 1.87, and allows for population growth. This rate is an increase from 2016 (1.43) and similar to the average of 1.84 (range=1.43-2.45) for the three-year period 2014-16. During the 2002-17 period, average productivity was 1.49 fledglings per male and exceeded 1.2 fledglings per male in 13 of the 16 years (Table 6). (Note that if the number of breeding males is underestimated, the number of chicks fledged per male is an overestimate.)

Mortality (other than eggs)
There was a minimum of 17 documented snowy plover mortalities (other than eggs) at ODSVRA from November of 2016 (subsequent to last year's report) to November of 2017. Predators involved were one red-tailed hawk (*Buteo jamaicensis*) (one plover chick) and two peregrine falcons (one juvenile and one adult plover). Documented mortality other than predation included three chicks, two juveniles, and nine adults. One of the dead chicks was observed prior to death with limited mobility and unattended by its nearby parent adult. (For additional information see Predators and predator management section on page 41, Notes section, and Appendix G.)

Protection of known location and fate nests with exclosures and symbolic fencing
Of the 238 nests from known location and with known fate 129 were initiated within the wire mesh predator fencing of the large seasonal exclosure installed at the beginning of the season in 6, 7, 8, and Boneyard exclosures and North Oso Flaco. These nests had a 56% (72/129) hatch rate.

For the 6, 7, and 8 exclosures and North Oso Flaco, there were an additional 53 nests with known location and fate established on the shoreline outside of the seasonal fencing. This shoreline is closed to public use during the nesting season. Two nests in North Oso Flaco were protected by individual circular exclosures and both hatched. Fifty-one nests were protected only by symbolic rope fencing with signs that provides no predator protection but is designed to discourage vehicle and pedestrian trespass. These nests did not receive individual wire fence protection due to a combination of the following factors: avoiding disturbance of nearby broods, nest abandonment concerns due to adult mortality, and a continuing high hatch rate without the use of single nest wire exclosures. Of these nests 80% (41/51) hatched.

In South Oso Flaco there were 55 nests from known location and with known fate, all ultimately within seasonal symbolic rope fencing (visitor pedestrian use allowed on beach west of symbolic fencing). On sixteen occasions nests were found west of or very near the symbolic fence and the fence was moved westward to provide more of a buffer between nests and pedestrians. Seventeen nests did not receive any wire exclosure due to concerns of windblown sand potentially burying eggs or adult vulnerability to predators. Of these 17 nests, three hatched (18% hatch rate). An additional eight nests failed before a planned circular exclosure could be installed. Thirty nests received circular exclosures and 87% hatched (26/30).

One nest in Arroyo Grande creek area was within seasonal symbolic rope fence and failed (flooded by creek and tide) prior to additional fencing being installed. See Table E.2 in Appendix E for additional details of protective fencing measures for nests.

Banded snowy plovers breeding at ODSVRA in 2017
In California the closest site north of ODSVRA where banding occurs is Monterey Bay in Monterey County (most chicks banded). To the south, banding has not occurred at the Guadalupe-Nipomo Dunes NWR for 14 years, but occurs annually at Vandenberg Air Force Base in Santa Barbara County (varying percentage

of chicks banded), and at several sites in San Diego County. In 2017 the minimum number of breeding adults was 183 birds (93 males and 90 females) and of these 89 (48.6%) were banded with known origins (Figure 14). The great majority (83.1%, 74/89) of known origin banded birds breeding at ODSVRA in 2017 represent recruitment from chicks banded and fledged from ODSVRA. Fourteen breeding birds were banded as chicks from 2011 to 2016 at Vandenberg Air Force Base. One was banded as a chick in 2014 at Moss Landing Salt Ponds in Monterey County. An additional four breeding birds were missing one or more bands and were from unknown locations. (Table D.3 in Appendix D).

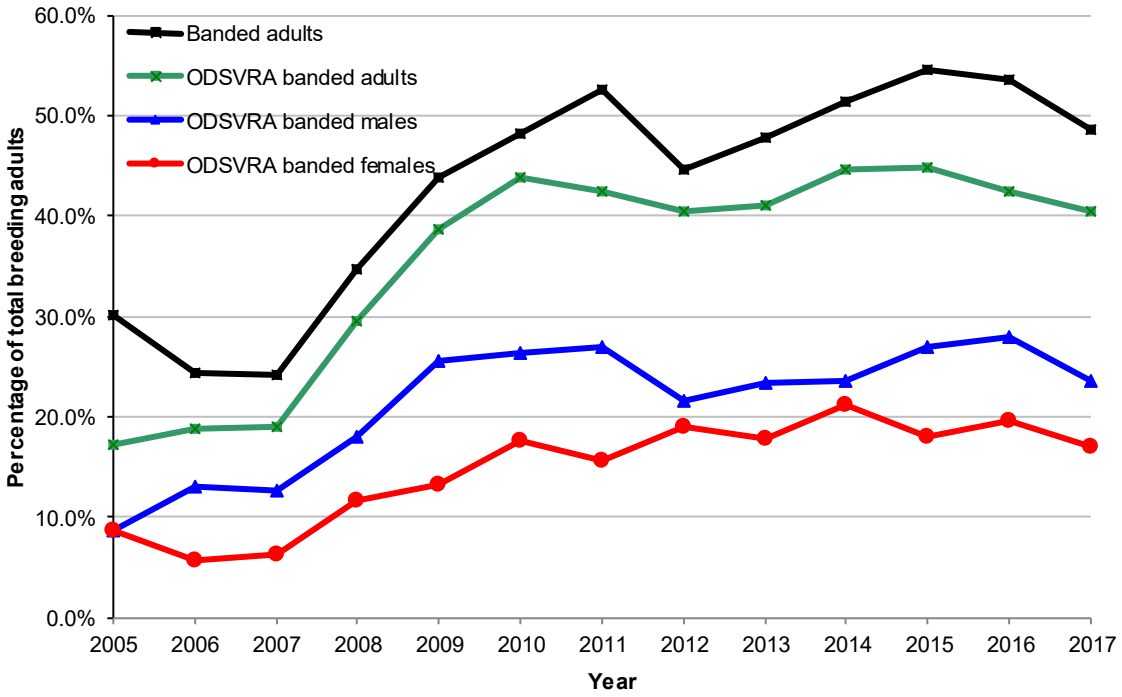


Figure 14. Percentages over the total calculated breeding population at ODSVRA of all verified banded adults and the sum of males and females originally banded at ODSVRA breeding from 2005-17.
All ODSVRA banded adults were banded on-site when chicks.

Snowy plover surveys at ODSVRA during the nonbreeding season
Surveys for wintering plovers (populations of both Pacific coast breeding birds joined by interior breeding birds) were conducted one to four times a month during the five-month period October through February (see Monitoring and Management Actions for survey details). Between 5 October 2016 and 21 February 2017, single day wintering plover counts at ODSVRA ranged from 102-209 birds (single day high count on 15 February 2017). The shore was divided into five beach sections and the monthly average number of plovers (from one to four weekly surveys) was obtained for each section. An average number of plovers for each beach section for the five-month winter period was obtained by averaging each month's average count. Of the five sections, the beach north of Grand Avenue had an average of two plovers during the winter period (range of monthly averages=0-9); Grand Avenue to marker post 2 had an average of 33 (range=0-56); marker post 2 to marker post 6 had an average of 57 (range=17-117); marker post 6 to the southern boundary of the riding area, closed to public entry during the breeding season, had an average of 42 (range=8-89); and Oso Flaco had an average of 22 (range=0-52) (Figure 15).

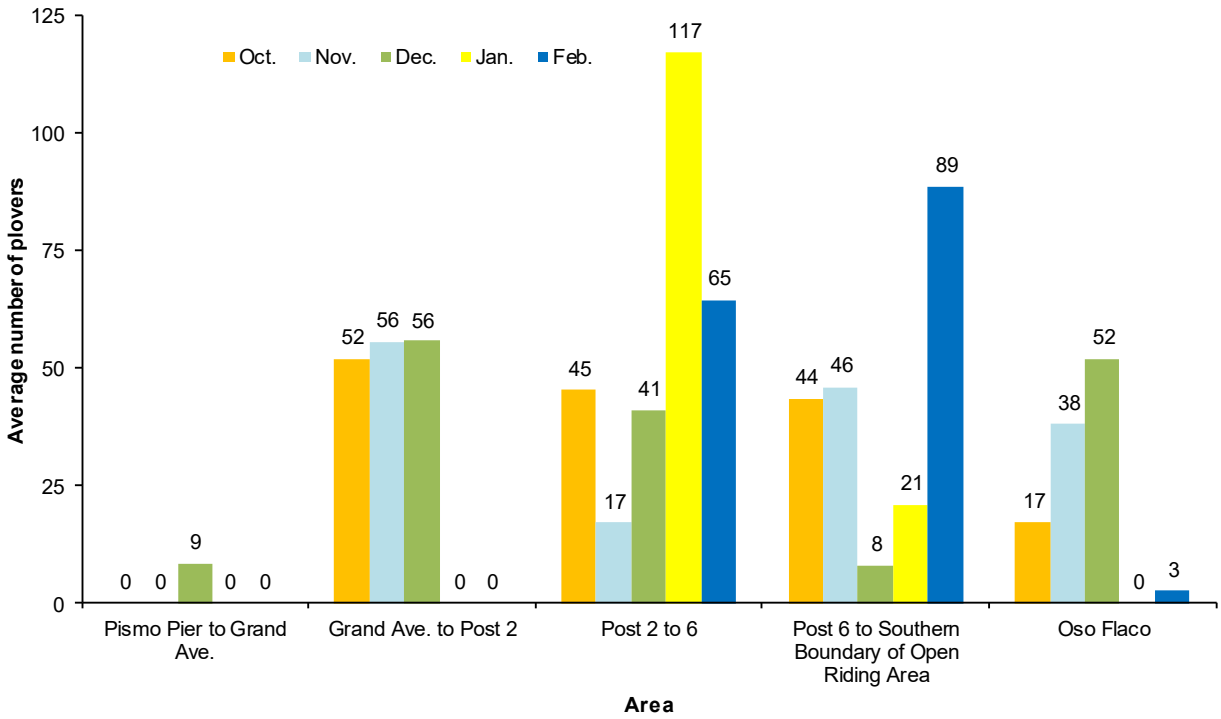


Figure 15. Monthly average number of snowy plovers observed during nonbreeding season surveys at ODSVRA from October 2016 to February 2017.

Surveys conducted one to four times a month. Months with reduced number of surveys completed was due to inaccessibility of some sites during extremely high creek flows.

Beginning in 2004, ODSVRA has participated in a snowy plover winter season window survey organized by USFWS and conducted in January throughout the U.S. Pacific coast. Plovers present during this time include birds from both the Pacific coast breeding population and interior breeding birds wintering on the coast. In 2017, the survey at ODSVRA counted 138 adult plovers, a 44% decrease from 246 in 2016 (Figure 16). This compares to an average winter window count of 248 (range 238-261) during the previous 3-year period 2014-2016 and 160 (range=62-261) during the 14-year period 2004-17 (Figure 16).

Ninety-four banded snowy plovers were recorded during surveys from 1 October 2016 to 28 February 2017 at ODSVRA. These birds were banded at the following locations (all in California): 72 from ODSVRA, 11 from Vandenberg Air Force Base in Santa Barbara County, nine from the Monterey Bay area in Monterey County, and two were missing one or more bands and were from unknown locations (Table D.2 in Appendix D).

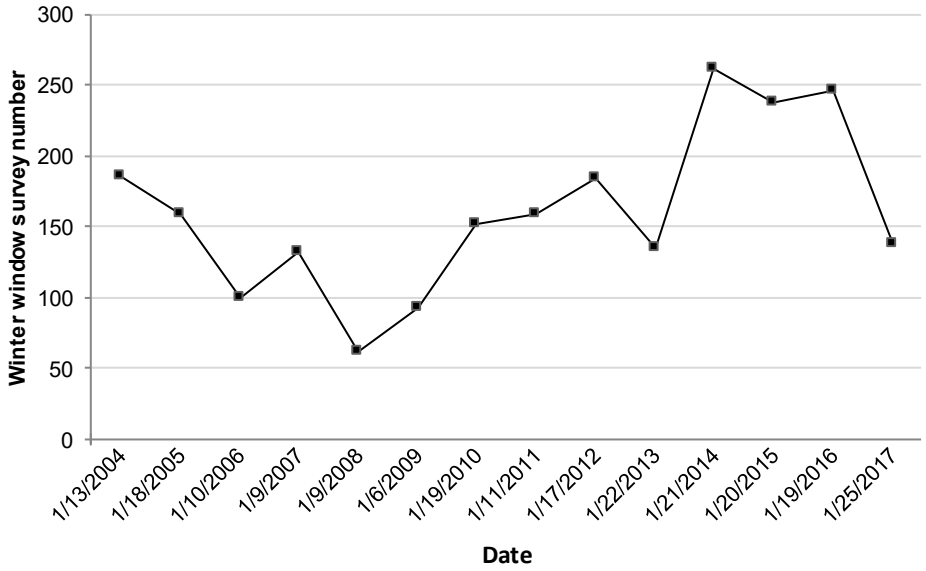


Figure 16. Number of snowy plovers counted on USFWS winter window surveys from 2004-17.

FACTORS INFLUENCING LEAST TERN AND SNOWY PLOVER REPRODUCTIVE SUCCESS

The following is a discussion of some of the factors that influence reproductive success of terns and plovers at ODSVRA. The adequacy of any single factor alone is not sufficient to achieve and sustain recovery goals.

Size of protected habitat

Maintaining an adequate size of protected habitat at ODSVRA has been important in providing sufficient area for terns and plovers to roost, nest, and raise young. Protected breeding habitat of sufficient size allows nests and chicks to be dispersed which can reduce exposure and vulnerability to predators, as well as reduce adverse disturbance from human recreational activities. For plovers, it also improves opportunities for chicks to have access to adequate invertebrate food resources.

Quality of protected habitat

During the March through September least tern and snowy plover nesting season, habitat within the seasonal Southern Exclosure is protected and closed to public entry. Following the nesting season, for the five-month period October through February, the area is open to public use, including camping, street-legal vehicles, and off-highway vehicles. This recreational use results in large areas of flattened terrain and barren sand with very limited scattered natural debris and vegetation. Areas of patchy cover can benefit plovers and terns during the nesting and chick-rearing periods and to make available more such areas park staff places material, including surf-cast kelp (wrack), branches, driftwood, and woodchips, in the 6, 7, and 8 exclosures. On the shoreline of 6, 7, and 8 exclosures talitrids may be added to help restore populations of this important invertebrate prey of snowy plover chicks, juveniles, and adults.

Predators and predator management

Predators and predation can be an important factor limiting least tern and snowy plover reproductive success (Page et al. 1995; Thompson et al. 1997). Predators may impact terns and plovers directly by depredating eggs, chicks, juveniles, or adults. Indirect predator impacts, such as disturbance, can increase time spent by adults in vigilance or avoidance behavior, and may limit incubating and brooding behavior. Presence of predators may result in a brood becoming scattered and the loss of any chick failing to reunite with the adult. Depredation of an adult tern or plover may result in egg abandonment or loss of dependent chicks.

Species known to be predators of terns and plovers were documented by both number of days detected, as well as number of occurrences (mammalian) and sightings (avian). Number of days detected describes the total number of days predator presence was documented in the nesting area (Southern Exclosure and Oso Flaco) during the nesting season. Additional information was collected in order to estimate the extent of predator activity, both temporally and spatially, in the protected area. Occurrences and sightings were used for mammalian and avian predators, respectively, to reflect the difference in manner of detection; almost all mammalian predators were detected by tracks whereas almost all avian predators were detected by direct observation (with the notable exception of nocturnal owls). Both occurrences and sightings are used to better describe the extent of predator activity on a single day by categorizing presence separately for the different areas of the Southern Exclosure (6, 7, 8, and Boneyard exclosures) and Oso Flaco (North and South). In addition, observations of an individual remaining in one area longer than one hour are counted as multiple sightings (one sighting per hour or portion thereof) in order to account for possible additional impacts. Information was more limited for mammalian predators and does not include details such as number of individuals, behavior, or duration of presence. The date range for all observations discussed is from 1 March to 10 September. Note that the number of recorded occurrences or sightings for the first two weeks of March may be biased lower, with less time during this period spent on predator surveys and more time spent on habitat enhancement and fencing projects.

Selective live-trapping and relocation of raptors was conducted by Bloom Biological, Inc. and lethal removal of mammalian and avian predators was conducted by USDA Wildlife Services. Predator monitoring effort by Bloom Biological, Inc. was conducted from mid-February until mid-September and USDA Wildlife Services monitoring effort was conducted from early-May until mid-September. Twenty-three striped skunks, three raccoons (*Procyon lotor*), two coyotes, four common ravens (*Corvus corax*), two California gulls (*Larus californicus*) and one herring gull (*Larus argentatus*) were removed lethally. One peregrine falcon (*Falco peregrinus*) and one great horned owl (*Bubo virginianus*) were live-trapped and relocated (Table F.2 in Appendix F).

Documented Predation

Predation can occur quickly, leaving little or no evidence, and it is likely that only a small percentage of events are documented during a season. There are many hours each day (including almost all night hours) when monitoring staff and/or predator management specialists are not present to observe predation. Even when monitors are present, there are limitations in the ability to detect predators, such as diurnal avian predators, that can travel quickly over large distances. Despite limited documentation of predation events and detection bias, predators of particular concern identified during the 2017 season included peregrine falcon, great horned owl, red-tailed hawk, gull spp., raven, and skunk.

In 2017, five tern nests were documented lost to predation, all by striped skunk. Forty-three plover nests were identified lost to the following predators: striped skunk (18 nests), unidentified predator (9), common raven (10), unidentified avian (2), coyote (2), and unidentified gull species (2). From 2002-17, 2.7% (20/733) of all tern nests with known fate were documented lost to predators (14 mammalian, one avian, and five unidentified predator). During this same 16-year period, 7.3% (189/2578) of plover nests with known location and fate were documented lost to predation (36 mammalian, 109 avian, and 44 unidentified predator). In addition to documented loss, a number of failed nests attributed to “abandoned pre-term” and “unknown cause” are likely a result of predation.

Three documented predation events, other than eggs, in 2017 included: one plover chick (juvenile red-tailed hawk), one juvenile plover (peregrine falcon), and one adult plover (peregrine falcon) (Appendix G). This compares to fifteen documented losses in 2016: nine plover chicks (three by loggerhead shrike [*Lanius ludovicianus*], five by California gull, and one by peregrine falcon); four juvenile plovers (California gull); one adult plover (peregrine falcon); and one juvenile tern (peregrine falcon).

Mammalian Predators

Opossum

Opossum (*Didelphis virginiana*) tracks were documented on eight days in the Southern Exclosure and Oso Flaco in 2017 and averaged 10 days per season (range=3-25) from 2007-16 (Figure 17). From 2002-17, known nest loss to opossum was limited to two tern nests, occurring in 2010 and 2013.

Skunk

In 2017, for the first time since at least 2001, skunks had a significant impact on terns and plovers, with five tern and 18 plover nests documented lost to skunk. Additional nest loss is suspected, as well as loss of tern chicks at or near nests. From 2002-16, known nest loss to skunk was limited to six plover nests; five in Oso Flaco from 2009-11 and one in Boneyard exclosure in 2016 (Table 11). In 2017, skunk tracks were documented on 87 days in the Southern Exclosure and Oso Flaco compared to an average of 26 days per season (range=2-57) from 2007-16 (Figure 17). There were 145 recorded skunk occurrences in distinct areas in 2017. This compares to an average of 42 (range=5-71) for the eight year period 2009-16 (Appendix F.3). The most striking difference in 2017 was the persistence of abundant tracks over a wide area in sensitive habitat. The local skunk population appeared higher than typical and 23 striped skunks were removed in an effort to reduce presence in the Southern Exclosure.

Raccoon

Three non-targeted raccoons were caught in traps intended for skunks and were euthanized. Raccoon tracks were documented on 77 days in the Southern Exclosure and Oso Flaco. Tracks and scat indicated that raccoons commonly traveled across the exclosure to forage in the intertidal zone on prey that included mole crabs (*Emerita analoga*). Documented raccoon activity averaged 103 days (range=39-145) for 2007-16 (Figure 17). From 2002-17, known nest loss to raccoons was limited to one tern nest in 6 exclosure in 2015 and two plover nests in Oso Flaco, occurring in 2010 and 2011.

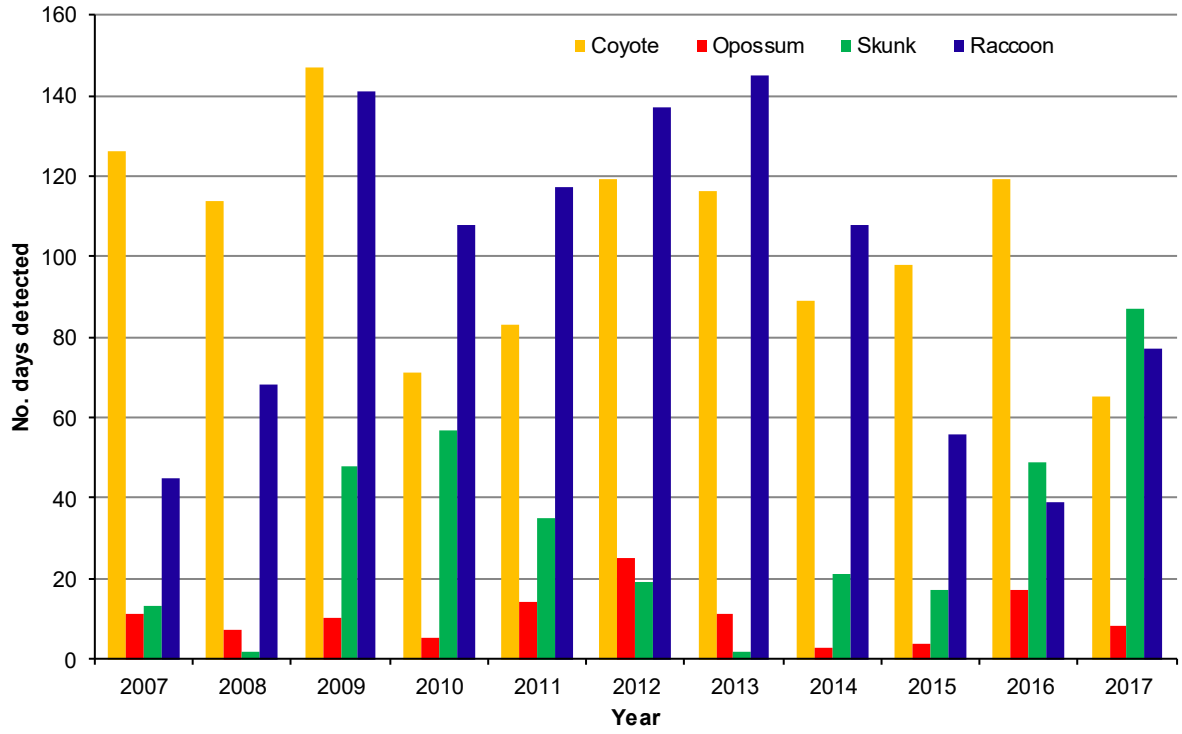


Figure 17. Number of days coyote, opossum, skunk, and raccoon were detected in the Southern Exclosure and Oso Flaco at ODSVRA from 2007-17.

Coyote

Live sightings of coyotes have rarely been documented inside the exclosure or along the shoreline during daytime hours. The lack of diurnal sightings, as well as timing of observed fresh tracks relative to windblown sand and tides, indicate that coyote activity is primarily nocturnal in these areas.

Two coyotes were removed in an effort to reduce the threat of predation and disturbance due to coyote presence documented within sensitive nesting habitat. This compares to an average of six removed per year from 2007-16 (range=4-11). As part of monitoring at ODSVRA, coyote scat encountered by monitoring staff and contractors was checked in the field for plastic or aluminum bands used for banding least terns and snowy plovers. Bands were found in coyote scat for the first time in 2012, with four coyote scats contained a total of 11 bands (representing a minimum of one plover chick, two unknown age plovers, and one unknown age tern) (CDPR 2012). No bands were found in coyote scat in 2013-17 (CDPR 2013, 2014, 2015, 2016).

In the combined Southern Exclosure and Oso Flaco areas coyote presence was recorded on 65 days (this includes 25 days inside the predator fenced portion of the Southern Exclosure and North Oso Flaco) (Table 12). For comparison, coyote presence was documented an average of 108 days (range=71-147) during the previous eight-year period from 2009-16. There were 73 recorded coyote occurrences in distinct areas in 2017. This compares to an average of 204 (range=99-307) for the previous eight years. Coyote presence on the shoreline of the Southern Exclosure and North Oso Flaco was strikingly low with five occurrences recorded this season, compared with an average of 115 (range =37-193) for the last eight years (Appendix F.1). It should be noted that predator tracks are documented opportunistically and counts represent a minimum level of activity. In addition, shoreline accessibility for monitoring staff may vary between years making direct comparison difficult.

From 2002-17, documented coyote depredation of nests has been limited to eleven plover nests and six tern nests, occurring in 2002 (1 plover, 2 tern), 2003 (1 tern), 2004 (1 plover, 2 tern), 2006 (4 plover), 2007 (1 plover), 2012 (1 plover), 2013 (1 tern), 2014 (1 plover), and 2017 (2 plover).

Table 12. Coyote occurrence in the Southern Exclosure and Oso Flaco at ODSVRA from 2009-17.
Date range is from 1 March to 10 September (a 194-day period).

Year	Inside Southern Exclosure and North Oso Flaco predator fencing	6, 7, 8 exclosure shoreline	North Oso Flaco shoreline	South Oso Flaco	Total no. occurrences (Total no. days detected)
2009	19	99	94	95	307 (147)
2010	5	24	23	47	99 (71)
2011	10	17	20	55	102 (83)
2012	92	100	47	35	274 (119)
2013	49	55	38	60	202 (116)
2014	28	115	38	42	223 (89)
2015	48	104	32	29	213 (99)
2016	36	61	49	63	209 (124)
2017	25	1	4	43	73 (65)

Avian Predators

In 2017, one juvenile female peregrine falcon and one adult male great horned owl were live-trapped and relocated. In addition, two California gulls (one removed inadvertently), one herring gull, and four common ravens were lethally removed. Unsuccessful efforts were made to trap two additional great horned owls and two juvenile red-tailed hawks. Avian predators perched in sensitive areas within the Southern Exclosure and Oso Flaco were hazed when possible (see Management Actions section for more detail).

Loggerhead shrike

From 17 July – 25 August a minimum of two loggerhead shrikes were documented on seven days in 2017 in the Southern Exclosure and Oso Flaco. Shrikes were observed perch-hunting and flying over Boneyard and Oso Flaco. On five occasions, shrikes were hazed from areas of plover nesting and chick-rearing habitat in Oso Flaco.

Merlin

From 28 March – 28 April, a minimum of two merlins (*Falco columbarius*) were documented on four days (four sightings) in 2017 actively hunting shorebirds in the Southern Exclosure and Oso Flaco (Table 13). A merlin was not seen again until 16 August. In 2016, there were 15 sightings of merlins on 10 days and in the nine-year period 2007-15, merlin activity averaged seven days (range=0-16) a year. From 2004 to 2017,

merlins were documented taking four adult plovers (one in each of the years 2004-06 and one in 2015) at ODSVRA. In addition, an adult female merlin was observed eating a small shorebird that may have been a plover in 2011. In 2014, their presence coincided with several plover nests being abandoned pre-term with adult mortality suspected as the cause.

American kestrel

There were 30 documented sightings on 18 days of American kestrels (*Falco sparverius*) in specific areas of the Southern Exclosure and Oso Flaco (Table 13). Kestrels were primarily observed perch-hunting and flying over Boneyard and Oso Flaco, and were noted perched on 6, 8 and North Oso Flaco exclosure fences on 8 days. Kestrels were hazed out of sensitive areas when perched. For the 10-year period 2007-16, kestrels were seen an average of 14 days per season (range=6-28) (CDPR 2007-16).

Owl

The majority of owl "sightings" are from detection of tracks with very few visual sightings. The level of owl activity, as evidenced by tracks, is difficult to estimate during daytime monitoring as there is limited entry into the nesting and chick-rearing areas to look for tracks. The tracks may extend only a short distance and can be quickly covered by windblown sand. In addition, accessibility to areas where tracks have often been noted previously (e.g., North Oso Flaco, 8 exclosure, 7.5 revegetation area) may vary between years making direct comparison difficult. Most owl tracks documented at ODSVRA are likely from great horned owls; barn owls (*Tyto alba*) have also been documented but to a much lesser extent. Burrowing owls (*Athene cunicularia*) have been seen at ODSVRA in previous years but would not be confused with other species and have typically migrated out of the area before the tern and plover breeding season.

In 2017, owl tracks were periodically documented in sensitive nesting and chick-rearing habitat, with owl presence detected on 33 days with 42 separate sightings (Table 13, Figure 18). In the 10-year period 2007-16, owl activity was documented on an average of 28 days (range=5-53). On the night of 12 July, a great horned owl was recorded in one nest camera photo landing next to a snowy plover nest (SP242) protected by a circular exclosure in the southwest portion of 8 exclosure. A plover was recorded returning to incubate the nest 50 minutes later. One adult male great-horned owl was live-trapped in Pipeline revegetation area on 4 April and relocated the following day. Later efforts to trap two great horned owls hunting in and around the exclosure were unsuccessful.

Red-tailed hawk

Red-tailed hawks were primarily observed perching and flying in the North and South Oso Flaco foredunes. In 2017, a juvenile red-tailed hawk was observed depredating a plover chick on 8 exclosure shoreline; trapping efforts for this bird were unsuccessful. This is the first known predation of a nest, chick, or adult plover by a red-tailed hawk at ODSVRA, but they have been a documented predator of plovers and terns at other sites. Red-tailed hawk presence was documented on 66 days (129 sightings) (Table 13, Figure 18). From 2007-16, activity was recorded on an average of 40 days (range=7-74). Based on concurrent sightings and age, there was a minimum of four individuals (one adult, one sub-adult, and two juveniles) observed in or adjacent to the nesting area.

Northern harrier

Northern harrier (*Circus hudsonius*) has been documented as a predator of nests, chicks and juveniles of plovers and/or terns at ODSVRA in past years. In 2017, there were 70 sightings of northern harriers on 30 days. In the 10-year period 2007-16, activity was recorded on an average of 44 days (range=25-68) (Figure 18, Table 13). Based on age and sex, there was a minimum of three individuals (one adult female, one sub-adult [likely male], and one juvenile) observed during this season.

Table 13. Sightings of merlin, American kestrel, large owl spp., red-tailed hawk, northern harrier, and peregrine falcon in specific areas of the Southern Exclosure and Oso Flaco at ODSVRA in 2017.
Date range is from 1 March to 10 September (194-day period). Note most owl "detection" based on tracks.

Location	Merlin	American kestrel	Large owl spp.	Red-tailed hawk	Northern harrier	Peregrine falcon	Total
6 exclosure	1	1	2	1	4	31	**40**
7 exclosure	0	2	4	8	10	35	**59**
8 exclosure	2	5	17	10	14	40	**88**
Boneyard exclosure	0	4	13	9	4	8	**38**
North Oso Flaco	0	7	3	33	12	37	**92**
South Oso Flaco	2	11	3	68	26	41	**151**
TOTAL	**5**	**30**	**42**	**129**	**70**	**192**	**468**

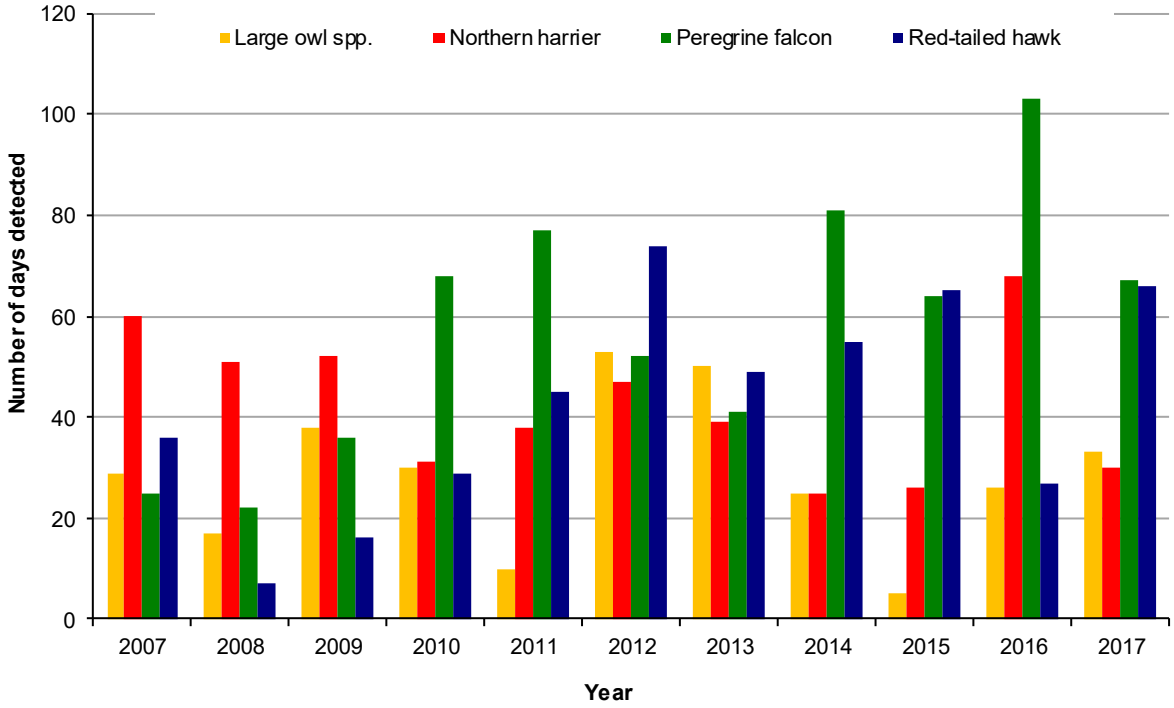


Figure 18. Number of days large owl spp., northern harrier, peregrine falcon and red-tailed hawk were detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2007-17.
Date range is from 1 March to 10 September (194-day period).

Peregrine falcon

Peregrines were commonly observed actively hunting, perching, and consuming prey in the Southern Exclosure and Oso Flaco. Peregrines hunting on the exclosure shoreline, even when not focused on plovers and terns, can cause disturbance that limits foraging time for plover chicks while increasing the risk of broods being separated or moved. Peregrines perched in the nesting area for an extended period of time were hazed on 30 days in 2017 (sometimes requiring repeated efforts before the bird left the nesting area). Hazing peregrines out of sensitive areas provided a temporary solution but did not deter individual falcons from returning to ODSVRA.

On 28 June an unbanded sub-adult peregrine caught an unbanded adult plover over the ocean west of 7 exclosure (Appendix G). Additionally, on 21 August, an unbanded juvenile female peregrine was observed depredating a young plover fledgling on North Oso Flaco shoreline (Appendix G). On 30 August, a juvenile female peregrine with similar plumage was trapped in South Oso Flaco. On 31 August, it was released in the Inyo National Forest 179 miles northeast of ODSVRA and provided with a USFWS band "1687-16591" on left leg and a VID band "W47" (white characters on black band) on right leg.

In 2017, there were 192 sightings of peregrine falcon on 67 days (Table 13), a 24% decrease in sightings from the previous year (254 sightings on 103 days). This also represents a 16% increase from the average of 166 (range=38-362) sightings from 2008-16 (Table 14). The average number of days peregrines were recorded during the period 2008-16 was 60 (range=22-103).

A minimum of seven individual peregrine falcons were identified at ODSVRA this season: one banded adult male (VID band "50AB"), one banded adult female (VID band "17D"), one banded adult sex unknown with bands partially read with silver on left leg and black VID on right (not "17D"), one banded juvenile, one unbanded sub-adult, one unbanded adult, and one unbanded juvenile live-trapped and banded (VID band "W47"). The adult female with VID band "17D" was banded as a nestling in 2013 in southern California and was seen at ODSVRA the previous two years. The adult male with VID band "50AB" was trapped and banded by ODSVRA's avian specialist in 2015, and released on 8 May 2015 to the Fort Jones area east of Mount Shasta, 467 miles north of ODSVRA. This bird was confirmed to return to ODSVRA on 14 August 2015.

Table 14. Sightings of peregrine falcon in specific areas of the Southern Exclosure and Oso Flaco at ODSVRA from 2008-17.

Date range is from 1 March to 10 September (a 194-day period).

Location	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
6 exclosure	11	13	37	39	41	28	75	41	54	31
7 exclosure	11	13	29	45	37	23	85	31	50	35
8 exclosure	5	13	25	40	31	19	67	28	45	40
Boneyard exclosure	6	6	11	32	9	2	11	15	16	8
North Oso Flaco	4	9	24	37	27	14	69	19	32	37
South Oso Flaco	1	20	18	12	11	14	55	29	57	41
Total no. sightings	**38**	**74**	**144**	**205**	**156**	**100**	**362**	**163**	**254**	**192**
No. days detected	**22**	**36**	**68**	**77**	**52**	**41**	**81**	**64**	**103**	**67**
No. peregrines trapped	**0**	**1**	**3**	**0**	**1**	**0**	**1**	**1**	**0**	**1**

Corvids (American crow and common raven)

American crows (*Corvus brachyrhynchos*) and common ravens are efficient predators at many tern and plover nesting sites and can have pronounced impacts over a short period of time. American crow sightings were limited to eight sightings over three days, including one event of five crows flying over 8 exclosure. There were 14 sightings of common raven over eight days. During the 10-year period 2007-16, crows were seen annually on an average of six days (range=0-12) and ravens on six days (range=2-14) (CDPR 2007-16). In 2017, known nest losses to raven were 10 plover nests during a 13-day period from 16 to 28 May. On 18 May, three juveniles were lethally removed at a raven nest approximately eight miles south of ODSVRA, but close enough to be a potential threat to plovers and terns. On 30 May, an adult common raven was lethally removed from approximately 0.25 miles east of Oso Flaco.

Gulls

On 2 May, an immature herring gull was observed behaving suspiciously in active nesting and brood rearing plover habitat in 6, 7, and 8 exclosures. During efforts to remove this gull one immature California gull was

inadvertently killed. The herring gull was followed to the Arroyo Grande Creek area and lethally removed. On 2 May, a different large-bodied white gull was observed flying, circling, and landing in plover nesting habitat in 7 exclosure and flying over 8 exclosure. On this same day, a nest in 8 exclosure was confirmed depredated by a gull and a second nest in 7 exclosure was last incubated on this date and later confirmed depredated by a gull. On July 24, an immature California gull exhibiting suspicious behavior on the Southern Exclosure shoreline was lethally removed by USDA Wildlife Services after unsuccessful attempts were made to haze the gull out of the area. (Table F.2 in Appendix F).

Gulls can pose a significant threat to snowy plover breeding success at ODSVRA, especially individual gulls that key in on adults with broods. Such gulls can become "specialists" searching for and preying on chicks over a wide area, and depredation events can happen quickly and easily go undetected. In 10 of the 14 years from 2004-17, gulls have been documented taking plover chicks. Between 2011-16 gulls took a minimum of 31 plover chicks, juveniles, and unknown age birds. In 2011, three gulls took a minimum of six chicks, three juveniles, one juvenile or adult, and five plovers of unknown age over a four-day period from 28-31 July. In 2012, a regurgitated gull pellet found on 6 exclosure shoreline contained nine bands, representing a minimum of three unknown-age plovers; none of these predation events were observed. In 2013, no plovers were known depredated by gulls. In 2014, two gulls took a minimum of two plover chicks and one juvenile or adult. In 2015, one gull took a minimum of one plover chick. In 2016, two gulls took a minimum of five plover chicks and four juveniles. In 2017, no plovers were known depredated by gulls.

RECOMMENDATIONS

Continue monitoring
Monitoring is critical for effective protection of nesting terns and plovers. As problems and threats arise for adult birds, nests, and chicks, timely information from monitoring can help guide appropriate management actions and evaluate their effectiveness. Monitoring efforts at ODSVRA should have adequate funding, resources, and flexibility to address anticipated problems (e.g., nesting failure, causes of chick loss, predator pressure) as well as unanticipated problems.

Continue banding least tern and snowy plover chicks
Continue banding least tern and snowy plover chicks to better understand chick behavior and factors promoting or threatening survival of chicks (e.g., feeding rates for tern chicks, foraging activity and movements of plover chicks, age and location of disappearance of different cohorts of chicks). Banding also provides a means to document fledging success. Without this information, the seasonal productivity of terns and plovers at ODSVRA would be unknown and management effectiveness could not be assessed. Additionally, bands provide an opportunity to gain insight into predator impacts on chicks and fledglings. Over time, banding of tern and plover chicks will provide information on natal site fidelity of terns and plovers fledged at ODSVRA, as well as migration to other sites.

Continue banding least tern chicks to individual
Beginning in 2006, least tern chicks were banded to allow individual chicks to be identified. This was done, in part, by placing one or two different colors of tape on the federal band, creating a unique combination for each chick. Banding to individual provides the opportunity to gain additional information that otherwise may not be obtainable, including:

1) providing the most accurate means to count the number of juveniles produced;
2) identifying if different areas within the colony are having different fledging success during a season;
3) identifying if broods hatching more than one chick are fledging more than one chick;
4) tracking individual chick and juvenile movement within the ODSVRA colony;
5) providing information on the length of stay of individual juveniles at the colony site after fledging;
6) tracking recruitment of juveniles into ODSVRA's breeding population; and
7) tracking movement of individuals to other colonies in California.

Banding to individual provides valuable information to assist in developing and assessing site management actions directed toward the recovery of the least tern.

Continue option to band adult snowy plovers
The occurrence of abandoned plover nests can raise concern about possible mortality of adult plovers. If elevated adult mortality rates occur or are suspected, it could prove beneficial to band certain adults. This would allow monitors to verify if mortality was taking place and possibly identify the causes.

Provide adequate-sized bumpouts and single nest exclosures to protect least tern nests and chicks in or close to the open riding area
Least tern nests inside the Southern Exclosure and located close to the north or east fence receive temporary additional fencing to create a buffer from recreational activities in the open riding area. These bumpouts connect to the fence adjacent to the nests and extend into the open riding area. Recent practice has been to provide a 100-foot buffer between a nest and the open riding area, using bumpout fencing for nests inside the Southern Exclosure and a 100-foot-radius circular single nest exclosure for nests in the open riding area.

In 2016 and 2017, as recommended by CDFW, the minimum distance between least tern nests and the open riding area was increased, and where needed bumpouts were used to provide a buffer of 300 feet in 2016 and 328 feet (100 meters) in 2017. Fifty-four percent (28/52) of known location nests were within 328 feet

of the exclosure fence in 2017 and bumpouts were installed to increase the buffer from the open riding area. This is similar to 2016 when fifty percent (24/48) of known location nests were within 300 feet of the exclosure fence. Also similar to 2016, all nests receiving bumpouts in 2017 were in close proximity and near the eastern side of 6 and 7 exclosures, and therefore the bumpout fencing was moved and connected several times over the course of the nesting season as additional nests were initiated. By the end of the season, several bumpouts had coalesced into one large bumpout with multiple layers of fencing (Appendix C). Of the nests with bumpouts 43% (12/28) were documented to hatch. This compares to 42% (10/24) for nests where bumpouts were not required (Appendix A).

For 2018, it is recommended to continue to provide a bumpout for tern nests within 328 feet (100 meters) of the open riding area fencing, as approved by CDFW. Nests in the open riding area should receive a single nest exclosure with a minimum radius of 328 feet. Nests will be monitored closely to assess the adequacy of protective fencing in reducing disturbance. If necessary, bumpouts or single nest exclosures may increase in size if disturbance to incubating birds is observed as a result of recreational activity. Tern chicks will also be monitored and the bumpout size may be adjusted if chicks are observed to remain within 328 feet of the eastern bumpout fence. ODSVRA will continue to maintain a safe vehicle corridor adjacent to the north and east fence, any bumpouts, and single nest exclosures.

Continue to provide adequate-sized bumpouts and single nest exclosures to protect snowy plover nests in or close to the open riding area

In 2017, snowy plover nests inside the Southern Exclosure and located within 100 feet of the north or east fence received temporary additional fencing to create a buffer from recreational activities in the open riding area. These bumpouts connect to the fence adjacent to the nests and extend into the open riding area. Nests inside the exclosure and more than 100 feet from the fence may also receive a bumpout if repeated disturbance from the open riding area is observed. For nests found in the open riding area, the protocol is to install a single nest exclosure with a minimum radius of 100 feet.

In 2017, four snowy plover nests were given bumpouts. Three bumpouts were to increase the distance to 100 feet from nests in 6 exclosure (SP15 and SP156) and 8 exclosure (SP243) to the open riding area fence. A nest in 8 exclosure (SP182) was found 127 feet from the open riding area fence and a bumpout was installed to increase the distance to approximately 200 feet from the nest to the open riding area fence, after it was observed to be disturbed by visitor activity. All four nests hatched, producing 10 chicks of which four fledged (Appendix B).

For 2018, it is recommended to continue to install bumpouts for snowy plover nests close to the Southern Exclosure fence to create a buffer of at least 100 feet between the nest and the open riding area. Nests in the open riding area should receive a single nest exclosure with a minimum radius of 100 feet. Nests will be monitored closely to assess the adequacy of protective fencing in reducing disturbance. If necessary, bumpouts or single nest exclosures may increase in size if disturbance to incubating birds is observed as a result of recreational activity. ODSVRA will continue to maintain a safe vehicle corridor adjacent to the north and east fence, any bumpouts, and single nest exclosures.

Continue to position a large section of the shoreline exclosure fence further east (inland) to provide a wider functional shoreline habitat

The shoreline west of the exclosure west fence is important snowy plover habitat for rearing chicks. Prior to 2011, the management practice had been to place the west fence as low as possible on the shoreline. This was to maximize the amount of nesting and potential brooding area inside the seasonal fence protected from coyotes. In 2011, two small experimental shoreline fence sections, located in 6 and 7 exclosures, were placed up to 100 feet further to the east and these areas appeared to have a broader and more functional shoreline when evaluated at the end of the season. In 2012-17, the shoreline fence was moved 100 feet east for the southern half of 6 exclosure and for the majority of 7 exclosure (except for the 7.5 revegetation

area). The Southern Exclosure is seasonally open to off-highway and street-legal vehicles during five months of the year between October and February. As a result of recreational activity during this time, the shoreline of the 6, 7, and 8 exclosures has almost no cover or topographic relief at the beginning of the breeding season and park staff distributes wood and wrack to provide some cover above and below the drift line. The shoreline is further altered with the installation of the west fence as it results in substantial deposition of fine windblown sand on the leeward (east) side of the fence. A fence set low on the shore can result in a very narrow swath of shore with cover (west of the fence) bordered by limited cover over the majority of a strip of habitat (approximately 100 to 180 feet wide) immediately east of the fence, with deposited sand burying existing or introduced cover.

Moving the west fence 100 feet eastward improved shoreline habitat characteristics for chick-rearing by allowing for a wider area of shore with cover and wrack. There was more topography and cover created by increased debris, woodchips, and wrack as well as greater foraging opportunities with the increased area of habitat enhancement. There continued to be broad areas of mobile sand with reduced cover east of the west fence.

Adjusting the fence eastward allows for the following benefits to the overall management goals for snowy plover productivity:

1) allow access from the shoreline for monitoring staff to maintain a wider swath of shore with habitat enhancement materials (including wrack) throughout the breeding season;
2) reduced chance of high tides and surf washing up and removing a low-set fence and habitat enhancement material;
3) provide better conditions for pioneering plants to grow in a wider area between the high tide line and the west fence (windblown sand deposited leeward of the fence can adversely impact seedling survival);
4) may increase foraging opportunities for plovers;
5) may reduce vulnerability to predators by providing more space and cover for chicks; and
6) may reduce bouts of aggression between adults with broods by decreasing brood density and, therefore, may decrease the chance of chicks becoming separated from their brood or attacked by adults with other broods.

It is recommended for 2018 to repeat the shoreline configuration as was present in 2017, with a large portion of the 6 and 7 exclosure shoreline fence approximately 100 feet to the east of the pre-2012 shoreline fence location. If tide conditions allow, the northern section of 6 exclosure would not be moved east to avoid potential impacts to nests on the shoreline from trespassers. The shoreline fence should continue to be installed last (after all other fencing is installed) and as close to 1 March as possible to lessen the chance of storm-driven high surf damaging the fence.

Continue to enhance habitat in the Southern Exclosure by distributing natural materials and increase efficiency with the help of maintenance staff and heavy equipment

Natural materials such as driftwood, woodchips, and wrack (surf-cast kelp) should be distributed in large amounts within the exclosures (including the shoreline) to enhance habitat features. Since 2002, wrack has been gathered by hand and placed in the exclosure. Approximately 220 cubic yards of wrack were distributed on the exclosure shoreline during the 2017 season as habitat enhancement. Greater efficiencies may be possible for wrack distribution. Since 2008, ODSVRA monitoring staff has received assistance from available heavy equipment operators from park maintenance staff in loading woodchips to be distributed in the exclosure. However, a method using heavy equipment has not been found to collect and distribute large amounts of wrack from the open riding to the seasonal shoreline exclosure. Attempts in the past resulted in more sand than wrack being collected with the equipment compared to hand collection. In 2018, it is recommended that methods to better use heavy equipment for wrack collection should be further explored. The goal would be to have heavy equipment available throughout the season to assist in loading

large piles of wrack collected from the open riding area, to then be placed and distributed by permitted staff on the Southern Exclosure shore. This would increase staff efficiency and allow larger amounts of wrack to be dispersed, helping to maintain larger populations of invertebrate prey over a broader area for snowy plover chicks, fledglings, and adults. Broader distribution of wrack also provides shelter from wind and cover from predators. The use of heavy equipment needs to be balanced with other operational needs in the park.

Wrack and woodchip additions could also occur during the winter or prior to 1 March if materials and staff levels allow. As time permits, it is recommended to place large wrack piles in the winter or at the beginning of the season in the area where the seasonal exclosure will be located.

Continue to study the benefits of wrack addition to the Southern Exclosure shoreline and inoculation with wrack-associated invertebrates as a possible means to restore invertebrate species and biomass (these invertebrates are part of the prey base for snowy plover chicks, juveniles, and adults)
In 2007, a study was initiated by Drs. Jenifer Dugan and Mark Page, researchers from the Marine Science Institute at the University of California Santa Barbara (UCSB), examining the responses of invertebrate numbers and diversity in areas where wrack was added to the Southern Exclosure shoreline throughout the breeding season. Preliminary findings from the five-year study (2007-11) indicated that the seven-month seasonal closure (March-September) is not a sufficient period of time for invertebrates to effectively and naturally recover species diversity and abundance on the Southern Exclosure shoreline following five months of recreational use. In 2012, invertebrate sampling (by Dr. Dugan) was more limited, with one series of transects at the beginning of the season and repeated once at the end of the season. In 2013-17, park staff, following the same methodology, performed one series of invertebrate sampling at the end of the season and a beginning season sampling survey was done in 2015-17. The survey was comprised of 10 transects in the Southern Exclosure and three transects in North Oso Flaco (as a control). Samples were sent to Dr. Dugan at UCSB for analysis and findings added to the data set. For 2018, it is recommended to continue the beginning and end of season sampling.

From 2012-17, park staff has inoculated wrack added to the shoreline with invertebrates following protocols developed by UCSB and it is recommended to continue these protocols in 2018. In 2016, experimental wrack surveys were performed a limited number of times counting the number of holdfasts or floats in different areas of the exclosure over time as a potential index of total wrack deposition. The holdfast and float surveys were not performed in 2017 because of time constraints and a simpler survey method should be explored prior to the 2018 season. Examination of wrack and invertebrate manipulation on the Southern Exclosure shore should continue in the 2018 season with the goal of identifying potential means to enhance the diversity and abundance of invertebrate species that are natural prey for plovers.

Continue to look for an appropriate design to cover trash dumpsters
The predator management strategy at ODSVRA includes methods to discourage attracting predators to the site. The large trash dumpsters (22 feet long, 20 cubic yard capacity) located near marker post 2 attract a large number of gulls landing on and foraging in the dumpsters. Four to six dumpsters are present during the busy summer months. In 2012, an experimental cover was designed for one dumpster, but it was removed because the design did not stand up well in high winds and quickly became ineffective. In late September of 2016, an experimental cover that has two openings with latches was tested on one dumpster, but was removed because the design did not meet ODSVRA needs.

Daily surveys at the dumpster area during the 2017 nesting season resulted with the month of September having the highest daily average number of gulls (111) and the maximum number of gulls present at one time was 375 on 25 August. It is recommended for 2018 to cover all the trash dumpsters in the marker post 2 area with lids designed to exclude gulls and meet the needs of the ODSVRA staff and visitors.

Continue to maintain option to salvage and rescue eggs, chicks, juveniles, and adults under very limited circumstances

In some circumstances the abandonment of least tern or snowy plover eggs and chicks can be directly attributed to human disturbance. The option to salvage such eggs and chicks to be raised in captivity by an approved facility and released in the wild is useful. Beginning in 2003, a limited number of abandoned but likely viable snowy plover eggs or chicks from ODSVRA were brought into captivity. Chicks were raised in a manner that they did not imprint on humans and were released into the wild when fledged. All fledglings were color-banded to individual to facilitate collecting information on movements, survival, and future reproductive success. Captive care should only be used selectively and not as a substitute for responding to the primary causes of elevated egg or chick abandonment rates.

Ongoing management actions that will continue in 2018

The following are part of our ongoing management actions and monitoring procedures for which a specific recommendation is no longer necessary (see Monitoring and Management Actions section for more detail). Background information and justifications for these management actions have been discussed in detail in previous annual reports.

- Oso Flaco area protection will continue at the same monitoring and management level as set in 2005 (Site Description).
- The Arroyo Grande Creek protected area will be clearly delineated as a closed area around the Arroyo Grande Creek and lagoon by using posts, symbolic rope, and signs as practiced since 2006 (Site Description).
- Night vision equipment will continue to be used for monitoring the least tern night roost. The equipment has been used for monitoring since 2007.
- Continue monitoring least tern juveniles and the night roost. Continue monitoring foraging activity at nearby freshwater lakes, if time allows.
- Continue use of motion detector cameras for nest monitoring and train and permit additional monitoring staff as needed.
- Continue to use an anemometer with data logger from a wind tower to record daily wind speeds and direction.
- Continue option to use tern chick shelters.
- Continue option to use least tern chick fencing on the east side of the exclosure and a method to maintain the tern chick fencing will continue to be explored.
- Predator monitoring and management actions that have been in place since 2003 and 2004 will continue.
- Continue daily gull surveys at the trash dumpster area at marker post 2 as they have been done since 2014. Full park monthly surveys were done from 2008-15, but because of time constraints, it is not recommended to do monthly full park gull surveys in 2018.
- The Southern Exclosure protected area will include the use of increased fence height as practiced since 2006 and use of aprons as used since 2007 to improve the effectiveness of the perimeter fence in protecting breeding terns and plovers.
- The Southern Exclosure and North Oso Flaco shoreline will continue to be protected, this includes maintaining the posts and rope at marker post 6 and Oso Flaco boardwalk intertidal zones to minimize trespass, which has been part of the management actions in these locations since 2008.
- Continue use of 10-foot by 10-foot single nest exclosures with net tops, circular exclosures with net tops, and mini-exclosures as needed to protect nests from mammalian and avian predators. These small exclosures are not without risks to incubating adults and we will continue to closely monitor and evaluate their use.
- Surveys for plovers will continue during the nonbreeding season. These weekly surveys have been conducted since the winter of 2009-10.
- Continue to document impacts and, when possible, reduce disturbance caused by low-flying aircraft over the Southern Exclosure and Oso Flaco.
- Continue to work to address water quality issues at Oso Flaco Lake.
- Efforts to retain skilled monitors will continue at ODSVRA.

NOTES

Snowy plover chicks in the open riding area

On 28 April, one three-day-old chick from the SP8 nest was found unattended and crouched in the open riding area approximately 150 feet east of the northern 6 exclosure fencing. The nest hatched on 25 April and the brood of three chicks was seen at the nest in northern 6 exclosure on 26 April. The unattended chick was collected, placed in warmed brooder, fed talitrids, bands marked with black marker, and reunited with the associated adult and one sibling on the 6 exclosure shoreline the following day (see section titled Snowy plover chicks (five) separated from adults, picked up, and reunited with adults within this Notes section). On 5 May, the chick with marked bands was found unattended, lying flat and only moving its head on the northern 6 exclosure shoreline (see section titled Injured or sick snowy plover sightings within this Notes section). The other sibling chick was attended by the associated adult and seen foraging normally nearby. The immobile chick was ultimately collected and placed in a warmed brooder but the chick did not survive. The chick was last seen active and brooding on 4 May. No chicks fledged from this brood.

On 25 August, one 25-day-old chick from the SP248 nest was found in the open riding area 40 feet east of the 7 exclosure and with an attending adult. (Three chicks from this brood were last seen on 1 August at one day old and two chicks last seen 6 August at six days old.) Vehicle traffic was directed away from the area while the adult and chick were directed back into the exclosure. The following day the adult and chick were on the 7 exclosure shoreline, and the chick subsequently fledged. On 16 September, the SP248 juvenile was found dead on the 8 exclosure shoreline, 1.5 feet west of the 8 exclosure shoreline fence (see section titled Snowy plover carcasses collected or observed).

Snowy plover chicks at north end of 6 exclosure shoreline and movement toward or within open riding area

Shoreline habitat provides a source of invertebrate prey for plovers and is an important area for raising chicks. At marker post 6 the boundary between the exclosure shore and the open riding area is symbolically fenced to prevent trespass of park visitors, but because of the changing tidal conditions it cannot be fenced to prevent chick movement into the open riding area. Each year there are snowy plover broods raised close to marker post 6 or found moving outside of the protected shoreline. In 2015 and 2016 there were five and nine broods (nine and 16 chicks), respectively, observed within or very close to the open riding area, and in 2017 there were 10 plover chicks from four broods raised in this area. These broods in 2017 were monitored closely, often during all daylight hours, and were directed away from the riding area when necessary. The gull flock that forms at the northern 6 exclosure shoreline, individual gulls, or other potential predators were also monitored. Three of these broods were raised at similar times, in close proximity to each other, and aggression between the associated adults or aggression towards chicks was observed. Possible reasons broods move from the north end of 6 exclosure into the open riding area may include the search for food; spacing out of broods to avoid territorial fighting of adults and attacks on chicks; and efforts to avoid predators, especially gulls forming a flock at the north end of 6 exclosure.

Two chicks from the SP95 nest were often foraging very close to the open riding area near marker post 6 and were monitored closely from 1 June when one day old until fledge age. Aggression between the adult of the SP95 brood and the associated adult of nearby SP144 brood was observed on multiple occasions. The SP95 brood was observed moving a short distance into the open riding area multiple times on three consecutive days from 25-27 June when 25 to 27 days old. In addition, on 27 June at 6:17 am, the two chicks were observed foraging approximately 150 feet into the open riding area. On each occasion, the chicks were directed back into the exclosure. Two chicks reached fledge age on 28 June and continued to be seen near marker post 6. On 3 July, one of the two fledglings was found sitting on the ground with limited mobility just south of marker post 6 and was taken to Pacific Wildlife Care for medical treatment (see section titled Injured or sick snowy plover sightings within this Notes section). The other fledgling

continued to be seen near marker post 6 until 5 August, was seen flying on a two occasions, and was last seen on 6 exclosure shoreline on 10 August.

On 17 June, three chicks from the SP156 nest were seen in the open riding area approximately 20 feet north of marker post 6 when three days old. The adult associated with the nearby SP95 brood aggressively attacked the chicks, picking up and carrying one chick and pecking at both. The SP156 chicks appeared unharmed after this incident and ran with the adult east into the exclosure. The following day, the brood of three chicks was seen moving further south onto the 6 exclosure shoreline and remained in this area until one chick fledged.

Three chicks from the SP144 nest were present and monitored closely on the northern 6 exclosure shoreline beginning 21 June when two days old. Two chicks were seen within 10 feet of the open riding area boundary on 27 June and the brood was monitored until it moved south and away from the boundary. Aggression between the adult of the SP144 brood and the associated adult of nearby SP95 brood was observed on multiple occasions. In addition, one SP144 chick was seen attacked by the SP95 adult on 3 July. Three chicks were last seen on 29 June, two chicks last seen 4 July, and one chick last seen on 5 July. No chicks were known to have fledged.

Two chicks from the SP266 brood were raised just south of marker post 6 at the border of the open riding area. They were monitored closely beginning on 11 August at one to two days old and were seen very close to the open riding area on several occasions. Two chicks were last seen on 19 August and one chick fledged.

Injured least tern sightings
On 16 May, an adult least tern, banded B/W on left and possibly R/W on right, was seen within 7 exclosure with a possible injured right foot or leg. The tern was observed stumbling when moving from a roosting position. An adult tern banded with B/W on left (right leg bands unknown) was observed with a right leg injury on 24 June within 7 exclosure and may possibly be the same injured bird seen in May. The band combination B/W:R/W was given to a tern chick fledging from ODSVRA in 2011. Subsequent to 2011, a bird with this combination has not been confirmed at ODSVRA.

On 24 June, an unbanded adult least tern was seen in 7 exclosure with a left leg injury but was not subsequently seen.

Injured or sick snowy plover sightings
During the 2017 season, there were two adults, seven fledglings and juveniles, and three chicks observed sick or with injuries. If it was determined to be appropriate, the plover was captured and taken to Pacific Wildlife Care in Morro Bay under the care of Dr. Shannon Riggs, DVM, medical records are attached.

<u>Injured adult sightings</u>
On 16 and 17 July, an unbanded male was seen with an injured left foot at the southern end of the South Oso Flaco shoreline. The foot appeared swollen and the plover only applied weight to the foot when standing still. The adult was seen sitting on the ground more than normal while attending a brood of two unbanded chicks (unknown nest number, possibly from an off-site brood). The injured male was not subsequently seen and the fate of the chicks is unknown.

From 23 to 31 July, an adult female banded PG:YY and associated with the SP241 nest and brood was seen occasionally in 6 exclosure and on the 6 exclosure shoreline with a slight limp and favoring the right leg. On 23 September, a PG:YY female, assumed to be the same injured bird from the SP241 nest, was seen with a swollen right leg and foot in South Oso Flaco, and on the following day it was captured. The upper right leg band was not moving freely and was immediately removed after capture. The right leg had skin and tissue damage and the foot was slightly swollen and discolored. It was taken to Pacific Wildlife Care

the same day where it was treated by the veterinarian and the remaining lower right band, which did move freely, was removed (now banded PG:-). By 4 October the leg condition had greatly improved and the bird was released on this date in South Oso Flaco. It was seen again on 23 October in South Oso Flaco, foraging normally and without a limp.

Injured or sick juvenile and young fledgling sightings

On 18 to 19 June, an approximately 56-day-old juvenile banded PV:RG and from the SP2 nest was seen in 7 exclosure and on the 7 exclosure shoreline with an injured right leg. The juvenile had a slight limp and was periodically holding its right foot off the ground. The juvenile was seen one additional time on 22 June north of marker post 6 and no injury was noted.

On 3 July, a 33-day-old fledgling from the SP95 nest was found sitting on the ground with limited mobility on the 6 exclosure shoreline. The fledgling was collected and placed in a warmed brooder; it did not recover, and was taken to Pacific Wildlife Care that same day for medical treatment. It was noted to be emaciated and lethargic and tested positive for giardia, a microscopic parasite that infects the intestines, and the fledgling died the following day. CDFW OSPR performed a necropsy and the report results were consistent with the giardiasis diagnosis.

On the evening of 12 July, an unbanded juvenile plover was observed with a left leg injury on the North Oso Flaco shoreline. It was limping while foraging and putting little to no weight on the left foot. The injured plover was observed while surveying the area after a high speed chase occurred on the exclosure shoreline, involving a driver trespassing and speeding greater than 25 miles per hour down the exclosure shoreline followed by multiple law enforcement vehicles. It is not known if this incident resulted in any injuries to plovers but seven adult Heermann's gulls (*Larus heermanni*), one adult Western gull (*Larus occidentalis*), and one immature California gull on the 6 exclosure shoreline were killed or seriously injured.

On 16 to 18 July, a 40- to 42-day-old juvenile banded VV:RB and from the SP116 nest was observed on the 8 exclosure shoreline with a left leg injury. It was observed limping, occasionally hopping on the right leg, and putting little weight on the left leg. No swelling or foreign material was observed and the bands appeared to move freely and not associated with the injury. The juvenile was seen on 4 August on the 8 exclosure shoreline and no injury was noted.

From 21 to 26 August, a 42-day-old juvenile banded PG:OR and from the SP237 nest was seen on the North Oso Flaco shoreline limping with a left leg injury. On 26 August, the bird was captured and the left leg was observed to be red and swollen above the tibiotarsal joint, with the leg angled away from the body. The two bands on the left leg, both below the tibiotarsal joint, moved freely and were not involved in the injury. The bird was taken to Pacific Wildlife Care that same day and treated for a wound and fracture above the tibiotarsal joint with bone protruding. The leg healed well and the bird was released on 7 September on the North Oso Flaco shoreline. The plover was seen on subsequent days with only a slight limp and putting full weight on the left leg while walking and running.

On 24 August, one 28-day-old fledgling (large chick, not flight capable, banded RR:OB from the SP243 nest) was seen in South Oso Flaco hopping on the right leg with a large feather attached to the left leg and restricting movement. The bird was captured the same day and multiple barbs of the feather were tightly knotted above the tibiotarsal joint. The barbs were then twisted and further looped around the leg (see photo to right). The feather was removed and the plover released. This plover was observed on subsequent days moving normally.

On 28 September, a juvenile banded VV:YB (58 to 59 days old from the SP259 nest) was observed on the 7 exclosure shoreline with a right wing injury. The wing was hanging low, touching the ground, and the bird was not flight capable. The bird was captured the same day and transported to Pacific Wildlife Care. The veterinarian confirmed it had a fractured wing with a bone protruding through the skin and there was degradation of tissue on the patagium (upper wing) surface. Surgery was performed the following day, placing a pin through the ulna. On 18 October, the pin was removed from the ulna and the fracture was healing, but the patagium wound was reported as still present. On 1 November, Pacific Wildlife Care reported that the fracture healed well, but the extensive damage and scarring to the patagium causes the extension of the wing to be compromised, and it is not considered releasable. As of the date of this report, the bird continues to be cared for at Pacific Wildlife Care until a decision is made for its outcome.

Injured or sick chick sightings

As discussed previously within this section, one live chick from the SP8 nest was found immobile on the shoreline of 6 exclosure on 5 May. The chick was placed in a brooder where it died a short time later. USFWS was notified and the carcass was placed in a freezer (see sections within this Notes section: Snowy plover chicks in the open riding; Snowy plover chicks (five) separated from adults, picked up, and reunited with adults).

On 7 June, one chick from the SP114 nest (one day old, banded BB:OR on 6 June) was observed with a non-functioning right leg. The leg pointed out from the body at an odd angle with the bottom portion of the leg hanging loosely, preventing the bird from walking normally. The chick was assessed in the hand and there was no swelling or discoloration on either leg, all bands moved freely, and the bands did not appear to be associated with the injury. The chick was released and was last seen on 9 June.

On 4 August, one wet chick from the SP238 nest (six day old, banded VG:RR on 29 July) was at the north end of the 6 exclosure shoreline and observed crouched for over an hour, vocalizing, and wings splayed, and no attending adult was found in the area. The chick was placed in a warmed brooder with food and water, the chick did not react to the talitrids and remained inactive. On the following morning, the chick was found dead in the brooder. USFWS was notified and the carcass was placed in a freezer. A second chick from this brood was last seen 18 August (20 days old).

Least tern carcasses found

On 30 May, desiccated partial remains from an adult least tern were found mostly buried approximately 250 feet east of 7 exclosure in the open riding area. There were coyote tracks and dig marks at the remains. Parts from two wings were partially exposed and the head was completely buried in the sand. The remains were determined by CDFW OSPR to be too desiccated for analysis.

On 14 July, the desiccated carcass of an adult least tern was found in the middle of 6 exclosure. Some flight feathers were missing from the wings, but otherwise the carcass was intact except for an opening in the body cavity. There was a metal federal service band on the right leg identifying the bird was banded G/Y:S as a chick at ODSVRA on 22 June 2004 (13 years old when found). The remains were determined by CDFW OSPR to be too desiccated for analysis.

Snowy plover carcasses collected or observed

For the period from 2 November 2016 to 6 November 2017, a total of 10 carcasses (nine adults and one juvenile) were collected and one chick carcass was observed but not collected. The proximity of young plover broods prevented the chick carcass from being recovered. No suggestion of predation was evident at any of the carcasses. For carcasses that received a necropsy, reports from CDFW OSPR are attached.

Carcasses of nine adult snowy plovers in the riding area

Details on nine adult snowy plover carcasses found in the riding area from 2 November 2016 to 6 November 2017 are provided below. Included are two carcasses found 30 November 2016, subsequent to the 2016 season annual report and not previously described. Seven carcasses have been found to date in 2017 (1 January to 6 November) and seven adults were found in 2016. This is higher than the average of two carcasses (range=1-4) (all adult or juvenile) found per year in the riding area during the seven-year period 2009-15 (CDPR 2009-16).

On 30 November 2016, a dead snowy plover banded BB:PW was seen carried a short distance and pecked at by a gull south of marker post 1. After the gull was flushed from the area, a second dead unbanded plover was found flattened in tire tracks approximately 20 feet from the location where the gull was seen with the banded plover carcass. Necropsy results indicated both birds had evidence of severe crush trauma, presumably caused by vehicle strike. The BB:PW plover was banded as a chick at ODSVRA in 2014 or 2016 (one fledged in each year).

On 11 January, a dead adult male snowy plover, banded YR:YR, was found near the waterline between Pier Avenue and marker post 1 in the riding area. The intact carcass was sent for necropsy and results indicated it died of acute crush trauma, presumably from a vehicle strike. The bird was banded as a chick at Monterey Bay, California, in 2015, was a successful breeding adult in the Monterey Bay area in 2016 and wintered at ODSVRA. It was last observed alive on 20 December 2016 in a flock near marker post 1.

On 15 February, a dead unbanded adult snowy plover was found in tire tracks east of marker post 7 in the riding area. The partial plover remains were extremely desiccated and included a partial body, wing, and crushed head.

On 25 February, a dead unbanded adult snowy plover was found 50 feet north of marker post 3 in the riding area and appeared fresh. The carcass was sent to CDFW OSPR and placed in their freezer as directed by USFWS.

On 26 February, a dead adult snowy plover, banded PV:GG, was found wet and on the shoreline approximately 900 feet south of marker post 8 in the riding area. The carcass appeared fresh. The carcass was sent to CDFW OSPR and placed in their freezer as directed by USFWS. The adult banded PV:GG was from a chick hatching at ODSVRA in either 2014 or 2015 (two fledged in each year).

On 6 September, a dead unbanded adult snowy plover was found north of marker post 1 in the riding area. The carcass was found lying belly up with a blood spot on its chest. USFWS was notified and the carcass was placed in a freezer at ODSVRA.

On 12 September, a dead unbanded adult plover was found east of marker post 5 and east of the camper area in the riding area. The plover was not in vehicle tracks, appeared flattened, and was decaying and not fresh. USFWS was notified and the carcass was placed in a freezer at ODSVRA.

On 6 November, a dead unbanded snowy plover was found halfway between Grand and Pier Avenues in the riding area. The carcass appeared fresh and was flattened and partially covered with sand next to fresh vehicle tracks. USFWS was notified and the carcass was placed in a freezer at ODSVRA.

Carcass of one snowy plover juvenile on the 8 exclosure shoreline

On 16 September, a dead juvenile snowy plover, banded BB:BW from the SP248 nest, was found 1.5 feet west of the 8 exclosure shoreline fence. The intact carcass was partially buried, decomposing, and maggots were present. USFWS was notified and the carcass was placed in a freezer at ODSVRA. The bird fledged from ODSVRA on 28 August and was last seen alive on 7 exclosure shoreline on 5 September when 36 days old.

Carcass of one snowy plover chick on the 6 exclosure shoreline not collected

On 14 June, the carcass of a chick was observed on the northern 6 exclosure shoreline. The chick was banded with YR on one leg and the other leg was not visible. The carcass could not be recovered due to the proximity of young plover broods.

Snowy plover chicks (five) separated from adults, picked up, and reunited with adults

As discussed previously within this section, one three-day-old chick from the SP8 nest was found unattended and crouched in the open riding area on 28 April. The chick was collected, placed in a warmed brooder, and fed talitrids. The following day, the chick (bands marked with black marker) was reunited with the associated adult and sibling on the 6 exclosure shoreline. The adult male brooded both chicks and the chicks were observed following the adult away from the area. On 5 May, the chick with marked bands was found immobile on the northern 6 exclosure shoreline. The chick was placed in a warmed brooder where it died a short time later (see sections within this Notes section: Snowy plover chicks in the open riding area, Injured or sick snowy plover sightings).

On 12 May, one three-day-old chick (banded VV:AG from the SP37 nest) was seen crouched and immobile on the 8 exclosure shoreline for an extended period of time. The two sibling chicks were brooded by an adult and seen foraging normally nearby. While monitoring the immobile chick, the SP37 associated unbanded adult was observed aggressively fighting with another adult plover nearby. The immobile chick was collected and placed in a warmed brooder. The chick quickly became active and was fed talitrids. On the following morning, the chick was reunited with the SP37 brood and the adult and all three chicks were observed moving together away from the area. The three chicks were seen on 14 May with one chick separated and adopted by the nearby SP36 brood (unbanded adult and two banded chicks). One chick was last seen on 18 May (no adult or other chicks nearby) and no SP37 chicks were known to have fledged.

On 10 July, three chicks hatched from the SP225 nest in South Oso Flaco within a circular exclosure. One chick was observed from a distance to be less mobile than the other two chicks. The following day, all three chicks were banded near the nest location and returned to same area. The adult returned to the chicks and two chicks followed the adult away from the area and out of sight while one chick remained crouched. The area was monitored for an extended period of time and the associated adult remained out of sight and did not return to attend the crouched chick. The chick was collected, placed in a warmed brooder and fed talitrids. The nest area and the broader area was monitored and the brood was not relocated that same day. The chick was kept in the brooder overnight and on the morning of 12 July the chick was reunited with the two sibling chicks and associated adults south of the southern boundary. There was some adult aggression near the chicks and to limit disturbance monitoring staff left the area. The brood was not seen on subsequent monitoring surveys.

On 15 July, a seven-day-old chick from the SP213 nest (banded GA:PG) was on the northern 6 exclosure shoreline and separated from the adult and two sibling chicks by approximately 200 feet. The chick was crouched with wings splayed, vocalizing, and with no adult in attendance. The chick was ultimately collected, placed in a warmed brooder and fed talitrids. The chick became more active and was reunited with the adult and two sibling chicks later the same day (bands marked with black marker). The chick with marked bands was not subsequently seen. One chick from the SP213 brood fledged.

The SP248 nest on the 7 exclosure shoreline hatched three chicks on 31 July and all three chicks were banded BB:BW the same day. Three chicks were last seen 1 August on the 7 exclosure shoreline and only two chicks were seen in the same area the following day. On 3 August, one chick was found on the North Oso Flaco shoreline and separated from its brood by approximately 1.1 miles. This chick was with the SP279 male and his two six-day-old unbanded chicks. The SP248 chick was noted to be less mobile than the two older chicks. The SP279 male was observed brooding all three chicks, but also pecked at the BB:BW chick on multiple occasions and also picked up and tossed the chick several times. The chick would often crouch after periods of being attacked, but was still mobile. The SP248 chick was collected and placed in a warmed brooder, fed talitrids, bands marked with black marker, and reunited the same day with its sibling chick and associated adult on the 7 exclosure shoreline. Both SP248 chicks were observed following the adult away from the area. The reunited chick was last seen on 6 August and the other chick fledged but was found dead on 16 September (see section titled Snowy plover carcasses collected or observed within this Notes section). The two SP279 chicks remained on the North Oso Flaco shoreline and both fledged.

Selective collection and transfer of abandoned potentially viable eggs

Management strategies may include the collection of abandoned but potentially viable eggs or chicks under select circumstances. Potentially viable abandoned eggs or chicks may be considered for collection if disturbance factors from visitors or park management efforts may have been a factor in the abandonment. Examples of such factors include but are not limited to: abandoned eggs or chicks from a nest in the open riding area; abandoned eggs or chicks from a nest with a single nest exclosure such as a circular exclosure, with suspected adult mortality; or abandoned eggs or chicks from a nest near the park's two-inch by four-inch fencing that may have increased the amount of windblown sand on the nest. Collected potentially viable eggs are first assessed for transfer to nests which are being actively incubated but determined to have nonviable eggs (well past estimated hatch date). When no nest is available, and in consultation with USFWS, potentially viable eggs are transported to the Santa Barbara Zoo for captive-rearing. Collected abandoned chicks are first assessed for possible reuniting with their associated adult; if not possible, they are transported to the Santa Barbara Zoo for captive-rearing. In 2017, one abandoned chick was collected in the field and transported to the Santa Barbara Zoo for captive-rearing. Five nests abandoned pre-term had their eggs collected in the field: one clutch was transferred to a nest with nonviable eggs; one clutch was initially transferred to a different nest with nonviable eggs and then later transported to the Santa Barbara Zoo for captive-rearing; and three clutches were transported to the Santa Barbara Zoo for captive-rearing.

<u>One chick from the SP52 nest transported to the Santa Barbara Zoo</u>

On 14 May, one chick (one day old from the SP52 nest) was seen sprawled and not moving near the nest and within the circular exclosure in South Oso Flaco, unattended by an adult and no other chicks were in the area. The cold chick was placed in a warmed brooder and fed talitrids with the goal of reuniting with the adult and two sibling chicks. The following morning, the chick did not appear active and was transported to the Santa Barbara Zoo. It was treated with fluids but remained lethargic and died on 18 May. The veterinarian at the zoo performed a necropsy and an umbilical infection was suspected. The other two chicks from the SP52 nest fledged in South Oso Flaco.

Two eggs from the SP191 nest transferred to replace the two nonviable SP86 eggs

The SP191 nest was found by seeing an incubating bird on 7 June in South Oso Flaco. On 8 June, an adult was actively incubating with one egg present and a circular exclosure was installed because of heightened predator concerns. An adult was observed incubating the nest on 9 and 10 June. On 11 June, no bird was on the nest and two eggs found buried two inches under the sand within the circular exclosure were placed on the surface. The following day the two eggs were mostly buried, determined to be abandoned, and were collected and placed in a warmed brooder. On 13 June, the two eggs were transferred to the active SP86 nest in 6 exclosure, replacing two nonviable eggs actively incubated 26 days past the expected hatch date and confirmed nonviable by the Cal Poly State University poultry department using candling equipment. The third egg in SP86 nest was left in the nest and all three eggs were marked with their nest number. Contents of the three SP86 eggs were examined post-season at the Santa Barbara Museum of Natural History, two had no sign of fertilization and one had an approximately two-week-old dead embryo. The two SP191 eggs hatched on 8 and 9 July, the chicks were banded VG:OR on 9 July, and the remaining SP86 egg was collected. The chicks were not subsequently seen.

Three eggs from the SP264 nest initially transferred to replace two nonviable SP187 eggs and then subsequently transported to the Santa Barbara Zoo

The SP264 nest in South Oso Flaco was found with three eggs on 16 July east of the symbolic fence and a circular exclosure was installed the same day. The nest had an incubating adult from the date found to 22 July. On 23 July, three eggs were in the nest bowl and the associated adult female (banded GG:GG) was foraging away from the nest for a long period of time, and no bird was observed incubating the nest. The nest was monitored the following two days and determined to be abandoned.

On 25 July, the three abandoned SP264 eggs were collected and transferred to the SP187 two-egg nest in 7 exclosure, replacing the two nonviable SP187 eggs that had been actively incubated 25 days past the expected hatch date. The adult returned and consistently incubated after the egg transfer. Monitoring observations and nest camera information indicated there was little to no incubation during the night from 1 August to 7 August and a female consistently incubated the nest during daylight hours until the nest was abandoned on 7 August. On 9 August, the three abandoned eggs were collected and transported to the Santa Barbara Zoo where the eggs were determined to be nonviable.

Two eggs from the SP22 nest transported to the Santa Barbara Zoo

On 1 April, the three-egg SP22 nest was found in South Oso Flaco, a circular exclosure was installed the following morning, and the symbolic fence was moved west on 8 April to decrease possible pedestrian disturbance. On 25 April, no bird was seen on the nest or in the area, one egg was within the circular exclosure in a nest bowl, and a second egg was near the west edge of the circular exclosure with no nest bowl. This second egg was moved to the nest bowl with the first egg. In addition, a chick was seen crouched approximately 15 feet south of the circular exclosure. The monitor left the area and the following morning one chick was attended by an adult and two unattended eggs were visible in the circular exclosure when viewed from a distance. On 27 April, the two eggs were confirmed abandoned and transported to the Santa Barbara Zoo. When examined, a dead chick was inside one egg and the egg shell was unusually brittle. The second egg hatched on 8 May, the chick reached fledging age, and was banded PA:BA with pink band above the tibiotarsal joint. The fledgling was released at Coal Oil Point Reserve, Santa Barbara County, California on 6 July at 59 days old. Coal Oil Point Reserve personnel reported the PA:BA plover was seen 11 July but not subsequently. The chick that did hatch at the nest was last seen 11 May in South Oso Flaco and did not fledge.

Two eggs from the SP27 nest transported to the Santa Barbara Zoo

The SP27 nest in South Oso Flaco was found as a one-egg nest on 5 April, the symbolic fence was moved west to decrease possible pedestrian disturbance on 8 April when at two eggs, and a circular exclosure was installed on 11 April when at three eggs. The nest was consistently incubated until 23 April. On 25 April,

no bird was on the nest and one egg was 50% buried within the circular exclosure. On 27 April, the nest area was overblown with sand and two eggs were found two inches apart and completely buried within the circular exclosure. The two abandoned eggs were collected, placed in a warmed brooder, and transported to the Santa Barbara Zoo the following morning. Upon examination, one egg was determined nonviable and the second egg had an embryo. This egg was monitored for five days but there was no movement and the embryo was determined to be dead.

Two eggs from the SP113 nest transported to the Santa Barbara Zoo

On 10 May, the SP113 nest was found with two eggs in South Oso Flaco, a circular exclosure was installed on 18 May, and the nest was consistently incubated until 31 May. On the morning of 3 June, no eggs were visible and two eggs were found fully buried and one of the eggs had a large crack when unburied. (The crack was clearly not of the type occurring during the hatching process.) Both eggs were placed on the sand surface and the nest was monitored from a distance. The nest was determined to be abandoned and the two eggs were collected and taken to the Santa Barbara Zoo later that same day. Zoo staff reported that the egg with a crack was in late development stage and the chick inside was dead, the second egg had no sign of development and was determined to be nonviable.

One egg from the SP251 nest transported to the Santa Barbara Zoo

On 8 July, one egg was damaged while handling the three eggs at the SP251 nest in South Oso Flaco for floating purposes. The egg was taken to Santa Barbara Zoo that same day where a patch was applied to the crack and the egg was monitored in an incubator. The nest had an estimated initiation date of 27 June and the egg was monitored over several days, but no development occurred.

LITERATURE CITED

CDPR. 2016. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2016 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2015. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2015 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2014. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2014 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2013. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2013 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2012. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2012 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2011. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2011 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2010. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2010 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2009. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2009 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2008. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2008 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2007. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2007 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

eBird. 2017. eBird: An online database of bird distribution and abundance (web application). eBird, Ithaca, New York. Available: http://www.ebird.org (accessed: September 2017).

Frost, N. 2017. California least tern breeding survey, 2016 season. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2017-03. Sacramento, CA.

Frost, N. 2016. California least tern breeding survey, 2015 season. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2016-01. Sacramento, CA.

Frost, N. 2015. California least tern breeding survey, 2014 season. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2015-01. Sacramento, CA.

Frost, N. 2014. California least tern breeding survey, 2013 season. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2014-06. Sacramento, CA.

Frost, N. 2013. California least tern breeding survey, 2012 season. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2013-01. Sacramento, CA.

Marschalek, D.A. 2012. California least tern breeding survey, 2011 season. California Department of Fish and Game. Sacramento, CA.

Marschalek, D.A. 2011. California least tern breeding survey, 2010 season. California Department of Fish and Game. Sacramento, CA.

Marschalek, D.A. 2010. California least tern breeding survey, 2009 season. California Department of Fish and Game. Sacramento, CA.

Marschalek, D.A. 2009. California least tern breeding survey, 2008 season. California Department of Fish and Game. Sacramento, CA.

Marschalek, D.A. 2008. California least tern breeding survey, 2007 season. California Department of Fish and Game. Sacramento, CA.

Marschalek, D.A. 2007. California least tern breeding survey, 2006 season. California Department of Fish and Game. Sacramento, CA.

Marschalek, D.A. 2006. California least tern breeding survey, 2005 season. California Department of Fish and Game. Sacramento, CA.

Massey, B.W. and J.L. Atwood. 1981. Second-wave nesting of the California least tern: age composition and reproductive success. Auk 98:595-605.

Page, G.A., J.S. and J.C. Warriner, and P.W.C. Paton. 1995. Snowy Plover (*Charadrius alexandrinus*). In The Birds of North America, No. 154, (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington DC.

Thompson, B.C., J.A. Jackson, J. Burger, L.A. Hill, E.M. Kiroch, and J.L. Atwood. 1997. Least Tern (*Sterna antillarum*). In The Birds of North America, No. 290, (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

USFWS. 2007. Recovery Plan for the Pacific Coast Population of the western Snowy Plover (*Charadrius alexandrinus nivosus*). In two volumes. Sacramento, CA. xiv+751pp.

USFWS. 2006. Five-Year Review Summary and Evaluation for the California Least Tern (*Sterna antillarum browni*). USFWS, Carlsbad, CA. September 2006.

USFWS. 1985. Recovery Plan for the California Least Tern (*Sterna antillarum browni*). USFWS, Portland, OR. 112 pp.

Warriner, J.S., J.C. Warriner, G.W. Page and L.E. Stenzel. 1986. Mating system and reproductive success of a small population of polygamous snowy plovers. Wilson Bulletin 98(1):15-37.

APPENDICES

APPENDIX A. CALIFORNIA LEAST TERN NESTS AT ODSVRA IN 2017.

Least tern chicks were banded with green over yellow vinyl tape on a size 1A blank aluminum band on the left leg and a size 1A numbered aluminum federal band on the right. Color tape was placed on the federal band to create combinations unique to individual. Chicks were weighed immediately prior to banding, typically at one to three days old. Fourteen chicks from nine hatching nests were not banded. Two unbanded fledglings were confirmed concurrently in 7 exclosure on 14 July but unknown from which nest. Evidence supports these two unbanded fledglings originated at ODSVRA. Information on adult pair is provided where known. Sex of adults is typically not known. Contents of several nonhatching eggs were examined for fertilization post-season at the Santa Barbara Museum of Natural History.

Location: 6 = 6 exclosure, 7 = 7 exclosure, 8 = 8 exclosure

U = unbanded

unk = unknown

na = estimated date not available due to insufficient information

? or (?) = unconfirmed band combinations or colors

≥ = minimum of one egg in nest and unable to confirm final egg number

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
1	6	U B/W:O/Y	24-May	Hatch	14-Jun	2	2 (1)	G/Y:W (7.7) G/Y:O (5.0)	G/Y:W	Bumpout Seasonal exclosure	G/Y:O chick last seen on 22 June at 8 days old.
2	7	B/W:B/O U	25-May	Hatch	15-Jun	2	2 (0)	G/Y:V (6.7) G/Y:G (8.2)		Bumpout Seasonal exclosure	Both chicks last seen on 20 June at 4 and 5 days old.
3	7	U W(?):G/Y	24-May	Hatch	15-Jun	2	2 (1)	G/Y:Y (7.6) G/Y:G/Y (7.5)	G/Y:G/Y	Seasonal exclosure	G/Y:Y chick last seen when banded on 17 June at 2 days old.
4	7	banded U	26-May	Hatch	18-Jun	2	2 (1)	G/Y:A/Y (7.4) G/Y:A/O (6.5)	G/Y:A/Y	Bumpout Seasonal exclosure	G/Y:A/O chick last seen when banded on 19 June at 1 day old.
5	7	banded	25-May	Hatch	19-Jun	2	2 (0)	G/Y:A/B (5.6) G/Y:A/R (5.3)		Seasonal exclosure	Both chicks last seen on 20 June at 1 day old.
6	6	W/B:R/Y	27-May	Hatch	17-Jun	2	2 (0)	G/Y:L (5.7) G/Y:G/O (5.5)		Bumpout Seasonal exclosure	Both chicks last seen on 19 June at 2 day old.
7	6		24-May	Hatch	15-Jun	2	2 (0)	G/Y:R (5.2) G/Y:A (7.3)		Bumpout Seasonal exclosure	Both chicks last seen when banded on 16 June at 1 day old.
8	7	W/B:W/G B/W:O/W	27-May	Hatch	18-Jun	2	2 (0)	G/Y:W/R (8.6) G/Y:W/G (6.1)		Bumpout Seasonal exclosure	Both chicks last seen when banded on 20 June at 1 and 2 days old.
9	6	banded U	25-May	Hatch	15-Jun	2	2 (1)	G/Y:P (5.2) G/Y:B (6.1)	G/Y:B	Bumpout Seasonal exclosure	G/Y:P chick last seen when banded on 16 June on day of hatch.

Appendix A. California least tern nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
10	6		na	Abandoned pre-term	1-Jun	1	0 (0)			Bumpout Seasonal exclosure	On 29 May, nest found at 1 egg and seen incubated on 3 days from 29-31 May. Egg collected 22 August. No sign of fertilization when egg contents examined. Insufficient information to closely estimate initiation date.
11	6	U	28-May	Hatch	19-Jun	2	2 (unk)	U U		Symbolic fence	One unbanded chick last seen on 19 June on day of hatch, other unbanded chick suspected to be from this brood was last seen 21 June at 2 days old.
12	7	W/B:B/W W/B:G/Y	30-May	Hatch	20-Jun	2	2 (0)	G/Y:B/Y (7.5) G/Y:B/O (8.9)		Bumpout Seasonal exclosure	Both chicks last seen when banded on 22 June at 2 days old.
13	7		29-May	Hatch	20-Jun	2	1 (unk)	U		Seasonal exclosure	One unbanded chick last seen on 21 June at 1 day old.
14	7		na	Unknown	20-Jun	2	0 (0)			Seasonal exclosure	On 30 May, nest found at 2 eggs and seen incubated on 20 days from 30 May-19 June. Fate occurred during period of high skunk activity. Insufficient information to closely estimate initiation date.
15	7	banded	na	Unknown	20-Jun	≥1	0 (0)			Seasonal exclosure	On 30 May, nest found at 1 egg and seen incubated on 18 days from 30 May-19 June. Fate occurred during period of high skunk activity. Insufficient information to closely estimate initiation date.
16	7		29-May	Hatch	20-Jun	2	2 (unk)	U U		Seasonal exclosure	Both unbanded chicks last seen on 21 June at 1 day old.

Appendix A. California least tern nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
17	6	B?:W/B banded	26-May	Hatch	16-Jun	2	1 (unk)	U		Bumpout Seasonal exclosure	One unbanded chick last seen on 16 June on day of hatch. One egg collected 22 August. No sign of fertilization when egg contents examined.
18	6		29-May	Abandoned pre-term	(16-Jun)	2	0 (0)			Bumpout Seasonal exclosure	Nest seen incubated on 17 days from 30 May-15 June. Two eggs collected 22 August. Both eggs had approximately 2.5-week-old dead embryos when contents examined.
19	6		26-May	Hatch	18-Jun	2	1 (unk)	U		Bumpout Seasonal exclosure	One unbanded chick last seen on 19 June at 1 day old.
20	6	W/B:W U	na	Failed, unknown cause	(2-Jun)	2	0 (0)			Bumpout Seasonal exclosure	On 1 June, nest found at 1 egg and seen incubated only that day. Two partial eggs present at nest on 22 August. Insufficient information to closely estimate initiation date.
21	6		na	Abandoned pre-term	(2-Jun)	1	0 (0)			Bumpout Seasonal exclosure	On 1 June, nest found at 1 egg and seen incubated only that day. Nest in visible location and not likely to have been incubated undetected a long enough period to suggest abandonment post-term. Insufficient information to closely estimate initiation date.
22	7	U	2-Jun	Unknown	23-Jun	2	0 (0)			Bumpout Seasonal exclosure	On 22 June, both eggs were well cracked. Eggs or hatched chicks not seen following day or subsequently. Fate occurred during period of high skunk activity.

Appendix A. California least tern nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
23	7		29-May	Abandoned, unknown if pre- or post-term	(23-Jun)	2	0 (0)			Bumpout Seasonal exclosure	Nest seen incubated on 16 days between 29 May-22 June. Two eggs collected on 28 August. Both eggs had approximately 2.5-week-old dead embryos when contents examined.
24	7		na	Unknown	(21-Jun)	≥1	0 (0)			Seasonal exclosure	Nest location known by multiple observations of incubating adult from 30 May-20 June. No eggs found when nest walked to 24 June. Fate occurred during period of high skunk activity.
25	6		27-May	Hatch	(17-Jun)	2	2 (unk)	U U		Seasonal exclosure	Both unbanded chicks suspected to be from this brood last seen on 21 June at 4 days old.
26	7		4-Jun	Depredated, skunk	22-Jun	≥1	0 (0)			Seasonal exclosure	Nest seen incubated on 16 days from 4-21 June.
27	7	banded	28-May	Hatch	18-Jun	2	2 (0)	G/Y:W/B (7.4) G/Y:W/O (6.5)		Seasonal exclosure	G/Y:W/B chick last seen when banded on 20 June. G/Y:W/O chick last seen on 24 June at 5 days old.
28	6		28-May	Hatch	18-Jun	2	1 (0)	G/Y:A/W (7.2)		Seasonal exclosure	G/Y:A/W chick last seen when banded on 19 June at 1 day old. One egg collected 23 September. No sign of fertilization when egg contents examined.
29	7		30-May	Hatch	20-Jun	2	2 (unk)	U U		Bumpout Seasonal exclosure	Both unbanded chicks last seen on 20 June on day of hatch.
30	6		28-May	Hatch	18-Jun	≥1	1 (unk)	U		Seasonal exclosure	One unbanded chick last seen on 18 June on day of hatch.
31	6		3-Jun	Depredated, skunk	20-Jun	≥1	0 (0)			Seasonal exclosure	Nest location known by multiple observations of incubating adult from 3-19 June.

Appendix A. California least tern nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
32	7	U	na	Unknown	(23-Jun)	≥1	0 (0)			Seasonal exclosure	Nest location known by multiple observations of incubating adult from 5-22 June. No eggs found when nest walked to 25 June. Fate occurred during period of high skunk activity. Insufficient information to closely estimate initiation date.
33	7		na	Unknown	(23-Jun)	2	0 (0)			Bumpout Seasonal exclosure	Nest seen incubated on 14 days from 9-22 June. No eggs found when nest walked to 24 June. Fate occurred during period of high skunk activity. Insufficient information to closely estimate initiation date.
34	7		na	Unknown	(22-Jun)	≥1	0 (0)			Bumpout Seasonal exclosure	Nest location known by multiple observations of incubating adult from 10-21 June. No eggs found when nest walked to 24 June. Fate occurred during period of high skunk activity. Insufficient information to closely estimate initiation date.
35	7	banded U	28-May	Hatch	18-Jun	3	2 (unk)	U U		Seasonal exclosure	One egg collected 6 September. No sign of fertilization when egg contents examined.
36	6	U A/B:G/Y	9-Jun	Abandoned pre-term	30-Jun	2	0 (0)			Bumpout Seasonal exclosure	Nest seen incubated on 18 days between 9-29 June. Two eggs collected 22 August. Both eggs had approximately 2.5-week-old dead embryos when contents examined.

Appendix A. California least tern nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
37	6		na	Unknown	(22-Jun)	≥1	0 (0)			Seasonal exclosure	Nest location known by multiple observations of incubating adult from 9-21 June. No eggs found when nest walked to 24 June. Fate occurred during period of high skunk activity.
38	6		na	Unknown	(24-Jun)	≥1	0 (0)			Seasonal exclosure	Nest location known by multiple observations of incubating adult from 12-23 June. No eggs found when nest walked to 7 July. Fate occurred during period of high skunk activity.
39	6		na	Depredated, skunk	22-Jun	≥1	0 (0)			Seasonal exclosure	Nest location known by multiple observations of incubating adult from 11-21 June.
40	6		na	Unknown	20-Jun	≥1	0 (0)			Seasonal exclosure	Nest location known by multiple observations of incubating adult from 11-19 June. No eggs found when walked to 2 September. Fate occurred during a period of high skunk activity.
41	7		na	Depredated, skunk	22-Jun	≥1	0 (0)			Bumpout Seasonal exclosure	Nest location known by multiple observations of incubating adult from 16-21 June. Insufficient information to closely estimate initiation date.
42	6		na	Unknown	(24-Jun)	≥1	0 (0)			Bumpout Seasonal exclosure	Nest location known by multiple observations of incubating adult from 21-23 June. No eggs found when nest walked to 22 August. Fate occurred during period of high skunk activity.

Appendix A. California least tern nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
43	6		na	Unknown	(24-Jun)	≥1	0 (0)			Seasonal exclosure	Nest location known by multiple observations of incubating adult from 14-23 June. No eggs found when nest walked to 7 July. Fate occurred during period of high skunk activity.
44	7	W/B:W/YU	21-Jun	Abandoned pre-term	9-Jul	1	0 (0)			Bumpout Seasonal exclosure	Nest seen incubated on 16 days from 22 June-8 July. One egg collected 15 September. Egg had approximately 2.5-week-old dead embryo when contents examined.
45	7		na	Unknown	(23-Jun)	1	0 (0)			Seasonal exclosure	On 22 June, nest found at 1 egg. Unable to confirm incubation 23-29 June. No eggs were found at nest on 29 June. Fate occurred during period of high skunk activity. Insufficient information to closely estimate initiation date.
46	6		na	Unknown	22-Jun	≥1	0 (0)			Bumpout Seasonal exclosure	Nest location known by multiple observations of incubating adult from 20-21 June. No eggs found when nest walked to 25 June. Fate occurred during period of high skunk activity. Insufficient information to closely estimate initiation date.
47	6		na	Unknown	20-Jun	≥1	0 (0)			Symbolic fence	Nest location known by multiple observations of incubating adult from 14-19 June. No eggs found when nest walked to 7 September. Fate occurred during period of high skunk activity. Insufficient information to closely estimate initiation date.

Appendix A. California least tern nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
48	7		na	Unknown	20-Jun	≥1	0 (0)			Seasonal exclosure	Nest location known by multiple observations of incubating adult from 14-19 June. No eggs found when nest walked to 29 June. Fate occurred during period of high skunk activity. Insufficient information to closely estimate initiation date.
49	6	U W/B:W/A	30-Jun	Hatch	21-Jul	2	2 (1)	G/Y:K (7.5) G/Y:N (4.1)	G/Y:K	Bumpout Seasonal exclosure	G/Y:N chick last seen when banded on 23 July at 2 days old.
50	6		na	Depredated, skunk	2-Jul	2	0 (0)			Bumpout Seasonal exclosure	Insufficient information to closely estimate initiation date.
51	7		na	Unknown	(22-Jun)	≥1	0 (0)			Bumpout Seasonal exclosure	Nest location known by multiple observations of incubating adult from 16-21 June. No eggs found when nest walked to 28 August. Fate occurred during period of high skunk activity. Insufficient information to closely estimate initiation date.
52	7		na	Unknown	17-Jun	≥1	0 (0)			Bumpout Seasonal exclosure	Nest location known by multiple observations of incubating adult from 13-16 June. No eggs found when nest walked to 28 August. Fate occurred during period of high skunk activity. Insufficient information to closely estimate initiation date.

APPENDIX B. SNOWY PLOVER NESTS AT ODSVRA IN 2017.

Plover chicks were banded to brood. Split hatch noted for nests when hatching of all chicks in the brood may have occurred over more than one day. Contents of several nonhatching eggs were examined for fertilization post-season at the Santa Barbara Museum of Natural History. The majority of unbanded chicks were not banded to avoid disturbing nearby young snowy plover broods.

In reading the codes of color-banded birds the left leg is shown first and separated by a colon from the right leg. If two bands are on a single leg the upper band is shown first. Colors for letter codes: A = aqua (light blue), B = dark blue, G = dark green, L = lime (light green), K = black, N = brown, O = orange, P = pink, R = red, S = silver (bare metal federal band), V = violet, W= white, Y = yellow.

Location: 6 = 6 exclosure, 7 = 7 exclosure, 8 = 8 exclosure, BY = Boneyard exclosure, NOF = North Oso Flaco, SOF = South Oso Flaco

Adult pair: M = male, F = female, U = unbanded

Nest protection type: see Management Actions for description of seasonal exclosure, symbolic fence, and bumpout.

na = estimated date not available due to insufficient information

? or (?) = unconfirmed band combinations or colors

≥ = minimum of one or two egg(s) in nest and unable to confirm final egg number

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
1	SOF	F=PV:PY M=U	17-Mar	Hatch	26-Apr	3	2 (0)	2 GG:OY	Circular excl. with top Symbolic fence	On 19 March, symbolic fence moved west to decrease possible pedestrian disturbance. On 23 March, camera installed at nest. On 13 April, camera confirmed inconsistent incubation by both male and female. One egg with unknown fate showed cracks, but egg or hatched chick not subsequently seen.
2	8	F=banded M=U	20-Mar	Hatch	23-Apr	3	3 (1)	2 PV:RG 1 unbanded	Seasonal exclosure	Split hatch. On 18 to 19 June, PV:RG juvenile (approximately 56 days old), seen with a right leg injury (see report Notes section).
3	6	F=U M=U	20-Mar	Hatch	24-Apr	3	2 (2)	2 RR:WB	Symbolic fence	On 6 May, 1 chick from SP5 observed brooding with associated unbanded male of SP3, not subsequently seen. One egg (without cracks) abandoned post-term. Approximately 3-week-old dead embryo in egg when contents examined.
4	6	F=U M=U	20-Mar	Hatch	25-Apr	3	1 (0)	1 VG:YG	Symbolic fence	Two eggs abandoned post-term.
5	6	F= M=PG:PW	20-Mar	Hatch	23-Apr	3	3 (1)	3 PV:GR	Symbolic fence	Split hatch. Three chicks last seen brooded together on 4 May. One thirteen-day-old chick was separated and brooded by SP3 adult on 6 May and not subsequently seen.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
6	7	F=U M=U	20-Mar	Hatch	1-May	3	2 (0)	2 VG:RG	Symbolic fence	Remained at 1 egg from 20 to 30 March. Camera installed on 31 March confirmed inconsistent incubation during period of incomplete clutch. On 3 April, camera confirmed third egg laid and consistent incubation followed. One egg (without cracks) abandoned post-term. On 4 May, associated male adopted an additional 1- to 2-day-old banded chick from SP13. Chicks last seen on 6 May and not known to fledge. SP6 band combination reused on 2 chicks hatching from SP250 on 2 August.
7	7	F=U M=U	20-Mar	Hatch	24-Apr	2	1 (0)	1 PG:RW	Symbolic fence	One egg (without cracks) abandoned post-term.
8	6	F=BB:YW M=BB:BY	20-Mar	Hatch	25-Apr	3	3 (0)	3 PG:PR	Seasonal exclosure	On 28 April, 1 unattended chick found in open riding area east of 6 exclosure, was collected and reunited with brood the following day (bands marked). On 5 May, chick with marked bands found unattended and crouched, collected and did not survive. Chick last seen active and brooding on 4 May (see report Notes section).
9	NOF	F=U M=U	24-Mar	Hatch	30-Apr	3	2 (0)	2 PG:OG	Symbolic fence	Split hatch. On 13 April, 1 egg found 3 feet outside of nest bowl. Egg marked and replaced in bowl and egg was abandoned post-term. On 29 April, an unmarked egg with hatching cracks found 14 inches outside of the nest bowl. Egg marked and replaced in bowl.
10	7	F=U M=BB:PG	19-Mar	Hatch	24-Apr	3	2 (0)	2 VG:WG	Seasonal exclosure	On 18 April, 1 egg missing pre-term. Last chick sighting on 2 May and not known to fledge. Band combination reused on 2 chicks hatching from SP266 on 8 August.
11	SOF	F=U M=	16-Mar	Failed, unknown cause	30-Mar	3	0 (0)		Symbolic fence	Coyote depredation suspected.
12	7	F=U M=U	22-Mar	Hatch	24-Apr	3	2 (2)	2 VG:WY	Seasonal exclosure	Split hatch. One egg unknown fate.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
13	6	F=U M=GG:PW	28-Mar	Hatch	2-May	3	2 (0)	2 VG:GB	Seasonal exclosure	Split hatch. One egg with unknown fate showed cracks, but egg or hatched chick not subsequently seen. One chick adopted by SP6 brood beginning 4 May. Last chick sighting on 6 May and not known to fledge. SP13 band combination reused on 2 chicks hatching from SP274 on 5 August.
14	AG Creek	F=NW:WG M=AG:GA	28-Mar	Flooded by creek and tide	1-Apr	1	0 (0)		Symbolic fence	On 29 March, symbolic fence moved west to decrease possible pedestrian and vehicle disturbance. On 28-30 March, creek overwashed egg during high tide and adult subsequently seen incubating. On 1 April, nest again overwashed and destroyed.
15	6	F=U M=U	28-Mar	Hatch	27-Apr	3	3 (0)	2 VG:AG 1 PV:WG	Bumpout Seasonal exclosure	Split hatch. On 28 April, 3 chicks at nest, 1 chick sprawled out with limited movement. Two normal chicks banded and other chick left unbanded. On 10 May, unbanded chick banded PV:WG. Last VG:AG chick sighting on 5 May and band combination reused on 2 chicks hatching from SP273 on 2 August.
16	8	F=PV:VW M=U	30-Mar	Hatch	6-May	3	1 (0)	1 unbanded	Seasonal exclosure	Two eggs abandoned post-term.
17	NOF	F=U M=	27-Mar	Unknown	27-Apr	3	0 (0)		Seasonal exclosure	Nest fate occurred during period of high nest loss to avian predation.
18	NOF	F=VG:GW M=	29-Mar	Abandoned pre-term	24-Apr	3	0 (0)		Seasonal exclosure	Nest incubated from 1-23 April. On 26 April, 3 eggs visible through spotting scope and appeared slightly separated from each other. On 7 May, no nest bowl or eggs found.
19	NOF	F=U M=	22-Mar	Unknown	24-Apr	3	0 (0)		Seasonal exclosure	Nest fate occurred during period of high nest loss to avian predation.
20	SOF	F=VV:GW M=	na	Unknown	27-Apr	3	0 (0)		Symbolic fence	On 1 April, 3 eggs floated at 20°, 70°, and 13 mm when found. Nest fate occurred during period of high nest loss to avian predation.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
21	SOF	F=GA:OG M=BB:YR	26-Mar	Unknown	27-Apr	1	0 (0)		Symbolic fence	On 1 April, symbolic fence moved west to decrease possible pedestrian disturbance. On 27 April, associated adults foraging in area and not seen incubating subsequently. On 28 April, no nest bowl, no eggs, and minimal tracks not focused in 1 location. Lost during period of documented high nest loss to avian predation and wind.
22	SOF	F=PG:YY M=VV:VB	23-Mar	Hatch	25-Apr	3	1 (0)	1 BB:VG	Circular excl. with top Symbolic fence	On 8 April, symbolic fence moved west to decrease possible pedestrian disturbance. On 22 April, eggs recentered in circular and consistently incubated by adult until 23 April. On 25 April, 2 eggs recentered in circular and 1 chick hatched. On 27 April, the 2 remaining eggs determined to be abandoned and taken to Santa Barbara Zoo on following day. One egg hatched and chick fledged (see report Notes section).
23	8	F=U M=U	29-Mar	Hatch	1-May	3	2 (1)	2 VG:GR	Seasonal exclosure	Split hatch. One egg (without cracks) abandoned post-term.
24	6	F=banded M=U	2-Apr	Unknown	3-May	3	0 (0)		Seasonal exclosure	Nest fate occurred during period of high nest loss to avian predation.
25	BY	F=NB:PG M=RR:OR	na	Abandoned, unknown if pre- or post-term	24-Apr	3	0 (0)		Seasonal exclosure	On 4 April, 3 eggs floated at 25°, 9 mm, and 14 mm when found. Female NB:PG not seen after abandonment. In 2015 and 2016, female nested in similar area in boneyard exclosure multiple times during each season at ODSVRA. Adult female mortality suspected.
26	SOF	F=U M=	23-Mar	Hatch	25-Apr	3	2 (0)	2 unbanded	Symbolic fence	One egg unknown fate.
27	SOF	F=U M=	5-Apr	Abandoned pre-term	25-Apr	3	0 (0)		Circular excl. with top Symbolic fence	On 8 April, symbolic fence moved west to decrease possible pedestrian disturbance. On 27 April, 2 eggs abandoned pre-term collected and taken on following day to Santa Barbara Zoo and neither egg hatched (see report Notes section). One egg unknown fate.
28	6	F=U M=	3-Apr	Abandoned pre-term	20-Apr	3	0 (0)		Symbolic fence	
29	8	F= M=	na	Abandoned, suspected wind	15-Apr	1	0 (0)		Seasonal exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
30	6	F=U M=GG:PW	8-Apr	Hatch	12-May	3	2 (0)	2 VV:OW	Seasonal exclosure	One egg unknown fate. Last chick sighting on 20 May and none known to fledge. Band combination reused on 2 chicks hatching from SP270 on 10 August.
31	8	F=O-:AG M=PG:VG	8-Apr	Hatch	9-May	3	1 (1)	1 PV:YW	Seasonal exclosure	On 2 May, 2 eggs missing pre-term.
32	8	F= M=	8-Apr	Depredated, avian	30-Apr	3	0 (0)		Seasonal exclosure	
33	8	F=U M=U	8-Apr	Depredated, avian	30-Apr	3	0 (0)		Symbolic fence	
34	SOF	F=U M=GA:WW	8-Apr	Failed, unknown cause	24-Apr	≥2	0 (0)		Symbolic fence	On 8 April, symbolic fence moved west to decrease possible pedestrian disturbance. Nest loss during period of high wind and predation events.
35	8	F= M=	10-Apr	Failed, unknown cause	30-Apr	3	0 (0)		Seasonal exclosure	On 30 April, 1 egg on surface of sand and 2 eggs missing pre-term. Nest loss during period of high wind and predation events.
36	8	F=VV:BR M=U	10-Apr	Hatch	13-May	3	2 (0)	2 unbanded	Seasonal exclosure	On 30 April, camera installed at nest. One egg unknown fate. Associated male adopted an additional banded chick from SP37.
37	8	F= M=U	7-Apr	Hatch	9-May	3	3 (0)	3 VV:AG	Seasonal exclosure	On 12 May, 1 chick seen crouched and unattended, was collected, and reunited with brood the following day (see report Notes section). One 5-day-old chick adopted by SP36 brood beginning 14 May. Last chick sighting on 18 May and none known to fledge. Band combination reused on 2 chicks hatching from SP262 on 13 August.
38	BY	F=U M=U	9-Apr	Hatch	12-May	2	1 (1)	1 GG:AW	Seasonal exclosure	One egg (with large hole and live chick visible) with unknown fate.
39	BY	F=U M=U	10-Apr	Hatch	15-May	3	3 (1)	3 VG:OW	Seasonal exclosure	
40	6	F=GA:AR M=	11-Apr	Failed, unknown cause	15-Apr	2	0 (0)		Seasonal exclosure	
41	6	F=GG:(GO)? M=U	8-Apr	Hatch	11-May	3	2 (0)	2 GG:PG	Seasonal exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
42	8	F=BB:(B)?R M=U	12-Apr	Hatch	16-May	3	2 (0)	2 VG:PB	Symbolic fence	One egg unknown fate. Last chick sighting on 24 May and not known to fledge. Band combination reused on chicks hatching from SP249 on 31 July.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
43	NOF	F=U M=	8-Apr	Failed, unknown cause	27-Apr	3	0 (0)		Seasonal exclosure	Nest loss during period of high wind and predation events.
44	SOF	F= M=	11-Apr	Abandoned pre-term	13-Apr	1	0 (0)		Symbolic fence	On 12 April, 1 egg found and not seen incubated. On 13 April, symbolic fence moved west to decrease possible pedestrian disturbance. Nest fate occurred during period of high wind.
45	7	F=U M=GG:AY	12-Apr	Failed, unknown cause	27-Apr	≥2	0 (0)		Seasonal exclosure	Nest loss during period of high wind and predation events.
46	7	F=PV:VY M=U	9-Apr	Hatch	12-May	3	3 (3)	3 GA:VB	Seasonal exclosure	Split hatch. One 3- or 4-day-old chick adopted by SP49 brood beginning 16 May and subsequently fledged.
47	8	F=U M=	11-Apr	Depredated	2-May	3	0 (0)		Seasonal exclosure	Depredated, unidentified predator.
48	8	F= M=	13-Apr	Depredated	1-May	3	0 (0)		Seasonal exclosure	Depredated, unidentified predator.
49	6	F=GG:VY M=U	9-Apr	Hatch	12-May	3	3 (3)	3 VV:AB	Seasonal exclosure	On 16 May, associated male adopted an additional banded chick (when 3 or 4 days old) from SP46 and adopted chick fledged.
50	6	F= M=	9-Apr	Depredated, skunk	3-May	3	0 (0)		Seasonal exclosure	
51	6	F=VV:AA M=G-:WB	9-Apr	Hatch	12-May	3	3 (3)	2 VG:BW 1 unbanded	Seasonal exclosure	On 4 May, camera installed at nest. Split hatch.
52	SOF	F=U M=BB:GR	10-Apr	Hatch	13-May	3	3 (2)	3 unbanded	Circular excl. with top Symbolic fence	Split hatch. On 27 April, eggs recentered in circular. On 13 May, 2 eggs and 1 chick recentered in circular. On 14 May, 1 unattended chick seen sprawled and unmoving near nest bowl and associated brood not seen in area. Chick transported to Santa Barbara Zoo the following day and died on 18 May (see report Notes section).
53	7	F= M=banded	16-Apr	Unknown	19-May	3	0 (0)		Seasonal exclosure	On 20 May, 1 unattended egg on surface of sand found nine feet from nest bowl, unknown if associated with nest. Nest fate occurred during period of high nest loss to avian predation.
54	8	F= M=	8-Apr	Depredated, gull	2-May	3	0 (0)		Seasonal exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
55	6	F= M=	17-Apr	Failed, unknown cause	2-May	3	0 (0)		Seasonal exclosure	
56	6	F=NO:NR M=U	13-Apr	Hatch	16-May	3	3 (0)	3 VV:YB	Seasonal exclosure	Last chick sighting on 26 May and none known to fledge. Band combination reused on 3 chicks hatching from SP259 on 1 August.
57	6	F=U M=PV:WY	12-Apr	Hatch	15-May	3	3 (1)	3 VG:WW	Seasonal exclosure	
58	6	F=BB:?? M=U	12-Apr	Hatch	15-May	3	3 (2)	3 GA:PB	Symbolic fence	Split hatch.
59	7	F= M=	10-Apr	Depredated, gull	2-May	3	0 (0)		Seasonal exclosure	
60	7	F=U M=U	18-Apr	Depredated	3-May	≥2	0 (0)		Seasonal exclosure	Depredated, unidentified predator.
61	7	F=WV:VW M=Y-:GO	10-Apr	Hatch	13-May	3	2 (1)	2 BB:BR	Seasonal exclosure	One egg (without cracks) abandoned post-term.
62	8	F= M=	16-Apr	Hatch	19-May	3	2 (0)	2 BB:RG	Seasonal exclosure	One egg with unknown fate showed cracks, but egg or hatched chick not subsequently seen.
63	BY	F=U M=U	16-Apr	Unknown	19-May	3	0 (0)		Seasonal exclosure	Nest fate occurred during period of high nest loss to avian predation.
64	7	F=O-:WY M=U	13-Apr	Hatch	16-May	3	3 (1)	3 unbanded	Symbolic fence	
65	8	F= M=	15-Apr	Hatch	18-May	3	2 (0)	1 PV:VB 1 unbanded	Seasonal exclosure	One egg with unknown fate showed cracks, but egg or hatched chick not subsequently seen. Banded chick last seen on day of hatch and not known to fledge. Band combination reused on 2 chicks hatching from SP241 on 29 July.
66	BY	F=(B-:YG)? M=U	17-Apr	Abandoned pre-term	6-May	3	0 (0)		Seasonal exclosure	
67	8	F=U M=U	19-Apr	Hatch	23-May	3	2 (1)	2 VG:YW	Seasonal exclosure	On 2 May, camera installed at nest. One egg (without cracks) abandoned post-term.
68	8	F= M=	20-Apr	Unknown	21-May	3	0 (0)		Seasonal exclosure	Nest fate occurred during high nest loss to avian predation.
69	8	F= M=	20-Apr	Failed, unknown cause	16-May	≥1	0 (0)		Seasonal exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
70	8	F= M=	12-Apr	Depredated	29-Apr	3	0 (0)		Seasonal exclosure	Depredated, unidentified predator.
71	7	F=U M=U	21-Apr	Hatch	24-May	2	2 (0)	2 PG:VY	Seasonal exclosure	
72	SOF	F=VV:WR M=NW:OG	20-Apr	Depredated, raven	16-May	3	0 (0)		Symbolic fence	On 30 April, camera installed at nest. On 16 May, camera confirmed raven depredating nest. On 17 May, 2 intact eggs and 1 egg fragment with tissue found buried.
73	6	F=banded M=U	13-Apr	Failed, unknown cause	3-May	3	0 (0)		Seasonal exclosure	Nest loss during period of high wind and predation events.
74	SOF	F= M=	na	Failed, unknown cause	25-Apr	≥2	0 (0)		Symbolic fence	Nest loss during period of high wind and predation events.
75	SOF	F= M=	5-Apr	Failed, unknown cause	27-Apr	3	0 (0)		Symbolic fence	Nest loss during period of high wind and predation events.
76	NOF	F=U M=banded	na	Failed, unknown cause	27-Apr	≥2	0 (0)		Symbolic fence	Nest loss during period of high wind and predation events.
77	8	F= M=	13-Apr	Failed, unknown cause	29-Apr	3	0 (0)		Seasonal exclosure	Nest loss during period of high wind and predation events.
78	SOF	F=U M=PV:GG	na	Failed, unknown cause	27-Apr	3	0 (0)		Symbolic fence	Nest loss during period of high wind and predation events.
79	SOF	F= M=	na	Depredated, coyote	27-Apr	3	0 (0)		Symbolic fence	
80	6	F=RR:PW M=BB:BG	21-Apr	Hatch	24-May	3	2 (2)	1 PG:YB 1 GG:PY	Seasonal exclosure	Split hatch. One egg (without cracks) abandoned post-term.
81	BY	F= M=	23-Apr	Failed, unknown cause	19-May	3	0 (0)		Seasonal exclosure	Lost during period of documented high nest loss to predation and wind.
82	7	F= M=	19-Apr	Depredated	2-May	3	0 (0)		Seasonal exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
83	6	F=U M=GA:OG	21-Apr	Hatch	24-May	3	2 (0)	2 PV:GY	Seasonal exclosure	One egg abandoned post-term. No sign of fertilization when egg contents examined.
84	6	F= M=	16-Apr	Failed, unknown cause	2-May	3	0 (0)		Seasonal exclosure	
85	SOF	F= M=	29-Apr	Failed, unknown cause	4-May	≥2	0 (0)		Symbolic fence	On 4 May, coyote, domestic dog, and human tracks at nest site. No evidence of eggs found.
86	6	F=U M=banded	20-Apr	Abandoned post-term	13-Jun	3	0 (0)		Seasonal exclosure	On 4 May, camera installed at nest. On 13 June, 2 eggs (without cracks) collected post-term and replaced with 2 eggs from SP192, both eggs hatched on 8 and 9 July. One egg from SP86 left in nest bowl to maintain 3 egg clutch (see report Notes section). (For purpose of report nest fate category for SP86 is abandoned post-term on day eggs were replaced, 13 June.)
87	7	F=U M=PV:BB	30-Apr	Hatch	2-Jun	3	3 (2)	3 unbanded	Seasonal exclosure	
88	8	F= M=	30-Apr	Depredated	28-May	3	0 (0)		Seasonal exclosure	On 3 May, camera installed at nest. On 28 May, camera confirms last day nest seen incubated, raven in frame of photo at a distance from nest. Camera did not capture depredation of nest. Depredated on day raven known to depredate other nests in area.
89	8	F= M=PV:YB	23-Apr	Hatch	26-May	3	1 (1)	1 unbanded	Seasonal exclosure	Two eggs (without cracks) abandoned post-term.
90	SOF	F= M=	na	Abandoned, unknown if pre- or post-term	6-May	1	0 (0)		Symbolic fence	
91	SOF	F= M=U	5-May	Hatch	7-Jun	3	3 (1)	2 PG:WB 1 unbanded	Circular excl. with top Symbolic fence	Split hatch.
92	6	F=PG:OW M=AG:GA	1-May	Hatch	3-Jun	3	3 (1)	3 BB:VY	Seasonal exclosure	Split hatch.
93	Unknown	F=U M=PG:OW	na	Hatch	(1-May)	≥2	2 (0)	2 BB:BW		On 3 May, found as brood of 2 small unbanded chicks on South Oso Flaco shoreline. Last sighting of chicks on 7 May and not known to fledge. Band combination reused on 3 chicks hatching from SP248 on 31 July.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
94	7	F=U M=U	20-Apr	Hatch	23-May	3	2 (0)	2 GG:RB	Seasonal exclosure	One egg (without cracks) abandoned post-term.
95	6	F=U M=U	28-Apr	Hatch	31-May	3	2 (2)	2 VV:GW	Symbolic fence	One egg (without cracks) abandoned post-term. Brood raised on north end of 6 exclosure shoreline near the open riding area and territorial adult aggression seen on several occasions. On 3 July, one 33-day-old fledgling found sitting on the ground with limited mobility. Collected and taken to Pacific Wildlife Care (see report Notes section).
96	6	F= M=PV:AB	20-Apr	Hatch	23-May	3	2 (2)	2 GA:YB	Symbolic fence	One egg (without cracks) abandoned post-term.
97	6	F= M=U	24-Apr	Hatch	27-May	3	2 (1)	2 GA:WG	Seasonal exclosure	One egg (without cracks) abandoned post-term.
98	SOF	F=U M=BB:BG	9-May	Hatch	11-Jun	3	2 (1)	2 BB:PY	Circular excl. with top Symbolic fence	One egg (without cracks) abandoned post-term.
99	SOF	F=GA:OG M=	4-May	Depredated, raven	17-May	3	0 (0)		Symbolic fence	
100	SOF	F=PV:PY M=	1-May	Failed, unknown cause	17-May	3	0 (0)		Symbolic fence	Nest loss during period of high wind and predation events.
101	BY	F= M=	6-May	Depredated	29-May	3	0 (0)		Seasonal exclosure	Nest depredated during period of high nest loss to raven.
102	8	F= M=	4-May	Depredated	27-May	3	0 (0)		Seasonal exclosure	Nest depredated during period of high nest loss to raven.
103	SOF	F=U M=	1-May	Failed, unknown cause	14-May	3	0 (0)		Symbolic fence	On 14 May, 1 egg 10% buried at nest bowl and 2 eggs missing pre-term.
104	SOF	F=U M=U	9-May	Hatch	15-Jun	3	3 (0)	3 PV:RB	Circular excl. with top Symbolic fence	On 13 May, while still a 2 egg nest, both eggs found 90% buried. Eggs marked and replaced on surface of sand. On 25 May, 3 eggs recentered in circular.
105	SOF	F=U M=	1-May	Failed, unknown cause	17-May	3	0 (0)		Symbolic fence	Failed during period of high nest loss to raven.
106	Unknown	F= M=PV:YG	na	Hatch	(1-May)	≥2	2 (0)	2 unbanded		On 8 May, found as brood of 2 small unbanded chicks on 8 exclosure shoreline.
107	NOF	F= M=	9-May	Failed, unknown cause	17-May	≥2	0 (0)		Seasonal exclosure	Nest lost during period of high nest loss to raven.
108	7	F=U M=U	6-May	Hatch	8-Jun	3	2 (0)	2 BB:WR	Seasonal exclosure	One egg (without cracks) abandoned post-term.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
109	6	F=U M=BB:RR	26-Apr	Hatch	29-May	3	3 (0)	3 GG:WW	Seasonal exclosure	
110	6	F=U M=RR:AB	4-May	Hatch	6-Jun	3	3 (0)	3 unbanded	Symbolic fence	
111	SOF	F= M=	28-Apr	Depredated, raven	18-May	3	0 (0)		Symbolic fence	On 15 May, 1 egg missing pre-term. On 18 May, camera installed at nest and on same day recorded nest depredated by raven.
112	SOF	F=U M=	na	Abandoned pre-term	11-May	3	0 (0)		Symbolic fence	On 10 May, nest found with 3 eggs and incubating female. No bird seen incubating subsequently. Nest in area where incubating adult would not be missed for a long period of time. No sign of fertilization when egg contents examined.
113	SOF	F=U M=L:Y/G	1-May	Abandoned, suspected wind	1-Jun	2	0 (0)		Circular excl. with top Symbolic fence	On 3 June, 2 eggs found fully buried (1 egg found with crack) were taken to Santa Barbara Zoo. When egg contents were examined the cracked egg showed signs of late development and the other showed no sign of fertilization (see report Notes section).
114	SOF	F=PG:YY M=U	4-May	Hatch	6-Jun	3	2 (1)	2 BB:OR	Circular excl. with top Symbolic fence	On 25 May, 1 egg unburied and marked. All 3 eggs recentered in circular on same day. One egg (marked and without cracks) abandoned post-term, contained a less than 1-week-old embryo when contents examined post-season. On 7 June, 1 chick observed with non-functioning right leg. Chick was assessed in hand and bands not associated with injury. Chick was released and last seen on 9 June (see report Notes section).
115	7	F=U M=GG:AY	3-May	Hatch	5-Jun	3	3 (2)	3 unbanded	Seasonal exclosure	
116	7	F=U M=U	4-May	Hatch	6-Jun	3	3 (1)	3 VV:RB	Symbolic fence	On 16-18 July, banded fledgling observed favoring left leg (see report Notes sections).
117	7	F=U M=BB:PG	10-May	Hatch	11-Jun	3	3 (1)	3 unbanded	Seasonal exclosure	
118	8	F= M=VV:WR	na	Abandoned, unknown if pre- or post-term	12-May	2	0 (0)		Symbolic fence	
119	7	F=U M=RR:BW	8-May	Hatch	9-Jun	3	3 (1)	3 VV:YY	Seasonal exclosure	Split hatch.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
120	6	F=U M=U	10-May	Abandoned pre-term	3-Jun	3	0 (0)		Seasonal exclosure	Approximately 2-week-old dead embryo in all 3 eggs when contents examined.
121	8	F=U M=	10-May	Abandoned pre-term	23-May	3	0 (0)		Symbolic fence	On 17 July, 1 egg with large hole and small bit of dried yolk visible collected, no sign of other 2 eggs. Approximately 1-week-old dead embryo in egg when contents examined.
122	6	F=PV:?? M=U	7-May	Hatch	9-Jun	3	3 (0)	3 unbanded	Symbolic fence	
123	6	F=U M=BB:WB	8-May	Hatch	10-Jun	3	3 (0)	3 unbanded	Seasonal exclosure	
124	SOF	F= M=	na	Depredated, raven	18-May	3	0 (0)		Symbolic fence	On 18 May, camera installed at nest and on same day confirmed raven depredating nest.
125	BY	F= M=	22-Apr	Failed, unknown cause	17-May	2	0 (0)		Seasonal exclosure	Nest loss during period of high wind and predation events.
126	7	F=PG:OG M=-:AY	7-May	Hatch	9-Jun	3	3 (1)	3 unbanded	Seasonal exclosure	Split hatch. Nest location known by multiple observations of incubating adult. To avoid disturbing nearby young snowy plover broods nest not walked to.
127	7	F=U M=GA:Y-	2-May	Hatch	4-Jun	3	3 (3)	3 unbanded	Seasonal exclosure	
128	7	F= M=U	9-May	Hatch	11-Jun	3	1 (0)	1 PV:OG	Seasonal exclosure	Two eggs (1 without cracks and 1 with crack not associated with hatching) abandoned post-term.
129	SOF	F= M=	na	Failed, unknown cause	17-May	3	0 (0)		Symbolic fence	Nest lost during period of high nest loss to raven predation.
130	7	F=(V)?B:G- M=U	12-May	Hatch	14-Jun	2	1 (0)	1 PG:WR	Seasonal exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
131	8	F= M=	17-May	Depredated, raven	28-May	3	0 (0)		Seasonal exclosure	
132	8	F=U M=	2-May	Depredated, raven	28-May	3	0 (0)		Seasonal exclosure	On 22 May, 1 egg missing pre-term and camera installed at nest. On 28 May, camera recorded raven depredating nest.
133	BY	F= M=	4-May	Depredated, raven	28-May	3	0 (0)		Seasonal exclosure	On 22 May, camera installed at nest. On 26 May, camera batteries died and no photos taken after 05:37. On 28 May, corvid tracks at nest and raven observed depredating other nests in area.
134	6	F=BB:YW M=NY:WB	8-May	Hatch	10-Jun	3	3 (1)	3 VV:RW	Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
135	8	F=U M=BB:OB	2-May	Hatch	4-Jun	3	3 (2)	3 GA:BB	Symbolic fence	
136	BY	F=banded M=	29-Apr	Depredated, raven	18-May	3	0 (0)		Seasonal exclosure	
137	BY	F= M=	na	Abandoned, unknown if pre- or post-term	18-May	1	0 (0)		Seasonal exclosure	No sign of fertilization when egg contents examined.
138	6	F= M=GG:PW	14-May	Hatch	16-Jun	3	3 (2)	3 unbanded	Symbolic fence	Nest location known by multiple observations of incubating adult. To avoid disturbing nearby young snowy plover broods, nest not walked to.
139	8	F=PG:?? M=	na	Unknown	1-Jun	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 10-31 May. To avoid disturbing nearby young snowy plover broods, nest not walked to and egg number unknown. Insufficient information to estimate initiation date. Nest lost during period of documented high nest loss to predation.
140	6	F=banded M=U	9-May	Unknown	9-Jun	3	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 10 May-8 June. To avoid disturbing nearby young snowy plover broods, nest not walked to, but 3 eggs visible through spotting scope on 28 May and 4 June. Nest lost during period of high nest loss to predation. One egg collected 8 Sept. No sign of fertilization when egg contents examined.
141	6	F=U M=U	6-May	Hatch	8-Jun	3	3 (2)	3 GG:PR	Seasonal exclosure	
142	6	F=BB:PW M=BB:AW	2-May	Hatch	4-Jun	≥2	2 (2)	2 GA:WW	Seasonal exclosure	Nest location known by multiple observations of incubating adult and a minimum of 2 eggs based on number of chicks observed.
143	7	F= M=-:BW	5-May	Hatch	7-Jun	3	1 (0)	1 RR:BG	Seasonal exclosure	Two eggs (without cracks) abandoned post-term. Male banded -:BW, with missing left foot.
144	6	F=NR:BR M=BB:BY	17-May	Hatch	19-Jun	3	3 (0)	3 unbanded	Symbolic fence	Brood raised on north end of 6 exclosure shoreline near the open riding area and territorial adult aggression seen on several occasions (see report Notes section).

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
145	6	F=PV:VW M=	15-May	Hatch	17-Jun	3	1 (0)	1 unbanded	Symbolic fence	Nest not walked to when active but 3 eggs visible through spotting scope on 26 May.
146	6	F=banded M=	na	Unknown	24-May	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult. To avoid disturbing nearby young snowy plover broods, nest not walked to and egg number unknown. Insufficient information to estimate initiation date. Nest fate occurred during period of high nest loss to predation.
147	7	F=U M=	7-May	Hatch	9-Jun	3	2 (0)	2 unbanded	Symbolic fence	Split hatch. One egg unknown fate.
148	6	F=PV:- M=GA:AR	7-May	Hatch	9-Jun	3	3 (3)	3 unbanded	Symbolic fence	
149	6	F=U M=BB:YB	7-May	Hatch	9-Jun	3	3 (1)	3 GG:YR	Seasonal exclosure	
150	8	F= M=	na	Depredated, raven	28-May	≥1	0 (0)		Seasonal exclosure	Nest location known by multiple observations of incubating adult from 9-28 May. To avoid disturbing nearby young snowy plover broods, nest not walked to and egg number unknown. Insufficient information to estimate initiation date.
151	NOF	F=U M=U	19-May	Hatch	20-Jun	3	3 (3)	3 PV:YY	Seasonal exclosure	Split hatch. Nest located in the south end of North Oso Flaco and adult observed repeatedly flushed from nest by pedestrian traffic in South Oso Flaco. On 23 May, symbolic fence protecting the shoreline of North Oso Flaco moved south to reduce possible pedestrian disturbance. On 20 June, access to the beach in South Oso Flaco temporarily closed to protect nest during hatching.
152	SOF	F=U M=VV:VB	18-May	Hatch	20-Jun	3	3 (3)	3 PV:AW	Circular excl. with top Symbolic fence	
153	8	F= M=VV:WR	16-May	Hatch	18-Jun	3	3 (2)	3 VV:RG	Seasonal exclosure	
154	8	F=U M=	19-May	Depredated, skunk	4-Jun	≥2	0 (0)		Seasonal exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
155	7	F= M=	18-May	Unknown	na	3	0 (0)		Seasonal exclosure	Nest found 21 May at 2 eggs (both float 20°) and progressed to 3 eggs. Nest in location where incubating adult not visible from a distance and nest last observed to be active with 3 eggs on 1 June. Nest not walked to again until 21 June, no evidence of nest present, and insufficient information to closely estimate fate date.
156	6	F=VV:RY M=U	12-May	Hatch	14-Jun	3	3 (1)	3 PV:GW	Bumpout Seasonal exclosure	From 14-17 June, brood raised at north end of 6 exclosure shoreline. After observed adult aggression toward chicks the brood moved and remained further south on 6 exclosure shoreline (see report Notes section).
157	6	F=VV:BG M=U	10-May	Hatch	12-Jun	3	3 (3)	3 BB:AR	Seasonal exclosure	
158	7	F=U M=U	14-May	Hatch	16-Jun	3	2 (0)	2 VG:YY	Seasonal exclosure	Split hatch. One egg with unknown fate showed cracks, but egg or hatched chick not subsequently seen.
159	6	F=U M=NB:OY	5-May	Hatch	7-Jun	3	3 (0)	3 GG:GB	Seasonal exclosure	
160	8	F= M=	na	Depredated, raven	28-May	≥1	0 (0)		Seasonal exclosure	Nest location known by multiple observations of incubating adult from 11-28 May. To avoid disturbing nearby young snowy plover broods, nest not walked to and egg number unknown. Insufficient information to estimate initiation date.
161	6	F=PV:(W)? M=U	9-May	Hatch	11-Jun	3	2 (0)	2 unbanded	Symbolic fence	One egg abandoned post-term. No sign of fertilization when egg contents examined.
162	BY	F=U M=	20-May	Depredated, skunk	30-Jun	3	0 (0)		Seasonal exclosure	On 8 June, 1 egg missing pre-term. On 1 July, no eggs at nest bowl and skunk tracks at nest.
163	SOF	F=U M=	23-May	Overwash by tide	26-May	2	0 (0)		Symbolic fence	
164	SOF	F=GA:OG M=BB:YR	22-May	Hatch	25-Jun	3	3 (0)	3 PG:GY	Circular excl. with top Symbolic fence	Split hatch. From 3-23 June, eggs recentered in circular on 4 separate occasions.
165	7	F=U M=U	18-May	Hatch	20-Jun	3	3 (1)	3 unbanded	Symbolic fence	
166	6	F=U M=GA:WR	10-May	Hatch	12-Jun	3	3 (0)	3 unbanded	Seasonal exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
167	NOF	F=VG:GW M=U	22-May	Failed, unknown cause	1-Jun	3	0 (0)		Seasonal exclosure	
168	NOF	F= M=V-:BR	15-May	Hatch	17-Jun	3	3 (3)	3 unbanded	Symbolic fence	
169	SOF	F=U M=U	16-May	Hatch	18-Jun	3	3 (1)	3 PG:BY	Circular excl. with top Symbolic fence	
170	8	F=GA:PR M=U	na	Unknown	23-Jun	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 29 May-22 June. To avoid disturbing nearby young snowy plover broods, nest not walked to, but 3 eggs visible through spotting scope on 11 and 22 June. Nest lost during period of high nest loss to predation.
171	8	F=GA:OR M=U	20-May	Hatch	22-Jun	3	3 (2)	3 unbanded	Symbolic fence	
172	NOF	F=U M=	na	Depredated, skunk	20-Jun	3	0 (0)		Symbolic fence	
173	7	F=U M=VG:VY	13-May	Hatch	15-Jun	3	3 (1)	3 unbanded	Symbolic fence	
174	6	F=U M=banded	18-May	Unknown	27-Jun	3	0 (0)		Symbolic fence	On 5 June, 3 eggs floated 70°, 80°, and 90°. On 26 June, nest last seen incubated. Nest fate occurred during period of high nest loss to skunk predation.
175	6	F=GG:GG M=	21-May	Hatch	23-Jun	≥2	1 (0)	1 unbanded	Symbolic fence	Nest not walked to when active but a minimum of 2 eggs visible through spotting scope on 18 June.
176	6	F= M=	na	Unknown	24-Jun	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 30 May to 23 June. One egg found fully buried at nest on 27 June, collected. No sign of fertilization when egg contents examined. Nest fate occurred during period of high nest loss to skunk predation.
177	SOF	F=PV:PY M=VG:VB	na	Failed, unknown cause	29-May	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 24 to 28 May.
178	7	F=VO:BW M=U	23-May	Hatch	25-Jun	3	3 (2)	3 PV:PG	Seasonal exclosure	Split hatch.
179	8	F=banded M=	23-May	Depredated, skunk	23-Jun	3	0 (0)		Seasonal exclosure	On 8 June, camera installed at nest. On 23 June, camera confirmed skunk depredating nest.
180	6	F=NO:NR M=U	26-May	Hatch	28-Jun	3	2 (1)	2 GA:BR	Seasonal exclosure	One egg (without cracks) abandoned post-term. Approximately 2-week-old dead embryo in egg when contents examined.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
181	BY	F= M=RR:OR	4-Jun	Depredated, skunk	8-Jun	2	0 (0)		Seasonal exclosure	
182	8	F=U M=U	31-May	Hatch	3-Jul	3	2 (2)	2 RR:BB	Bumpout Seasonal exclosure	Split hatch. On 8 June, 1 egg missing pre-term.
183	SOF	F=U M=R:W/G	26-May	Hatch	28-Jun	2	1 (1)	1 VG:RB	Circular excl. with top Symbolic fence	On 22 June, 1 egg missing pre-term, high tide reached circular, possibly overwashed nest area, and circular removed.
184	SOF	F=VV:GW M=U	30-May	Hatch	2-Jul	3	3 (3)	3 PV:OB	Circular excl. with top Symbolic fence	Split hatch.
185	6	F= M=	na	Unknown	22-Jun	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 31 May-21 June. To avoid disturbing nearby young snowy plover broods, nest not walked to and egg number unknown. Insufficient information to estimate initiation date. Nest fate occurred during period of high nest loss to skunk predation.
186	7	F=U M=U	21-May	Hatch	23-Jun	3	3 (1)	3 unbanded	Symbolic fence	Nest location known by multiple observations of incubating adult.
187	7	F= M=	2-Jun	Abandoned post-term	7-Aug	2	0 (0)		Seasonal exclosure	On 25 July, 2 eggs (without cracks) collected post-term (no sign of fertilization when egg contents examined) and replaced with 3 eggs from SP264. On 8 August, camera installed at nest. On 9 August, camera confirmed 3 SP264 eggs were abandoned and eggs were collected (no sign of fertilization when egg contents examined by Santa Barbara Zoo) (see report Notes section).
188	BY	F= M=	na	Depredated, coyote	14-Jun	3	0 (0)		Seasonal exclosure	
189	NOF	F=U M=	na	Unknown	20-Jun	≥2	0 (0)		Seasonal exclosure	Nest not walked to when active but a minimum of 2 eggs visible through spotting scope on 8 June. Nest lost during period of high nest loss to skunk predation.
190	8	F=U M=VG:VB	na	Unknown	3-Jul	3	0 (0)		Symbolic fence	Nest fate occurred during period of high nest loss to skunk predation.
191	SOF	F=U M=RR:BG	8-Jun	Abandoned, suspected wind	11-Jun	2	0 (0)		Circular excl. with top Symbolic fence	On 13 June, 2 eggs abandoned pre-term and eggs transferred to SP86. Eggs hatched on 8 and 9 July (see report Notes section).
192	7	F=GA:OY M=U	4-Jun	Hatch	7-Jul	3	3 (2)	3 GA:PR	Seasonal exclosure	On 14 July, 1 chick adopted by SP214 brood and not known to fledge.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
193	7	F= M=	na	Unknown	23-Jun	3	0 (0)		Seasonal exclosure	Nest lost during period of high nest loss to skunk predation.
194	7	F= M=	na	Depredated, skunk	23-Jun	3	0 (0)		Seasonal exclosure	
195	NOF	F=banded M=	na	Depredated, skunk	20-Jun	≥2	0 (0)		Symbolic fence	
196	7	F= M=U	na	Depredated, skunk	23-Jun	≥2	0 (0)		Seasonal exclosure	
197	BY	F=U M=U	8-Jun	Hatch	11-Jul	3	1 (1)	1 VG:PR	Seasonal exclosure	Two eggs (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
198	6	F= M=	na	Unknown	24-Jun	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 9-23 June. Nest fate lost during period of high nest loss to skunk predation.
199	7	F= M=	na	Unknown	25-Jun	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult 8-24 June. Nest lost during period of high nest loss to skunk predation.
200	7	F=U M=U	25-May	Hatch	27-Jun	3	3 (0)	2 PG:AY 1 unbanded	Seasonal exclosure	Split hatch.
201	8	F= M=	28-May	Depredated	24-Jun	3	0 (0)		Seasonal exclosure	Nest lost during period of high nest loss to skunk predation.
202	8	F= M=	23-May	Depredated, skunk	(17-Jun)	3	0 (0)		Seasonal exclosure	
203	6	F= M=	na	Unknown	26-Jun	≥1	0 (0)		Seasonal exclosure	Nest location known by multiple observations of incubating adult from 11-25 June. To avoid disturbing nearby young snowy plover broods, nest not walked to and egg number unknown. Nest lost during period of high nest loss to skunk predation.
204	6	F= M=	na	Unknown	24-Jun	3	0 (0)		Seasonal exclosure	Nest lost during period of high nest loss to skunk predation.
205	7	F=PV:VY M=PV:WY	6-Jun	Hatch	9-Jul	3	1 (1)	1 BB:RR	Seasonal exclosure	Two eggs (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
206	8	F= M=	na	Depredated, skunk	23-Jun	2	0 (0)		Seasonal exclosure	
207	SOF	F=U M=U	3-Jun	Hatch	6-Jul	3	2 (2)	2 unbanded	Symbolic fence	One egg abandoned post-term. No sign of fertilization when egg contents examined.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
208	7	F=U M=	na	Unknown	23-Jun	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 13-21 June. To avoid disturbing nearby young snowy plover broods, nest not walked to and egg number unknown. Insufficient information to estimate initiation date. Nest lost during period of high nest loss to skunk predation.
209	6	F= M=	8-Jun	Depredated, skunk	22-Jun	3	0 (0)		Seasonal exclosure	
210	6	F=VV:AA M=GG:WB	6-Jun	Hatch	9-Jul	3	3 (2)	3 PV:OY	Seasonal exclosure	
211	8	F=banded M=	na	Unknown	1-Jul	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 17-30 June. To avoid disturbing young snowy plover broods, nest not walked to and egg number unknown. Insufficient information to estimate initiation date. Nest lost during period of high nest loss to skunk predation.
212	6	F= M=	na	Unknown	(15-Jun)	2	0 (0)		Seasonal exclosure	On 16 June, nest found as 2 eggs partially silted in without a nest bowl. No bird observed attending nest. No sign of fertilization when egg contents examined.
213	6	F=U M=U	5-Jun	Hatch	8-Jul	3	3 (1)	2 GA:PG 1 unbanded	Seasonal exclosure	On 15 July, 1 banded chick separated from brood, collected, and placed in brooder with talitrids. The chick was reunited with the brood later that same day, but was not subsequently seen (see report Notes section). One banded chick fledged.
214	7	F=GG:YG M=GG:GY	28-May	Hatch	30-Jun	3	3 (3)	3 unbanded	Seasonal exclosure	Split hatch.
215	SOF	F=U M=GA:WW	1-Jun	Hatch	4-Jul	3	2 (2)	1 GA:YY 1 G-:YY	Circular excl. with top Symbolic fence	One egg (without cracks) abandoned post-term. On 28 July, 1 chick confirmed to have lost aqua band on left leg and now has band combination G-:YY.
216	SOF	F=U M=banded?	19-Jun	Overwash by tide	22-Jun	≥1	0 (0)		Symbolic fence	
217	SOF	F=U M=BB:GR	8-Jun	Hatch	11-Jul	3	3 (3)	2 PG:YR 1 GA:RR	Circular excl. with top Symbolic fence	Split hatch. On 15 July, 2 chicks from SP217 brooded with 3 eggs at SP239 nest site. Chicks seen the following day with associated male of SP217.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
218	BY	F=U M=	20-Jun	Depredated, skunk	4-Jul	3	0 (0)		Seasonal exclosure	
219	6	F=U M=	17-Jun	Hatch	20-Jul	3	3 (1)	3 VG:RY	Symbolic fence	Nest location known by multiple observations of incubating adult.
220	7	F=U M=	na	Unknown	25-Jun	≥1	0 (0)		Seasonal exclosure	Nest location known by multiple observations of incubating adult from 15-24 June. To avoid disturbing nearby young snowy plover broods, nest not walked to and egg number unknown. Insufficient information to estimate initiation date. Nest lost during period of high nest loss to skunk predation.
221	6	F= M=	30-May	Failed, unknown cause	23-Jun	3	0 (0)		Seasonal exclosure	Nest lost during period of high nest loss to skunk predation.
222	7	F= M=	na	Unknown	23-Jun	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 14-21 June. To avoid disturbing nearby young snowy plover broods, nest not walked to and egg number unknown. Insufficient information to estimate initiation date. Nest lost during period of high nest loss to skunk predation.
223	SOF	F=PV:YG M=U	20-Jun	Hatch	23-Jul	3	3 (2)	3 PV:YR	Circular excl. with top Symbolic fence	On 23 July, symbolic fence moved west to decrease possible pedestrian disturbance to recently hatching chicks.
224	SOF	F=U M=RR:BG	11-Jun	Hatch	14-Jul	3	3 (1)	2 PV:PR 1 unbanded	Circular excl. with top Symbolic fence	Split hatch. On 23 June, symbolic fence moved west to decrease possible pedestrian disturbance.
225	SOF	F=U M=U	7-Jun	Hatch	10-Jul	3	3 (0)	3 PV:AY	Circular excl. with top Symbolic fence	On 11 July, 1 chick separated from brood, collected, and placed in brooder with talitrids overnight. The chick was reunited with the brood the following day south of ODSVRA on the Guadalupe-Nipomo Dunes NWR. Brood not subsequently seen (see report Notes section).
226	6	F= M=U	22-May	Hatch	24-Jun	3	3 (1)	3 PG:OY	Symbolic fence	Nest location known by multiple observations of incubating adult.
227	6	F= M=	na	Depredated, skunk	7-Jul	2	0 (0)		Seasonal exclosure	
228	6	F= M=banded	18-Jun	Depredated, skunk	5-Jul	2	0 (0)		Seasonal exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
229	8	F= M=	na	Unknown	1-Jul	≥2	0 (0)		Symbolic fence	Nest not walked to when active but a minimum of 2 eggs visible through spotting scope on 29 June. Nest lost during period of high nest loss to skunk predation. SP229 and SP230 in similar location and with similar initiation and fate.
230	8	F= M=	na	Unknown	1-Jul	≥2	0 (0)		Symbolic fence	Nest not walked to when active but a minimum of 2 eggs visible through spotting scope on 29 June. Nest fate occurred during period of high nest loss to skunk predation. SP229 and SP230 in similar location and with similar initiation and fate.
231	SOF	F=U M=PG:OW	13-Jun	Hatch	16-Jul	3	3 (1)	3 GA:OR	Circular excl. with top Symbolic fence	
232	SOF	F=U M=L:Y/G	25-Jun	Hatch	28-Jul	3	3 (2)	3 RR:GB	Circular excl. with top Symbolic fence	On 5 July, symbolic fence moved west to decrease possible pedestrian disturbance.
233	SOF	F=U M=VV:OB	17-Jun	Hatch	20-Jul	3	3 (3)	3 GA:RY	Circular excl. with top Symbolic fence	
234	SOF	F=U M=VG:OW	19-Jun	Hatch	22-Jul	3	3 (1)	3 RR:VY	Circular excl. with top Symbolic fence	
235	8	F= M=	na	Unknown	1-Jul	≥2	0 (0)		Seasonal exclosure	Nest location known by observations of incubating adult on 29 and 30 June. To avoid disturbing nearby young snowy plover broods, nest not walked to, but 2 eggs visible through spotting scope on 29 June. Nest lost during period of high nest loss to skunk predation.
236	7	F= M=	na	Unknown	1-Jul	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 21-30 June. To avoid disturbing nearby young snowy plover broods, nest not walked to and egg number unknown. Insufficient information to estimate initiation date. Nest fate occurred during period of high nest loss to skunk predation.
237	NOF	F=VV:WY M=U	11-Jun	Hatch	14-Jul	3	3 (2)	3 PG:OR	Symbolic fence	Nest location known by multiple observations of incubating adult. On 21 August, 1 fledge observed limping with left leg injury. On 26 August, bird taken to Pacific Wildlife Care, treated, and released on 7 September (see report Notes section).

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
238	6	F=VV:BR M=U	26-Jun	Hatch	29-Jul	2	2 (0)	2 VG:RR	Symbolic fence	On 4 August, 1 chick observed crouching in place for ~1.25 hours, vocalizing, wings splayed, and no attending adult. Chick placed in brooder overnight with food and water. On 5 August, chick found dead in brooder (see report Notes section).
239	SOF	F=U M=U	21-Jun	Hatch	24-Jul	3	3 (1)	3 RR:VG	Circular excl. with top Symbolic fence	On 11 July, symbolic fence moved west to decrease possible pedestrian disturbance. On 15 July, adult with 3-egg SP239 nest broods two 3- and 4-day old chicks from SP217. Chicks seen the following day with associated male of SP217.
240	SOF	F=PG:OW M=U	15-Jun	Hatch	18-Jul	3	1 (1)	1 GG:RR	Symbolic fence	Two eggs (1 without cracks and second with pip hole and dead chick inside) abandoned post-term.
241	6	F=PG:YY M=U	26-Jun	Hatch	29-Jul	2	2 (2)	2 PV:VB	Seasonal exclosure	Chick band combination reused from SP65. SP65 chicks last seen on 18 May and not known to fledge. From 23 to 31 July, PG:YY adult female seen with a right leg injury (see report Notes section).
242	8	F= M=	15-Jun	Depredated, skunk	12-Jul	3	0 (0)		Circular excl. with top Seasonal exclosure	On 7 July, camera installed at nest. On 12 July, camera recorded skunk depredating nest.
243	8	F=U M=GA:GR	24-Jun	Hatch	27-Jul	3	2 (1)	2 RR:OB	Bumpout Seasonal exclosure	One egg (without cracks) abandoned post-term (no sign of fertilization when egg contents examined). On 24 August, one 28-day-old chick/fledgling found with a large feather tangled around the upper portion of the right leg and restricting movement. Chick caught and feather removed the same day (see report Notes section).
244	NOF	F=U M=NO:OR	26-Jun	Hatch	29-Jul	3	2 (1)	2 PV:OR	Symbolic fence	One egg (without cracks) abandoned post-term.
245	7	F=U M=	17-Jun	Abandoned post-term	25-Aug	3	0 (0)		Seasonal exclosure	Three eggs (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
246	NOF	F=VG:GW M=U	26-Jun	Hatch	29-Jul	3	2 (2)	2 RR:AG	Circular excl. with top Symbolic fence	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
247	SOF	F=PV:PY M=VG:VB	28-Jun	Hatch	31-Jul	3	3 (2)	3 unbanded	Circular excl. with top Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
248	7	F=O-:WY M=U	28-Jun	Hatch	31-Jul	3	3 (1)	3 BB:BW	Symbolic fence	Nest location known by multiple observations of incubating adult. On 3 August, 1 chick found separated from brood, collected, and reunited with brood on same day. On 25 August, one 25-day-old chick seen in open riding area east of 7 exclosure. On 16 September, 1 fledgling found dead on 7 shoreline last seen alive on 5 September at 36 days old. Chick band combination reused from SP93 (no chicks fledging) (see report Notes section).
249	6	F=(L)?:WG M=U	28-Jun	Hatch	31-Jul	3	3 (2)	2 VG:PB 1 unbanded	Seasonal exclosure	Split hatch. One unbanded chick last seen alive on 28 August at 26 days old.
250	SOF	F=U M=U	30-Jun	Hatch	2-Aug	2	2 (2)	2 VG:RG	Circular excl. with top Symbolic fence	Chick band combination reused from SP6 (no chicks fledging).
251	SOF	F=U M=U	27-Jun	Hatch	30-Jul	3	2 (2)	2 RR:AW	Symbolic fence	On 8 July, 1 egg damaged while handling eggs at nest and taken to Santa Barbara Zoo (see report Notes section).
252	SOF	F=NB:OY M=NR:WB	28-Jun	Hatch	31-Jul	3	3 (3)	2 BB:VG 1 unbanded	Circular excl. with top Symbolic fence	Split hatch. On 11 July, symbolic fence moved west to decrease possible pedestrian disturbance.
253	7	F=U M=U	27-Jun	Hatch	30-Jul	2	2 (2)	2 RR:BW	Seasonal exclosure	
254	6	F= M=BB:WB	23-Jun	Hatch	26-Jul	2	1 (0)	1 PV:RR	Seasonal exclosure	One egg (without cracks) abandoned post-term.
255	8	F=PG:PB M=U	na	Depredated, skunk	14-Jul	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 7 to 13 July. To avoid disturbing nearby young snowy plover broods, nest not walked to and egg number unknown. Insufficient information to estimate initiation date.
256	7	F=U M=U	28-Jun	Hatch	31-Jul	2	1 (0)	1 PG:WG	Symbolic fence	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
257	NOF	F=U M=	na	Depredated, skunk	20-Jul	≥1	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 9 July to 19 July. To avoid disturbing nearby young snowy plover broods, nest not walked to and egg number unknown. Insufficient information to estimate initiation date.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
258	6	F= M=	na	Unknown	10-Jul	≥2	0 (0)		Symbolic fence	Nest location known by multiple observations of incubating adult from 23 June to 9 July. To avoid disturbing nearby young snowy plover broods, nest not walked to and minimum egg number known from 2 abandoned, unknown pre- or post-term eggs. Insufficient information to estimate initiation date. No sign of fertilization when egg contents examined.
259	7	F= M=U	29-Jun	Hatch	1-Aug	3	3 (2)	3 VV:YB	Seasonal exclosure	Split hatch. Chick band combination reused from SP56 (no chicks fledged). On 28 September, a VV:YB juvenile (58 to 59 days old) was observed with a right wing injury (see report Notes section).
260	7	F=U M=	8-Jul	Abandoned pre-term	8-Aug	3	0 (0)		Seasonal exclosure	On 2 August, camera installed at nest. Nest with inconsistent incubation 28 July to 7 August with no incubation after. Approximately 2-week-old dead embryo in all 3 eggs when contents examined.
261	NOF	F=U M=U	5-Jul	Hatch	7-Aug	3	3 (1)	3 unbanded	Circular excl. with top Symbolic fence	
262	NOF	F=RR:PW M=U	11-Jul	Hatch	13-Aug	3	3 (0)	2 VV:AG 1 unbanded	Seasonal exclosure	Chick band combination reused from SP37 (no chicks fledged).
263	8	F= M=	29-Jun	Unknown	29-Jul	3	0 (0)		Seasonal exclosure	
264	SOF	F=GG:GG M=	6-Jul	Abandoned pre-term	23-Jul	3	0 (0)		Circular excl. with top Symbolic fence	On 23 July, 3 eggs abandoned pre-term and eggs transferred to SP187 (eggs nonviable) on 25 July. On 9 August, camera confirmed 3 SP264 eggs at SP187 nest were abandoned and eggs were collected (no sign of fertilization when egg contents examined by Santa Barbara Zoo) (see report Notes section).
265	6	F= M=PG:PW	30-Jun	Hatch	2-Aug	3	3 (1)	3 unbanded	Symbolic fence	Split hatch.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
266	6	F=BB:YW M=AG:GA	6-Jul	Hatch	8-Aug	2	2 (1)	1 VG:WG 1 unbanded	Seasonal exclosure	Split hatch. On 3 August, 1 egg noted with inward dented area penetrating the eggshell but still hatched on 10 August, 2 days later than the other egg. Chick band combination reused from SP10 (no chicks fledged). Brood raised on northern 6 exclosure shoreline near the open riding area (see report Notes section). One banded chick known to fledge.
267	8	F=U M=U	8-Jul	Hatch	10-Aug	3	1 (1)	1 RR:WY	Symbolic fence	Two eggs (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
268	7	F=BB:VY M=U	10-Jul	Hatch	12-Aug	3	3 (1)	3 unbanded	Symbolic fence	
269	NOF	F= M=	na	Abandoned, unknown if pre- or post-term	na	3	0 (0)		Symbolic fence	On 19 July, nest found as 3 eggs abandoned, unknown if pre- or post-term. Insufficient information to estimate initiation or fate date. No sign of fertilization when egg contents examined.
270	SOF	F=U M=U	8-Jul	Hatch	10-Aug	3	2 (2)	2 VV:OW	Circular excl. with top Symbolic fence	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined. Chick band combination reused from SP30 (no chicks fledged).
271	8	F=U M=U	27-Jun	Hatch	30-Jul	3	2 (1)	2 RR:AB	Symbolic fence	One egg (without cracks) abandoned post-term.
272	6	F=banded M=U	28-Jun	Hatch	31-Jul	2	2 (1)	2 RR:PG	Symbolic fence	
273	6	F=U M=NB:OY	25-Jun	Hatch	28-Jul	3	2 (2)	2 VG:AG	Symbolic fence	One egg abandoned post-term.
274	8	F= M=VG:VY	3-Jul	Hatch	5-Aug	2	2 (1)	1 VG:GB 1 unbanded	Seasonal exclosure	One chick banded at 10 days old and known to fledge. Chick band combination reused from SP13 (no chicks fledged).
275	Unknown	F= M=GA:OW	na	Hatch	(17-May)	3	3 (1)	3 unbanded		On 18 May, found as brood of 3 small unbanded chicks on 8 exclosure shoreline.
276	Unknown	F= M=BB:VR	na	Hatch	(31-May)	≥1	1 (1)	1 unbanded		On 7 June, found as brood of 1 small unbanded chick on North Oso Flaco shoreline.
277	Unknown	F= M=U	na	Hatch	(2-Jun)	≥2	2 (2)	2 unbanded		On 7 June, found as brood of 2 small unbanded chicks on North Oso Flaco shoreline.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
278	Unknown	F= M=BB:OR	na	Hatch	(29-Jun)	≥1	1 (1)	1 unbanded		On 6 July, found as brood of 1 small unbanded chick on South Oso Flaco shoreline.
279	Unknown	F=U M=U	na	Hatch	(28-Jul)	≥2	2 (2)	2 unbanded		On 1 August, found as brood of 2 small unbanded chicks on North Oso Flaco shoreline. On 3 August, associated male brooding 1 chick from the SP248 brood (see report Notes section).
280	Unknown	F= M=	na	Hatch	(1-Aug)	≥2	2 (1)	2 unbanded		On 5 August, found as brood of 2 small unbanded chicks on 8 exclosure shoreline.
281	7	F= M=	na	Unknown	na	≥2	0 (0)		Seasonal exclosure	On 1 September, nest found as 2 eggs abandoned, unknown if pre- or post-term. No sign of fertilization when egg contents examined.

Appendix B. Snowy plover nests at ODSVRA in 2017 (continued).

Insufficient information available to assign the following broods to a specific nest. Most to all of these broods were likely from nests with an assigned number, known to hatch and with chicks not banded at nest. The majority of chicks could not be banded to avoid disturbing nearby young snowy plover broods.										
Nest	**Location**	**Adult pair**	**Est. initiation date**	**Nest fate**	**Fate date (est.)**	**No. eggs**	**No. chicks (No. fledged)**	**No. chicks banded and combination**	**Nest protection type**	**Notes**
UNK1	Unknown	F= M=NY:NR	na	Hatch	(4-Jun)	-	3 (1)	3 unbanded	-	
UNK2	Unknown	F=PG:PG M=VV:YG	na	Hatch	(9-Jun)	-	2 (2)	2 unbanded	-	
UNK3	Unknown	F= M=U	na	Hatch	(10-Jun)	-	3 (1)	3 unbanded	-	
UNK4	Unknown	F=U M=U	na	Hatch	(13-Jun)	-	2 (1)	2 unbanded	-	
UNK5	Unknown	F= M=U	na	Hatch	(1-Aug)	-	2 (1)	2 unbanded	-	
UNK6	Unknown	F=U M=VG:BY	na	Hatch	(23-May)	-	3 (0)	3 unbanded	-	

APPENDIX C. MAPS OF ALL CALIFORNIA LEAST TERN AND SNOWY PLOVER NEST LOCATIONS AT ODSVRA IN 2017.

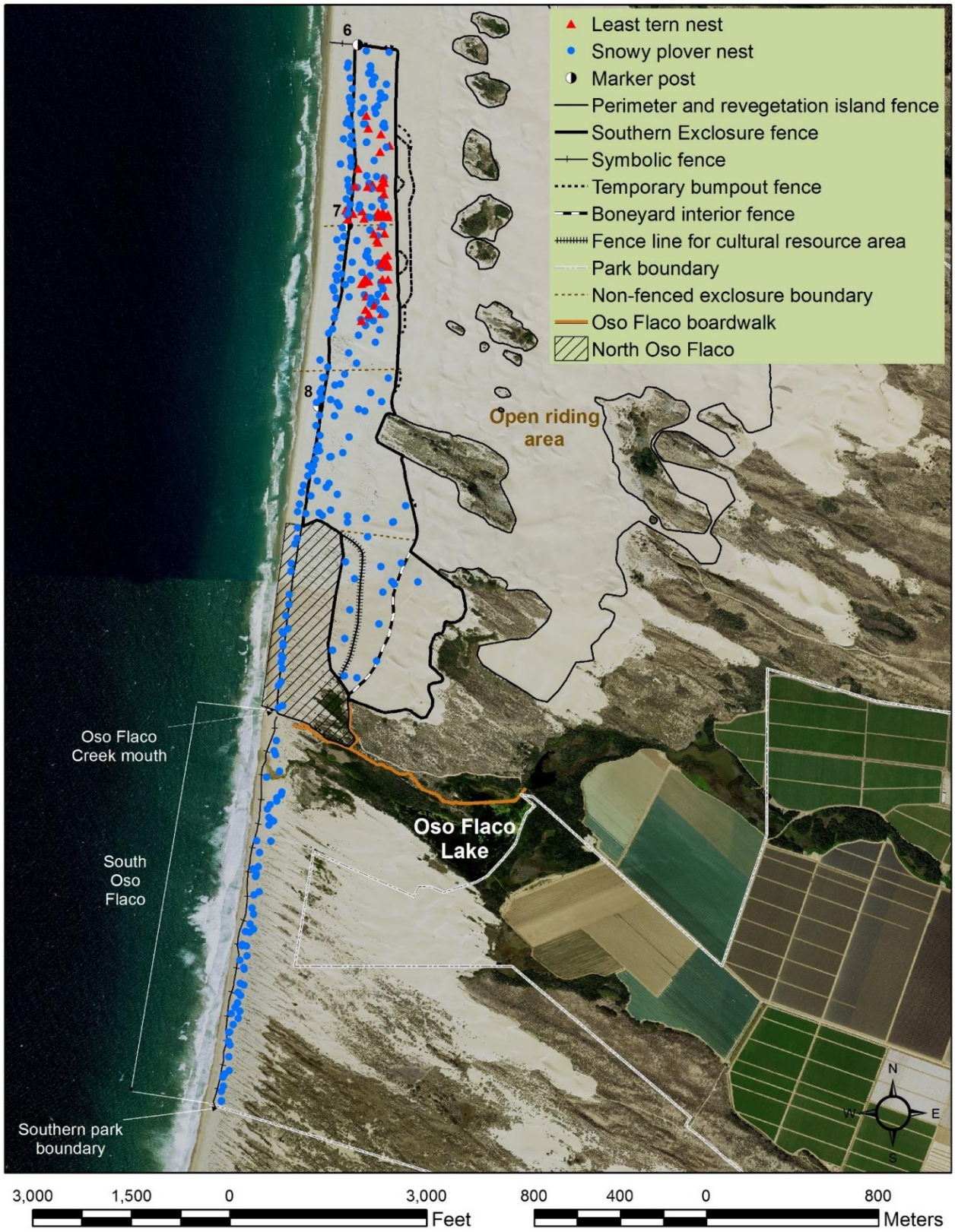


Figure C.1. California least tern and snowy plover nest locations at ODSVRA in 2017.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2017 (continued).

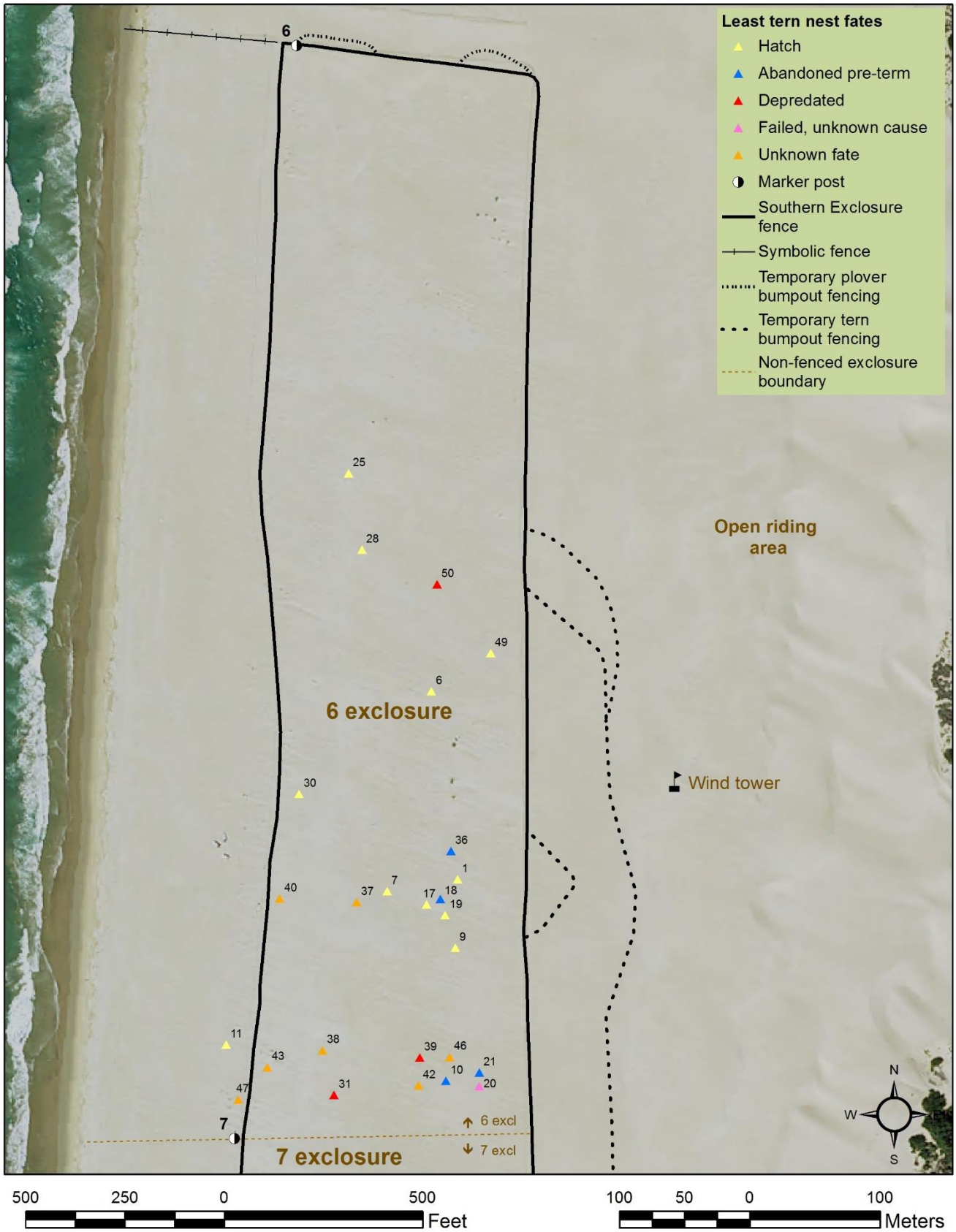


Figure C.2. California least tern nest locations at ODSVRA 6 exclosure in 2017.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2017 (continued).

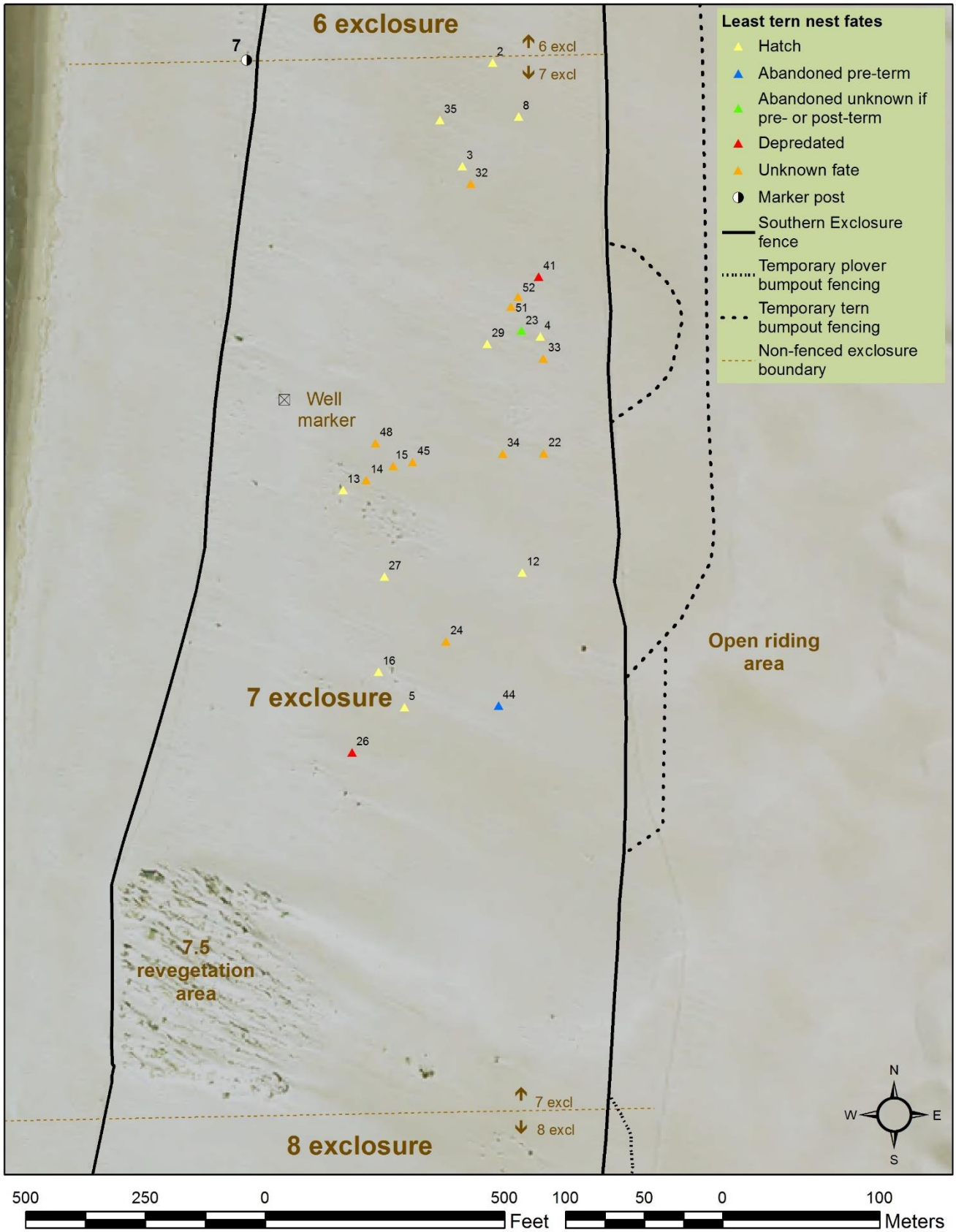


Figure C.3. California least tern nest locations at ODSVRA 7 exclosure in 2017.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2017 (continued).

Figure C.4. Snowy plover nest location at ODSVRA Arroyo Grande Creek area in 2017.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2017 (continued).

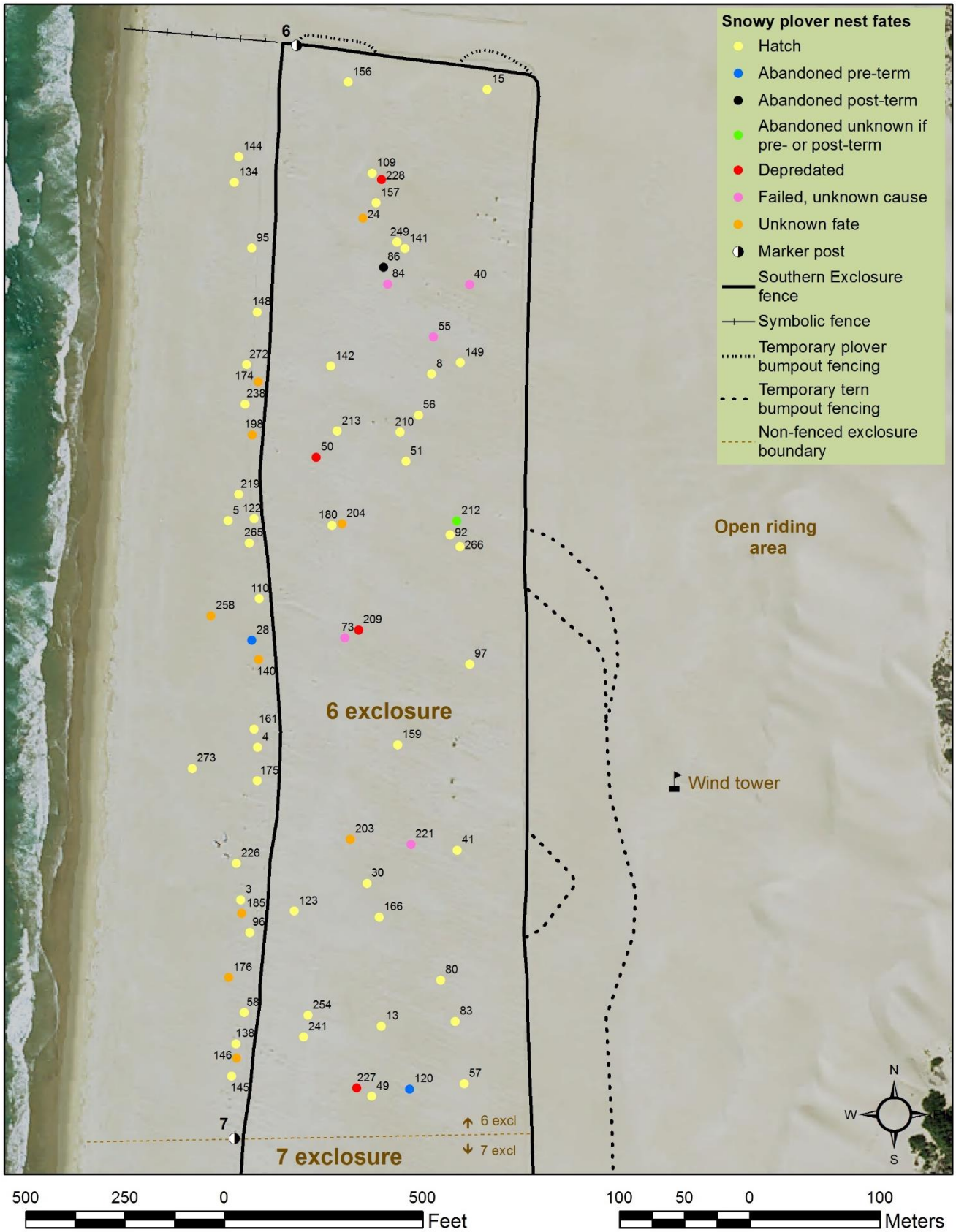


Figure C.5. Snowy plover nest locations at ODSVRA 6 exclosure in 2017.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2017 (continued).

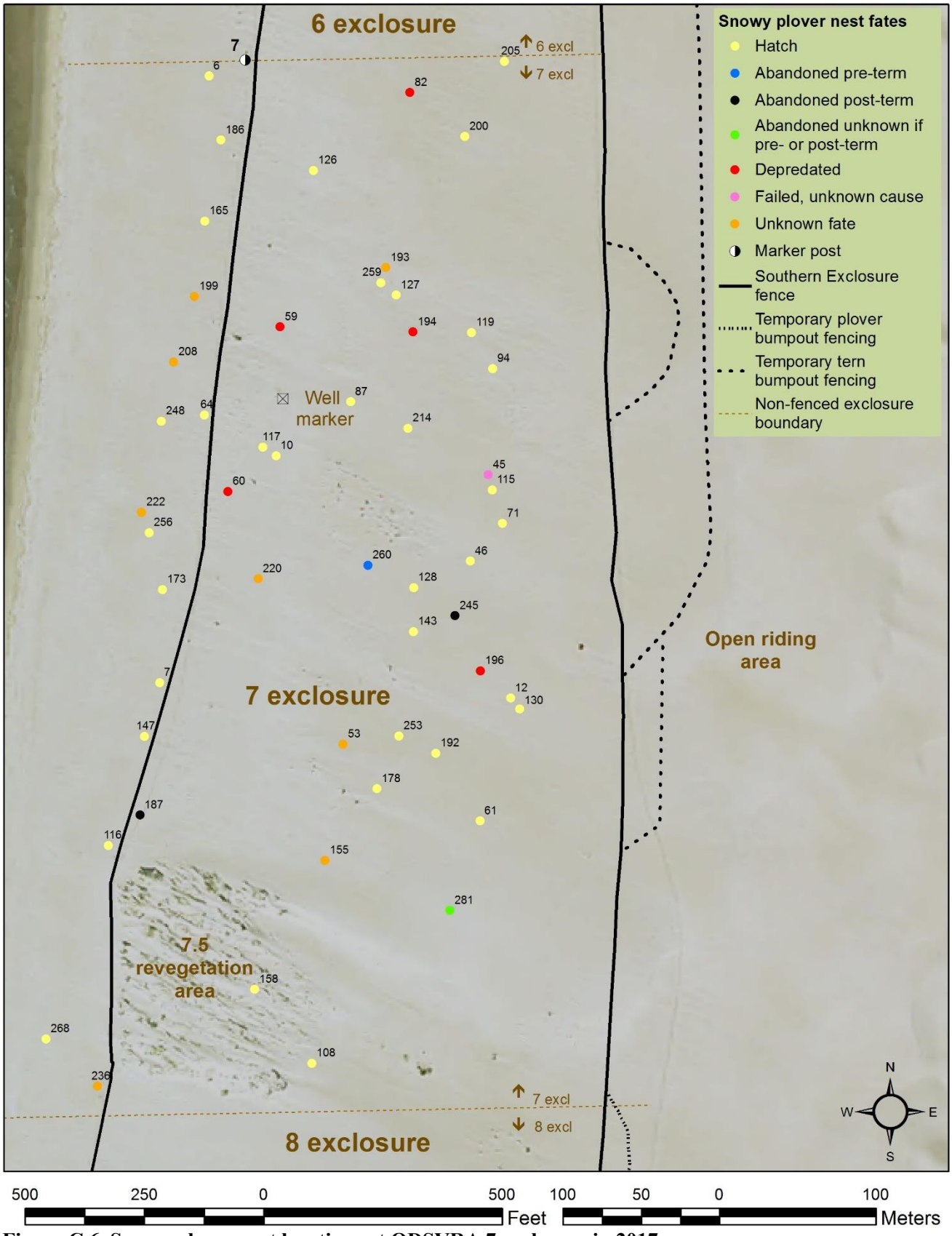


Figure C.6. Snowy plover nest locations at ODSVRA 7 exclosure in 2017.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2017 (continued).

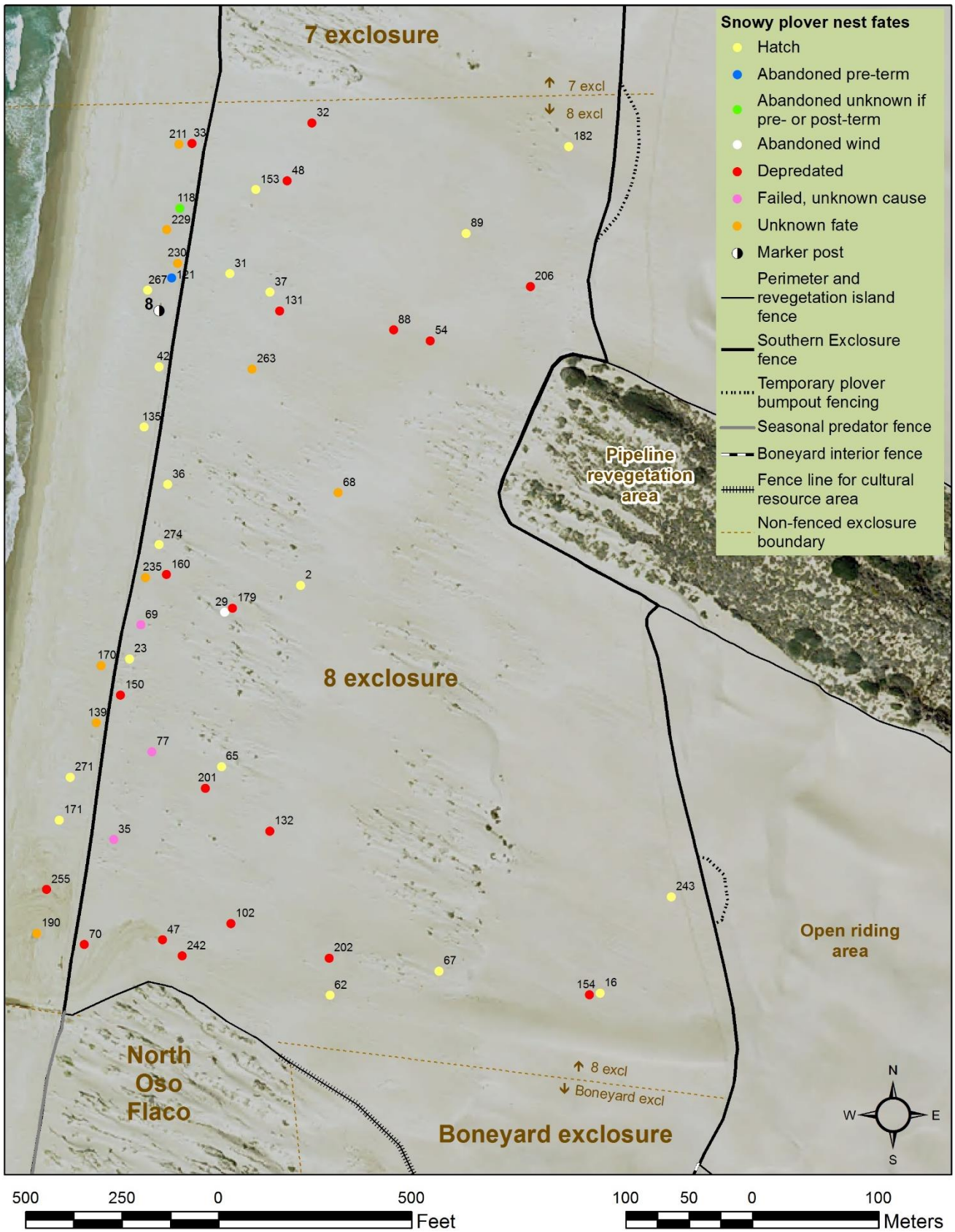


Figure C.7. Snowy plover nest locations at ODSVRA 8 exclosure in 2017.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2017 (continued).

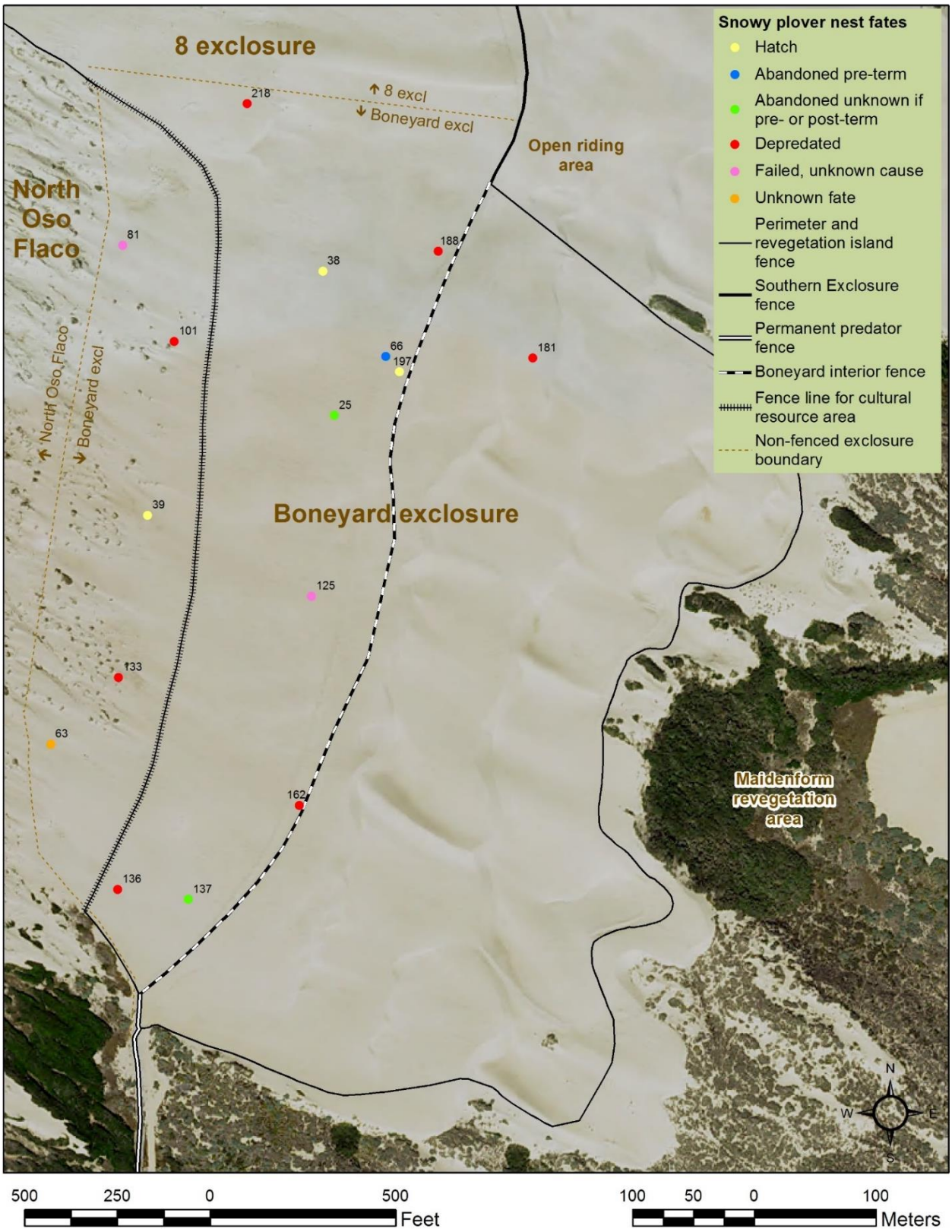


Figure C.8. Snowy plover nest locations at ODSVRA Boneyard exclosure in 2017.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2017 (continued).

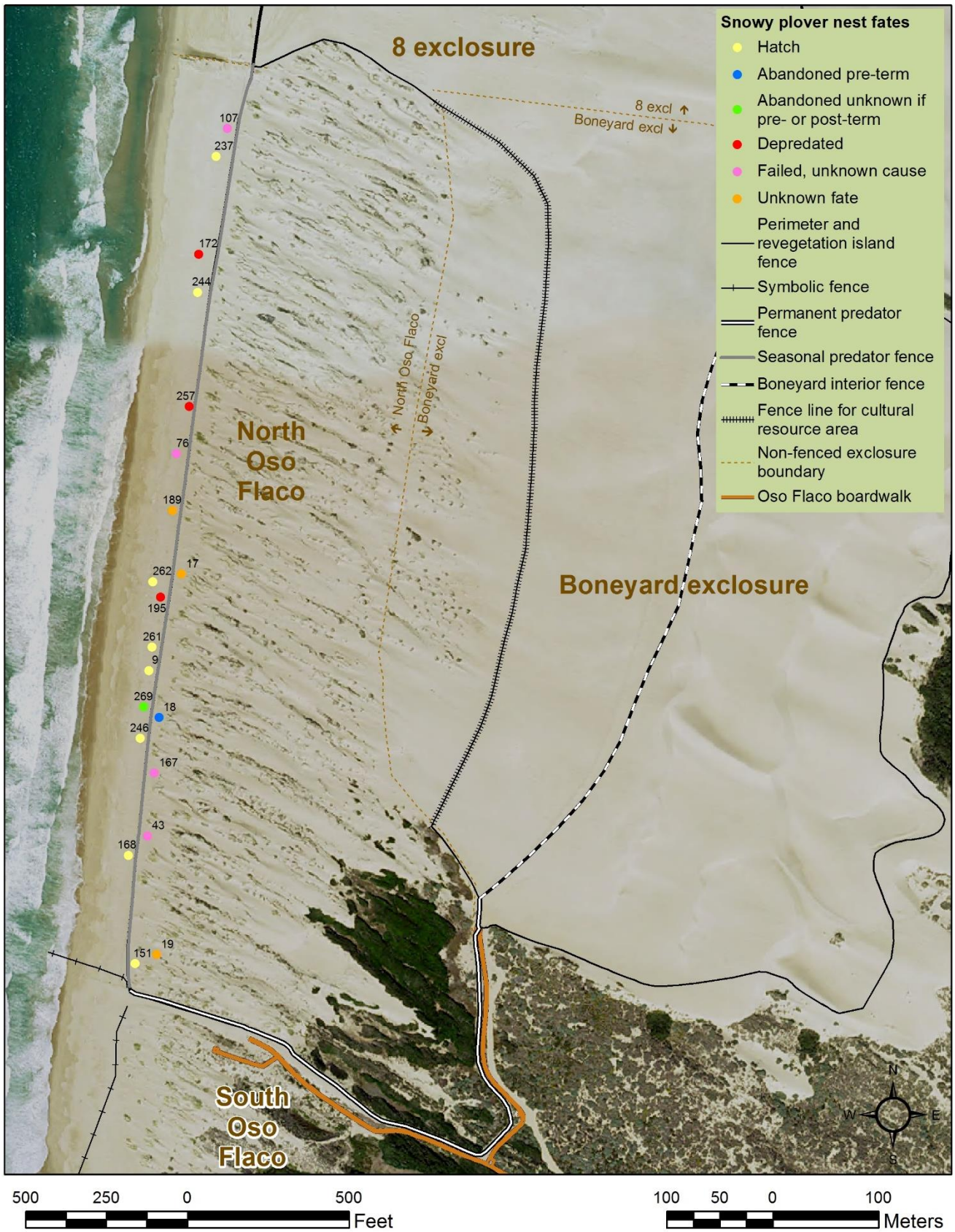


Figure C.9. Snowy plover nest locations at ODSVRA North Oso Flaco in 2017.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2017 (continued).

Figure C.10. Snowy plover nest locations at ODSVRA South Oso Flaco in 2017.

APPENDIX D. BANDED LEAST TERNS AND SNOWY PLOVERS.

Table D.1. Banded least terns recorded at ODSVRA in 2017.

Juveniles fledged from ODSVRA in 2017 are not included. All birds from ODSVRA were banded as chicks. Additional color-banded birds were recorded but combinations not confirmed. A number of birds had a band on only one leg. These birds may have been banded on only one leg or have lost a band. All possible band combinations of birds known fledging from ODSVRA are listed for incomplete band combinations or for band combinations that were used multiple years. Sex is included if copulation was observed and bands could be determined at that time. (For a description of color band letter codes see Appendix B.)

Band	Dates Seen	Origin and Year Banded	Notes
-:A/B	6/24	ODSVRA unknown year	Y/G:A/B in 2006, G/Y:A/B in 2008, W/B:A/B in 2010, B/W:A/B in 2011.
-:G/O	6/24	ODSVRA 2008 or 2011	G/Y:G/O in 2008, B/W:G/O in 2011.
-:S	7/2	Unknown	Multiple sites may band with only the federal band. Also may be any ODSVRA fledgling from 2004 when all banded G/Y:S or any ODSVRA fledgling that lost the left band and tape on a metal band.
-:W	5/25	ODSVRA unknown year	Multiple birds were banded with white on the right leg at ODSVRA in 2006, and 2008 to 2013.
-:W/A	5/20, 5/25	ODSVRA unknown year	Y/G:W/A in 2006, G/Y:W/A in 2008, W/B:W/A in 2010, B/W:W/A in 2011.
-:W/A/W	5/20, 5/21, 5/22, 7/28	ODSVRA 2008	G/Y:W/A/W in 2008. **Breeding adult associated with unbanded juvenile.**
-:W/B/W	6/22	ODSVRA 2008	G/Y:W/B/W in 2008
-:Y/R	7/2	ODSVRA unknown year	Y/G:Y/R in 2006, G/Y:Y/R in 2008, W/B:Y/R in 2010, B/W:Y/R in 2011
A/B:G/Y	6/12, 6/24	ODSVRA 2014	**LT36 breeding adult**
A/W:Y/G	5/25	ODSVRA 2015	
B/O:-	6/24	ODSVRA 2009, 2012, or 2014	B/O:W/B in 2009, B/O:B/W in 2012, or B/O:- in 2014
B/R:Y/G	6/24, 7/13, 7/16	ODSVRA 2015	
B/W:B/O	6/11, 6/16, 6/24	ODSVRA 2011	**LT2 breeding adult**
B/W:B/Y	6/24	ODSVRA 2011	
B/W:O/W	6/20, 6/22	ODSVRA 2011	**LT8 breeding adult**
B/W:P	6/24	ODSVRA 2011	
B/W:R/W	5/16	ODSVRA 2011	
B/W:W/B	6/24, 7/7	ODSVRA 2009, 2011, or 2013	
B/W:Y/G	5/24	ODSVRA 2011, or 2015	
B:G/Y	6/24	ODSVRA 2007 or 2014	
B:W/B	6/24, 7/2	ODSVRA 2009 or 2013	
G/O:Y/G	7/16	ODSVRA 2015	
G/W:G/Y	6/22	ODSVRA 2007 or 2014	
G/Y:B/W	6/22	ODSVRA 2008 or 2012	**Breeding adult associated with unbanded juvenile.**
G:B/W	6/24	ODSVRA 2012	
K:W/B	5/27, 6/17, 6/24, 7/26	ODSVRA 2013	
L:Y/G	7/14, 7/16	ODSVRA 2014	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.1. Banded least terns recorded at ODSVRA in 2017 (continued).

Band	Dates Seen	Origin and Year Banded	Notes
N:G/Y	6/24	ODSVRA 2014	
O/A:Y/G	6/24	ODSVRA 2015	
O/G:B/W	7/15, 7/16	ODSVRA 2012	
O/Y:B/W	6/16	ODSVRA 2012	
P:G/Y	6/24	ODSVRA 2007 or 2014	
R/W:G/Y	6/24, 7/15, 7/16	ODSVRA 2007 or 2014	
R:Y/G	6/23	ODSVRA 2015	
S:-	6/24, 7/2, 7/5	Unknown	Multiple sites may band with only the federal band. Also may be any ODSVRA fledgling from 2003 when all banded S:G/Y or any ODSVRA fledgling that lost the right band and tape on a metal band.
W/A:Y/G	6/24, 7/2	ODSVRA 2015	
W/B:B/W	6/20	ODSVRA 2010 or 2012	**LT12 breeding adult**
W/B:G/Y	6/22	ODSVRA 2007 or 2014	**LT12 breeding adult**
W/B:R/Y	6/18, 6/19, 7/5, 7/7	ODSVRA 2010	**LT6 breeding adult**
W/B:W	6/1, 6/19, 6/22, 7/15	ODSVRA 2010	**LT20 breeding adult**
W/B:W/A	6/24, 7/10, 7/16	ODSVRA 2010	**LT49 breeding adult**
W/B:W/G	6/20	ODSVRA 2010	**LT8 breeding adult**
W/B:W/Y	6/26	ODSVRA 2010	**LT44 breeding adult**
W/G:Y/G	6/24	ODSVRA 2015	
W/O:B/W	6/16	ODSVRA 2012	
W/R:G/Y	8/2	ODSVRA 2007 or 2014	
W/Y:W/B	5/27	ODSVRA 2009 or 2013	
W:G/Y	6/24, 7/13, 7/17	ODSVRA 2007 or 2014	
W:W/B	6/17	ODSVRA 2009 or 2013	
Y/G:B/W	5/20, 6/24, 7/13	ODSVRA 2006 or 2012	
Y/G:R/A	7/23	ODSVRA 2006	
Y/O:W/B	7/15	ODSVRA 2009	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2016 to 28 February 2017.

All birds were banded as chicks unless otherwise noted. Chicks banded outside of San Luis Obispo County are noted in order from north to south. Some sites band to brood and can have more than one bird with the same combination. At ODSVRA, the same combination may be on birds hatched in different years. (For a description of color band letter codes see Appendix B.)

ODSVRA = Oceano Dunes SVRA, SLO = San Luis Obispo, VAFB = Vandenberg Air Force Base, SB = State Beach, NWR = National Wildlife Refuge

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
AG:GA	Moss Landing Salt Ponds 2014	Monterey, Ca	10/1, 10/2, 10/3, 10/4, 10/5, 10/6, 10/7, 10/8, 10/11, 10/12, 10/13, 10/17	
OW:GL	Moss Landing Salt Ponds 2016	Monterey	10/1, 10/2, 10/3, 10/4, 10/6, 10/8, 10/10, 10/12, 10/13, 10/16, 10/19, 10/20, 10/21, 10/24, 10/27, 10/29, 10/30, 10/31, 11/6, 12/7, 12/8, 12/20, 1/25, 2/15	
BY:RR	Salinas River SB 2010	Monterey	10/21	
OL:GP	Salinas River NWR 2009	Monterey	10/1, 10/2, 10/3, 10/4, 10/5, 10/7, 10/9, 10/12, 10/13, 10/17, 10/18, 10/21, 10/28, 10/29, 12/7, 12/20, 2/15	
YP:OL	Salinas River NWR 2008	Monterey	10/1, 10/2, 10/3, 10/5, 10/12, 10/13, 10/16, 10/18, 10/19, 10/21, 10/22, 10/24, 12/20	
OL:RL	Reservation Road 2016	Monterey	10/11, 10/12, 10/13, 10/14, 10/16	
OY:RB	Reservation Road 2014	Monterey	10/1, 10/3, 10/4, 10/5, 10/7, 10/11, 10/12, 10/13, 10/14, 10/15, 10/16, 10/17, 10/20, 10/21, 10/22, 10/23, 10/24, 10/27, 10/30, 10/31, 11/3	
YG:WL	Reservation Road 2016	Monterey	10/8, 10/10, 10/12, 10/16, 10/17, 10/22, 10/23, 10/24, 10/27, 12/20, 12/22, 1/25, 2/15	
YR:YR	Fort Ord 2015	Monterey	10/5, 10/7, 10/8, 10/11, 10/12, 10/14, 10/16, 10/19, 10/20, 10/21, 10/22, 10/27, 10/29, 10/30, 10/31, 11/6, 12/8, 12/20	
-:BW originally banded VO:BW	ODSVRA 2014 or 2015	SLO, Ca	10/1, 10/3, 10/10, 10/12	Bird originally banded VO:BW, violet and orange bands removed 2016and now banded -:BW. Left foot missing.
BB:BY	ODSVRA 2010 or 2013	SLO	10/1, 10/5, 10/6, 10/8, 10/10, 10/11, 10/13, 10/20, 10/23, 10/24, 10/27, 10/28, 10/29, 10/30, 12/5, 12/8, 12/20, 1/25, 2/8	
BB:GB	ODSVRA 2014 or 2015	SLO	10/2, 10/3, 10/7, 10/11, 10/14, 10/16, 10/18, 10/19, 10/20, 10/31, 11/3, 11/5	
BB:GG	ODSVRA 2013 or 2014	SLO	10/6	
BB:PG	ODSVRA 2013 or 2014	SLO	10/3, 10/6, 10/8, 10/11, 10/12, 10/16, 10/17, 10/20, 11/6, 11/18, 11/28, 11/30, 12/20, 1/25, 2/15	
BB:PW	ODSVRA 2014 or 2016	SLO	10/1, 10/3, 10/4, 10/5, 10/7, 10/11, 10/17, 10/20, 10/21, 10/22, 10/27	On 30 November 2016, carcass found at ODSVRA (see Appendix G).
BB:RR	ODSVRA 2016	SLO	10/1	
BB:RW	ODSVRA 2014 or 2015	SLO	10/8	
BB:VG	ODSVRA 2013	SLO	11/3	
BB:VR	ODSVRA 2011, 2013, or 2014	SLO	10/6, 10/7, 10/12, 10/17, 10/18, 10/19, 10/20, 10/23, 10/24, 10/28, 12/20, 2/15	
BB:YG	ODSVRA 2011 or 2015	SLO	10/6, 10/18, 10/19, 10/22, 10/29	
BB:YR	ODSVRA 2015 or 2016	SLO	10/5, 10/19, 10/28, 11/5, 2/8	
BB:YW	ODSVRA 2013	SLO	10/1, 10/3, 10/4, 10/5, 10/7, 10/8, 10/9, 10/10, 10/11, 10/13, 10/15, 10/20, 10/21, 10/22, 10/27, 10/31, 11/3, 11/4, 11/5, 11/6, 12/7, 12/20, 1/25	
GA:AG	ODSVRA 2012 or 2013	SLO	10/18	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2015 to 28 February 2017 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
GA:BY	ODSVRA 2014 or 2016	SLO	10/3, 10/4, 10/6, 10/8, 10/12, 10/13, 10/14, 10/17, 10/20, 10/23, 10/24, 10/27, 10/28, 10/29, 10/30, 10/31, 12/7, 12/8, 2/15	
GA:GR	ODSVRA 2015 or 2016	SLO	10/1, 10/3, 10/8, 10/16, 10/19, 10/28, 11/5, 11/6	
GA:GY	ODSVRA 2012 or 2013	SLO	10/1, 10/2, 10/5, 10/7, 10/8, 10/11, 10/21, 10/22, 10/23, 10/27, 10/30, 10/31, 11/5	
GA:OY	ODSVRA 2014 or 2015	SLO	10/1, 10/2, 10/3, 10/6, 10/16, 10/20, 10/21, 10/23, 10/27, 10/30, 11/4, 11/17, 11/22, 12/8, 12/12, 12/20	
GA:RB	ODSVRA 2010	SLO	10/12, 10/18, 10/28, 10/29, 11/5, 12/20, 2/15	
GA:RG	ODSVRA 2015 or 2016	SLO	10/2, 10/3, 10/6, 10/8	
GA:VY	ODSVRA 2014 or 2015	SLO	10/21	
GA:WW	ODSVRA 2016	SLO	10/17, 10/18, 10/19, 10/20, 10/22, 10/27, 10/28, 10/29, 11/6, 11/28, 12/20	
GG:AY	ODSVRA 2012 or 2013	SLO	10/1, 10/3, 10/4, 10/13, 10/14, 10/20, 10/22, 10/24, 10/27, 10/31, 11/5, 11/6, 11/30	
GG:GG	ODSVRA 2011 or 2013	SLO	10/1, 10/3, 10/4, 10/5, 10/6, 10/7, 10/11, 10/12, 10/13, 10/14, 10/18, 10/20, 10/21, 10/22, 10/23, 10/27, 10/29, 10/31, 11/5, 11/6, 1/25	
GG:GY	ODSVRA 2015 or 2016	SLO	10/28	
GG:OR	ODSVRA 2014 or 2015	SLO	10/1, 10/2, 10/5, 10/7, 10/8, 10/10, 10/13, 10/14, 10/16, 10/17, 10/19, 10/20, 10/21, 10/23, 10/24, 10/27, 10/28, 11/6, 12/8, 2/15, 2/21	
GG:PW	ODSVRA 2013 or 2014	SLO	10/1, 10/2, 10/3, 10/5, 10/6, 10/8, 10/10, 10/13, 10/14, 10/15, 10/16, 10/17, 10/18, 10/19, 10/20, 10/23, 10/24, 10/27, 10/30, 11/6, 12/7, 12/8, 12/12, 12/13, 12/20, 1/25, 2/15	
GG:RW	ODSVRA 2014 or 2015	SLO	10/4, 10/29	
GG:VY	ODSVRA 2011 or 2013	SLO	10/1, 10/6, 10/7, 10/8, 10/10, 10/12, 10/14, 10/15, 10/16, 10/17, 10/18, 10/19, 10/27, 10/31, 11/6, 12/8, 12/12, 2/21	
PG:AR	ODSVRA 2014	SLO	10/1, 10/2, 10/3, 10/4, 10/5, 10/6, 10/7, 10/8, 10/9, 10/12, 10/13, 10/14, 10/17, 10/18, 10/19, 10/20, 10/21, 10/22, 10/23, 10/24, 10/27, 10/28, 10/30, 10/31, 11/6, 12/13, 12/22, 1/25	
PG:GG	ODSVRA 2012 or 2013	SLO	10/13	
PG:GY	ODSVRA 2016	SLO	10/1, 10/2, 10/6, 10/7, 10/10, 10/11, 10/12, 10/14, 10/17, 10/20, 10/21, 10/23, 10/27, 10/30, 12/8, 12/20	
PG:OG	ODSVRA 2015	SLO	10/1, 10/2, 10/7, 10/8, 10/14, 10/16, 10/20, 10/21, 10/23, 10/27, 10/28, 10/29, 10/30, 10/31, 11/28, 12/8, 2/8	
PG:OW	ODSVRA 2015 or 2016	SLO	10/2, 10/3, 10/6, 10/10, 10/11, 10/12, 10/15, 10/16, 10/17, 10/18, 10/20, 10/21, 10/23, 10/24, 10/27, 10/28, 10/29, 10/30, 10/31, 11/30, 12/20, 2/15, 2/21	
PG:PG	ODSVRA 2014 or 2015	SLO	10/8, 10/10, 10/13, 10/17, 10/22, 10/24, 10/30, 10/31, 11/6, 12/7, 12/8, 1/25, 2/15	
PG:PW	ODSVRA 2012 or 2014	SLO	10/1, 10/8, 10/12, 10/15, 10/16, 10/18, 10/23, 10/28, 10/29, 10/31, 11/18, 11/30	
PG:VG	ODSVRA 2014 or 2015	SLO	10/1, 10/3, 10/4, 10/6, 10/7, 10/13, 10/14, 10/17, 10/18, 10/23, 10/27, 10/28, 10/29, 10/30, 11/3, 11/6, 12/8, 1/25, 2/15	
PG:WG	ODSVRA 2014, 2015 or 2016	SLO	10/3, 10/20, 10/23, 10/24, 10/27, 10/29, 12/20, 12/22	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2015 to 28 February 2017 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
PG:YY	ODSVRA 2015	SLO	10/1, 10/2, 10/3, 10/5, 10/6, 10/7, 10/11, 10/12, 10/13, 10/14, 10/15, 10/17, 10/18, 10/19, 10/20, 10/22, 10/23, 10/24, 10/27, 10/28, 10/29, 10/30, 10/31, 11/5, 2/15	On 1 November 2016, carcass found at ODSVRA (CDPR 2016). Three birds banded with the same band combination in 2015.
PV:-	ODSVRA unknown year	SLO	10/1, 10/8, 10/13, 10/18, 10/19, 10/21, 10/27, 11/6, 12/20, 1/25, 2/15	
PV:GG	ODSVRA 2014 or 2015	SLO	2/15, 2/26	On 26 February 2017, carcass found at ODSVRA (see Appendix G). Four birds banded with the same combination, two in 2014 and two in 2015.
PV:GY	ODSVRA 2008	SLO	10/6	
PV:PY	ODSVRA 2014 or 2016	SLO	10/5	
PV:VW	ODSVRA 2014 or 2015	SLO	10/3, 10/6, 12/20, 1/25	
PV:VY	ODSVRA 2009	SLO	10/1, 10/2, 10/3, 10/7, 10/10, 10/16, 10/17, 10/24, 10/27, 10/30, 10/31, 11/6	
PV:WG	ODSVRA 2016	SLO	2/21	
PV:YG	ODSVRA 2015	SLO	10/2, 10/5, 10/7, 10/8, 10/9, 10/11, 10/13, 10/14, 10/15, 10/16, 10/17, 10/19, 10/20, 10/27, 10/28, 10/29, 10/31, 11/5, 11/30, 12/7, 12/20, 1/25, 2/15	
RR:AB	ODSVRA 2016	SLO	12/12, 2/15	
RR:BB	ODSVRA 2016	SLO	12/20, 1/25, 2/15	
RR:BG	ODSVRA 2016	SLO	10/1, 10/5, 11/5, 12/8, 2/15	
RR:VY	ODSVRA 2016	SLO	10/1	
VG:AW	ODSVRA 2011 or 2013	SLO	2/15	
VG:GW	ODSVRA 2011 or 2013	SLO	10/28, 11/5, 11/30, 12/20, 2/15	
VG:OB	ODSVRA 2014 or 2015	SLO	10/1, 10/2, 10/4, 10/5, 10/6, 10/13, 10/14	
VG:VW	ODSVRA 2011 or 2013	SLO	12/20	
VG:YB	ODSVRA 2014 or 2015	SLO	12/20	
VG:YR	ODSVRA 2012 or 2015	SLO	10/1, 10/2, 10/19, 11/5, 11/30, 12/8	
VV:AA	ODSVRA 2011	SLO	10/2, 10/5, 10/7, 10/8, 10/10, 10/11, 10/17, 10/20, 10/22, 10/23, 10/24, 10/27, 11/5, 12/20, 1/25, 2/15	
VV:BB	ODSVRA 2011 or 2013	SLO	11/3	
VV:BG	ODSVRA 2013	SLO	10/1, 10/2, 10/3, 10/5, 10/7, 10/28, 10/31, 11/5, 11/6, 12/8, 1/25, 2/15	
VV:GR	ODSVRA 2012 or 2013	SLO	10/1, 10/2, 10/4, 10/7, 10/8, 10/12, 10/17, 10/18, 10/21, 10/22, 10/24, 10/30, 12/20, 12/22, 1/25, 2/21	
VV:GW	ODSVRA 2015	SLO	2/21	
VV:OY	ODSVRA 2015 or 2016	SLO	10/1, 10/2, 10/3, 10/6, 10/7, 10/11, 10/20, 10/21, 10/22, 10/23, 10/27, 10/29, 10/30, 10/31, 11/5, 11/6, 12/5, 12/7, 12/8, 12/13, 12/20	
VV:RG	ODSVRA 2015	SLO	10/2, 10/27	
VV:RY	ODSVRA 2015 or 2016	SLO	2/15	
VV:VB	ODSVRA 2011 or 2013	SLO	10/3, 10/6, 10/14, 10/18, 10/19, 10/20, 10/22, 12/8, 2/15	
VV:VG	ODSVRA 2009, 2011 or 2013	SLO	10/8	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2015 to 28 February 2017 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
VV:VW	ODSVRA 2008, 2011 or 2013	SLO	10/3, 10/7, 10/13, 10/14, 10/18, 10/23, 10/28, 10/29, 10/31, 11/4	
VV:VY	ODSVRA 2011	SLO	10/17	
VV:WY	ODSVRA 2012 or 2013	SLO	10/1, 10/2, 10/6, 10/11, 10/13, 10/14, 10/15, 10/16, 10/20, 10/24, 10/28, 10/30, 10/31, 11/4, 11/6, 12/7, 12/8, 12/20, 12/22, 2/21	
VV:YR	ODSVRA 2014 or 2015	SLO	10/12	
VV:YW	ODSVRA 2011 or 2013	SLO	10/1, 10/19, 10/22, 10/28, 10/29	
A:G/W/G	VAFB 2016	Santa Barbara, Ca	2/15	
B:Y/G	VAFB 2013	Santa Barbara	10/10, 10/20, 11/5	
L:Y/G	VAFB 2016	Santa Barbara	11/5, 11/30, 12/8, 2/6, 2/15	
NB:PG	VAFB 2016	Santa Barbara	11/5	
NO:NR	VAFB 2015	Santa Barbara	10/31	
NO:OR	VAFB 2016	Santa Barbara	10/3, 10/12, 10/13, 10/18, 10/20, 10/22, 10/23, 10/24, 10/27, 10/30, 11/4, 11/6, 12/13, 1/25, 2/15, 2/21	
NW:WG	VAFB 2014	Santa Barbara	10/5, 10/7, 10/11, 10/12, 10/13, 10/14, 10/16, 10/20, 10/27, 10/30, 11/6, 12/20, 1/25, 2/15, 2/21	
NY:RB	VAFB 2008 or 2013	Santa Barbara	10/1, 10/2	
O-:AG originally banded NO:AG	VAFB 2012	Santa Barbara	10/2, 10/4, 10/11, 10/13, 10/18, 10/19, 10/20, 10/21, 10/22, 10/24, 10/27, 10/31, 11/6, 1/25	Originally banded NO:AG, top brown band missing and now banded O-:AG. On federal service band on left leg there is exposed metal above orange band.
O-:WY originally banded NO:WY	VAFB 2013	Santa Barbara	10/3, 10/6, 10/14, 10/27	Originally banded NO:WY, top brown band missing and now banded O-:WY. On federal service band on left leg there is exposed metal below orange band.
RB:PG	VAFB 2011	Santa Barbara	10/17, 10/19, 10/20, 10/28	
-:AY	Unknown origin	Unknown	10/2, 10/3, 10/4, 10/8, 10/12, 10/13, 10/17, 10/18, 10/20, 10/23, 10/27, 10/28, 10/29, 10/30, 10/31, 11/4, 11/6, 12/8, 12/20, 1/25	
S:-	Unknown origin	Unknown	10/19, 10/29	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2017.

Juveniles fledged from ODSVRA in 2017 are not included. All birds were banded as chicks unless otherwise noted. Chicks banded outside of San Luis Obispo County are noted in order north to south. Some sites band to brood and can have more than one bird with the same combination. (For a description of color band letter codes see Appendix B.)

ODSVRA = Oceano Dunes SVRA, SLO = San Luis Obispo, VAFB = Vandenberg Air Force Base, SB = State Beach, NWR = National Wildlife Refuge

F = Female, M = Male

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
GW:WG		Siltcoos 2011	Lane, OR	8/7, 8/8, 8/21	Banded as an adult.
R:G/K		Coos Bay 2017	Coos, OR	9/23	
BY:AR	M	Pajaro Spit 2017	Monterey, CA	8/7	Banded as an adult. Blue band on left leg on upper leg segment.
OW:GL		Pajaro Spit 2016	Monterey	3/3, 3/26, 3/31, 9/21, 9/24	
BO:WR		Zmudowski 2017	Monterey	8/24, 8/25, 8/27, 8/28	Juvenile.
YP:OL		Salinas River NWR 2008	Monterey	9/14	
YG:WL		Reservation Road 2016	Monterey	3/17, 3/26, 3/29, 3/31, 4/3	
AG:GA	M	Moss Landing Salt Ponds 2014	Monterey	3/12, 3/13, 3/23, 3/25, 3/27, 3/28, 3/29, 3/30, 3/31, 4/2, 4/3, 4/4, 4/5, 4/6, 4/7, 4/11, 4/12, 4/16, 4/22, 4/26, 4/29, 5/5, 5/7, 5/8 5/14, 5/18, 5/19, 5/24, 5/26, 5/28, 6/6, 6/8, 6/17, 6/21, 6/23, 7/1, 7/2, 7/5, 7/6, 7/7, 7/13, 8/1, 8/11, 8/12, 8/14, 8/15, 8/16, 8/17, 8/18, 8/21, 8/22, 8/23, 8/24, 8/25, 8/26, 8/27, 8/30, 9/1, 9/8, 9/9, 9/24, 9/29	ODSVRA breeding male.
AY:BL		Fort Ord 2016	Monterey	3/2, 3/6, 3/12	
-:BW originally banded VO:BW	M	ODSVRA 2014 or 2015	SLO, CA	4/18, 4/22, 5/20, 5/22, 6/6, 6/9, 6/10	ODSVRA breeding male. Bird originally banded VO:BW, violet and orange bands removed 2016 and now banded -:BW. Left foot missing.
BB:AW	M	ODSVRA 2015 or 2016	SLO	5/3, 5/5, 5/9, 5/10, 5/14, 5/18, 5/25, 6/1, 6/5, 6/9, 6/11, 6/14, 6/18, 6/21, 6/23, 7/1, 7/2, 7/5, 7/6	ODSVRA breeding male.
BB:BG	M	ODSVRA 2015 or 2016	SLO	4/3, 5/20, 5/21, 5/24, 5/26, 5/31, 6/8, 6/9, 6/10, 6/12, 6/16, 6/21, 6/28, 6/29, 7/8, 7/21	ODSVRA breeding male
BB:BY	M	ODSVRA 2010 or 2013	SLO	3/2, 3/15, 3/17, 3/22, 3/23, 3/25, 4/1, 4/3, 4/4, 4/7, 4/8, 4/9, 4/12, 4/13, 4/20, 4/21, 4/26, 4/28, 4/29, 5/1, 5/2, 5/4, 5/5, 5/6, 5/8, 5/9, 5/10, 5/11, 5/14, 5/16, 5/17, 5/18, 5/19, 5/20, 5/21, 5/22, 5/24, 5/26, 5/27, 6/2, 6/3, 6/7, 6/9, 6/13, 6/14, 6/15, 6/18, 6/21, 6/22, 6/26, 6/29, 6/30, 7/2, 7/3, 7/4, 7/5, 7/6, 7/8, 7/29, 7/30, 7/31, 8/1, 8/3, 8/9, 8/11, 8/22, 8/24, 8/26, 8/31, 9/1, 9/4, 9/8, 9/14	ODSVRA breeding male.
BB:GR	M	ODSVRA 2012 or 2015	SLO	4/11, 4/14, 4/28, 5/11, 5/19, 5/21, 5/23, 5/25, 5/26, 5/28, 5/30, 6/3, 6/13, 6/15, 7/12, 7/14, 7/16, 7/17, 7/21, 7/25, 7/26, 7/28, 7/29, 8/2, 8/6, 8/7, 8/8, 8/9, 8/11, 8/27, 8/28	ODSVRA breeding male.
BB:OB	M	ODSVRA 2014 or 2016	SLO	4/19, 4/22, 5/4, 5/19, 5/24, 5/31, 6/4, 6/6, 6/7, 6/8, 6/17, 6/29, 6/30, 7/2, 7/6, 7/11, 7/13	ODSVRA breeding male.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2017 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
BB:OR	M	ODSVRA 2016	SLO	5/12, 5/21, 6/20, 7/6, 7/7, 7/10, 7/11, 7/12, 7/16, 7/17, 7/20, 7/25, 7/26, 7/27, 7/28, 7/29, 8/4, 8/5	ODSVRA breeding male.
BB:OW		ODSVRA 2015 or 2016	SLO	5/3, 5/7, 5/8, 5/9	
BB:PG	M	ODSVRA 2013 or 2014	SLO	4/25, 4/26, 5/1, 5/2, 5/4, 5/20, 6/14, 6/16, 6/18, 6/21, 6/28, 7/5, 7/9, 7/10, 7/13, 7/15, 7/21, 7/22, 7/24	ODSVRA breeding male.
BB:PW	F	ODSVRA 2014 or 2016	SLO	5/20	ODSVRA breeding female.
BB:RB		ODSVRA 2015	SLO	4/3, 4/13, 4/21, 4/26, 4/27, 4/28, 4/29, 5/4, 5/15, 5/19, 5/20, 5/24, 5/25, 5/26, 5/27, 5/28, 6/8, 6/9, 6/11, 6/14, 6/15, 7/4, 7/11, 8/13	
BB:RR	M	ODSVRA 2016	SLO	4/12, 4/29, 5/3, 5/4, 5/6, 5/7, 5/8, 5/9, 5/14, 5/16, 5/24, 5/25, 5/26, 5/27, 6/6, 6/9, 6/11, 6/14, 6/18, 6/26, 6/27, 6/30, 7/1, 7/2, 7/4, 8/24	ODSVRA breeding male.
BB:VR	M	ODSVRA 2011, 2013 or 2014	SLO	3/28, 4/4, 5/21, 5/24, 6/7, 6/8, 6/10, 6/14, 6/21, 6/23, 6/30, 7/5, 7/15, 7/19, 7/25, 8/17, 9/5, 9/16, 9/23	ODSVRA breeding male.
BB:VY	F	ODSVRA 2016	SLO	4/7, 5/25, 6/23, 7/3, 7/21, 7/24, 8/28, 8/31	ODSVRA breeding female.
BB:WB	M	ODSVRA 2013	SLO	4/1, 4/5, 4/10, 5/1, 5/3, 5/19, 5/28, 5/31, 6/10, 6/16, 7/26, 7/27, 7/28, 7/29, 7/30, 7/31, 8/1, 8/14	ODSVRA breeding male.
BB:YB	M	ODSVRA 2011, 2013 or 2015	SLO	4/2, 4/3, 4/4, 4/7, 4/16, 4/18, 4/21, 4/29, 4/30, 5/5, 5/8, 5/9, 5/17, 5/18, 5/19, 5/23, 5/24, 5/26, 6/5, 6/8, 6/21, 6/28, 7/2, 7/3, 7/6, 7/8	ODSVRA breeding male.
BB:YG		ODSVRA 2011 or 2015	SLO	7/2	
BB:YR	M	ODSVRA 2015 or 2016	SLO	4/3, 4/4, 4/18, 4/27, 4/28, 5/4, 5/14, 6/13, 6/15, 6/17, 6/26, 6/29	ODSVRA breeding male.
BB:YW	F	ODSVRA 2013	SLO	3/2, 3/15, 3/17, 3/22, 3/23, 3/25, 3/29, 4/27, 4/29, 5/3, 5/4, 5/5, 5/7, 5/9, 5/10, 5/17, 5/18, 5/30, 6/10, 6/11, 6/17, 6/21, 6/26, 7/2, 7/5, 7/16, 7/17, 8/3, 8/7, 8/9, 8/14, 8/17, 8/19, 8/22, 8/24, 8/31, 9/1, 9/3, 9/14, 9/18, 9/24	ODSVRA breeding female.
BB:YY		ODSVRA 2010	SLO	4/29	
GA:AR	M and F	ODSVRA 2015	SLO	3/22, 3/23, 3/24, 3/25, 3/28, 4/26, 5/5, 5/11, 5/14, 5/19, 5/24, 5/25, 5/31, 6/3, 6/9, 6/10, 6/11, 6/16, 6/18, 6/21, 6/23, 6/26, 6/30, 7/1,7 /2, 7/5, 7/7, 7/13, 7/15, 7/16	ODSVRA breeding male and female.
GA:BR		ODSVRA 2016	SLO	7/6, 8/25, 8/27, 8/28	
GA:BY		ODSVRA 2014 or 2016	SLO	3/2, 3/3, 3/5, 3/7, 3/12	
GA:GR		ODSVRA 2015 or 2016	SLO	3/26, 4/2, 4/26, 5/3, 5/24, 7/21, 8/6, 8/7, 8/8, 8/11, 8/13, 8/14, 8/22, 8/23, 8/24, 8/28, 9/5	
GA:O-		ODSVRA unknown	SLO	4/1, 4/7, 5/4, 6/6, 6/15, 7/5	Bird missing right foot.
GA:OG	M and F	ODSVRA 2014 or 2015	SLO	4/1, 4/4, 4/27, 4/28, 5/3, 5/12, 5/19, 5/24, 5/25, 6/5, 6/25	ODSVRA breeding male and female.
GA:OR	F	ODSVRA 2016	SLO	5/22, 5/24, 6/22, 6/23, 6/30, 7/4, 7/5, 7/10, 7/11, 7/13, 7/16, 7/17, 7/19, 7/20, 7/21, 7/25, 7/29, 8/27	ODSVRA breeding female
GA:OW	M	ODSVRA 2013 or 2014	SLO	4/14, 5/11, 5/19, 5/20, 5/22, 5/23, 5/28, 5/30, 6/7, 6/8, 6/9, 6/14, 6/17, 6/21, 6/22	ODSVRA breeding male.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2017 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
GA:OY	F	ODSVRA 2014 or 2015	SLO	5/29, 8/8, 8/20, 8/21, 8/22, 8/23, 8/25, 8/27, 8/28, 9/6, 9/18, 9/24, 9/30	ODSVRA breeding female.
GA:PR	F	ODSVRA 2016	SLO	5/21, 5/24, 5/29, 6/2, 6/17, 6/22, 6/23, 7/4, 8/24, 8/26	ODSVRA breeding female.
GA:RB		ODSVRA 2010	SLO	5/31, 7/12, 8/28, 9/5	
GA:RG		ODSVRA 2015 or 2016	SLO	4/21, 4/28, 5/28, 6/21, 6/28, 7/10, 7/25	
GA:WR	M	ODSVRA 2015 or 2016	SLO	5/24, 5/31, 6/14, 6/15, 6/16, 6/21, 6/28, 6/30	ODSVRA breeding male.
GA:WW	M	ODSVRA 2016	SLO	4/8, 4/12, 5/4, 5/10, 5/19, 5/23, 5/28, 5/31, 7/5, 7/9, 7/15, 7/23, 7/24, 7/25, 7/28, 8/8, 8/9, 8/10, 8/19, 8/25, 8/27, 9/4	ODSVRA breeding male.
GA:Y-	M	ODSVRA unknown	SLO	4/11, 5/4, 6/2, 6/6, 6/7, 6/9, 6/11, 6/14, 6/15, 6/21, 6/28, 6/30, 7/2, 7/5, 7/7, 7/8, 7/19, 7/20, 7/23, 7/25	ODSVRA breeding male.
GA:YR		ODSVRA 2014	SLO	7/17	
GG:AY	M	ODSVRA 2012 or 2013	SLO	4/2, 4/13, 4/15, 4/16, 5/20, 5/21, 6/5, 6/6, 6/8, 6/9, 6/11, 6/16, 6/21, 6/28, 6/29, 7/3, 7/7, 7/13, 7/14	ODSVRA breeding male.
GG:GG	F	ODSVRA 2011 or 2013	SLO	5/25, 7/16, 7/21, 7/23, 8/26, 9/22, 9/24, 9/30	ODSVRA breeding female.
GG:GR		ODSVRA 2011 or 2013	SLO	4/3, 4/11, 5/24, 5/25, 6/21, 7/5	
GG:GW		ODSVRA 2014 or 2015	SLO	8/27	
GG:GY	M	ODSVRA 2015 or 2016	SLO	5/27, 7/1, 7/4, 7/5, 7/10, 7/16, 7/18, 7/19, 7/20, 7/21, 7/24, 7/25, 7/26, 7/27, 7/29, 7/31, 8/2, 8/6	ODSVRA breeding male.
GG:OR		ODSVRA 2014 or 2015	SLO	4/11, 4/18, 5/24, 5/29, 6/4, 6/21, 8/7, 8/8, 8/18, 8/24, 8/25, 8/26, 8/27, 8/31, 9/1, 9/4	
GG:OW		ODSVRA 2014 or 2015	SLO	8/28	
GG:PW	M	ODSVRA 2013 or 2014	SLO	5/3, 5/4, 5/14, 5/17, 5/19, 5/20, 6/6, 6/17, 6/21, 6/23, 6/26, 6/28, 6/30, 7/2, 7/4, 7/5, 7/7, 7/13, 7/14, 7/15, 7/18, 7/19, 7/21, 7/22, 7/23, 7/28, 7/29, 7/30, 8/2, 8/5, 8/13, 8/16, 8/20, 8/24, 8/25, 8/26, 8/30, 9/3, 9/4, 9/6, 9/7, 9/22, 9/24, 9/25, 9/30	ODSVRA breeding male
GG:RG		ODSVRA 2012 or 2015	SLO	5/10	
GG:RW		ODSVRA 2014 or 2015	SLO	3/2, 5/21, 8/25	
GG:VY	F	ODSVRA 2011 or 2013	SLO	3/6, 3/12, 4/3, 5/7, 5/20, 5/21, 6/15	ODSVRA breeding female
GG:WB	M	ODSVRA 2011 or 2013	SLO	3/24, 4/1, 4/23, 4/29, 5/3, 5/10, 5/19, 5/20, 6/8, 6/9, 7/12, 7/13, 7/16, 7/19, 7/20, 7/21, 7/25, 7/27, 8/1, 8/4	ODSVRA breeding male.
GG:YG	F	ODSVRA 2011 or 2013	SLO	7/10, 7/13, 7/14, 7/19, 8/8, 8/21, 8/23, 8/25, 8/27, 8/28, 9/5	ODSVRA breeding female.
PG:- originally banded PG:YY	F	ODSVRA 2015	SLO	7/23, 7/29, 7/31, 8/1, 9/23, 9/24	ODSVRA breeding female. Originally banded PG:YY. On 24 September, yellow bands on the right leg removed due to swelling on leg from unknown injury. Sightings during the 2017 season at ODSVRA of PG:- adult different from the PG:YY sightings (see report Notes section).
PG:BB		ODSVRA 2011, 2013 or 2014	SLO	4/28	
PG:BG		ODSVRA 2015 or 2016	SLO	8/10	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2017 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
PG:OG	F	ODSVRA 2015	SLO	4/18, 6/11, 7/31, 8/7, 8/8, 8/27	ODSVRA breeding female.
PG:OW	M and F	ODSVRA 2015 or 2016	SLO	3/22, 3/28, 4/4, 4/16, 4/19, 4/20, 4/22, 4/26, 4/27, 5/3, 5/4, 5/7, 5/9, 5/19, 6/3, 7/6, 7/8, 7/12, 7/16, 7/17, 7/20, 7/21, 7/26, 7/27, 7/28, 8/3, 8/4, 8/7, 8/8, 8/11, 8/13, 8/14, 8/25, 9/5, 9/6, 9/7, 9/16, 9/23, 9/24, 9/28	ODSVRA breeding male and female.
PG:PB	F	ODSVRA 2014 or 2015	SLO	3/28, 4/3, 5/24, 6/29, 7/7, 7/30, 8/1, 8/14, 8/18, 8/28	ODSVRA breeding female.
PG:PG		ODSVRA 2014 or 2015	SLO	3/2, 3/11, 3/22, 4/6, 4/7, 5/3, 5/10, 5/21, 5/24, 6/9, 6/11, 7/6, 7/8, 7/23, 7/30, 7/31, 8/3, 8/6, 8/10, 8/11, 8/18, 8/22, 8/25, 8/26, 9/2, 9/14, 9/24, 9/25, 9/30	
PG:PW	M	ODSVRA 2012 or 2014	SLO	3/2, 3/6, 3/12, 3/22, 3/23, 3/25, 3/28, 4/25, 5/6, 5/7, 5/10, 5/11, 5/12, 5/20, 5/21, 5/24, 5/28, 6/7, 6/19, 6/30, 7/20, 8/5, 8/7, 8/11, 8/14, 8/16, 8/18, 8/19, 8/20, 8/21, 9/1, 9/12, 9/14, 9/22, 9/24, 9/28	ODSVRA breeding male.
PG:PY		ODSVRA 2014	SLO	5/24	
PG:VB		ODSVRA 2015 or 2016	SLO	3/31, 4/7, 5/20, 6/7	
PG:VG	M	ODSVRA 2014 or 2015	SLO	3/10, 5/9, 5/18, 5/19, 5/20, 5/23, 5/28, 5/30, 6/8, 7/29, 7/31, 8/5, 8/12, 8/17, 8/23, 8/24, 8/25, 8/26, 9/1, 9/14, 9/30	ODSVRA breeding male.
PG:VY		ODSVRA 2015	SLO	9/1	
PG:WG		ODSVRA 2014, 2015 or 2016	SLO	3/2, 3/3	
PG:YY	F	ODSVRA 2015	SLO	3/6, 3/28, 4/2, 4/4, 4/25, 5/11, 5/24, 5/25, 5/31, 6/20, 8/17, 8/21, 8/23, 9/4, 9/7, 9/24	ODSVRA breeding female. Sightings during the 2017 season at ODSVRA of PG:YY adult different from the PG:- sightings.
PV:-	F	ODSVRA unknown	SLO	3/6, 3/12, 3/22, 3/23, 3/24, 3/28, 4/4, 4/16, 5/11, 6/11, 7/17, 7/29, 7/31, 8/6, 8/10, 8/24, 8/25, 8/26, 9/1, 9/3, 9/22	ODSVRA breeding female.
PV:AB	M	ODSVRA 2014 or 2015	SLO	4/11, 4/24, 5/15, 5/20, 5/24, 5/26, 5/31, 6/3, 6/5, 6/6, 6/21, 6/23, 6/28, 6/29, 7/4, 7/5, 8/8	ODSVRA breeding male.
PV:AR		ODSVRA 2014 or 2015	SLO	3/2, 3/6, 4/1, 4/16, 8/3, 8/8, 8/24, 8/26, 8/27, 8/28, 8/29	
PV:AW		ODSVRA 2015	SLO	4/1, 5/4, 5/5, 5/6, 5/7, 5/10, 5/11, 5/12, 5/14, 5/15, 5/16, 5/18, 5/24, 5/25, 6/13, 6/14, 6/21, 7/5, 7/31, 8/16, 8/22, 8/27, 8/28, 8/29, 8/30	
PV:BB	M	ODSVRA 2014 or 2015	SLO	4/10, 4/11, 5/19, 6/3, 6/9, 6/18, 6/21, 6/28, 6/29, 6/30, 7/2	ODSVRA breeding male.
PV:BW		ODSVRA 2012 or 2014	SLO	5/10, 6/21, 8/6, 8/11, 8/27	
PV:GG	M	ODSVRA 2014 or 2015	SLO	4/6, 4/19, 4/23, 4/28, 5/4, 5/7, 5/11	ODSVRA breeding male.
PV:OR		ODSVRA 2015	SLO	9/23	
PV:OY		ODSVRA 2016	SLO	6/3, 9/6, 9/8	
PV:PG		ODSVRA 2015	SLO	8/29	
PV:PY	F	ODSVRA 2014 or 2016	SLO	3/20, 7/6	ODSVRA breeding female.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2017 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
PV:VW	F	ODSVRA 2014 or 2015	SLO	3/22, 3/23, 3/24, 3/25, 3/27, 5/3, 5/10, 5/11, 6/29, 7/12, 7/25, 8/7, 8/17, 8/18, 8/24, 8/25, 8/27, 8/29, 9/4, 9/7, 9/9, 9/16	ODSVRA breeding female.
PV:VY	F	ODSVRA 2009	SLO	3/10, 5/10, 5/20, 5/25, 6/6, 7/18, 7/21, 7/26, 7/28, 8/5, 8/6, 8/11, 8/12, 8/26, 8/31, 9/14, 9/24, 9/30	ODSVRA breeding female.
PV:WY	M	ODSVRA 2014 or 2015	SLO	4/1, 4/20, 4/26, 5/12, 5/19, 5/23, 5/28, 5/30, 6/5, 6/6, 6/7, 6/11, 6/20, 7/9, 7/23, 7/29, 7/30, 8/26	ODSVRA breeding male.
PV:YB	M	ODSVRA 2012	SLO	5/30, 6/4, 6/6, 6/7, 6/8, 6/9, 6/10, 6/11, 6/17, 6/22, 6/26, 6/28, 6/29	ODSVRA breeding male.
PV:YG	M and F	ODSVRA 2015	SLO	3/3, 4/1, 4/11, 5/8, 6/23, 7/16, 7/21, 8/23, 8/25, 8/27, 8/28, 8/29, 9/16, 9/22, 9/24	ODSVRA breeding male and female.
RR:AB	M	ODSVRA 2016	SLO	4/27, 5/11, 5/24, 6/6, 6/8, 6/11, 6/28, 7/8, 8/18, 8/27, 8/28, 9/5, 9/6	ODSVRA breeding male.
RR:BB		ODSVRA 2016	SLO	3/2, 3/5, 3/7, 3/15, 3/17, 3/26, 3/28, 3/31, 4/1, 4/3, 9/15	
RR:BG	M	ODSVRA 2016	SLO	4/28, 5/20, 5/26, 5/31, 6/8, 7/1, 7/4, 7/6, 7/12, 7/17, 7/20, 7/26, 7/27, 8/4, 8/7, 8/8, 8/11, 8/13, 8/14, 9/6, 9/23	ODSVRA breeding male.
RR:BW	M	ODSVRA 2016	SLO	5/10, 5/21, 5/23, 5/31, 6/9, 6/10, 6/11, 6/14, 6/21, 6/28, 7/4, 7/7, 7/8, 9/23, 9/28	ODSVRA breeding male.
RR:OR	M	ODSVRA 2010	SLO	3/18, 4/4, 4/11, 4/21, 5/5, 5/21, 5/31, 6/5, 6/15	ODSVRA breeding male.
RR:PW	F	ODSVRA 2014	SLO	5/3, 5/26, 7/16, 7/31, 8/17, 8/18, 8/20, 8/23, 8/25, 8/27, 8/28, 8/30, 9/1, 9/2, 9/3, 9/4, 9/5, 9/6	ODSVRA breeding female.
RR:WG		ODSVRA 2012	SLO	8/7, 8/14	
VG:AW		ODSVRA 2011 or 2013	SLO	5/8, 5/11, 5/31	
VG:BB		ODSVRA 2011, 2013 or 2014	SLO	5/21, 6/21	
VG:BY		ODSVRA 2012 or 2013	SLO	5/23, 5/24	
VG:GW	F	ODSVRA 2011 or 2013	SLO	4/13, 4/23, 5/21, 5/24, 7/5, 8/8, 8/27, 8/28, 9/4	ODSVRA breeding female.
VG:OW	M	ODSVRA 2016	SLO	6/18, 7/9, 7/12, 7/19, 7/20,7 /22, 7/23, 7/26, 8/4, 8/7, 8/14, 8/28, 8/30, 9/22, 9/24, 9/25, 9/30	ODSVRA breeding male.
VG:OY		ODSVRA 2015 or 2016	SLO	7/26	
VG:VB	M (2)	ODSVRA 2015 or 2016	SLO	4/26, 5/4, 5/11, 5/20, 5/24, 6/3, 6/7, 6/8, 6/9, 6/17, 6/23, 6/29, 6/30, 7/4, 7/5, 7/6, 7/10, 7/12, 7/16, 7/17, 7/28, 7/31, 8/2, 8/3, 8/5, 8/7, 8/8, 8/9, 8/11, 8/14, 8/17, 8/18, 8/20, 8/21, 8/22, 8/23, 8/25, 8/27, 8/28, 9/1	ODSVRA breeding males (2).
VG:VY	M	ODSVRA 2012 or 2013	SLO	5/24, 5/25, 5/31, 6/1, 6/14, 6/21, 6/28, 6/29, 6/30, 7/5, 7/7, 7/9, 7/13, 7/18, 8/14, 8/15, 8/16, 8/17, 8/25, 8/28, 8/29, 8/30, 8/31, 9/3	ODSVRA breeding male.
VO:BW	F	ODSVRA 2014 or 2015	SLO	3/22, 3/26, 5/20	ODSVRA breeding female.
VV:AA	F	ODSVRA 2011	SLO	3/23, 3/24, 5/18, 5/20, 5/24, 5/25, 5/26, 7/9, 7/16, 7/17, 7/20, 7/21, 7/22, 7/23, 7/24, 7/27, 7/28, 7/30, 7/31, 8/9, 8/11, 8/22, 8/24, 8/26, 8/31, 9/1, 9/3, 9/14, 9/25, 9/30	ODSVRA breeding female.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2017 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
VV:BG	F	ODSVRA 2013	SLO	3/6, 3/12, 4/3, 4/6, 5/5, 5/9, 5/14, 5/16, 5/18, 6/13, 6/14, 6/23, 6/29, 7/6, 7/17, 8/3, 8/5, 8/9, 8/26, 8/29, 9/9, 9/22	ODSVRA breeding female.
VV:BR	F	ODSVRA 2015 or 2016	SLO	3/28, 4/2, 5/22, 5/24, 7/1	ODSVRA breeding female.
VV:BW		ODSVRA 2014 or 2015	SLO	4/7, 5/19, 6/2, 6/15, 6/16	
VV:GG		ODSVRA 2009	SLO	7/6, 7/25, 9/26	
VV:GR		ODSVRA 2012 or 2013	SLO	7/7, 7/17, 7/30, 8/5, 8/10, 8/12, 8/14, 8/25, 8/26, 8/31, 9/2, 9/14	
VV:GW	F	ODSVRA 2015	SLO	4/13, 5/12, 6/29, 7/3, 7/26, 7/29, 8/6	ODSVRA breeding female.
VV:OB	M	ODSVRA 2013 or 2015	SLO	7/11, 7/12, 7/16, 7/17, 8/4, 8/7	ODSVRA breeding male.
VV:OG		ODSVRA 2014 or 2015	SLO	5/7	
VV:RY	F	ODSVRA 2015 or 2016	SLO	3/2, 3/10, 4/11, 5/11, 5/14, 5/17, 5/18, 5/21, 7/6, 7/8, 7/17, 7/31, 8/10, 8/11, 8/12, 8/26, 8/31, 9/3, 9/14, 9/24, 9/26, 9/30	ODSVRA breeding female.
VV:VB	M	ODSVRA 2011 or 2013	SLO	3/28, 4/2, 4/4, 4/26, 4/27, 4/28, 5/4, 5/11, 5/21, 6/21, 7/1, 7/5, 7/6, 7/20, 7/25, 7/26, 9/23, 9/28	ODSVRA breeding male.
VV:WB		ODSVRA 2013 or 2014	SLO	6/30	
VV:WG		ODSVRA 2012	SLO	8/18, 8/25, 8/27, 9/4, 9/5, 9/7	
VV:WR	M and F	ODSVRA 2015 or 2016	SLO	4/3, 4/6, 4/16, 4/21, 5/11, 5/12, 6/18, 6/21, 6/29, 6/30, 7/2, 7/7, 7/13, 7/16, 7/17, 7/21	ODSVRA breeding male and female.
VV:WY	F	ODSVRA 2012 or 2013	SLO	5/5, 7/14, 7/19, 7/21, 8/25, 8/28, 9/1, 9/25	ODSVRA breeding female.
VV:YG		ODSVRA 2013 or 2015	SLO	4/3, 5/1, 5/10, 5/31, 6/2, 6/7, 6/11, 6/16, 6/22, 6/28, 6/30, 7/2, 7/7	
VV:VW now appears as WV:VW	F	ODSVRA 2008, 2011 or 2013	SLO	3/23, 4/7, 4/19, 5/18, 5/22, 6/30	ODSVRA breeding female. Originally banded VV:VW, violet tape lost around top left band and remaining violet plastic band faded to white.
V:G/W now appears as B:G/W		VAFB 2016	Santa Barbara, CA	4/20	Originally banded V:G/W, violet tape lost around top left band and remaining violet plastic band faded to blue color.
B:G/Y		VAFB 2017	Santa Barbara	9/7, 9/14	Juvenile.
B:Y/G		VAFB 2013	Santa Barbara	4/11	
G:G/O/G		VAFB 2016	Santa Barbara	5/25, 5/26	
GN:OB		VAFB 2017	Santa Barbara	8/11	Juvenile.
L:W/G		VAFB 2016	Santa Barbara	5/25, 7/4	
L:Y/G	M	VAFB 2016	Santa Barbara	4/8, 4/12, 4/18, 5/19, 6/15, 6/16, 8/2, 8/7, 8/8, 8/14, 8/19, 8/20, 8/22, 9/6, 9/23	ODSVRA breeding male. On federal service band on left leg there is exposed metal above yellow tape.
NB:NR		VAFB 2015	Santa Barbara	9/10	
NB:OY	M and F	VAFB 2016	Santa Barbara	4/27, 6/2, 6/9, 6/11, 6/14, 6/18, 7/1, 7/2, 7/5, 7/10, 7/28, 7/29, 7/30, 7/31, 8/3, 8/4, 8/6, 8/7, 8/8, 8/11, 8/21, 8/25, 8/27, 8/29, 9/1	ODSVRA breeding male and female. On federal service band on left leg of male there is exposed metal below blue tape.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2017 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
NB:PG	F	VAFB 2011	Santa Barbara	4/4	ODSVRA breeding female. Female associated with abandoned pre-term nest and not seen since abandonment. Historically female nested in similar area multiple times during a single season. Adult mortality suspected.
NO:BW		VAFB 2015	Santa Barbara	5/8, 5/24	
NO:NR	F	VAFB 2015	Santa Barbara	3/2, 3/9, 3/10, 3/23, 3/24, 3/31, 4/5, 4/16, 5/8, 5/16, 5/21, 5/25, 6/30, 7/1, 7/2, 7/4, 7/5, 7/9, 7/13, 7/17, 7/31, 8/11, 8/22, 8/24, 8/25, 8/26, 8/31	ODSVRA breeding female. On federal service band on left leg there is exposed metal on orange tape.
NO:OR	M	VAFB 2016	Santa Barbara	3/1, 3/7, 3/9, 3/12, 4/1, 4/10, 4/20, 4/26, 5/5, 5/20, 5/21, 5/24, 5/31, 6/7, 6/8, 7/29, 8/1, 8/5, 8/7, 8/11, 8/13, 8/14, 8/15, 8/16, 8/17, 8/18, 8/20	ODSVRA breeding male. On federal service band on left leg there is exposed metal below orange tape.
NO:RG		VAFB 2017	Santa Barbara	9/23	
NO:YB		VAFB 2017	Santa Barbara	8/8	Juvenile.
NR:BR	F	VAFB 2016	Santa Barbara	5/8, 5/10, 5/11, 5/15, 5/16, 5/17, 5/18, 5/19, 5/20, 5/22, 6/22, 6/24, 6/29, 6/30, 7/2, 7/3, 7/4, 7/7	ODSVRA breeding female. On federal service band on left leg there is exposed metal below red tape.
NR:NB		VAFB 2017	Santa Barbara	9/10	Juvenile.
NR:WB	M	VAFB 2016	Santa Barbara	7/6, 7/12, 7/26, 7/28, 8/4, 8/5, 8/7, 8/8, 8/14, 8/18, 8/20, 8/22, 8/23, 8/28, 8/30	ODSVRA breeding male.
NR:YG		VAFB 2017	Santa Barbara	8/25, 8/26, 9/4, 9/14, 9/24	On federal service band on left leg there is exposed metal above red tape. Juvenile.
NW:OG	M	VAFB 2016	Santa Barbara	5/17, 5/20, 5/21, 5/22, 5/25	ODSVRA breeding male.
NW:WG	F	VAFB 2014	Santa Barbara	3/12, 3/23, 3/25, 3/27, 3/29, 3/30, 3/31, 4/2, 4/3, 4/4, 4/5, 4/6, 4/7	ODSVRA breeding female. On federal service band on left leg there is exposed metal above white tape.
NY:NR		VAFB 2015	Santa Barbara	4/27, 5/5, 5/8, 5/14, 5/19, 5/20, 5/24, 6/5, 6/6, 6/7, 6/8, 6/10, 6/11, 6/15, 6/18, 6/21, 6/27, 6/30, 7/2	
NY:WB	M	VAFB 2016	Santa Barbara	5/5, 5/7, 5/10, 5/26, 5/27, 7/29, 8/24, 9/12	ODSVRA breeding male. Tape peeling from yellow band and there were five additional sightings of this bird as NS:WB.
NY:WG		VAFB 2017	Santa Barbara	8/29, 9/2, 9/6	
O-:AG originally banded NO:AG	F	VAFB 2012	Santa Barbara	3/2, 4/7, 5/9, 6/30, 7/5, 8/11, 9/4, 9/14	ODSVRA breeding female. Originally banded NO:AG, top brown band missing and now banded O-:AG. On federal service band on left leg there is exposed metal above orange tape.
O-:PB originally banded NO:PB		VAFB 2014	Santa Barbara	5/8, 5/19, 5/31, 6/21, 6/30	Originally banded NO:PB, top brown band missing and now banded O-:PB. On federal service band on left leg there is exposed metal below orange tape.
O-:WG originally banded NO:WG		VAFB 2012	Santa Barbara	8/25, 8/31, 9/25	Originally banded NO:WG.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2017 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
O-:WY originally banded NO:WY	F	VAFB 2013	Santa Barbara	4/5, 4/7, 5/18, 5/20, 5/21, 5/23, 5/25, 5/26, 5/30, 6/4, 7/2, 7/6, 8/8, 8/25, 9/7, 9/16, 9/28	ODSVRA breeding female. Originally banded NO:WY, top brown band missing and now banded O-:WY. On federal service band on left leg there is exposed metal below orange tape.
R:W/G	M	VAFB 2015	Santa Barbara	4/21, 5/5, 5/11, 5/23, 7/5, 7/15, 7/25, 7/26, 7/28, 7/29	ODSVRA breeding male.
Y:G/W		VAFB 2017	Santa Barbara	9/30	
-:AY	M	Unknown Origin	Unknown	4/27, 5/1, 5/31, 6/6, 6/7, 6/11, 6/18, 6/21, 6/30, 7/2, 7/5, 7/8, 7/9, 7/13, 7/15, 7/23, 7/24, 8/7, 8/24, 8/31, 9/1, 9/2, 9/14, 9/30	ODSVRA breeding male.
G-:AY		Unknown Origin	Unknown	6/8, 6/10	
G-:WB	M	Unknown Origin	Unknown	5/23, 5/28, 6/7	ODSVRA breeding male.
V-:BR	M	Unknown Origin	Unknown	4/27, 5/21, 5/31, 6/21, 6/22, 6/26, 6/28, 7/4, 7/5, 7/7, 7/12, 7/14, 7/15	ODSVRA breeding male.
Y-:GO	M	Unknown Origin	Unknown	3/23, 4/7, 5/20, 5/23, 5/25, 5/30, 6/4, 6/7, 6/9, 6/29, 7/2	ODSVRA breeding male.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.4. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2016 to 28 February 2017.

This is a partial list based on information received from Point Blue (pers. comm. L. Stenzel, J. Miller), Morro Bay State Park (pers. comm. R. Orr), Malibu Lagoon State Beach and Zuma Beach (pers. comm. G. Murayama) and from sightings by staff of ODSVRA at nearby sites. ODSVRA bands chicks to brood and some bands have been used multiple years and it is possible to have more than one bird with the same combination. (For a description of color band letter codes see Appendix B.)

VAFB = Vandenberg Air Force Base, SLO = San Luis Obispo, SB = State Beach

Band Combination	Year Banded	Location Seen	County	Dates Seen
BB:GR	2012 or 2015	Half Moon Bay	San Mateo, CA	12/21
VV:GR	2012 or 2013	Half Moon Bay	San Mateo	10/4, 10/19
VV:OB	2013 or 2015	Half Moon Bay	San Mateo	10/25, 10/26
GA:OG	2014 or 2015	Pescadero Creek	San Mateo	11/30, 2/17
RR:BB	2016	Carmel River Mouth	Monterey, CA	11/4, 11/5, 11/8, 11/13
GG:PB	2012 or 2013	Arroyo Laguna	SLO, CA	10/20
PV:RY	2015	Arroyo Laguna	SLO	12/4
VG:YY	2016	Arroyo Laguna	SLO	10/14
VV:GW	2015	Arroyo Laguna	SLO	10/14
GA:PR	2016	San Simeon	SLO	2/13
GG:PB	2012 or 2013	San Simeon	SLO	11/13, 11/15
PV:RY	2015	San Simeon	SLO	10/27
VG:YY	2016	San Simeon	SLO	1/27, 2/13
VV:GW	2015	San Simeon	SLO	1/27
VV:RY	2015 or 2016	San Simeon	SLO	10/27
BB:RR	2016	Villa Creek	SLO	10/8
BB:VY	2016	Morro Strand	SLO	1/25, 2/6
GA:GR	2015 or 2016	Morro Strand	SLO	1/13, 2/6
BB:OB	2014 or 2016	Morro Sandspit	SLO	10/29, 1/3, 1/10, 1/24, 2/23
BB:VY	2016	Morro Sandspit	SLO	1/10, 1/24
GG:OG	2013 or 2014	Morro Sandspit	SLO	10/29, 11/6, 1/10
GG:WB	2011 or 2013	Morro Sandspit	SLO	1/25
PG:OB	2012 or 2014	Morro Sandspit	SLO	10/29, 1/10, 2/13, 2/23
PV:GG	2014 or 2015	Morro Sandspit	SLO	11/6, 1/10
PV:PB	2015	Morro Sandspit	SLO	10/29, 1/24
RR:WW	2010	Morro Sandspit	SLO	1/3, 1/10, 2/23
V-:W-	2008	Morro Sandspit	SLO	1/25
GA:BR	2016	VAFB	Santa Barbara, CA	11/24, 2/23
GA:GR	2015 or 2016	VAFB	Santa Barbara	10/18, 11/4, 12/28
GG:WB	2011 or 2013	VAFB	Santa Barbara	2/24
PG:OW	2015 or 2016	VAFB	Santa Barbara	11/12, 11/24, 2/23
RR:LY	2010	VAFB	Santa Barbara	12/28, 1/17, 1/25, 2/24
VV:AW	2011 or 2013	VAFB	Santa Barbara	2/24
VV:RY	2015 or 2016	VAFB	Santa Barbara	10/18
VW:BB	2013 or 2015	VAFB	Santa Barbara	1/25, 2/24
BB:RR	2016	VAFB	Santa Barbara	1/31
BB:AW	2015 or 2016	Coal Oil Point	Santa Barbara	10/18 , 1/3
GA:YR	2014	Coal Oil Point	Santa Barbara	10/4, 10/18, 1/3, 1/5, 1/17
PV:VW	2014 or 2015	Coal Oil Point	Santa Barbara	10/4, 10/18, 1/3, 1/5
PV:YG	2015	Coal Oil Point	Santa Barbara	10/18

Appendix D. Banded least terns and snowy plovers (continued).

Table D.4. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2016 to 28 February 2017 (continued).

Band Combination	Year Banded	Location Seen	County	Dates Seen
RR:OR	2010	Hollywood Beach	Ventura, CA	11/6, 12/21, 12/27, 1/9
GA:OY	2014 or 2015	Zuma Beach	Los Angeles, CA	1/31
PV:RB	2016	Zuma Beach	Los Angeles	2/22
RR:BB	2016	Zuma Beach	Los Angeles	1/31, 2/22
VV:AW	2011 or 2013	Zuma Beach	Los Angeles	1/31, 2/1,
BB:AW	2015 or 2016	Malibu Lagoon SB	Los Angeles	10/22
GA:OY	2014 or 2015	Malibu Lagoon SB	Los Angeles	12/9, 12/25, 1/2, 1/11
RR:BB	2016	Malibu Lagoon SB	Los Angeles	10/12, 10/23, 12/25, 1/17, 1/26
VV:AW	2011 or 2013	Malibu Lagoon SB	Los Angeles	10/18,12/25, 1/17
BB:BG	2015 or 2016	Tijuana River Mouth	San Diego, CA	2/14

Appendix D. Banded least terns and snowy plovers (continued).

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2017.

This is a partial list based on information received from Point Blue (pers. comm. L. Stenzel, J. Miller), Morro Bay State Park (pers. comm. R. Orr), Guadalupe-Nipomo Dunes NWR and Chevron property in Guadalupe-Nipomo Dunes complex (pers. comm. K. Paradis), Rancho Guadalupe Dunes Preserve (pers. comm. T. Applegate), Bolsa Chica Ecological Reserve (pers. comm. P. Knapp), Eden Landing (pers. comm. B. Pearl), Malibu Lagoon State Beach and Zuma Beach (pers. comm. G. Murayama) and from sightings by staff of ODSVRA at nearby sites.

ODSVRA is banding chicks to brood and some bands have been used multiple years so it is possible to have more than one bird with the same combination.

SLO = San Luis Obispo, Chevron = Chevron property in Guadalupe-Nipomo Dunes complex, Guadalupe NWR = Guadalupe-Nipomo Dunes National Wildlife Refuge, SB = State Beach, VAFB = Vandenberg Air Force Base

M = male, F = female.

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
PV:YB	2012		Eden Landing	San Francisco, CA	9/27	
VV:OB	2013 or 2015		Eden landing	San Francisco	7/31	
VV:OB	2013		Half Moon Bay	San Mateo, CA	8/1	
GG:PB	2012 or 2013		Arroyo Laguna	SLO, CA	9/28	
PV:AW	2016 or 2017		Arroyo Laguna	SLO	9/28	
PV:GW	2015 or 2017		Arroyo Laguna	SLO	8/9, 9/21	
VV:RY	2015 or 2016		San Simeon Creek	SLO	4/11	
PV:RY	2015		Villa Creek	SLO	3/13	
PV:RY	2015		Villa Creek	SLO	3/14	
RR:WB	2017		Villa Creek	SLO	6/29	Juvenile.
BB:GB	2014 or 2015		Morro Strand SB	SLO	9/19, 9/21	
BB:OB	2014 or 2016		Morro Strand SB	SLO	9/26	
BB:OW	2015 or 2016	F	Morro Strand SB	SLO	4/5, 4/6	
BB:VY	2016	F	Morro Strand SB	SLO	3/6, 3/21, 9/21	
GA:GR	2015 or 2016		Morro Strand SB	SLO	3/8, 9/21	
GA:PB	2016 or 2017		Morro Strand SB	SLO	7/18, 7/20, 7/21, 7/22, 7/25, 8/5, 8/6, 9/7, 9/19	
GG:PR	2017		Morro Strand SB	SLO	8/22, 8/24	Juvenile.
GG:WB	2011 or 2013		Morro Strand SB	SLO	9/19	
PV:AW	2016 or 2017		Morro Strand SB	SLO	8/30, 9/19, 9/21	
PV:RG	2017		Morro Strand SB	SLO	7/7, 7/8, 7/13, 7/14	Juvenile.
PV:RY	2015	F	Morro Strand SB	SLO	3/15, 3/21, 3/23, 3/24, 3/28, 3/30, 4/4, 4/5, 4/6, 4/11, 4/20, 4/24	
PV:YG	2015		Morro Strand SB	SLO	3/15	
PV:YW	2015 or 2017		Morro Strand SB	SLO	7/22, 7/23, 7/28, 8/17, 8/18, 8/19, 8/20	
RR:BB	2016	F	Morro Strand SB	SLO	3/22, 3/23, 3/24, 3/30, 3/31, 7/1, 7/4, 7/6, 7/12, 7/13, 7/20, 7/25, 7/28, 8/5, 8/8, 8/10, 8/12, 8/17, 8/19, 8/20, 8/22, 8/26, 8/28, 9/19, 9/19	
RR:WW	2010		Morro Strand SB	SLO	6/27, 9/21	
V-:W-	2008	M	Morro Strand SB	SLO	3/8, 3/20, 4/12, 4/18, 4/20, 4/27, 6/17, 6/18, 6/20, 6/25, 6/27, 6/29, 7/6, 7/7, 7/15, 7/18, 7/21, 7/22, 7/23, 7/25, 7/26, 7/28, 8/8, 8/26	Morro Strand breeding male.
VV:AB	2017		Morro Strand SB	SLO	7/23	Juvenile.
VV:GW	2015	F	Morro Strand SB	SLO	3/28	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2017.

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
VV:OR	2015 or 2016	M	Morro Strand SB	SLO	3/7, 3/8, 3/9, 3/15, 3/23, 3/29, 3/30, 3/31, 4/5, 4/6, 4/10, 4/11, 4/13, 4/21, 4/25, 6/17, 6/18, 6/20, 6/21, 6/22, 6/23, 6/25, 7/4 , 7/6, 7/9, 7/16, 7/18, 7/19, 7/20, 7/22, 7/23, 7/25, 7/26, 7/27, 8/6, 8/8, 8/11, 8/12, 8/24, 8/27, 9/19	Morro Strand breeding male.
VV:YY	2017		Morro Strand SB	SLO	8/20	Juvenile.
BB:GB	2014 or 2015	M	Morro Bay Sandspit	SLO	3/6, 3/7, 3/10, 3/13, 3/14, 3/15, 3/20, 3/21, 3/22, 3/29, 3/31, 4/10, 4/17, 6/20, 6/21, 6/23, 7/4, 7/5, 7/12, 7/13, 7/18, 7/19, 7/25, 7/28, 8/1, 8/4, 8/7, 8/8, 8/10, 8/17, 8/21, 8/23, 8/25, 8/30, 9/5	Morro Bay Sandspit breeding male.
BB:GR	2012 or 2015		Morro Bay Sandspit	SLO	7/18	
BB:OB	2014 or 2016	M	Morro Bay Sandspit	SLO	3/2, 3/8, 3/10, 3/21, 3/27, 3/28, 3/31, 4/4, 4/6, 7/25, 7/26, 8/4, 8/11, 8/17, 9/12, 9/15	
GA:BR	2016		Morro Bay Sandspit	SLO	3/14, 3/24, 3/28, 3/29, 3/30, 4/3, 4/5, 4/20, 4/21, 6/24, 7/6	
GG:OG	2013 or 2014	M	Morro Bay Sandspit	SLO	3/2, 3/6, 3/10, 3/13, 3/14, 3/15, 3/16, 3/17, 3/21, 3/22, 3/24, 3/29, 3/30, 3/31, 4/6, 4/17, 4/18, 4/19, 4/20, 4/21, 6/19, 6/20, 6/21, 6/22, 6/23, 6/24, 6/26, 6/28, 6/29, 6/30, 7/1, 7/3, 7/5, 7/7, 7/10, 7/11, 7/13, 7/17, 7/18, 7/19, 7/20, 7/22, 7/24, 7/25, 7/26, 7/27, 7/29, 8/2, 8/4, 8/10, 8/11, 8/12, 8/15, 8/16, 8/17, 8/18, 8/24, 9/12	Morro Bay Sandspit breeding male.
GG:PB	2012 or 2013	F	Morro Bay Sandspit	SLO	3/10, 3/13, 3/14, 3/17, 3/21, 3/28, 3/29, 3/31, 4/3, 4/4, 4/5, 4/6, 4/20, 4/21, 6/19, 6/20, 6/21, 6/24, 6/28, 7/1, 7/4, 7/10, 7/13, 7/18, 7/20, 7/22, 7/25, 7/26, 7/27, 7/28, 8/4, 8/11, 8/15, 8/17, 8/18, 8/24, 8/30, 9/1, 9/5	Morro Bay Sandspit breeding female.
GG:WB	2011 or 2013		Morro Bay Sandspit	SLO	7/27, 7/29, 8/1, 8/7, 8/16, 8/17, 8/21, 8/23, 9/5	
PG:OB	2012 or 2014	F	Morro Bay Sandspit	SLO	3/6, 3/10, 3/21, 3/22, 3/24, 3/27, 3/28, 3/31, 4/4, 4/6, 4/19, 4/21, 6/20, 6/23, 6/24, 7/13, 7/20, 7/27, 7/28, 8/3, 8/11, 8/12, 9/12	Morro Bay Sandspit breeding female.
PV:GB	2015 or 2016	F	Morro Bay Sandspit	SLO	3/24	
PV:GG	2014 or 2015		Morro Bay Sandspit	SLO	7/25	
PV:GR	2017		Morro Bay Sandspit	SLO	7/11	Juvenile.
PV:OB	2015 or 2017		Morro Bay Sandspit	SLO	9/7	
PV:PB	2015	F	Morro Bay Sandspit	SLO	3/21, 3/27, 3/30, 4/19, 4/20, 4/21, 6/22, 6/26, 6/29, 6/30, 7/13, 7/14, 7/19, 7/20, 8/2, 8/4	Morro Bay Sandspit breeding female.
PV:RB	2016		Morro Bay Sandspit	SLO	7/11	
PV:RG	2017		Morro Bay Sandspit	SLO	7/10	Juvenile.
PV:YW	2015 or 2017		Morro Bay Sandspit	SLO	7/25, 7/26, 8/15	
RR:BB	2016		Morro Bay Sandspit	SLO	6/30, 7/7	
RR:PB	2007 or 2010		Morro Bay Sandspit	SLO	6/26	
RR:WB	2017		Morro Bay Sandspit	SLO	6/28	Juvenile.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2017.

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
RR:WW	2010	M	Morro Bay Sandspit	SLO	3/7, 3/9, 3/10, 3/13, 3/14, 3/22, 3/24, 3/27, 3/31, 4/11, 6/19, 6/20, 6/23, 6/28, 6/29, 7/4, 7/5, 7/6, 7/18, 7/19, 7/20, 7/25, 7/26, 7/27, 7/28, 7/29, 8/2, 8/3, 8/4, 8/11, 8/16, 8/21, 8/23, 8/24, 8/25, 8/28	Morro Bay Sandspit breeding male.
V-:W-	2008	M	Morro Bay Sandspit	SLO	3/17	
VG:BW	2016 or 2017		Morro Bay Sandspit	SLO	7/18	
VV:AB	2017		Morro Bay Sandspit	SLO	7/26	Juvenile.
BB:OR	2016 or 2017		Guadalupe-Nipomo Dunes NWR	SLO	6/29	
BB:OY	2014 or 2015		Guadalupe-Nipomo Dunes NWR	SLO	7/20	
BB:WB	2013		Guadalupe-Nipomo Dunes NWR	SLO	7/23	
GA:PR	2016 or 2017		Guadalupe-Nipomo Dunes NWR	SLO	8/30	
GA:RB	2010		Guadalupe-Nipomo Dunes NWR	SLO	6/29, 7/20, 7/27, 8/15, 8/22	
GA:RY	2017		Guadalupe-Nipomo Dunes NWR	SLO	8/30, 9/8, 9/14, 9/28,	Juvenile.
GG:AW	2017		Guadalupe-Nipomo Dunes NWR	SLO	7/27	Juvenile.
GG:BB	2013		Guadalupe-Nipomo Dunes NWR	SLO	7/27	
GG:WB	2011 or 2013		Guadalupe-Nipomo Dunes NWR	SLO	7/7	
GG:YY	2011 or 2013		Guadalupe-Nipomo Dunes NWR	SLO	8/22	
PG:BB	2011, 2013, or 2014		Guadalupe-Nipomo Dunes NWR	SLO	7/20	
PG:BY	2017		Guadalupe-Nipomo Dunes NWR	SLO	9/28	Juvenile.
PG:OG	2015		Guadalupe-Nipomo Dunes NWR	SLO	9/28	
PG:OW	2015 or 2016		Guadalupe-Nipomo Dunes NWR	SLO	6/29	
PG:PW	2012 or 2014		Guadalupe-Nipomo Dunes NWR	SLO	7/27, 9/28	
PG:YY	2015		Guadalupe-Nipomo Dunes NWR	SLO	6/29, 7/27	
PV:GR	2017		Guadalupe-Nipomo Dunes NWR	SLO	6/29	Juvenile.
PV:PR	2017		Guadalupe-Nipomo Dunes NWR	SLO	8/30	Juvenile.
PV:YY	2015 or 2017		Guadalupe-Nipomo Dunes NWR	SLO	8/22	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2017.

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
RR:AW	2017		Guadalupe-Nipomo Dunes NWR	SLO	9/20, 9/28	Juvenile.
RR:BB	2016 or 2017		Guadalupe-Nipomo Dunes NWR	SLO	8/22, 9/20	
RR:VY	2016 or 2017		Guadalupe-Nipomo Dunes NWR	SLO	9/8	
RR:WB	2017		Guadalupe-Nipomo Dunes NWR	SLO	6/29	Juvenile.
VG:BG	2011		Guadalupe-Nipomo Dunes NWR	SLO	7/27	
VG:GB	2017		Guadalupe-Nipomo Dunes NWR	SLO	9/28	Juvenile.
VG:OW	2016 or 2017		Guadalupe-Nipomo Dunes NWR	SLO	7/20	
VG:PB	2015 or 2017		Guadalupe-Nipomo Dunes NWR	SLO	9/14	
VG:RG	2017		Guadalupe-Nipomo Dunes NWR	SLO	9/28	Juvenile.
VG:RY	2017		Guadalupe-Nipomo Dunes NWR	SLO	9/28	Juvenile.
VG:VB	2015 or 2016		Guadalupe-Nipomo Dunes NWR	SLO	7/27	
VG:VY	2015 or 2016		Guadalupe-Nipomo Dunes NWR	SLO	7/20	
VV:AB	2017		Guadalupe-Nipomo Dunes NWR	SLO	7/27	Juvenile.
VV:OB	2013 or 2015	M	Guadalupe-Nipomo Dunes NWR	SLO	6/7, 7/7, 7/20, 7/25, 7/26, 7/27, 8/8	Observed with ODSVRA banded chicks 20-26 July.
BB:GY	2006	M	Chevron	SLO	3/24	
GA:BR	2016		Chevron	SLO	7/24	
GA:GR	2015 or 2016		Chevron	SLO	6/30	
GA:OG	2014 or 2015	F	Chevron	SLO	6/29, 6/30, 3/2	
GA:PW	2014 or 2015	M	Chevron	SLO	3/22, 3/30, 4/10, 4/12, 5/12, 5/19, 5/22, 5/26	
GA:RG	2015 or 2016	F	Chevron	SLO	3/20, 4/6, 5/19,7/5	
GA:WG	2016 or 2017		Chevron	SLO	7/21	
GG:GY	2015 or 2016	M	Chevron	SLO	3/20, 3/24, 3/28, 4/10, 5/22	
GG:LY	2012	F	Chevron	SLO	3/2, 3/6, 3/13, 3/28, 3/30, 4/3, 4/12, 5/22, 5/24, 5/26, 6/27, 7/5, 7/7	Chevron breeding female.
GG:OG	2013 or 2014		Chevron	SLO	7/21	
GG:PW	2013 or 2014		Chevron	SLO	5/22	
GG:RG	2013 or 2014	F	Chevron	SLO	3/30	
GG:WG	2014 or 2015		Chevron	SLO	7/26	
GG:YB	2013		Chevron	SLO	7/21	
GG:YG	2011 or 2013		Chevron	SLO	4/10, 4/12, 5/17	
PV:BY	2015		Chevron	SLO	3/24, 3/30, 4/10, 6/30	
PV:PG	2015		Chevron	SLO	7/5	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2017.

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
PV:WG	2016	M	Chevron	SLO	3/22, 3/28	
PV:YG	2015		Chevron	SLO	3/22	
RR:AB	2016	M	Chevron	SLO	3/2, 3/6, 3/24, 4/6, 4/10, 7/5, 7/21, 7/28	
RR:BY	2010	M	Chevron	SLO	4/10, 4/12	
RR:GG	2011		Chevron	SLO	5/24	
RR:WG	2012	M	Chevron	SLO	3/28, 3/30, 5/12, 5/22, 7/5, 7/7	
VV:AB	2017		Chevron	SLO	7/5	
VV:BB	2011 or 2013	M	Chevron	SLO	3/30	Juvenile.
VV:BW	2014 or 2015		Chevron	SLO	7/28	
VV:WG	2012		Chevron	SLO	3/10, 3/15, 3/17, 3/30, 7/24	
RR:YB	2014	M	Rancho Guadalupe Dunes Preserve	Santa Barbara, CA	5/23	
VV:GG	2009	F	Rancho Guadalupe Dunes Preserve	Santa Barbara	6/8	
VV:RY	2015 or 2016	M	Rancho Guadalupe Dunes Preserve	Santa Barbara	8/6, 5/3	
BB:OR	2016 or 2017		VAFB	Santa Barbara	7/28	
BB:RR	2016	F	VAFB	Santa Barbara	7/18, 7/21, 7/26, 8/1, 8/7, 8/11	
GA:AB	2013 or 2015	F	VAFB	Santa Barbara	5/1, 5/18, 5/23	
GA:AB	2013 or 2015	F	VAFB	Santa Barbara	3/6, 3/22, 4/11	
GA:BR	2016 or 2017		VAFB	Santa Barbara	9/13	
GA:BR	2016	M	VAFB	Santa Barbara	3/15, 3/17, 4/2, 4/4, 4/6, 4/11	
GA:GR	2015 or 2016		VAFB	Santa Barbara	9/13, 9/28	
GA:GR	2015 or 2016	M	VAFB	Santa Barbara	5/2	
GA:OR	2016		VAFB	Santa Barbara	3/20, 3/24, 3/28, 4/12, 4/19, 5/8, 5/10, 9/5, 9/13, 9/19	
GA:PB	2016 or 2017		VAFB	Santa Barbara	9/1	
GA:PR	2016 or 2017		VAFB	Santa Barbara	5/2, 9/13, 9/28	
GA:Y-	Unknown	M	VAFB	Santa Barbara	4/5	Missing band.
GA:YB	2017		VAFB	Santa Barbara	7/28, 8/2, 8/3, 8/7	Juvenile.
GA:YY	2017		VAFB	Santa Barbara	8/29	Juvenile.
GG:PR	2017		VAFB	Santa Barbara	8/15, 9/13	Juvenile.
GG:WB	2011 or 2013	M	VAFB	Santa Barbara	3/9, 3/15, 3/24, 4/5, 4/10, 4/12, 5/3, 5/10, 6/7, 6/12, 6/19, 6/22, 6/24, 6/25, 6/26, 6/27, 7/18, 7/21, 7/24	VAFB breeding male.
PG:YB	2015	F	VAFB	Santa Barbara	7/24	VAFB breeding female.
PG:YG	2014 or 2016	F	VAFB	Santa Barbara	4/19, 6/7, 7/7, 7/11, 7/14, 7/18, 8/1, 8/7, 8/11	VAFB breeding female.
PG:YR	2017		VAFB	Santa Barbara	8/29	Juvenile.
PV:AW	2016 or 2017		VAFB	Santa Barbara	8/18	
PV:PB	2015	F	VAFB	Santa Barbara	7/24	
PV:RB	2016	F	VAFB	Santa Barbara	3/24, 4/3, 4/10, 4/12, 4/19, 5/1, 5/5, 5/8, 5/10, 5/16	
PV:YG	2015		VAFB	Santa Barbara	7/10	
PV:YW	2015 or 2017	F	VAFB	Santa Barbara	7/6, 7/21, 8/11	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2017.

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
RR:LY	2010	M	VAFB	Santa Barbara	4/19, 5/1, 5/5, 5/8, 5/10, 5/19, 5/24, 6/5, 6/7, 6/17, 6/19, 6/22, 6/22, 6/23, 6/24, 6/25, 6/26, 6/27, 6/30, 7/4, 7/7, 7/18, 7/21, 7/24, 7/24, 8/1, 8/7, 8/22, 8/23, 8/24, 8/25, 8/30, 9/19	VAFB breeding male.
RR:LY	2010	M	VAFB	Santa Barbara	3/9, 3/15, 3/20, 3/24, 4/5, 4/10	
VG:OW	2016 or 2017		VAFB	Santa Barbara	7/5, 8/30	
VG:WY	2017		VAFB	Santa Barbara	6/28	Juvenile.
VG:YW	2017		VAFB	Santa Barbara	7/19, 7/21	Juvenile.
VV:AB	2017		VAFB	Santa Barbara	7/21	Juvenile.
VV:AW	2013 or 2014	F	VAFB	Santa Barbara	4/30	
VV:AW	2013 or 2014	F	VAFB	Santa Barbara	3/3, 3/15, 3/20, 4/5, 4/12, 4/30	
VW:BB	2011 or 2013		VAFB	Santa Barbara	4/11, 5/23, 5/27, 6/29, 7/19, 8/29, 9/13	
BB:OR	2016 or 2017		Jalama Beach	Santa Barbara	8/4	
GG:AW	2017		Jalama Beach	Santa Barbara	8/4, 8/16	Juvenile.
PV:RB	2016		Coal Oil Point	Santa Barbara	6/6, 6/13, 6/20, 6/27, 6/28, 7/5, 7/6	
PV:VW	2014 or 2015		Coal Oil Point	Santa Barbara	3/2	
PV:WY	2014 or 2015		San Miguel Island	Ventura, CA	3/2	
PV:RB	2016		Zuma Beach	Los Angeles, CA	3/7	
PV:RB	2016	M	Zuma Beach	Los Angeles	3/17	
RR:BB	2016		Zuma Beach	Los Angeles	3/7	
GA:OY	2014 or 2015		Zuma Beach	Los Angeles	7/28	
GA:OY	2014 or 2015		Malibu Lagoon SB	Los Angeles	7/23	
RR:BB	2016	F	Malibu Lagoon SB	Los Angeles	4/7, 4/23, 5/4, 5/12, 9/9, 9/15	Malibu Lagoon SB breeding female.
BB:AY	2014 or 2016	F	Bolsa Chica	Orange, CA	4/14, 5/31, 7/7	
BB:GY	2006		Bolsa Chica	Orange	9/14	
GA:OY	2014 or 2015	F	Bolsa Chica	Orange	7/10	Bolsa Chica breeding female.
GA:VB	2017		Bolsa Chica	Orange	8/6	Juvenile.
VG:WY	2017		Bolsa Chica	Orange	9/14	Juvenile.
PG:YB	2015 or 2017		Balboa/Newport Beach	Orange	8/6	
BB:AY	2014 or 2016		San Clemente State Beach	San Diego, CA	3/21	
VV:GW	2015 or 2017		Camp Pendleton	San Diego	9/12	
VV:RG	2015 or 2017		Coronado	San Diego	9/20	
BB:BG	2015 or 2016		Tijuana River Mouth	San Diego	3/2, 3/9, 3/16, 3/24	

APPENDIX E. ADDENDUMS TO SNOWY PLOVER NESTING SUCCESS.

Table E.1. Nesting success of snowy plovers in identifiable areas at ODSVRA, 2001-17.

Nests from unknown locations (identified only by presence of broods) are not included in table. Percent nests hatching is calculated using number of hatching nests from known location divided by number of known location and fate nests. Those chicks whose specific area where hatching could not be identified are not included in table. Beginning in 2006, an additional 0.4 mile of shoreline at the southern end of the park has been monitored by ODSVRA (a survey conducted by the Guadalupe-Nipomo Dunes NWR in 2005 determined this area was part of the ODSVRA and not the refuge, as was previously thought). Between 1998-2003, increases occurred in the size of the seasonal Southern Exclosure; size has remained consistent since 2004. Information on areas in table is provided in the report Site Description section on page 4.

Excl. = Exclosure, BY = Boneyard

Year	Area	No. known location nests	No. nests with known location and known fate	No. nests with known location hatching	% nests hatching	No. chicks from known location	No. chicks from known location and with known fate	No. chicks from known location and with known fate fledged	% chicks known fledged
	Open Riding Area	1	1	0	0	0	0	0	0
	Arroyo Grande Excl. [1]	3	3	3	100	9	9	0	0
	Southern Exclosure	25	24	21	88	56	56	2	4
	Oso Flaco	4	2	2	100	6	6	1	17
2001	**Total**	**33**	**30**	**26**	**87**	**71**	**71**	**3**	**4**
	Southern Exclosure	33	33	25	76	62	62	35	56
	Oso Flaco	2	2	0	0	0	0	0	0
2002	**Total**	**35**	**35**	**25**	**71**	**62**	**62**	**35**	**56**
	Dunes Preserve	1	1	1	100	3	3	0	0
	Open Riding Area	1	1	1	100	3	3	3	100
	Pipeline Revegetation	3	3	2	67	4	4	2	50
	East of BY Exclosure [2]	2	2	1	50	3	3	2	67
	Southern Exclosure	74	73	52	71	136	135	92	68
	Oso Flaco	13	13	5	38	11	11	7	64
2003	**Total**	**94**	**93**	**62**	**67**	**160**	**159**	**106**	**67**
	Open Riding Area	1	1	0	0	0	0	0	0
	Pipeline Revegetation	1	1	1	100	3	3	0	0
	Southern Exclosure	113	111	87	78	208	205	59	29
	Oso Flaco	27	27	17	63	40	39	7	18
2004	**Total**	**142**	**140**	**105**	**75**	**251**	**247**	**66**	**27**
	East of BY Exclosure [2]	2	2	2	100	6	6	2	33
	Southern Exclosure	79	79	60	76	142	142	57	40
	Oso Flaco	22	22	18	82	49	49	23	47
2005	**Total**	**103**	**103**	**80**	**78**	**197**	**197**	**82**	**42**
	Open Riding Area	1	1	0	0	0	0	0	0
	Southern Exclosure	87	84	65	77	173	173	8	5
	Oso Flaco	29	29	22	76	57	57	9	16
2006	**Total**	**117**	**114**	**87**	**76**	**230**	**230**	**17**	**7**
	Southern Exclosure	76	76	61	80	159	157	58	37
	Oso Flaco	15	15	9	60	20	20	4	20
2007	**Total**	**91**	**91**	**70**	**77**	**179**	**177**	**62**	**35**
	Southern Exclosure	100	100	73	73	172	172	64	37
	Oso Flaco	19	19	8	42	19	19	5	26
2008	**Total**	**119**	**119**	**81**	**68**	**191**	**191**	**69**	**36**

Appendix E. Addendums to snowy plover nesting success (continued).

Table E.1. Nesting success of snowy plovers in identifiable areas at ODSVRA, 2001-17 (continued).

Year	Area	No. known location nests	No. nests with known location and known fate	No. nests with known location hatching	% nests hatching	No. chicks from known location	No. chicks from known location and with known fate	No. chicks from known location and with known fate fledged	% chicks known fledged
	Pismo Lagoon	1	1	0	0	0	0	0	0
	Southern Exclosure	125	124	86	69	221	221	79	36
	Oso Flaco	23	22	8	36	22	22	2	9
2009	**Total**	**149**	**147**	**94**	**64**	**243**	**243**	**81**	**33**
	Carpenter Creek	1	1	0	0	0	0	0	0
	Arroyo Grande Creek	3	3	0	0	0	0	0	0
	Open Riding Area	1	1	1	100	2	2	2	100
	Southern Exclosure	126	123	95	77	234	234	86	37
	Oso Flaco	22	22	13	59	33	33	15	45
2010	**Total**	**153**	**150**	**109**	**73**	**269**	**269**	**103**	**38**
	Open Riding Area	2	2	2	100	5	5	1	20
	Southern Exclosure	140	135	113	84	300	300	129	43
	Oso Flaco	23	23	16	70	40	40	18	45
2011	**Total**	**165**	**160**	**131**	**82**	**345**	**345**	**148**	**43**
	Open Riding Area	3	3	0	0	0	0	0	0
	Southern Exclosure	194	186	143	77	353	353	85	24
	Oso Flaco	14	14	9	64	21	21	4	19
2012	**Total**	**211**	**203**	**152**	**75**	**374**	**374**	**89**	**24**
	Southern Exclosure	147	144	115	80	288	288	147	51
	Oso Flaco	23	23	15	65	39	39	25	64
2013	**Total**	**170**	**167**	**130**	**78**	**327**	**327**	**172**	**53**
	Open Riding Area	1	1	0	0	0	0	0	0
	Southern Exclosure	201	194	173	89	428	428	142	33
	Oso Flaco	44	44	33	75	86	86	35	41
2014	**Total**	**246**	**239**	**206**	**86**	**514**	**514**	**177**	**34**
	Arroyo Grande Creek[3]	1	-	1	-	2	2	0	0
	Southern Exclosure	182	175	153	87	401	401	215	54
	Oso Flaco	20	20	14	70	39	39	24	62
2015	**Total**	**203**	**195**	**168**	**86**	**442**	**442**	**239**	**54**
	Arroyo Grande Creek[3]	1	-	1	-	2	2	1	50
	Southern Exclosure	169	156	136	87	326	326	91	28
	Oso Flaco	40	37	29	78	82	82	33	40
2016	**Total**	**210**	**193**	**166**	**85**	**410**	**410**	**125**	**30**
	Arroyo Grande Creek	1	1	0	0	0	0	0	0
	Southern Exclosure	195	165	107	65	252	252	105	42
	Oso Flaco	77	72	38	53	96	96	55	57
2017	**Total**	**273**	**238**	**145**	**61**	**348**	**348**	**160**	**46**

[1]Arroyo Grande Excl.: A seasonal exclosure (with two-inch by four-inch wire mesh fencing and closed from the riding area) in use in 2001 and 2002, but not subsequently. This area had three nests in 2001, none in 2002.

[2]East of BY Exclosure: Area closed to vehicles year-around and open to pedestrians. There were two nests in 2003 and two nests in 2005. All nests had a single nest exclosure (10-foot by 10-foot exclosure).

[3]Brood with approximately one-day-old chicks found in Arroyo Grande Creek area, likely from an unknown nest nearby.

Table E.2. Nest protection used at ODSVRA in 2017.

Nests with unknown location and unknown fate nests are excluded. The large seasonal exclosure is the portion of 6, 7, 8, Boneyard exclosures, and North Oso Flaco that is protected with predator fencing (does not include the shoreline). Percent in parenthesis is percent nests hatched.
Circular = single nest circular exclosure; un = unknown predator; av = avian; rav = common raven; sku = skunk; gul = gull, unknown species; coy = coyote; pre = abandoned pre-term; pos = abandoned post-term; ukp = abandoned unknown pre- or post-term; win = abandoned, suspected wind; fld = flooded; unk = failed, cause unknown.

Area	Large seasonal exclosure			Symbolic fencing	
	No additional fencing	Bumpout	Circular	No additional fencing	Circular
6 exclosure	**38**	**2**	**0**	**22**	**0**
Nests hatched	27 (71%)	2 (100%)		21(95%)	
Nests depredated	4 (4 sku)				
Nests failed other causes	7 (1 pre, 1pos, 5 unk)			1(1pre)	
7 exclosure	**33**	**0**	**0**	**11**	**0**
Nests hatched	24 (73%)			11(100%)	
Nests depredated	5 (2 sku, 1gul, 2 un)				
Nests failed other causes	5 (1pre, 2 pos, 1unk)				
8 exclosure	**32**	**2**	**1**	**9**	**0**
Nests hatched	12 (38%)	2 (100%)		5 (56%)	
Nests depredated	16 (4 sku, 4 rav, 1av, 1gul, 6 un)		1(1sku)	2 (1sku, 1av)	
Nests failed other causes	4 (3 unk, 1win)			2 (1pre, 1ukp)	
Boneyard	**15**	**0**	**0**		
Nests hatched	3 (20%)				
Nests depredated	7 (3 sku, 1coy, 2 rav, 1un)				
Nests failed other causes	5 (1pre, 2 ukp, 2 unk)				
SOUTHERN EXCLOSURE TOTALS	**118**	**4**	**1**	**42**	**0**
Nests hatched	66 (55%)	4 (100%)		37 (88%)	
Nests depredated	32 (13 sku, 1coy, 6 rav, 2 gul, 1av, 9 un)		1(1sku)	2 (1av, 1sku)	
Nests failed other causes	22 (3 pos, 3 pre, 11unk, 2 ukp, 1win)			3 (2 pre, 1ukp)	
North Oso Flaco	**6**	**0**	**0**	**9**	**2**
Nests hatched	2 (33%)			4 (44%)	2 (100%)
Nests depredated				3 (3 sku)	
Nests failed other causes	4 (1pre, 3 unk)			2 (1ukp, 1unk)	
South Oso Flaco				**25**	**30**
Nests hatched				4 (16%)	26 (87%)
Nests depredated				5 (1coy, 4 rav)	
Nests failed other causes				16 (2 pre, 1ukp, 2 fld, 11unk)	4 (2 pre, 2 win)
OSO FLACO TOTALS	**6**	**0**	**0**	**34**	**32**
Nests hatched	2 (33%)			8 (24%)	28 (87%)
Nests depredated				8 (4 rav, 1coy, 3 sku)	
Nests failed other causes	4 (1pre, 3 unk)			18 (2 pre, 2 ukp, 2 fld, 12 unk)	4 (2 pre, 2 win)
Arroyo Grande Creek				**1**	**0**
Nests hatched					
Nests depredated					
Nests failed other causes				1(1fld)	
GRAND TOTAL	**124**	**4**	**1**	**77**	**32**
Nests hatched	68 (54%)	4 (100%)		45 (58%)	28 (87%)
Nests depredated	32 (13 sku, 1coy, 6 rav, 2 gul, 1av, 9 un)		1(1sku)	10 (4 sku,1coy, 4 rav, 1av)	
Nests failed other causes	24 (3 pos, 4 pre, 14 unk, 2 ukp, 1win)			23 (4 pre, 3 ukp, 3 fld, 12 unk)	4 (2 pre, 2 win)

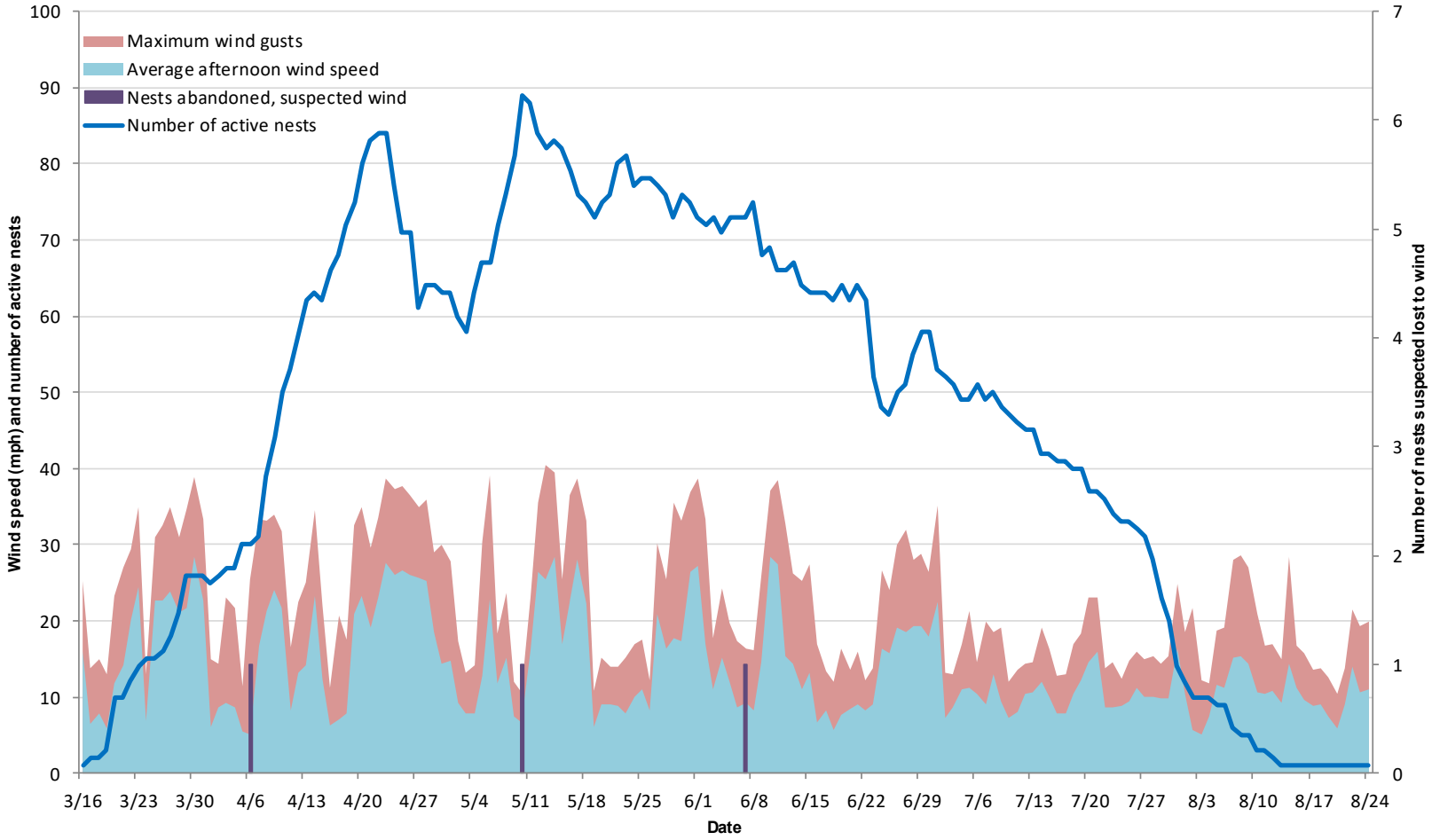


Figure E.1. Daily wind speed data (daily afternoon average and daily maximum wind gust) and snowy plover nest loss attributed to wind at ODSVRA from 16 March to 24 August 2017.

The left y-axis corresponds to wind speed in miles per hour (mph) and total number of active nests. The right y-axis corresponds to number of nests lost with fate abandoned, suspected wind. (Only nests with entire clutch lost, whether partial or complete, are included and not eggs lost from a nest that remained active.) Wind speed was collected at the S1wind tower, located approximately 375 feet east of 6 exclosure since 2011, from an anemometer at 10 meters height. For dates 12-22 June no data was collected from the S1wind tower and information was used from another site 0.47 miles east of marker post 6 (site 20 wind tower). The daily afternoon average wind speed is calculated from the average of the hours 1:00 pm – 5:00 pm. The maximum wind gust represents the maximum wind speed for the entire day.

APPENDIX F. PREDATOR SUMMARY TABLES AND FIGURES.

Table F.1. Summary of predators detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2017.

Observations from 1 March–10 September (a 194-day period). Contracted predator management specialists were essentially done and observer presence in field by park staff was reduced after the first week of September (no remaining chicks). Min no. individ. = minimum number of different individuals identified during season. This number was not determined for mammals or owls as these species are primarily nocturnal with occurrences detected by tracks.

Species	First date observed	Last date observed	No. days detected	Min no. individ.	Notes
Mammalian					
Coyote	17 Mar	10 Sep	65	-	Most common on South Oso Flaco shoreline. Uncommon on the Southern Exclosure and North Oso Flaco shoreline. Noted inside the predator fencing of the Southern Exclosure and North Oso Flaco on 25 days. Two coyotes were lethally removed this season.
Domestic dog	27 Mar	1 Sep	10	-	Primarily documented by tracks only on shoreline areas. On 4 May, coyote, dog, and human tracks at a failed plover nest site in South Oso Flaco. No evidence of eggs found.
Opossum	16 May	22 Aug	8	-	Activity primarily noted in the Southern Exclosure and on North Oso Flaco shoreline during August.
Raccoon	3 Mar	6 Sep	77	-	Activity noted inside the Southern Exclosure and shoreline. Tracks also present in North and South Oso Flaco. Three raccoons caught in traps intended for skunks were euthanized.
Skunk	16 Mar	9 Sep	87	-	Commonly observed in the Southern Exclosure. Eighteen plover nests and five tern nests documented lost to skunk and additional nest loss suspected during periods of high skunk activity and documented loss. In addition, skunk depredation of very young tern chicks is suspected of contributing to a very low fledgling rate. Twenty-three skunks were lethally removed.
Avian					
Osprey	Common throughout the season				Although not documented as a predator of plovers or terns, ospreys (*Pandion haliaetus*) are included in this table due to the disturbance they can cause when perched for long periods of time in sensitive areas. Primarily observed flying over 6, 7 and 8 exclosures and occasionally perched and eating fish.
Loggerhead shrike	17 Jul	25 Aug	7	2	All observations in South Oso Flaco and Boneyard.
Northern harrier	6 Apr	10 Sep	30	3	Almost all observations in flight and often hunting primarily over North and South Oso Flaco. Minimum of three individuals (based on age and sex characteristics) observed during season: one adult female, one sub-adult (likely male), and one juvenile.
Red-tailed hawk	2 Mar	8 Sep	66	4	Observed primarily perch-hunting in North and South Oso Flaco foredunes. A juvenile red-tailed hawk was documented taking one plover chick on 17 August (see Table G.1 in Appendix G). Minimum of four individuals (based on age characteristics) observed during season: one adult, one sub-adult, and two juveniles.
American kestrel	27 Mar	6 Sep	18	2	Observed perch-hunting primarily in Boneyard exclosure and North and South Oso Flaco. Perched on 6 exclosure fence on one day, perched on 8 exclosure fence on three days, and flying over 7 exclosure on two days. Minimum of two individuals (based on sex characteristics) observed during season: one male and one female.
Merlin	28 Mar	16 Aug	5	2	Observed hunting over 6 exclosure on one day, 8 exclosure and shore on two days, and South Oso Flaco on two days. Four of five days were observed between 28 March and 28 April and one day on 16 August. Minimum of two individuals (based on sex characteristics) observed during season: one male and one female.

Appendix F. Predator summary tables and figures (continued).

Table F.1. Summary of predators detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2017 (continued).

Species	First date observed	Last date observed	No. days detected	Min no. individ.	Notes
Peregrine falcon	1 Mar	8 Sep	67	7	Observed throughout the Southern Exclosure, North and South Oso Flaco in flight and perching, sometimes over an extended time period. Observed multiple times pursuing and/or consuming prey on the shoreline and inside the exclosure. Peregrines were documented taking one juvenile plover (see Table G.1 in Appendix G). Minimum of seven individuals (based on bands and/or age and sex characteristics) observed during season: one adult male VID banded "50AB" on left leg and silver on right; one adult female VID banded "17D" on right leg and silver on left; one banded adult, bands partially read with silver on left leg and black VID on right (not "17D"); one banded juvenile, bands partially read with silver on left leg and VID on right; one unbanded adult; one unbanded sub-adult; and one juvenile live-trapped and banded "W47" on right leg and silver on left leg.
Large owl spp.	2 Mar	1 Sep	33	-	Both great horned owl and barn owl documented on site but observations and tracks indicate great horned owl make up the majority of owl presence. Activity primarily noted in 8 and Boneyard exclosures. Noted inside 7 exclosure on four days and 6 exclosure on two days.
Gull spp.	Present daily throughout season				Gulls were present the length of the shoreline of the Southern Exclosure, North and South Oso Flaco. Two plover nests documented depredated by gull (presence of tracks at depredated nests). One herring gull and two California gulls were lethally removed. One of the California gulls was inadvertently killed while attempting to remove the herring gull.
American crow	6 Mar	24 Jul	3	5	Single bird observed flying over 6, 7, and/or 8 exclosure on two days. Five crows seen at same time flying over 8 exclosure and shoreline on one day.
Common raven	15 Mar	19 Aug	8	2	Primarily observed in flight over 8 exclosure and North and South Oso Flaco from 15 March to 30 May, observed over 6 and 7 exclosures on 15 March and 25 April. Two ravens seen at same time flying over 6 exclosure. Ten plover nests documented lost to raven with four of these recorded on nest camera photos (three in South Oso Flaco and one in 8 exclosure).

Table F.2. Mammalian and avian predators removed under predator management actions for least terns and snowy plovers at ODSVRA in 2017.

Two coyotes, four common ravens, one herring gull, two California gull, three raccoons, and twenty-three striped skunks were lethally removed. Three raccoons were caught in traps intended for skunks and euthanized. One immature California gull was inadvertently killed while attempting to remove a herring gull. All animals trapped or removed were within ODSVRA boundaries, with the exception of four ravens off-site with the permission of the landowner. Revegetation areas are adjacent to or east of the exclosure and within the open riding area (see report Site Description section).

Date	Species	Age/Sex	Location
Lethally removed			
2-May	herring gull	immature	Arroyo Grande Creek
2-May	California gull	immature	Arroyo Grande Creek
18-May	raven	juvenile	Brown Road, Santa Maria
18-May	raven	juvenile	Brown Road, Santa Maria
18-May	raven	juvenile	Brown Road, Santa Maria
24-May	striped skunk	adult female	8 exclosure
25-May	coyote	adult female	South Oso Flaco
30-May	raven	adult	Oso Flaco Lake Road (east of Oso Flaco)
6-Jun	striped skunk	adult female	8 exclosure
7-Jun	raccoon	adult male	8 exclosure
9-Jun	striped skunk	juvenile female	8 exclosure
9-Jun	striped skunk	juvenile female	8 exclosure
14-Jun	coyote	adult male	Maidenform revegetation area
23-Jun	striped skunk	adult female	Humpback revegetation area
23-Jun	striped skunk	adult female	Humpback revegetation area
24-Jun	striped skunk	juvenile male	Boneyard
26-Jun	striped skunk	adult male	7 exclosure
27-Jun	striped skunk	adult female	8 exclosure
28-Jun	striped skunk	adult female	Eucalyptus revegetation area
29-Jun	striped skunk	adult female	North Eucalyptus revegetation area
6-July	striped skunk	adult female	Eucalyptus revegetation area
6-July	striped skunk	adult female	7 exclosure
8-July	striped skunk	adult female	7 exclosure
8-July	striped skunk	adult male	8 exclosure
12-July	striped skunk	adult female	Humpback revegetation area
12-July	striped skunk	adult female	8 exclosure
14-July	striped skunk	adult male	8 exclosure
24-July	California gull	immature	6 shoreline
25-July	striped skunk	juvenile male	8 exclosure
27-July	raccoon	adult male	North Oso Flaco
31-July	raccoon	adult female	7 exclosure
1-Aug	striped skunk	juvenile female	8 exclosure
3-Aug	striped skunk	juvenile female	8 exclosure
7-Aug	striped skunk	adult female	8 exclosure
7-Aug	striped skunk	adult female	Boneyard

Appendix F. Predator summary tables and figures (continued).

Table F.2. Mammalian and avian predators removed under predator management actions for least terns and snowy plovers at ODSVRA in 2017 (continued).
Dates in parentheses are dates released.

Date	Species	Age/Sex	Location
Live-trapped and relocated			
30-Aug (31-Aug)	peregrine falcon	juvenile female	South Oso Flaco
4-Apr (5-Apr)	great horned owl	adult male	Pipeline revegetation area

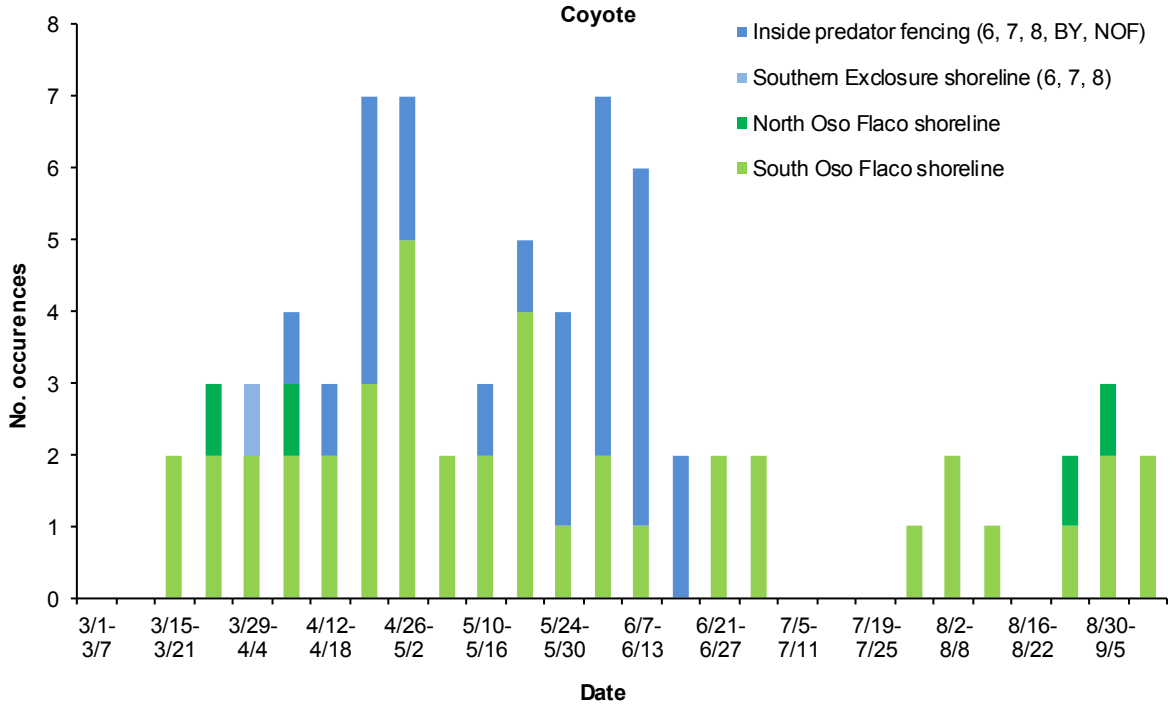


Figure F.1. Coyote occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2017.

Observations from 1 March–10 September (a 194-day period). Coyote presence is documented for the Southern Exclosure shoreline (6, 7, and 8 exclosures), North Oso Flaco shoreline, South Oso Flaco shoreline, and inside the predator fencing of both the Southern Exclosure (6, 7, 8, Boneyard exclosures) and North Oso Flaco as separate occurrences. For the Southern Exclosure (6, 7, 8, and Boneyard exclosures) and North Oso Flaco, a distinction is made between the shoreline and inside the predator fencing of the exclosures because coyotes are typically excluded from the area protected by predator fencing.

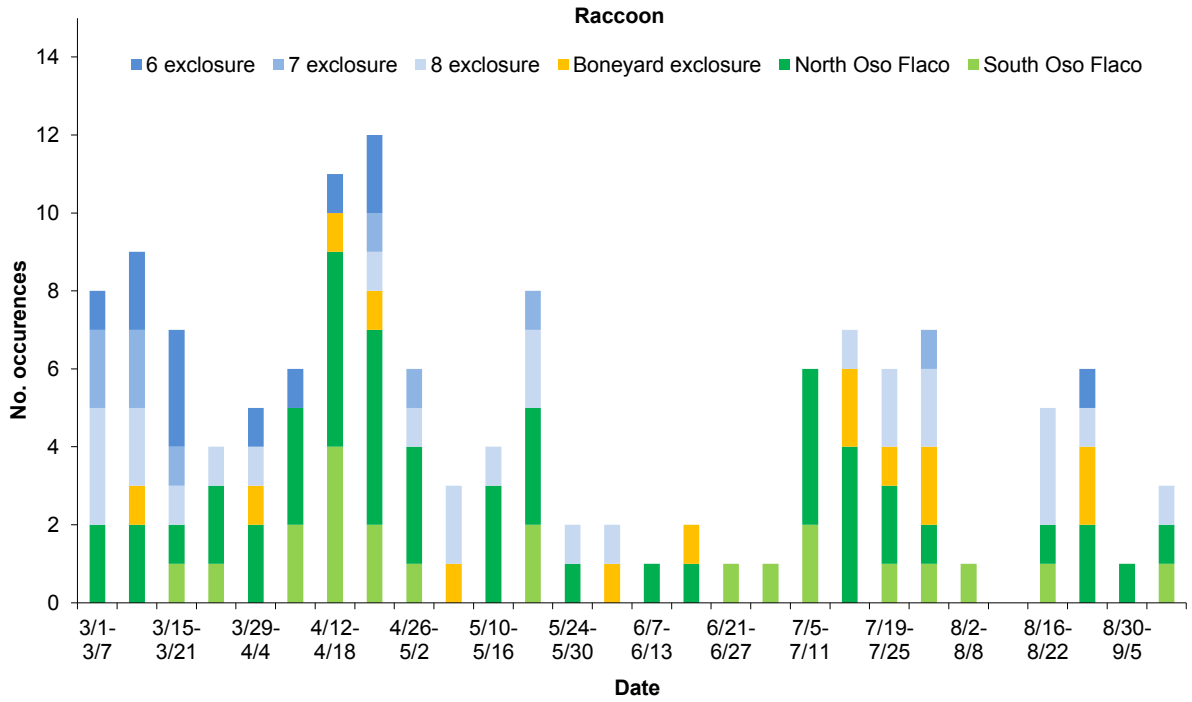


Figure F.2. Raccoon occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2017.

Observations from 1 March–10 September (a 194-day period). Raccoon presence is documented for each of the areas of the Southern Exclosure (6, 7, 8, and Boneyard exclosures), North Oso Flaco, and South Oso Flaco as separate occurrences. No distinction is made between the shoreline and inside the predator fencing of the exclosure since raccoons are able to climb over the predator fencing.

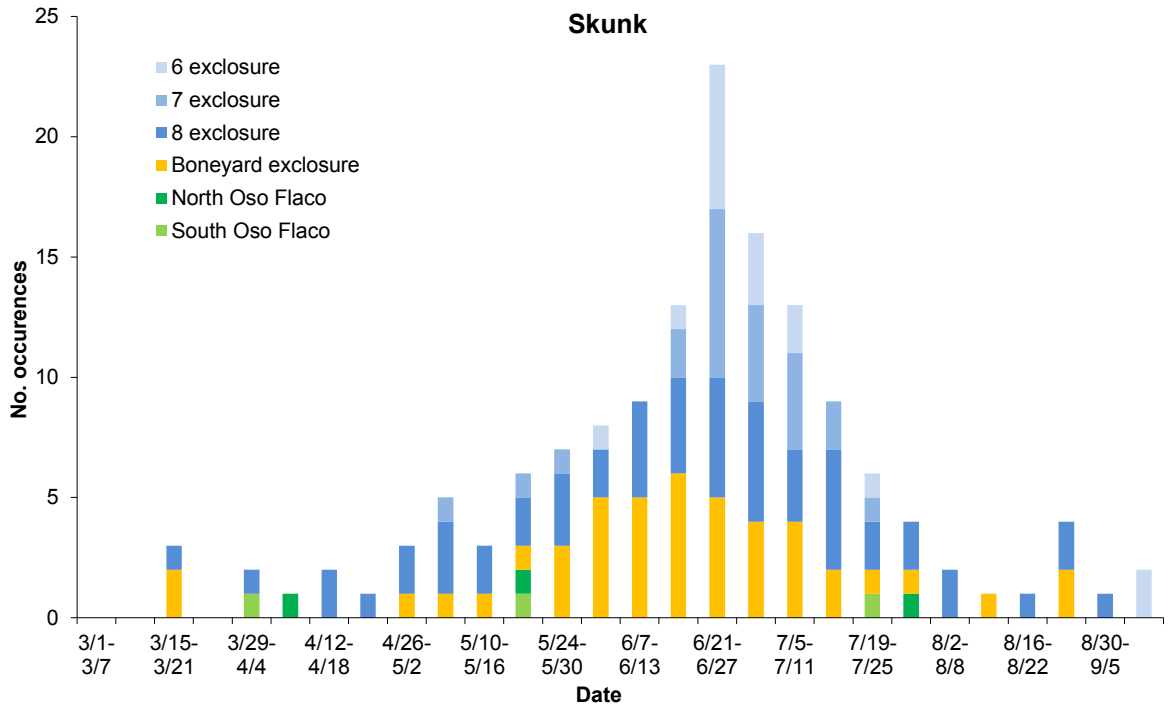
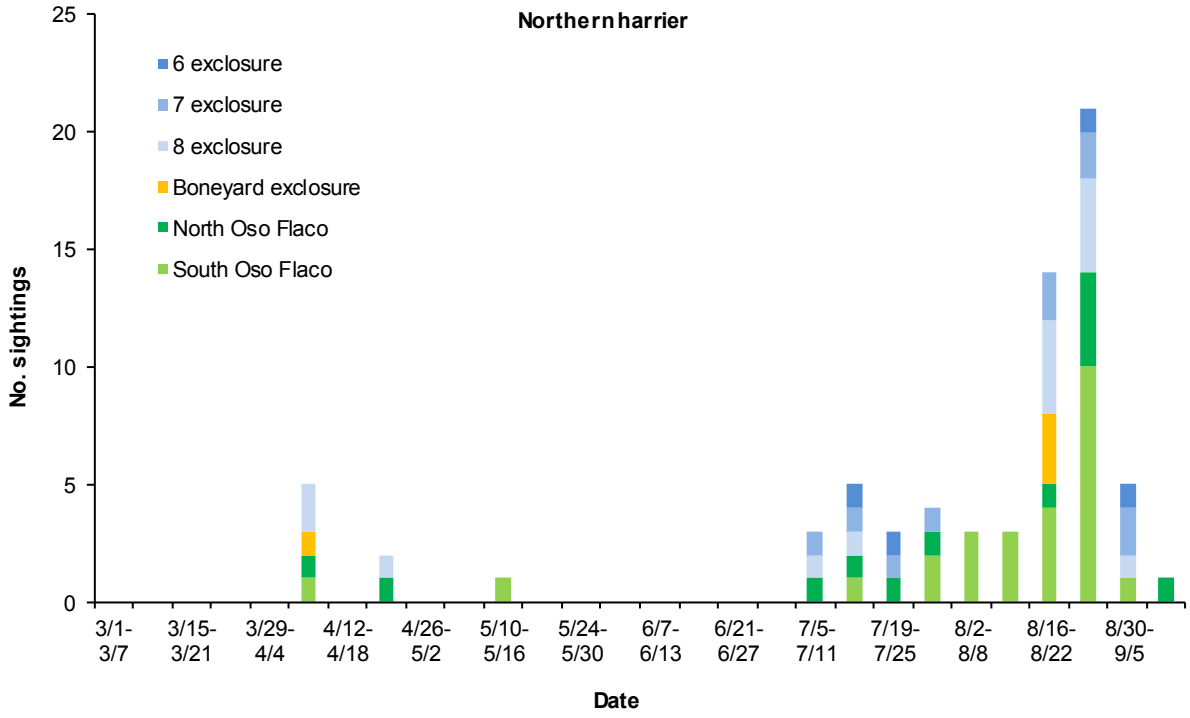


Figure F.3. Skunk occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2017.

Observations from 1 March–10 September (a 194-day period). Skunk presence is documented for each of the areas of the Southern Exclosure (6, 7, 8, and Boneyard exclosures), North Oso Flaco, and South Oso Flaco as separate occurrences. No distinction is made between the shoreline and inside the predator fencing of the exclosure since skunks are able to pass through predator fencing.



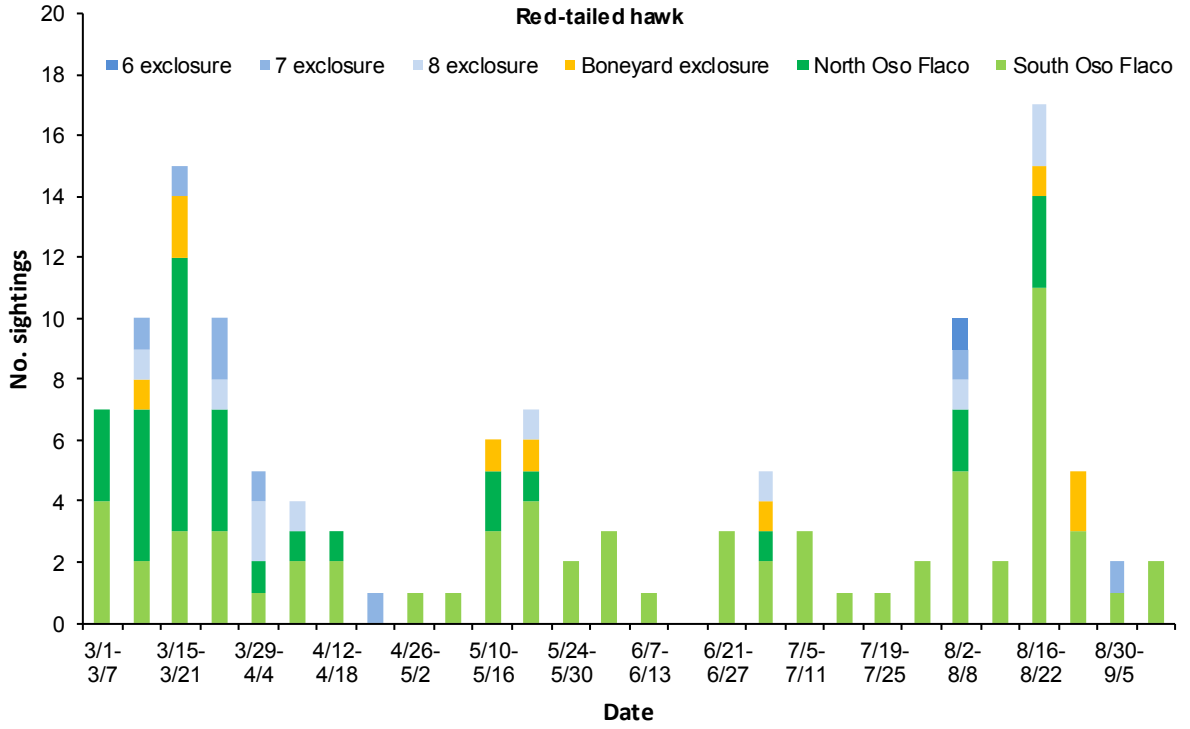
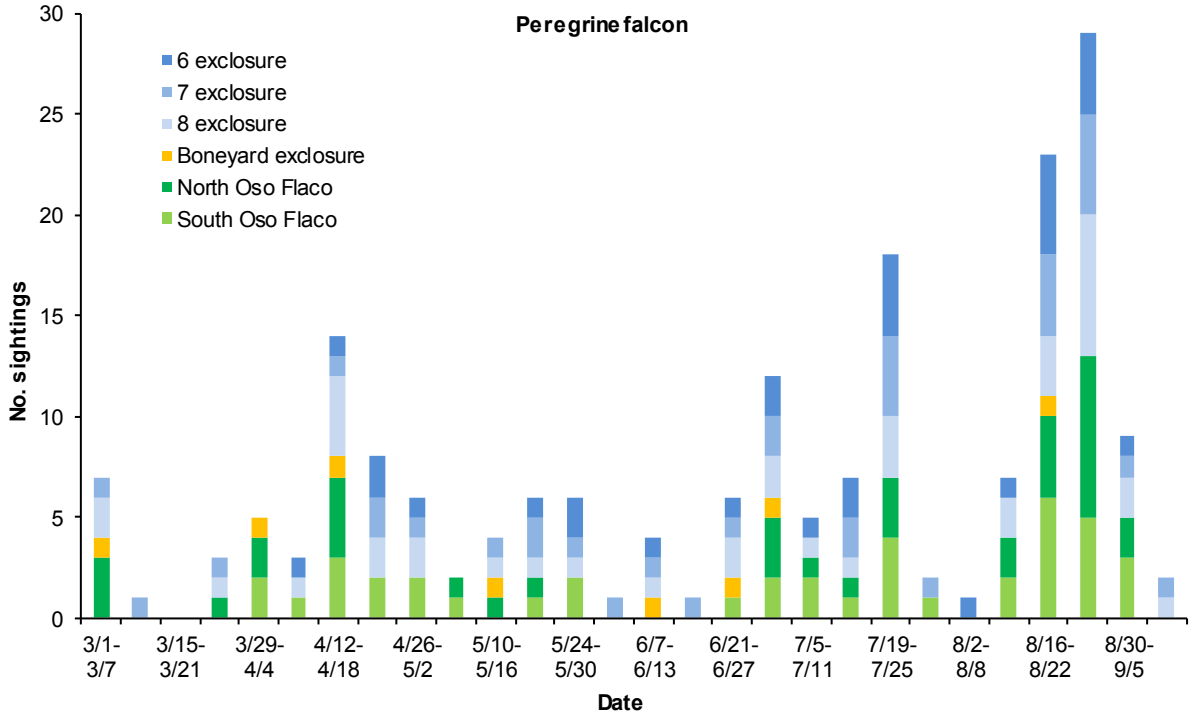


Figure F.4. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2017.
Observations from 1 March–10 September (a 194-day period).



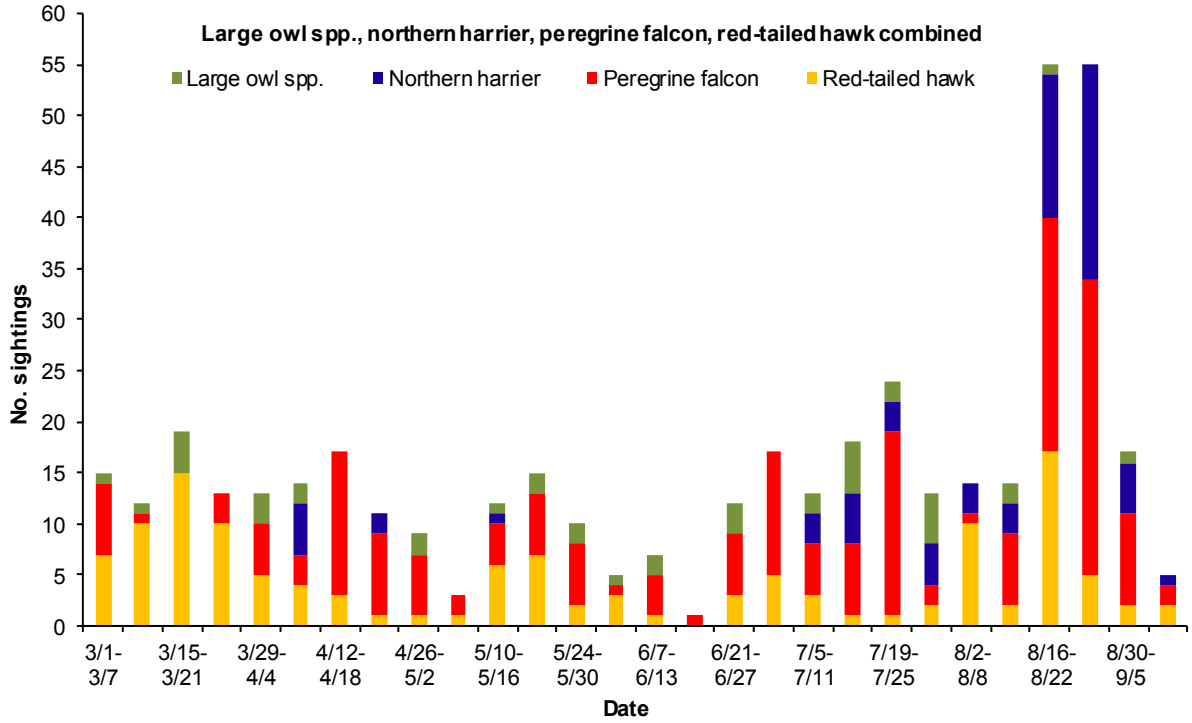


Figure F.4. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2017 (continued).
Observations from 1 March–10 September (a 194-day period).

APPENDIX G. DOCUMENTED MORTALITY OF CALIFORNIA LEAST TERN AND SNOWY PLOVER CHICKS, JUVENILES, AND ADULTS AT ODSVRA.

Table G.1. Documented predation of snowy plovers from 1 March to 30 September 2017.

No. (age)	Predator	Location	Notes
1 (adult)	Peregrine falcon	7 exclosure	On 28 June, an unbanded sub-adult peregrine caught an unbanded adult plover over the ocean west of 7 exclosure.
1 (juvenile)	Red-tailed hawk	8 exclosure	On 17 August, a juvenile red-tailed hawk was observed catching and eating a small unbanded plover chick on 8 exclosure shoreline.
1 (juvenile)	Peregrine falcon	8 exclosure	On 21 August, an unbanded juvenile female peregrine caught a juvenile plover on 8 exclosure shoreline.

Table G.2. Mortality, other than documented predation, of least terns from 1 March to 30 September 2017.

See Notes section and attached necropsy reports for more detail. All remains not suitable for necropsy were saved to be provided to a designated depository.

No. (age)	Location	Notes
1 (adult)	Open riding area	On 30 May, the desiccated partial carcass of an adult was found two hundred fifty feet east of 7 exclosure. The wing, primaries of a second wing, head, and small clumps of feathers had been dug up by a coyote and the head was found still buried. The CDFW OSPR determined it to be too desiccated for analysis.
1 (adult)	6 exclosure	On 14 July, the desiccated intact carcass of an adult was found in the middle of 6 exclosure. The ventral body surface was open and lying against the ground. The flight feathers of wings were missing from body (two dark outer primaries near carcass). A silver federal service band on the right leg identifies the bird was originally banded G/Y:S as a chick at ODSVRA on 22 June 2004 (13 years old when found). The remains were looked at by CDFW OSPR and determined to be too desiccated for analysis.

Table G.3. Mortality, other than documented predation, of snowy plovers from 30 November 2016 to 6 November 2017.

See Notes section and attached necropsy reports for more detail. All remains not suitable for necropsy were saved to be provided to a designated depository.

No. (age)	Location	Notes
2 (adult)	Open riding area	On 30 November 2016, two dead snowy plovers, one banded BB:PW and one unbanded, were found 20 feet apart south of marker post 1. The unbanded plover was flattened in tire tracks and the banded plover was seen carried a short distance and pecked by a gull. There was one fledge banded BB:PW from ODSVRA in 2014 and 2016.
1 (adult)	Open riding area	On 11 January, the intact carcass of an adult male banded YR:YR was found near the waterline between Pier Avenue and marker post 1. The carcass was sent for necropsy and results indicated it died of acute crush trauma, presumably from a vehicle strike. This bird was banded as a chick at Monterey Bay, California, in 2015, successfully bred in the Monterey Bay area in 2016, and wintered at ODSVRA in 2015 and 2016. It was last observed alive on 20 December 2016 in a flock near marker post 1.
1 (adult)	Open riding area	On 15 February, the desiccated remains of an unbanded adult were found in tire tracks east of marker post 7. The remains included a partial body with an attached wing and crushed head.
1 (adult)	Open riding area	On 25 February, the fresh carcass of an unbanded adult was found 50 feet north of marker post 3.
1 (adult)	Open riding area	On 26 February, the fresh, wet carcass of an adult banded PV:GG, was found on the shoreline 900 feet south of marker post 8. There were a total of four fledglings banded PV:GG at ODSVRA between 2014 and 2015.

Appendix G. Documented mortality of California least tern and snowy plover chicks, juveniles, and adults at ODSVRA (continued).

Table G.3. Mortality, other than documented predation, of snowy plovers from 30 November 2016 to 6 November 2017 (continued).

No. (age)	Location	Notes
1 (chick)	6 exclosure	On 28 April, one unattended three-day-old chick from the SP8 nest found in open riding area, was collected, and reunited with brood the following day (bands marked). On 5 May, this chick with marked bands was found immobile on the shoreline of 6 exclosure at 10 days old. The chick was placed in a brooder where it died a short time later. This chick was last seen active and brooding on 4 May at nine days old.
1 (chick)	6 exclosure	On 14 June, the carcass of a chick was seen through a spotting scope on the northern portion of 6 exclosure shoreline. The chick was banded YR on one leg and the other leg was not visible. The carcass could not be recovered to avoid disturbance to young nearby plover broods.
1 (juvenile)	6 exclosure	On 3 July, a 33-day-old fledgling from the SP95 nest was found sitting on the ground with limited mobility on the 6 exclosure shoreline. The fledgling was collected, placed in a warmed brooder and taken to Pacific Wildlife Care that same day for medical treatment. It was noted to be emaciated and lethargic, tested positive for giardia, and died the following day. CDFW OSPR performed a necropsy and the report results were consistent with the giardiasis diagnosis.
1 (adult)	Open riding area	On 6 September, an unbanded adult was found north of marker post 1. The ventral surface was facing up with a blood spot on the chest.
1 (adult)	Open riding area	On 12 September, the decaying carcass of an unbanded adult was found east of marker post 5 and appeared flattened.
1 (juvenile)	8 exclosure	On 16 September, the intact carcass of a juvenile banded BB:BW from the SP248 nest was found 1.5 feet west of the 8 exclosure shoreline fence. The carcass was partially buried, decomposing, and full of maggots. This bird was last seen alive on 7 exclosure shoreline on 5 September at 36 days old.
1 (chick)	6 exclosure	On 4 August, one wet six-day-old chick from the SP238 nest was observed crouched for over an hour, vocalizing, wings splayed, and no attending adult at the north end of the 6 exclosure shoreline. The chick was placed in a warmed brooder with food and water, the chick did not react to the talitrids and remained inactive. On the following morning, the chick was found dead in the brooder. A second chick from this brood was last seen 18 August (20 days old).
1 (adult)	Open riding area	On 6 November, the intact carcass of an unbanded adult was found between Grand Avenue and Pier Avenue. The carcass appeared flattened and was partially buried next to tire tracks.

Oceano Dunes State Vehicular Recreation Area

2017 Predator Management Report

Submitted To:

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Submitted By:

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&
Eric Covington, District Supervisor
San Luis District
CA Wildlife Services Program

Introduction

Prior to the 2017 California Least Tern (*Sternula antillarum browni*)(CLTE) and Western Snowy Plover (*Charadrius nivosus nivosus*)(SNPL) nesting season, USDA-APHIS-Wildlife Services entered into an agreement with Oceano Dunes State Vehicular Recreation Area (ODSVRA) to conduct predator management activities in the CLTE and SNPL nesting areas. Wildlife Specialist (WS) Alexander Schaefer was assigned to the ODSVRA project to monitor and selectively remove mammalian or avian predators for protection of nesting CLTE and SNPL.

WSS Alexander Schaefer began working the ODSVRA project on 8 May 2017 and worked through 13 September 2017. Prior to beginning, WSS Schaefer underwent USDA mandatory training including the use of firearms, trapping equipment, defensive driving, civil rights, and all aspects of safety.

Methods of Predator Management

Multiple methods were used for CLTE and SNPL protection throughout the nesting season. Activities included surveying, trapping, predator calling, shooting, spotlighting and hazing.

Daytime surveys were performed by either hiking or driving on the dunes and shoreline in an attempt to locate predators through track identification, binoculars or a spotting scope. Wildlife Services stayed in communication with State Park resource staff in order to stay current on their observations of predator activity. Predator surveys were conducted in revegetation islands such as Heather, Acacia, Cottonwood, Eucalyptus, Table Top, Pipeline, Boy Scout Camp, and Maidenform. Predator related activities also took place on the southern exclosure shoreline, North Oso Flaco and the South Oso Flaco areas (Appendix 1).

Trapping was the most widely used method for predator management during the 2017 nesting season. Methods included the use of Woodstream® #3 and #1.5 padded jaw leg-hold traps for predators such as coyotes (*Canis latrans),* common ravens (*Corvus corax*), and striped skunks (*Mephitis mephitis).* Traps were baited with commercially available lures made from different scents, glands and meat based baits as well as with hard boiled chicken eggs. The model of firearm used to remove trapped animals was a Ruger® 10/22 chambered in .22 long rifle, while the ammunition of choice was CCI® Short Range Green that fired a 21 grain non-lead bullet.

Calling and shooting was used for coyote management and was successful during the 2017 season. Calling is most effective at dawn or dusk and is performed by using manual hand held or electronic calls. Calling is an attempt to imitate a prey animal in distress in order to entice a predator to respond to the call. When a target predator can be positively identified, it is then removed through shooting. Efforts this season utilized manual hand held calls. The model of rifle used was a Mossberg Patriot® chambered in .243 caliber, firing an 85 grain, non-lead, copper tipped cartridge manufactured by Federal Ammunition®

Euthanasia of captured animals is conducted in compliance with standards set by the American Veterinary Medical Association. Where practical, captured animals are euthanized by a single shot at close range with a .22 caliber rifle. Circumstances sometimes require the use of euthanasia drugs to remove a target predator that is trapped. When necessary, sodium pentobarbital is administered through a needle and syringe that is fastened to a metal rod with a collar twisted in place to hold the syringe. The effects of sodium pentobarbital are rapid unconsciousness, followed by a reduction of respiration and central nervous system activity, and ending with cardiac arrest. When injected into the heart or major artery, the results are almost instantaneous. Sodium pentobarbital is a schedule II controlled substance whose use is monitored by the U.S. Drug Enforcement Administration. Use of sodium pentobarbital by WS employees is restricted to those that have received training and are certified in its use. Mammals euthanized in this fashion are given an injection of the drug and disposed of according to WS directives, and all applicable state and federal laws and regulations. Injections are placed in the intraperitoneal cavity. The typical dosage rate is 1 cc for every 10 pounds of body weight. A sliding internal rod within the larger metal rod allows the applicant to inject the drug with the use of their thumb while holding the end of the rod farthest away from the animal.

Spotlighting is a common method of predator management that is usually performed while driving a vehicle and shining a high powered light looking for the reflective eye shine of the predator. Once eye shine has been located, identification of the predator can then be made with the use of binoculars. The same method can also be performed while remaining in a stationary position along target predators' travel ways in an effort to remove them should they appear. The spotlight used to locate predators was an FLX 800® lumen unit manufactured by Barska Flashlights®. Binoculars used in identifying predators were 10 X 42mm Goldring® by Leupold Optics.

Baiting efforts to attract common ravens using hard boiled chicken eggs were employed in attempt to entice ravens to a location to feed on the hard boiled eggs. Once ravens have become habituated to feeding on the hard boiled eggs, eggs that have been injected with the corvicide DRC-1339 are then placed in the area where the pre-baiting occurred. Use of DRC-1339 is a registered pesticide that is regulated by the Environmental Protection Agency (EPA). The EPA label for DRC-1339 only allows employees with the United States Department of Agriculture who have been trained in its use (Appendix 2). In California, a permit must first be obtained from the county where the chemical will be used by a person who is licensed by the California Department of Pesticide Regulation prior to using the drug. DRC-1339 is a unique pesticide that is highly toxic to corvids, blackbirds and starlings. EPA labels of DRC-1339 are also available for use on pigeons and gulls. Most other species of birds and mammals would have to consume large amounts of the toxicant to cause harm. The active chemical in DRC-1339 is 3-Chloro-p-Toluidine Hydrochloride. Each egg bait contains only two milligrams of the chemical. Its effects on target species cause renal (kidney) failure resulting in toxic levels of uric acid in the blood. Most birds die at the roost site within 24 hours of consumption, but can take up to three days (Appendix 3).

Results of Predator Management Methods

When predator management efforts by Wildlife Services began for the 2017 season, the SNPL nesting season had already commenced. The main predation concerns this season were by common ravens and striped skunks in or near SNPL and CLTE habitat. Coyote track evidence suggested that individuals were hunting and foraging primarily along the shoreline areas in South Oso Flaco in areas where SNPL nests and chicks were found. In past nesting seasons, coyotes have been documented taking SNPL eggs and chicks at ODSVRA. In 2012, four coyote scats were found to contain a total of 11 bands (representing a minimum of one plover chick, two unknown age plovers, and one unknown age tern). Coyote scat surveys were conducted during the 2017 nesting season, but no SNPL or CLTE bands were discovered during those scat surveys. A minimal amount of coyote activity along the shoreline or past the Oso Flaco Boardwalk was documented by observations of coyote track in those areas. However, two SNPL nests were confirmed to have been predated by coyotes during the nesting season.

The 2017 nesting season saw a sharp increase of common raven (*Corvus* corax) predation events on SNPL nests. Multiple sightings were observed of individual birds frequenting the exclosure areas throughout the park with ten documented nest losses to ravens. Aggressive trapping efforts using replicated plover nest sets baited with quail eggs was attempted. Baiting efforts using hard boiled chicken eggs was attempted to attract ravens to feed on the eggs with enough consistency to later treat the eggs with corvicide DRC 1339. Motion activated cameras were placed at each bait site to verify raven consumption of the egg baits. The use of 1-1/2 padded jaw leg-hold traps baited with hard boiled chicken eggs were placed exclusively in South Oso Flaco. It is believed most ravens traveled north from the south or from the east via the Oso Flaco agriculture fields. Ravens failed to visit either the quail egg sets or chicken egg baits. No DRC-1339 egg baits were utilized this season.

Highly proactive predator watch shifts were also employed by park resource staff and by WS Schaefer. An active raven nest off the ODSVRA site near Brown Road was inspected by WS staff (WS Kevin Estrada and WS Alex Schaefer), as well as by Bloom Biological Incorporated's (BBI) Robert Chapman and independently by Paul Young. The nest was found to have two adult ravens and three juveniles, close to fledgling age. The nest's inhabitants were deemed a potential threat to SNPL nests due to its close proximity to ODSVRA. Preemptive efforts by WS staff resulted in the removal of the three juvenile ravens. Despite efforts, neither of the adult ravens were removed from the nesting area. The evening of 30 May saw the removal of one small adult raven by WS District Supervisor Eric Covington in the agricultural fields off of Oso Flaco Lake Road approximately 400 meters east of the Oso Flaco Lake parking lot. This individual was suspected to be the primary raven that had predated multiple nests and had been photographed via trail cameras placed at active SNPL nests by resources staff. All raven damage ceased with no further raven related predation during the remainder of the season following the removal of this individual.

Gull predation to SNPL chicks at ODSVRA is a concern and may potentially be a reason for chick loss during the 2017 season. On 24 July, an immature California gull *(Larus californicus)* was observed displaying suspicious foraging and hunting behavior among broods of young SNPL chicks on the 6 shoreline. A project lead and other resources staff were able to monitor the gull as WS Schaefer arrived at the scene. WS Schaefer was instructed to remove the gull as a precaution. WS Schaefer euthanized the gull with a .22 caliber rifle. The gull was necropsied, but no SNPL remains or bands were found.

Peregrine Falcons *(Falco peregrinis)* and Northern Harriers *(Circus hudsonius)* were commonly observed in and around SNPL and CLTE exclosures. Peregrine Falcons were observed perching on or within exclosure fences and flying low over the shoreline on many occasions. WS Schaefer would locate avian predators and assist park staff and BBI's Robert Chapman in hazing and some trapping efforts.

Great Horned Owls (*Bubo virginianus)* were a predation concern and were flushed from revegetation areas on occasion by WS Schaefer during predatory surveys. WS Schaefer would take note of owl tracks and report them to monitors as they were located in sensitive areas as well as collect and inspect owl pellets when found. Owl trapping attempts were performed by Chapman during the season, however WS Schaefer was not involved.

Two coyotes were lethally removed during the 2017 season (Table 1). One coyote was trapped and removed from South Oso Flaco in the fore dunes in a quail egg set placed for ravens. The second coyote was tracked by WS Schaefer as it exited under the fence of Interior Bone Yard and travelled from the west to West Maidenform revegetation. It was then called in and removed.

Three raccoons (*Procyon lotor*) were trapped using Tomahawk® cage traps. One adult raccoon was removed within the 8 exclosure west of the Pipeline revegetation. A second raccoon was removed within the 7.5 exclosure revegetation area. The final raccoon was removed within the north Oso Flaco exclosure near the boardwalk area (Table 1 and Appendix 1).

Three skunks were removed using #1.5 leg hold traps. The 2017 nesting season saw an unprecedented level of striped skunk (*Mephitis mephitis*) predations that focused on SNPL nests and CLTE nests. Predation of CLTE chicks is highly suspected but not documented. Aggressive and extensive trapping efforts targeting striped skunks took place in the North Oso Flaco fore dunes, West Boneyard, East Boneyard, 8 exclosure, 7.5 exclosure/revegetation, and in revegetation islands such as Pipeline, West Maidenform, Humpback Tabletop, Eucalyptus, and North Eucalyptus. The islands directly east of the exclosed areas are where WS Schaefer had repeatedly tracked most skunks across the Off Road Area from their point of exit/entrance in the exlcosures to their denning areas (Table 1 and Appendix 1). Twenty striped skunks were trapped and removed with cage traps and three were trapped and removed with padded jaw 1-1/2 leg-hold traps. Spotlighting attempts were made this season to remove striped skunks found near the exclosure areas, but were unsuccessful.

Future Recommendations

WS encourages educating the public about the importance of not feeding wildlife in an effort to reduce predator attraction.

WS also recommends that all garbage containers have reinforced lids to prevent garbage consumption by wildlife.

WS recommends the state park continue maintaining the height and strength of the perimeter fence surrounding the enclosures during the nesting season. Maintenance of fencing where sand has shifted to create low spots or places where mammalian predators can breach should continue to be conducted on a regular basis to prevent predators from entering enclosures while fencing is constructed during the season.

WS recommends the state park continue to enforce the leash law for pets on the beach, which is crucial during nesting season.

WS recommends the state park continue removing animal carcasses from the beach to eliminate alternate food sources that serve as an attractant to scavenging predators such as coyotes.

WS recommends the selective removal of predators that are a potential or known threat to the CLTE and SNPL breeding population at ODSVRA. Removal of concerning predators prior to predation events should be the goal to protect CLTE and SNPL nesting and brooding areas.

WS recommends the state park continue to train Wildlife Services specialists so they can be added to permits in a timely manner that allow entrance into areas where predators are threatening the productivity of CLTE and SNPLs as well as areas where predators travel, such as the shoreline and South Oso Flaco Dunes. The ability to capture problem predators where they are located without an ODSVRA staff escort increases WS efficiency.

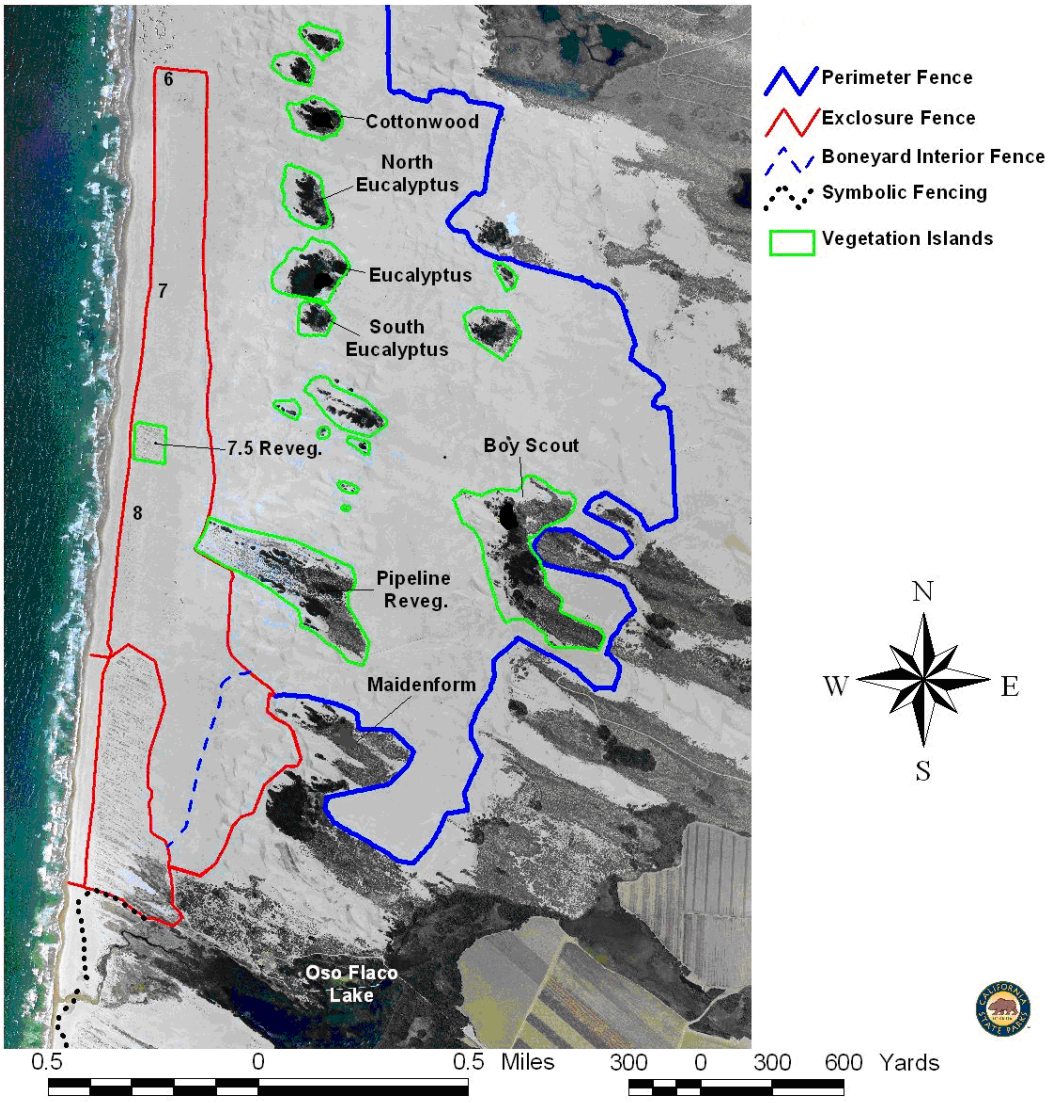
Table 1: Predator Removal Summary

Date	Species	Age/Sex	Location
5/18/17	Raven	Juvenile	Brown Road
5/18/17	Raven	Juvenile	Brown Road
5/18/17	Raven	Juvenile	Brown Road
5/24/17	Skunk	Adult Female	8 Exclosure
5/25/17	Coyote	Adult Female	South Oso Flaco
5/30/17	Raven	Adult N/A	Oso Flaco Lake Rd
6/6/17	Skunk	Adult Female	8 Exclosure
6/7/17	Raccoon	Adult Male	8 Exclosure
6/9/17	Skunk	Juv. Female	8 Exclosure
6/9/17	Skunk	Juv. Female	8 Exclosure
6/14/17	Coyote	Adult Male	West Maidenform
6/23/17	Skunk	Adult Female	Humpback TT
6/23/17	Skunk	Adult Female	Humpback TT
6/24/17	Skunk	Juv. Male	East Boneyard
6/26/17	Skunk	Adult Male	7.5 Exclosure
6/27/17	Skunk	Adult Female	8 Exclosure
6/28/17	Skunk	Adult Female	Eucalyptus
6/29/17	Skunk	Adult Female	N. Eucalyptus
7/6/17	Skunk	Adult Female	Eucalyptus
7/6/17	Skunk	Adult Female	7.5 Exclosure
7/8/17	Skunk	Adult Female	7.5 Exclosure
7/8/17	Skunk	Adult Male	8 Exclosure
7/12/17	Skunk	Adult Female	Humpback TT
7/12/17	Skunk	Adult Female	8 Exclosure
7/14/17	Skunk	Adult Male	8 Exclosure
7/24/17	Ca Gull	Immature	6 Shoreline
7/25/17	Skunk	Juv. Male	8 Exclosure
7/27/17	Raccoon	Adult Male	North Oso Flaco
7/31/17	Raccoon	Adult Female	7.5 Exclosure
8/1/17	Skunk	Juv. Female	8 Exclosure
8/3/17	Skunk	Juv. Female	8 Exclosure
8/7/17	Skunk	Adult Female	8 Exclosure
8/7/17	Skunk	Adult Female	East Boneyard

Alexander Schaefer, Wildlife Specialist
San Luis District
CA Wildlife Services

Eric Covington, District Supervisor
San Luis District
CA Wildlife Services

Appendix 1: Map of ODSVRA SNPL and CLTE Nesting Exclosures and Adjacent Areas



Appendix 2: DRC-1339 EPA Label

PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

Fatal if swallowed or inhaled. Corrosive. Causes irreversible eye damage and skin burns. This product may cause skin sensitization reactions in some people. Do not get in eyes, on skin, or on clothing. Wear protective clothing, protective eyewear, and respiratory protection, as listed under "Personal Protective Equipment". Wash thoroughly with soap and water after handling and before eating or smoking. Remove contaminated clothing and wash before reuse.

PERSONAL PROTECTIVE EQUIPMENT

Wear goggles or face shield and rubber gloves when handling. Wash hands with soap and water after handling. Handlers who mix packages containing 1 lb. or more of this product must wear: 1) Coveralls over long-sleeved shirt and pants, 2) Waterproof gloves, 3) Chemical-resistant footwear and sock, 4) Protective eyewear, and 5) Respirator with either an organic vapor-removing cartridge with a prefilter approved for pesticides (MSHA/NIOSH approval prefix TC-23C) or a canister approved for pesticides (MSHA/NIOSH approval prefix TC-14G), or a NIOSH approved respirator with an organic vapor (OV) cartridge or canister with any R, P or HE prefilter.

Users should remove PPE immediately after handling this product, wash thoroughly and put on clean clothing. If pesticide gets inside clothing, remove immediately. Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions are provided for washables, use detergent and hot water. Keep and wash PPE separately from other laundry before reuse.

ENDANGERED SPECIES CONSIDERATIONS

Before undertaking any control operations with this product, consult with local, State, and Federal wildlife authorities to ensure the use of this product presents no hazard to any endangered species.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

STORAGE: Store only in original container, in a dry place inaccessible to children, pest and domestic animals.

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spilled bait, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER DISPOSAL: Completely empty by shaking and tapping sides and bottom to loosen clinging particles. Empty residue into application equipment, then dispose of bags in a sanitary landfill or by incineration if allowed by State and local authorities. If burned, stay out of smoke.

RESTRICTED USE PESTICIDE

Due to Acute Hazards (Oral, Dermal, Inhalation, and Eye) to Humans, Nontarget Birds and Aquatic Invertebrate and the Need for Highly Specialized Applicator Training.

For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicators certification.

For use only by U.S. Department of Agriculture personnel trained in bird control or persons under their supervision.

COMPOUND DRC-1339 CONCENTRATE – Livestock, Nest & Fodder Depredations

For control of crows, ravens, and magpies that prey on newborn livestock, that prey on eggs and/or young of Federally-designated Threatened or Endangered Species or other species designated to be in need of special protection or that damage and feed on the contents of silage/fodder bags.

ACTIVE INGREDIENT:

3-Chloro-p-toluidine hydrochloride	97.0%
INERT INGREDIENTS:	3.0%
TOTAL:	100.0%

KEEP OUT OF REACH OF CHILDREN

DANGER - POISON

FIRST AID

IF SWALLOWED: CALL A PHYSICIAN OR POISON CONTROL CENTER IMMEDIATELY!

Drink 1 or 2 glasses of water and induce vomiting by touching back of throat with finger. Do not induce vomiting or give anything by mouth to an unconscious person.

IF INHALED: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

IF IN EYES: Flush with a steady stream of water for 15 minutes. Call a physician.

IF ON SKIN: Wash with plenty of soap and water. Get medical attention.

NOTE TO PHYSICIAN

Probable mucosal damage may contraindicate the use of gastric lavage.

ENVIRONMENTAL HAZARDS

This product is toxic to birds and aquatic invertebrates. Collect all spilled baits. Do not apply to water, or to areas where surface water is present, or to intertidal areas below the mean high tide mark. Runoff may be hazardous to aquatic organism in neighboring areas. Do not contaminate water when disposing of equipment washwaters or rinsate.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Read the entire label. Use strictly in accordance with precautionary statements and directions and with applicable State and Federal regulations.

GENERAL INFORMATION: Compound DRC-1339 Concentrate is a slow acting avicide. Birds ingesting treated bait(s) die within one to three days.

USE RESTRICTIONS

TARGET SPECIES

Common raven (Corvus corax)
White-necked raven (Corvus cryptoleucus)
Common crow (Corvus brachyrhynchos)
Black-billed magpie (Pica pica)

This product may be used only to prepare egg or meat-cube baits used to control common ravens (Corvus corax), white-necked ravens (C. cryptoleucus), common crows (C. brachyrhynchos), and black-billed magpies (Pica pica):

(1) in rangeland and pastureland areas where these species prey upon newborn livestock;
(2) in refuges or other areas under direct control of Federal or State agencies where ravens or crows prey upon the eggs and/or young of Federally-designated Threatened or Endangered Species, or upon the eggs and young of other species which Federal or State wildlife agencies have determined to be in need of protection from nest predators due to documented declines in numbers and/or in nesting success; or
(3) within 25 feet or silage/fodder bags that have been damaged or are likely to be damaged by crows, ravens, or black-billed magpies.

SEE BACK PANELS FOR ADDITIONAL DIRECTIONS FOR USE.

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICES
Riverdale, MD 20737-1237
EPA Est. No. 56228-ID-1
EPA Reg. No. 56228-29

Net Weight

3/00

DIRECTIONS FOR USE (*Cont.*)

Before applying treated baits, carefully observe feeding habits of ravens, magpies and/or crows to determine times of day when and sites where target species are likely to find and consume treated baits quickly while nontarget species potentially ate risk are unlikely to find treated baits. Prebaiting with untreated ("placebo") bait materials may be necessary to promote feeding by target species and to assess potential for exposure of nontarget species.

DO NOT apply treated baits in areas where there is a danger that Threatened or Endangered Species will consume baits unless special precautions are taken to limit such exposures. Such precautions shall include constant observation of baited sites and use of hazing tactics to frighten away Threatened or Endangered Species that otherwise might feed upon baits.

Dispose of unused, treated baits, and carcasses of dead or dying birds that are found by burning or burial, as authorized by applicable laws.

NOTE: WHEN CONTROLLING CROWS AND RAVENS, IT MAY BE NECESSARY TO OBTAIN A KILL-PERMIT FROM THE U.S. FISH AND WILDLIFE SERVICE AND/ OR THE APPLICABLE STATE WILDLIFE AGENCY.

DIRECTIONS FOR USE (*Cont.*)

MEAT BAITS:

FORMULATION DIRECTIONS: Mix 0.75 grams (0.027 oz) of Compound DRC-1339 Concentrate with 5.0 grams (0.18 oz) of powdered sugar. Pour or sprinkle concentrate sugar mixture over 200 meat cubes that measure about 1.3 cm (1/2 in) on each side. Mix or tumble bait slowly until all meat cubes appear to be evenly covered.

APPLICATION: Use meat baits prepared from this product only at the sites indicated above under **USE RESTRICTIONS** and only when use of egg baits is impractical or has proven to be ineffective.

Wear rubber gloves when handling baits. Place no more than 75 baits at each baited site. Place 5 to 10 baits in clusters over an area not to exceed 93 m^2 (1,000 ft^2) where control of ravens, magpies and/ or crows is desired. Draw stations (fresh, unpoisoned animal carcasses) may be needed to attract ravens, magpies and/or crows to desired bait exposure locations. When draw stations are used, place meat baits on or near the animal carcasses.

WHILE MEAT BAITS ARE EXPOSED, BAITED AREAS MUST BE OBSERVED CONTINUOUSLY FROM A DISTANCE OF NO MORE THAN 914 M (1000 YD) TO DETECT APPROACHES BY THREATENED OR ENDANGERED SPECIES AND OTHER DESIRED OR PROTECTED ANIMALS LIKELY TO EAT BAITS. Flush such nontarget animals away from treated baits by use of non-injurious methods. Because of wariness of target bird species, it may be necessary to observe baits from behind natural or specialy constructed blinds.

Unconsumed bait cubes must be retrieved at the conclusion of each observation period and no later than one hour after sunset daily. Dispose of retrieved baits in accordance with applicable State and Federal laws.

DIRECTIONS FOR USE (Cont.)

EGG BAITS:

FORMULATION DIRECTIONS: Dissolve 2 grams (0.035 oz) of Compound DRC-1339 Concentrate in 100 ml (0.2 pt) of warm potable water at 43.3°C (110°F) to make a 2% solution; or dissolve 4 grams (0.07 oz) of Compound DRC-1339 Concentrate in 100 ml (0.2 pt) of warm potable water to make a "4%" solution; or in other proportions appropriate to produce a "2%" or "4%" solution.

Using an 18-ga hypodermic needle or similar-sized implement, make an entry hole in the end of each hard-boiled chicken, turkey, or duck egg to be used. Using a syringe and a 20-ga Hypodermic needle, slowly inject 1 ml of the "2%" solution (or 0.5 ml of the "4%" solution) into the yolk of each egg.

MAKE ONLY ENOUGH SOLUTION TO TREAT THE DESIRED NUMBER OF EGGS. MARK TREATED EGGS WITH SMALL SKULL AND CROSSBONES OR THE WORD "POISON".

APPLICATION: Control of crows, magpies and raves with egg baits prepared from this product is limited to the sites indicated above under USE RESTRICTIONS. Place all egg baits used at one baited site within 25 ft (7.6 m) of the center of the site or within 25 ft of any silage/fodder bags that are to be protected. Place 1-4 eggs in each bait set, and do not use more than a total of 18 eggs per baited site. If a draw station (fresh, unpoisoned animal carcass) is used, all bait sets must be located at least 3 m (10 ft) from the carcass. Any silage that is spilled from the silage bag is not to be used for livestock feed. Wherever practicable, bait sets should be made in "dummy" nests created by making small depression in the ground. "Dummy" nests may be partially hidden by vegetation or other debris. In other situations, eggs may be placed on 1-ft2 or 2-ft2 elevated wooden platforms and restrained by wire to prevent eggs from falling off platforms or being removed by birds. Use 2-3 eggs per platform.

DO NOT USE MORE EGGS THAN ARE NEEDED TO EFFECT CONTROL as ravens and crows tend to cache surplus food.

Observed baited areas (from blinds) early in baiting (or prebaiting, if done) to determine whether nontarget species are approaching egg baits. Haze away threatened or Endangered species that might be at risk from baits. Remove baits if such Threatened or endangered Species continue to approach them.

Egg sets should be checked at 48-hour intervals. Rebait with additional treated eggs when more than 50% of the treated eggs offered have been removed by ravens, magpies or crows. When replacing baits, take care not to frighten target birds actively removing or feeding upon eggs. Retrieve unconsumed treated eggs within seven days of exposure. Old treated eggs and treated eggs not eaten by the time control operations cease must be disposed of in accordance with applicable State and Federal laws.

3/00

Appendix 3: Material Safety Data Sheet for DRC-1339

MATERIAL SAFETY DATA SHEET

PM Resources, Inc., Bridgeton, Missouri 63044 Phone: 314/291-6724
800/424-9300 (after hours)
INFOTRAC: 1-800-535-5053

Date 04/27/99
Reviewed: 3-8-00

PRODUCT NAME: DRC-1339 (Starlicide Technical)
EPA No's. 56228-10,17,28,29,30; 602-134

1. HAZARDOUS INGREDIENTS:

CAS#		%w/w
7745-89-3	3-Chloro-methylbenzenamine hydrochloride (3-Chloro-p-Toluidine Hydrochloride)	97
	Related impurities	3
		100%

2. PHYSICAL/CHEMICAL CHARACTERISTICS:

Solubility in Water: Soluble

Appearance and Odor: Off white to yellow powder; characteristic odor

3. FIRE AND EXPLOSION HAZARD DATA:

Extinguishing Media: Water, dry chemical, carbon dioxide, foam

Unusual Fire and Explosion Hazards: Nonflammable and Nonexplosive

4. REACTIVITY DATA:

Stable.

Hazardous Polymerization: Will not occur

5. HEALTH HAZARD DATA:

Mouse Oral LD_{50} - 2000 mg/kg
Field Mice (Peromyscus) LD_{50} - 1800 mg/kg

Rat Oral LD_{50} - Fasted Male Albino Rats - 1770 mg/kg
Fasted Female Albino Rats - 1170 (830-1640) mg/kg

Rabbit Dermal LD_{50} - Greater than 1250 mg/kg

Sheep - Single oral doses
200 mg/kg - no deaths
400 mg/kg - one of two died

5. HEALTH HAZARD DATA: (cont'd)

Chicken - Single Oral Dose

mg/kg	Killed/Total (mortality time)
9	10/10 (2 days)
6	33/40 (2 days)
3	7/25 (3 days)

- Chronic Toxicity - 5 days feeding

PPM in Diet	Killed/Total
250	10/10
60	8/10
15	0/10

- Intraperitoneal Injection in Water

mg/kg	Killed/Total
6	7/10
3	3/10

- Dermal (1/2 ml aqueous solution poured on back feathers)

	mg/kg	Killed/Total
3 wk old chicks (200 gm):	50	7/10
	25	6/15

Pigeon Oral LD_{50} - 17 mg/kg

Redwing Oral LD_{50} - 1.8-3.2 mg/kg

Magpie Oral LD_{50} - 5.6-17.7 mg/kg

Dogs (Single oral dose in corn oil suspension)

Dosage mg/kg	Sex M	Sex F	Mortality dead/total	Days to Death
1000	1	1	2/2	<1
500	1	1	2/2	3,3
250	2	-	2/2	1,1
100	-	2	2/2	3,1
50	-	1	0/1	-

5. HEALTH HAZARD DATA: (cont'd)

Route(s) of Entry: Inhalation-No
Skin-Yes
Ingestion-Yes

Carcinogenicity: NTP No
IARC-No
OSHA-No

Signs and Symptoms of Exposure: Depression, hematuria, diuresis, burning of skin and eyes.

Emergency and First Aid Procedures:

Skin: Flush with plenty of soap and water. Get medical attention.

Eyes: Flush with plenty of water. Get medical attention.

If Inhaled: Remove person to fresh air. If not breathing, give artificial respiration. Get medical attention.

If Swallowed: Call a physician or Poison Control Center. Give 1 or 2 glasses of water and induce vomiting by touching back of throat with finger. Do not induce vomiting or give anything by mouth to an unconscious person.

Note: 3-Chloro-p-Toluidine HCl can cause cyanosis.

6. PRECAUTIONS FOR SAFE HANDLING AND USE:

Steps to be Taken in Case Material is Released or Spilled:

Sweep up material and place in a suitable container.

Container Disposal:

Completely empty bag into application equipment. Then dispose of empty bag in sanitary landfill or by incineration, or, if allowed by State and local authorities, by burning. If burned stay out of smoke.

Pesticide Disposal:

Pesticide waste are acutely hazardous. Pesticide Disposal must be made in accordance with federal, state, and local regulations. If these waste cannot be disposed of by use according to the product label instructions contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

Precautions to be Taken in Handling and Storing:

Store in original container in a cool, dry area inaccessible to children or domestic animals.

7. CONTROL MEASURES:

Personal Protective Equipment:

Handle with protective gloves(rubber), clothing and face mask or respirator.

7. CONTROL MEASURES: (cont'd)

Work/Hygienic Practices:

Wash hands thoroughly after handling with soap and water.

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, PM Resources, Inc. makes no warranty with respect thereto and disclaims all liabilities from reliance thereon.

BLOOM BIOLOGICAL INC.
research | consulting | conservation

October 30, 2017

Mr. Ronnie Glick
Senior Environmental Scientist
Oceano Dunes District
California Department of Parks and Recreation
340 James Way, Suite 270
Pismo Beach, California 93449

[via email: Ronnie.Glick@parks.ca.gov]

SUBJECT: Summary of results of avian predator management activities during the 2017 season at Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California

Dear Mr. Glick:

Bloom Biological, Inc. (BBI) was retained by the State of California, Department of Parks and Recreation (CDPR) to provide an avian predator specialist to trap and relocate problem avian predators (raptors and shrikes) for the management of the federally threatened Western snowy plover (*Charadrius nivosus nivosus*, 'plover') and the federally and state endangered California least tern (*Sternula antillarum browni*, 'tern') at Oceano Dunes State Vehicular Recreation Area (ODSVRA, 'Project') in San Luis Obispo County, California.

This letter provides a summary of predator observations and predator management activities associated with the 2017 plover and tern breeding season.

INTRODUCTION

The presence and behavior of avian predators changed with time throughout the Project term, 1 March-10 September 2017 (i.e., '2017 Season'). This report summarizes avian predator observations made by park staff, USDA Wildlife Services contractors, Point Blue contractors and Bloom Biological contractors within this date range. See predator results in the ODSVRA 2017 season report (Predators and predator management section) for quantitative details of sightings for the 2017 Season.

Raptor observations are addressed according to the following seasonal periods:

- **Wintering**: Individuals onsite and using the Project area early (prior to nesting period), these individuals may or may not migrate out of the area after the arrival of "spring."
- **Pre-nesting**: Individuals that arrive onsite during "spring" which begin to set-up nesting territories. They may stay on site or they may continue to other areas.
- **Nesting**: Individuals breeding on or near the Project site.
- **Post-breeding dispersal**: Juvenile birds that arrive on site during summer or adult birds that begin to roam.

In this report, trapping effort is quantified in 'trap hours', where one trap hour unit may result from the operation of a single trap for one hour, or multiple traps for a cumulative total of one hour. Likewise, the operation of two traps for one hour would result in 2 trap hours, and so on.

Hazing is a term used in this report to refer to an act directed at a potential predator in an attempt to get it to leave an area. Hazing was performed collectively by park staff, USDA Wildlife Services contractors, Point Blue contractors and Bloom Biological contractors, and was performed using bird whistlers, or by approaching the predator on foot (human approach) or in a vehicle (by car). **Bird Whistlers®** are a pyrotechnic deterrent devise that makes a very loud "SCREECH" sound designed to scare away pest birds and wildlife.

SUMMARY OF PREDATOR OBSERVATIONS AND TRAPPING ACTIVITIES

During the 2017 Season, authorization was sought and granted by the California Department of Fish & Wildlife (CDFW; Carie Battistone, Senior Environmental Scientist) and the U.S. Fish & Wildlife Service (USFWS; Jennifer Brown, Wildlife Biologist) to trap and relocate one peregrine falcon (*Falco peregrinus*). Justification for removal was based on the observed predation of a plover fledgling and the habitual disturbance to the nesting colonies. This individual, a juvenile female, was successfully trapped on 30 August near the mouth of Oso Flaco Creek in South Oso Flaco (35°01'55.89" N 120°37'59.10" W), affixed with a USFWS band on the left leg and a visual Identification band (VID), white lettering on black, 'W/47,' on the right leg, and released on 31 August in the Owen's Valley of California (36°33'35.88" N 118°03'28.15" W), 179 miles to the Northeast. The capture of this peregrine falcon required one active trapping day.

The morning of 27 July a loggerhead shrike (*Lanius ludovicianus*) was observed in the South Oso Flaco Lagoon area foraging from a small dune. The bird relocated several times, at one point landing on a nesting circular with a nesting plover in attendance. The CDFW contact person, Esther Burkett, Senior Environmental Scientist, was contacted for guidance. Her criteria to warrant trapping and relocation of this species included the observation of: 1) the predation of a plover or tern chick or adult, or 2) attempted predation of a plover or tern chick or adult on two or more occasions. The shrike was last observed the morning of 28 July, and apparently moved out of the area before either of the criteria for trapping were met.

Three great horned owls were identified for trapping and relocation: 1) A lone male, resident in the Pipeline revegetated area (PLR) and 2) Two individuals resident in the Oso Flaco Lakes area. All three individuals were identified for trapping and relocation based on their habitual disturbance to the plover and tern colonies during the nesting period. As described below, the PLR male was eventually captured and relocated. However, the great horned owls identified for trapping and relocation in the Oso Flaco Lakes area avoided being trapped despite extensive, though intermittent, active trapping bouts over a 21-day period, from 30 May through 21 July, for a total of 228.5 trap hours.

Table 1. Avian Predators Trapped and Relocated at ODSVRA during 2017 Season

Species	Age/ Sex	Trapping Location (Date)	Release Location (Date)	Distance
Great horned Owl	Ad./M	Pipeline Reveg Island (4 April 2017)	Caliente, CA (5 April 2017)	115 mi.
		35°02'40.41" N 120°37'28.09" W	35°17'51.49" N 118°36'46.13" W	
Peregrine Falcon	Juv./F	South Oso Flaco (30 August 2017)	Lone Pine, CA (31 August 2017)	179 mi.
		35°01'55.89" N 120°37'59.10" W	36°33'35.88" N 118°03'28.15" W	

At PLR, constant owl trapping efforts were implemented for 55 trap hours, over five trapping days, from 29 March through 4 April. The PLR adult male was successfully trapped on 4 April (35°02'40.41" N 120°37'28.09" W) and released near Caliente, CA (35°17'51.49" N 118°36'46.13" W) on 5 April, 115 miles to the east-northeast. Owing to the difficulty of identifying banded owls (feathered tarsi, nocturnal habits secretive), it could not be determined whether this individual returned to the site after being relocated. Nonetheless, on 7 April a large grey, great horned owl in good feather condition, believed to be a female, was observed perched in the willows of PLR. The possibility of an active nest was eliminated with a very thorough search of PLR, which yielded no evidence of nesting. Evening observations of PLR on 11 and 12 April, revealed more great horned owl activity, but the individual observed was noted as a "brown bird in poor feather condition," a male.

During the 2017 Season, two juvenile red-tailed hawks were identified for removal based on observed predation of a plover chick on 17 August and their habitual threat and disturbance to plover chicks. The birds were regularly observed hunting from the dunes across the length of Oso Flaco shore. Red-tailed hawk trapping occurred on three days, from 21 August through 23 August, for a total of 27.75 trap hours. Red-tailed hawk trapping efforts ceased as of 23 August.

SUMMARY OF PREDATOR SPECIES OCCURRENCE

AMERICAN KESTREL

No American kestrel (*Falco sparverious*) nests were found in the Project area and this species was not observed predating or attempting to predate a plover or tern. However, the species was regularly observed in several areas, including at the Conoco-Phillips refinery adjacent to ODSVRA to the east. At least one pair was believed to have nested in the immediate area of the refinery, in the dune habitat west of the railroad tracks. Dead willow trees (*Salix spp.*) at Long Valley and Jack Lake provide numerous cavities, suitable for kestrel nesting. Two, or possibly three other kestrel pairs were suspected of nesting within ODSVRA, with territorial birds observed regularly at: 1) Carpenter creek, 2) the dune area immediately south of Grand Avenue ramp and 3) the Oceano Campground north of the Interpretive Trail. During the 2017 Season, observations were documented through the wintering and pre-nesting period, 1 March through 10 April. An observation of a kestrel was not documented again until 21 June; the beginning of post-breeding dispersal. Observations of individuals continued through 10 September, with many of these observations occurring in sensitive areas. Seven individuals were hazed out of these areas with the use of bird whistlers Two of these were hazed multiple times with bird whistlers to hasten their departure from the area.

MERLIN

Merlins (*Falco columbarius*) winter in the Project area and migrate out of San Luis Obispo County, typically becoming casual by April 1st annually. Six observations of merlins were documented during the 2017 Season, which is a 63% decrease from the 16 observations during the 2016 Season. Of the six observations in 2017, five occurred between 1 March and 28 April. Five observations were in sensitive areas, with two individuals having been hazed with bird whistlers out of the area. One individual was hazed multiple times. The 16 August sighting of a bird in flight, documented in South Oso Flaco was of an early autumn migrant.

Prairie Falcon

Prairie falcons are uncommon but regular breeders and residents of San Luis Obispo County. They occupy grassland, sagebrush and chaparral habitats inland of the coast. One individual perched in South Oso Flaco dunes on 22 August, which was the first of this species documented onsite in several years. This probable juvenile male departed South Oso Flaco to the north, and eventually left the Project area. Along the way it

flew through several sensitive areas, and was observed hunting; diving on house finches (*Carpodacus mexicanus*) and plovers, but was unsuccessful in its attempts.

Peregrine Falcon

As described above (see "Summary of Predator Observations and Trapping Activity"), one Peregrine Falcon was trapped, with CDFW and USFWS authorization, on 30 August. The juvenile female was bird was affixed with a USFWS band and a visual Identification band (VID), white lettering on black, 'W/47', on the right leg, and released on 31 August in the Owen's Valley of California.

Peregrine falcons are one of the most numerous raptors onsite at ODSVRA, along with red-tailed hawks and great horned owls, and are possibly the greatest raptor threat to plovers and terns. The precise number of peregrine falcon individuals observed is impossible to ascertain, but based on the presence of banded birds, and unbanded birds able to be identified to sex and age class, the minimum number is 10 distinct individuals over the course of the 2017 Season. Unbanded male and females of all age classes were present onsite at some point (adult, sub-adult, juvenile) along with four uniquely banded individuals: (1) 1687-2214 silver left, VID '17/D' black right (an adult female), (2) VID '50/AB' black left, silver right (an adult male), (3) VID left, silver right (an adult female), and (4) a banded juvenile male.

The majority of peregrine falcon observations occurred in sensitive areas, and were often of with birds with prey. During the 2017 Season, peregrine falcons were observed catching or eating two plovers, 11 unidentified small shorebirds (one plover suspected but not confirmed), one large unidentified shorebird, two Heermann's Gulls (*Larus heermanni*), one Western Gull (*Larus occidentalis*), one California Gull (*Larus californicus*), one unidentified gull, and one unidentified avian species. Peregrine falcons were hazed out of sensitive areas on 27 occasions: 24 by bird whistler, one by human approach, and two by car.

Peregrine falcons were observed throughout the 2017 Season, however the frequency of observation tended to decrease during the falcon 'nesting' period, from 28 April through to 18 June 2017, and gradually increased again thereafter, during the 'post-breeding dispersal' period, peaking in the third week of August 2017.

The adult male '50/AB' was trapped and banded by the ODSVRA avian specialist in 2015. The bird was released 8 May 2015 and confirmed to have returned to ODSVRA on 14 August 2015. This bird has been documented onsite each season since. Given the bird's history of predating plovers, this individual was authorized for relocation again in 2016, but avoided trapping. The bird was observed eating a small shorebird, a "likely sanderling," on 26 August 2017, the post-breeding dispersal period. This was the only confirmed sighting of this individual in 2017.

Female '17/D' was banded as a nestling in Southern California in 2013 and was documented at ODSVRA during the 2016 season. This large female habitually targets gulls. The ODSVRA's avian specialist collected more than 10 gull carcasses attributed to female '17/D' during the 2017 Season, primarily in and around the Arroyo Grande Creek Lagoon area, which is a common gull roosting area.

Falcon Species Unknown

Unknown/unidentified falcons were documented multiple times in the ODSVRA during the 2017 Season. From the descriptions and time of year these most likely included: four peregrine falcons, two American kestrels, and two merlins. Three of the eleven falcon observations lacked information that would help deduce the probable species. These birds were observed in flight, and most with quick looks, revealing little detail. Five of these were in sensitive areas, none required hazing.

Sharp-shinned Hawk

The Sharp-shinned hawk (*Accipiter striatus*) is an uncommon winter resident in San Luis Obispo County, and likely overwinter in small numbers in and around the Project area, particularly to the east where there are thick stands of eucalyptus. They appear during migration, but usually pass through the area quickly.

One juvenile migrant was observed on 10 March 2017 soaring low over ODSVRA's headquarters. The species is not known to pose a threat to plovers and terns at ODSVRA.

Cooper's Hawk

Over the course of the 2017 Season, Cooper's hawks (*Accipiter cooperi*) were observed on several occasions in the ODSVRA, including in sensitive areas. A juvenile Cooper's hawk was hazed with a bird whistler out of the South Oso Flaco Lagoon area on 19 August; the only such occurrence. Approximately half of the observations were made prior to 5 May 2017, during the wintering and pre-nesting periods. The other observations occurred after 3 August 2017, during the post-breeding dispersal period (a break of 89 days), including in sensitive areas, with 6 of the 7 aged individuals during this period being juveniles. While observations of this species are typically "rare" after 15 April annually in San Luis Obispo County, it probably nests on the fringes of the Project area in small numbers. Although not identified as a threat to plovers and terns at ODSVRA, the apparent increase in young birds late in the season could pose a threat in the future, as juvenile birds tend to be more aggressive and opportunistic than their adult counterparts.

Northern Harrier

Northern harriers (*Circus hudsonius*) are a fairly frequently observed species within the Project area. While the vegetation islands, teaming with various size rodents, lagomorphs and insects, provide good winter foraging, the dunes, for the most part, do not provide adequate nesting habitat. There are however, patches of appropriate habitat that do occur. Arroyo Grande Creek, which forms a small lagoon, and the associated wetlands in the past attracted numerous Northern harriers (there were no documented sightings from this location this season). South Oso Flaco Creek and its associated lagoon and wetlands has held nesting Northern harriers in years past, but no nesting attempt was documented this season. There is also suitable habitat in Dune Lakes, which is adjacent to the east boundary of the park, where nesting has been documented in the past.

There were numerous observations of Northern harrier during the 2017 Season, and the majority of sightings were in sensitive areas. Observations were documented as of 11 May 2017. Of those individuals identified with certainty, all were of adult or sub-adult females except for a single male observed flying north from the southern end of the Dunes Preserve on 12 April 2017. A Northern harrier was not observed again until 9 July 2017, a break of 58 days. Six individuals in sensitive areas were hazed, including four with bird whistlers and two by human approach.

Red-tailed Hawk

Red-tailed hawks (*Buteo jamaicensis*) are ubiquitous throughout the Project area. Although no nests were found in the Project area, due to a lack of appropriate nesting habitat, three nests were located very near and adjacent to ODSVRA: one nest was in a eucalyptus grove 0.8-mile east of the mouth of south Oso Flaco Creek, at the western edge of the agricultural fields. A second nest was located 50 yards south of the boundary within Guadalupe-Nipomo National Wildlife Refuge, and 0.6-mile east-southeast of the shoreline. These two nests each fledged three young in 2017. A third nest was in Long Valley, 0.6-miles east of the shore. The fate of this nest in 2017 was unknown.

Historically, red-tailed hawks have not been documented predating plovers, terns or their chicks at ODSVRA, although they have been documented doing so at other sites. This season, on 17 August 2017, a juvenile red-tailed hawk was observed predating a plover chick. The young red-tailed hawk was one of two similar looking juveniles documented hunting the dunes of South and North Oso Flaco. Both individuals were authorized for trapping and relocation (see "Summary of Predator Observations and Trapping Activities").

Thirty-five hazing events were documented, 32 by bird whistler and three by human approach. This is an extraordinary increase from one bird having been hazed by bird whistler in 2016.

Great Horned Owl and Large Owl Species Unknown

As described above (see "Summary of Predator Observations and Trapping Activities"), three great horned owls were identified for trapping and relocation during the 2017 Season. One was successfully trapped in PLR on 4 April 2017. The adult male was released near Caliente, CA on 5 April 2017. The other two great horned owls identified for trapping (in the Oso Flaco Lakes area) were not captured, despite extensive efforts.

Great horned owls are ubiquitous in the ODSVRA and occupy every niche available to them. They have been documented by their sign, including track, scat, pellets and feathers, the entire length and breadth of the Project. The physical observation of an owl is a highly opportunistic occurrence due to their secretive and nocturnal habits. Therefore, their actual impact on plover and tern nesting colonies is not well known. One known and historic nest, located along the refinery road on the east side of the Project which produced two young last year, went unoccupied this season, even though great horned owls were documented in the area in 2017.

Records of great horned owls were made in sensitive area, including in 8 exclosure, Boneyard, and South Oso Flaco. There were no records of great horned owls being hazed.

Great horned owls are an important management concern at ODSVRA due to their abundance throughout the Project area, invariably resulting in disturbance to the nesting colonies and while there has been no documented loss due to great horned owls at ODSVRA they are considered a substantial threat. Owl pellets are examined when found, through the course of the 2017 Season, and while there are slight changes to the make-up of these remains, depending on location, the majority contain, in varying combinations: kangaroo rat (*Dipodomys sp*.), Norway rat (*Rattus norvegicus*), voles (*Microtus californicus*), mice *(Peromyscus sp., Reithrodontomys megalotis*), woodrat (*Neotoma spp*.), Jerusalem cricket (*Stenopelmatus intermedius*), or other various insect remains and some vegetative matter.

Two dead adult male barn owls (*Tyto alba*) were found this season along the ODSVRA shoreline. One adult male barn owl was found dead but fresh on 23 May 2017 along the 6 exclosure shoreline, and another adult male barn owl was found dead by Resource staff 19 May 2017 on the South Oso Flaco shore. Barn owls possibly forage with some regularity in the Project area and are known to nest in the eucalyptus groves and hunt the agricultural fields to the east, but there has not been any documentation of this species nesting in the Project area. It is apparent that they are present to some extent within the Project area; the impact to terns and plovers may be minimal due to their competition with great horned owls.

Of the two large owl species possible at ODSVRA, the track of great horned owl and barn owl are separable given good, clear prints. Both tracks exhibit the typical 'K' pattern owing to their zygodactylous toes, although the great horned owl is thicker toed with numerous 'knuckles' along their length, giving the track a 'knobby' appearance. Barn owl toes on the other-hand are more slender and lack the obvious 'knuckles.'

LOGGERHEAD SHRIKE

Loggerhead shrikes are a considerable threat to plovers and terns at ODSVRA, and their numbers fluctuate from year to year. Historically shrikes were a regular nester in the ODSVRA area, but in recent years there has been no documented or suspected nesting. On 14 February 2017, a lone adult was present, vocalizing from the thickets east of the railroad tracks at the refinery, but this bird soon moved on and was not observed again. Loggerhead shrikes were documented from 17 July through 25 August 2017. These sightings were in or near South Oso Flaco, from the heavily vegetated area north of the boardwalk through to the southern boundary with Guadalupe-Nipomo National Wildlife Refuge, all in sensitive areas. Loggerhead shrikes were hazed on five occasions.

If you have any questions or comments regarding this letter, please feel free to call us at 949-272-0905.

Sincerely,

BLOOM BIOLOGICAL, INC.

Robert Chapman
Biologist

Michael Kuehn
Senior Biologist/Statistical Analyst

CDFW SEABIRD NECROPSY REPORT

California Department of Fish and Wildlife
Office of Spill Prevention and Response
Marine Wildlife Veterinary Care and Research Center
1451 Shaffer Road
Santa Cruz, CA 95060
(831) 469-1719

MWVCRC#: 16-0679
Species: SNPL
UCD PATH#: None
OWCN Intake#: None
Band#: BB:PW
Report Date: 12/20/2016

CASE PROFILE

COMMON NAME: Snowy Plover

SCIENTIFIC NAME: *Charadrius nivosus*

DATE FOUND: 11/30/2016

COLLECTION LOCATION: Oceano Dunes

COUNTY: San Luis Obispo

STATE: California

CARCASS CONDITION: Fresh

OILED/FOULED: No

AGE: Adult

SEX: Female

DEATH DATE: Unknown

EUTHANASIA: No

NECROPSY DATE: 12/2/2016

NECROPSY BY: Corinne Gibble

REPORT DATE: 12/20/2016

REPORT BY: Corinne Gibble

HISTOPATHOLOGY TAKEN (Y/N?): N

REVIEWING PATHOLOGIST: Melissa Miller

CASE BACKGROUND

Two western snowy plovers were found on November 30, 2016 at Oceano Dunes SVRA in San Luis Obispo County by Joanna Iwanicha, Environmental Scientist. Both birds were found in the riding area just south of marker post 1. One plover was banded (16-0679), and one was unbanded (16-0680; separate report). Bird 16-0679 was found flattened in a set of tire tracks.

CASE SUMMARY

Postmortem radiographs revealed fractures of the skull, radius, ulna, keel and ribs, and lateral keel displacement (Figure 1). The right wing had many comminuted fractures proximal to the radius and ulna (Figure 1). External examination revealed minimal decomposition and no scavenging. The body was dorsoventrally compressed, the right orbit was swollen, and the right eye was proptosed (pushed out of the socket; Figure 2A). The keel and pectoral muscle were flattened and extruded through the skin (Figure 2A, 2B).

Internal examination revealed bruising and hemorrhage along the entire right side of the body, with associated acute multifocal keel and rib fractures (Figure 3A, 3B). The gastrointestinal tract was laterally displaced in the body cavity, and the heart, liver, and spleen were fragmented into multiple pieces (crushing injury; Figure 3B). Acute hemorrhage and bruising were apparent along the left neck and throat, and blood was found in the trachea. The skull was compressed and the brain tissue was compressed and displaced (cranial/caudal) in the skull cavity, associated with bruising and hemorrhage (Figure 4A, 4B). This bird was an adult female in good nutritional condition, with fat and muscle mass. The pectoral muscle complex was even with the keel, with no discernable pectoral muscle atrophy. Subcutis and pericardial adipose tissue was abundant. The ventriculus was full of insect shells, signifying that the bird had recently eaten. Observed adipose and muscle mass indicate that the bird was in good nutritional condition just prior to death.

Based on recovery of the carcass from a vehicle tire impression, and confirmation of severe acute crush trauma with fresh hemorrhage, the presumptive cause of death is vehicle crush injury. No evidence of pre-existing disease was found on gross necropsy.

COMPLETED TESTS/PROCEDURES

1.) Gross photographs
2.) Radiographs

3.) Gross Necropsy

GROSS FINDINGS

Acute, severe vehicular crush trauma (presumptive), characterized by:

- -Acute bone fractures in keel, ribs, skull, radius, ulna (Figure 1)
- -Comminuted fracture in wing (radius/ulna; Figure 1)
- -Displacement of keel and multifocal rib fractures with severe coelomic crush injury (Figure 2A, 2B)
- -Acute hemorrhage and bruising throughout body (Figure 3A, 3B)
- -Liver and spleen fragmentation and dorsoventral compression (Figure 3A, 3B)
- -Heart fragmentation and dorsoventral compression (Figure 3A, 3B)
- -Skull fracture (Figure 1, 4A, 4B)
- -Cranial/caudal brain compression and crush injury (Figure 4A, 4B)

INCIDENTAL FINDINGS

None

HISTOPATH SUMMARY

N/A

HISTOPATH DIAGNOSES

N/A

FINAL DIAGNOSES

Presumptive cause of death: Acute, severe vehicular crush trauma

RECOMMENDED NEXT STEPS

None

SAMPLES SAVED

None

IMAGES

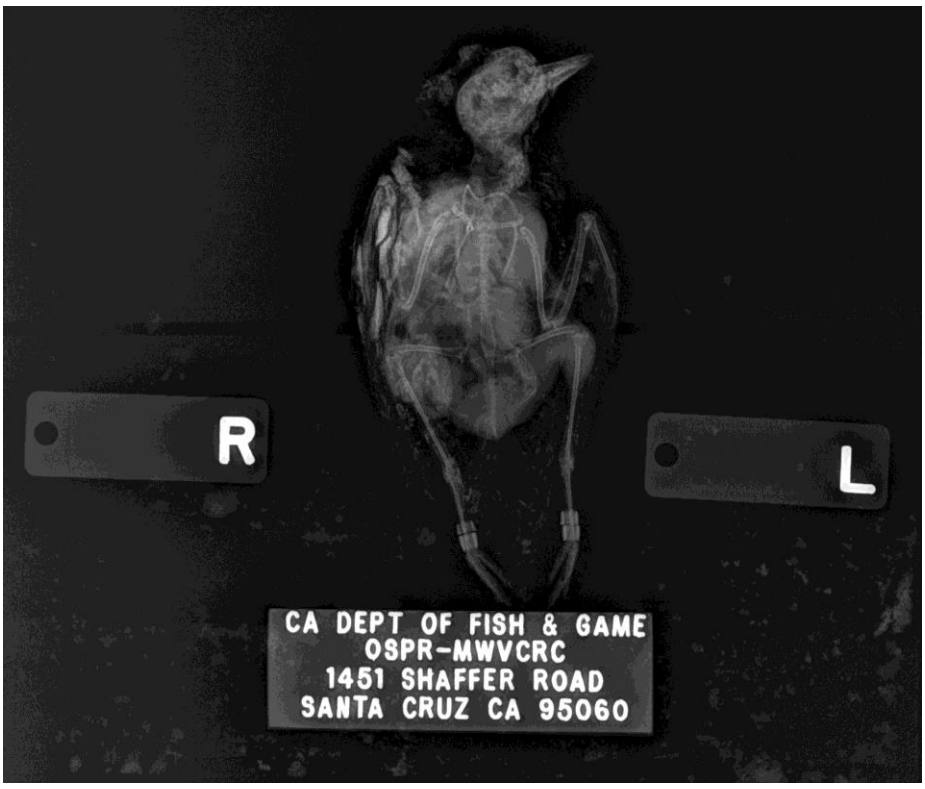


Figure 1: Radiographs, fractures in skull, radius, ulna, keel, and ribs visible

Figure 2A. Right orbit swollen and right eye proptosed (pushed out of socket), pectoral muscle and keel extruded through skin; Figure 2B. Ample muscle and adipose stores

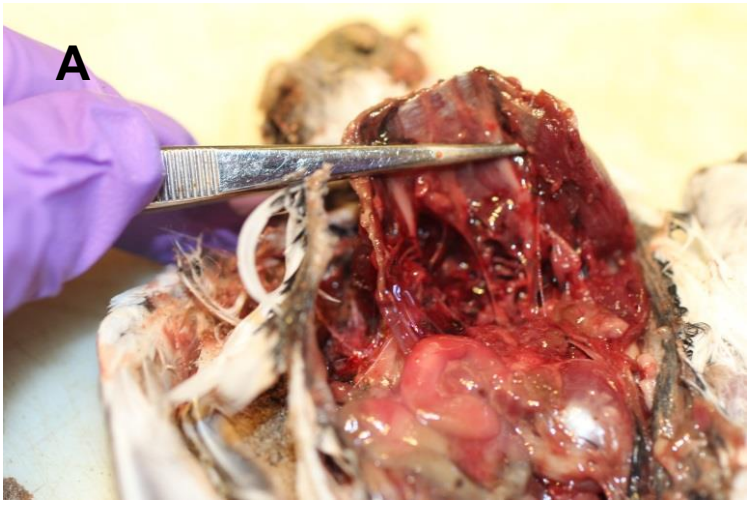


Figure 3A. Multifocal keel fractures and hemorrhage underlying keel; Figure 3B. Crush injuries to major organs, bruising and hemorrhage

Figure 4A. Comminuted skull fracture, bruising and intracranial hemorrhage; Figure 4B. Cranial/caudal brain compression and laceration

CDFW SEABIRD NECROPSY REPORT

California Department of Fish and Wildlife
Office of Spill Prevention and Response
Marine Wildlife Veterinary Care and Research Center
1451 Shaffer Road
Santa Cruz, CA 95060
(831) 469-1719

MWVCRC#: 16-0680
Species: SNPL
UCD PATH#: None
OWCN Intake#: None
Band#: None
Report Date: 12/20/2016

CASE PROFILE

COMMON NAME: Snowy Plover

SCIENTIFIC NAME: *Charadrius nivosus*

DATE FOUND: 11/30/2016

COLLECTION LOCATION: Oceano Dunes

COUNTY: San Luis Obispo

STATE: California

CARCASS CONDITION: Fresh

OILED/FOULED: No

AGE: Adult

SEX: Male

DEATH DATE: Unknown

EUTHANASIA: No

NECROPSY DATE: 12/2/2016

NECROPSY BY: Corinne Gibble

REPORT DATE: 12/20/2016

REPORT BY: Corinne Gibble

HISTOPATHOLOGY TAKEN (Y/N?): N

REVIEWING PATHOLOGIST: Melissa Miller

CASE BACKGROUND

Two western snowy plovers were found on November 30, 2016 at Oceano Dunes SVRA in San Luis Obispo County by Joanna Iwanicha, Environmental Scientist. Both birds were found in the riding area just south of marker post 1. One plover was unbanded (16-0680), and one was banded (16-0679; separate report). Bird 16-0680 was observed being pecked by a gull postmortem.

CASE SUMMARY

Postmortem radiographs revealed fractures of the skull, ribs, left humerus (left wing fracture), and a cervical fracture near the junction of the cervical and thoracic vertebrae (Figure 1). External examination revealed minimal decomposition and light scavenging. The body was dorsoventrally compressed and there is blood coming out of the mouth (Figure 2A). The humerus was exposed, and the pectoral muscle was extruded through the skin. Blood was observed proximal to the humeral fracture and along the left body wall (Figure 2A; antemortem bleeding, presumptive).

Internal examination revealed a severely right-displaced keel, with acute multifocal fractures of the left and right ribs (Figure 2B, 3A). Fresh hemorrhage was present beneath the keel on the left side and right sides, and surrounding the heart (Figure 3A). The liver, kidneys, and spleen were fragmented into multiple pieces with acute hemorrhage present in the lungs (crush wounds, presumptive; Figure 3B). The heart was grossly unremarkable, with adequate fat stores (Figure 3B). The skull was fractured and compressed, and the brain tissue was compressed and displaced (cranial/caudal) in the skull cavity, associated with fresh hemorrhage (crush injury, presumptive; Figure 4A, 4B). This bird was an adult male with good body condition and adequate body fat and muscle mass. The pectoral muscle complex was even with the keel with no discernable pectoral muscle atrophy (Figure 2B). Subcutis and pericardial adipose tissue was abundant. The ventriculus was full of partially digested insects, signifying that the bird had recently eaten. Observed adipose and muscle mass indicate that the bird was in good nutritional condition just prior to death.

Although the bird was observed being scavenged by a gull, based on evidence of severe crush trauma with fresh hemorrhage throughout the body and skull, the presumptive cause of death is vehicle crush injury. No evidence of pre-existing disease was found on gross necropsy, and effects of postmortem scavenging were minimal.

COMPLETED TESTS/PROCEDURES

1.) Gross photographs

2.) Radiographs
3.) Gross Necropsy

GROSS FINDINGS

Acute, severe vehicular crush trauma presumptive, characterized by:

-Acute bone fractures in keel, ribs, skull, humerus (Figure 1)
-Displacement of keel and multifocal rib fractures with severe coelomic crush injury (Figure 2A, 2B)
-Acute hemorrhage and bruising throughout body (Figure 3A, 3B)
-Liver and spleen fragmentation and dorsoventral compression (Figure 3A)
-Kidney fragmentation and dorsoventral compression (Figure 3B)
-Skull fracture (Figure 4A)
-Cranial/caudal brain compression and crush injury (Figure 4B)

INCIDENTAL FINDINGS

None

HISTOPATH SUMMARY

N/A

HISTOPATH DIAGNOSES

N/A

FINAL DIAGNOSES

Presumptive cause of death: Acute, severe vehicular crush trauma

RECOMMENDED NEXT STEPS

None

SAMPLES SAVED

None

IMAGES

Figure 1. Radiographs, fractures in skull, cervical vertebrate, humerus, and ribs visible

Figure 2A. Blood at mouth, fracture of left humerus, blood along the side of the body, and pectoral muscle extruded through skin; Figure 2B. Keel severely displaced, but with ample muscle and adipose stores

Figure 3A. Rib fractures and hemorrhage underlying keel, crush injuries to major organs, hemorrhage; Figure 3B. Crush injuries to major organs and hemorrhage

Figure 4A. Skull fracture and laceration and hemorrhage of brain tissue; Figure 4B. Cranial/caudal brain compression inside skull cavity

CDFW SEABIRD NECROPSY REPORT

California Department of Fish and Wildlife
Office of Spill Prevention and Response
Marine Wildlife Veterinary Care and Research Center
1451 Shaffer Road
Santa Cruz, CA 95060
(831) 469-1719

MWVCRC#: 17-0014
Species: SNPL
UCD PATH#: 07S0039
OWCN Intake#: None
Band#: YR:YR

CASE PROFILE

COMMON NAME: Snowy Plover

SCIENTIFIC NAME: *Charadrius nivosus*

DATE FOUND: 1/11/2017

COLLECTION LOCATION: Oceano Dunes

COUNTY: San Luis Obispo

STATE: California

CARCASS CONDITION: Fresh

OILED/FOULED: No

AGE: Adult

SEX: Male

DEATH DATE: Unknown

EUTHANASIA: No

NECROPSY DATE: 1/12/2017

NECROPSY BY: Corinne Gibble

REPORT DATE: 1/31/2017

REPORT BY: Corinne Gibble

HISTOPATHOLOGY TAKEN (Y/N?): Y

REVIEWING PATHOLOGIST: Melissa Miller

CASE BACKGROUND

This animal was found dead at Oceano Dunes State Vehicular Recreation Area (ODSVRA) near the waterline in the riding area of the park, between the Pier Avenue Ramp and marker post 1. The carcass was initially reported as intact with no obvious injuries. This bird had been previously banded YR:YR, allowing biologists to identify it as a bird that hatched on July 20, 2015 in Fort Ord, CA. This animal had returned to its general natal area (between Reservation Road in Marina, CA to Fort Ord, CA), and was a male that was found on two different nests here during 2016. This bird fledged one chick on his first nest, and was also observed in the wintering area at ODSVRA during the 2015-2016 winter and the 2016-2017 winter seasons. This bird was last seen 12/20/2016 in a flock near marker post 1 at ODSVRA.

CASE SUMMARY

Postmortem radiographs revealed lateral displacement of the keel and acute fractures of the keel and right ribs (Figure 1). During external examinations, this bird was found to be fresh and intact, however with a large wound visible on the right lower abdominal wall. The skin was broken and coelomic viscera were exposed through the skin (Figure 2A, 2B). Blood was visible near the bill, and blood and sand were stuck to the abdomen (Figure 2A, 2B).

Internal examination confirmed a large acute keel fracture, lateral displacement of the keel, and perilesional acute subcutaneous and intramuscular hemorrhage (Figure 3A, 3B). Multiple rib fractures were apparent along the right thoracic wall, accompanied by moderate acute hemorrhage in the caudal coelomic cavity (Figure 4A). Hemorrhage was present beneath the keel and surrounding the heart (Figure 4B). The liver was tan-red mottled and dorsoventrally compressed, with sharp edges, and small hepatic ruptures throughout (Figure 4A, 4B). The pulmonary parenchyma was diffusely pink with admixed acute hemorrhage (Figure 4B). The proventriculus and ventriculus were full of semi-digested food signifying that the bird had recently eaten (Figure 5A). The skull was intact grossly, but a small area of hemorrhage was noted in the occipital region (Figure 5B). This bird was in excellent nutritional condition with little postmortem autolysis observed. The bird had moderate to abundant subcutis, pericardial, and internal adipose fat, and the pectoral muscle complex projected above the keel, with no discernable pectoral muscle atrophy (Figure 3A, 3B, 4A, 4B). Observed adipose and muscle mass indicate that the bird was in good nutritional condition just prior to death.

Because this bird was recovered fresh dead from an ORV riding area with severe, acute crush trauma, the presumptive cause of death is vehicular crush injury. No gross evidence of pre-existing disease or postmortem scavenging was found.

COMPLETED TESTS/PROCEDURES

1.) Gross photographs
2.) Radiographs
3.) Gross Necropsy
4.) Histopathology
5.) Cryo-archived samples

GROSS FINDINGS

Acute severe crush trauma (Vehicular crush injury, presumptive), characterized by:

- -Acute fracture and displacement of keel, and ribs (Figure 1, Figure 3A, 3B, 4A)
- -Partial tear of right ventrolateral abdominal wall, with viscera exposed through skin (Figure 2A, 2B)
- -Multifocal perilesional acute hemorrhage and bruising (Figure 3A, 3B, 4A, 4B)
- -Liver: Dorsoventral compression (Figure 4B)
- -Possible focal occipital hemorrhage (Figure 5B)

INCIDENTAL FINDINGS

Proventriculus and ventriculus full of semi-digested food

HISTOPATH SUMMARY

Pending

HISTOPATH DIAGNOSES

N/A

FINAL DIAGNOSES

Presumptive cause of death: Vehicular crush injury

RECOMMENDED NEXT STEPS

None

SAMPLES SAVED

Histopathology: organ and tissue samples in formalin
Cryo-archived samples: stomach contents, pectoral muscle, liver

IMAGES

Figure 1: Radiograph showing displacement of keel, and rib fractures

Figure 2A: Ventral view showing injury to right lower abdomen 2B. Closer view of abdominal trauma

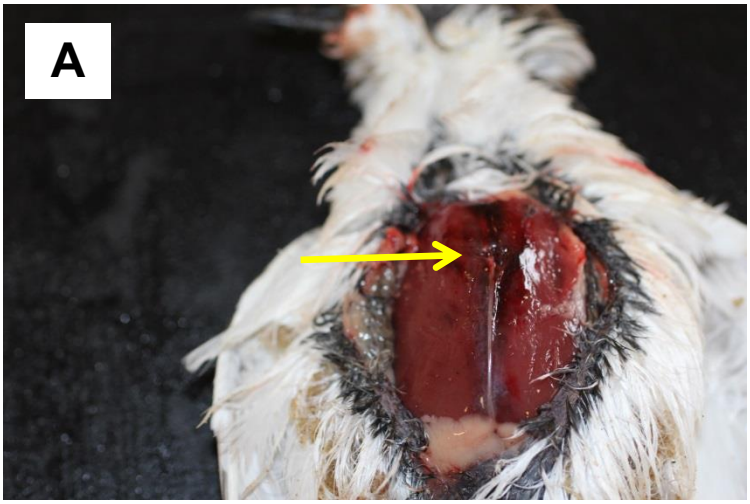
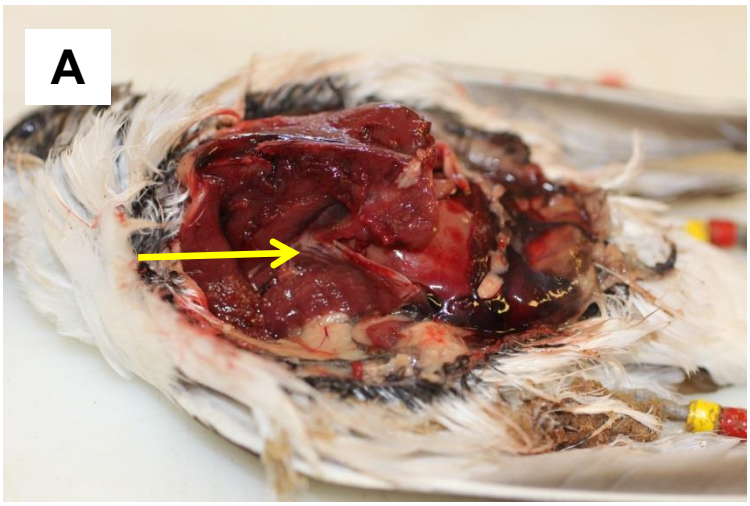


Figure 3A: Keel fracture and associated bruising and hemorrhage; abundant fat and minimal muscle atrophy; Figure 3B. Right pectoral muscle removed to show lateral view of acute keel fracture



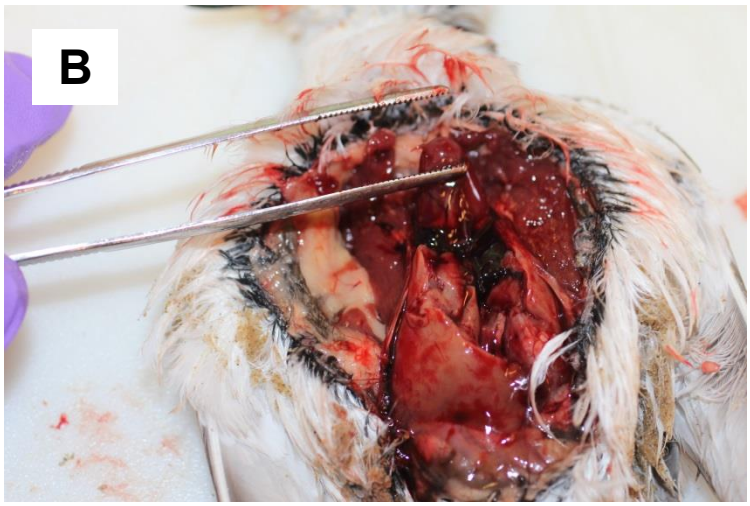


Figure 4A. Another right lateral view showing acute keel and rib fractures, abundant adipose and muscle; Figure 4B. In this photo the fractured keel has been removed, revealing hemorrhage around the heart, in the abdominal portion of the coelomic cavity, and pulmonary hemorrhage.

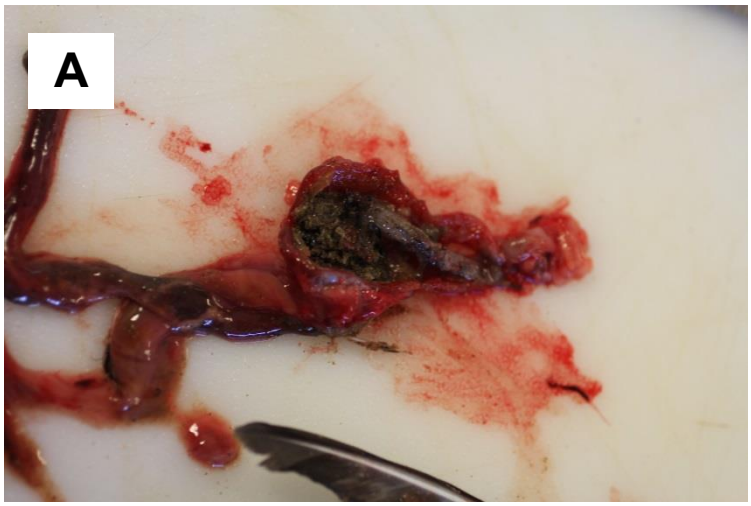


Figure 5A. Stomach (proventriculus and ventriculus) full of partially digested food; Figure 5B. Acute hemorrhage in the occipital portion of the skull

CDFW SEABIRD NECROPSY REPORT

California Department of Fish and Wildlife
Office of Spill Prevention and Response
Marine Wildlife Veterinary Care and Research Center
151 McAllister Way
Santa Cruz, CA 95060
(831) 469-1719

MWVCRC#: 17-0297
Species: SNPL
UCD PATH#: None
PWC Intake#: 17-1281
Band#: vv gw
Report Status: Gross

CASE PROFILE

COMMON NAME: Snowy Plover
SCIENTIFIC NAME: *Charadrius nivosus*
DATE FOUND: 7/3/2017
COLLECTION LOCATION: Oceano Dunes SVRA
COUNTY: San Luis Obispo
STATE: California
CARCASS CONDITION: Fresh
OILED/FOULED: No
AGE: Chick
SEX: Male
DEATH DATE: 7/4/2017
EUTHANASIA: No
NECROPSY DATE: 7/11/2017
NECROPSY BY: Corinne Gibble
REPORT DATE: 8/1/2017
REPORT BY: Corinne Gibble
HISTOPATHOLOGY TAKEN (Y/N?): Y
REVIEWING PATHOLOGIST: Melissa Miller

CASE BACKGROUND

This bird was found by Ryan Slack at Oceano Dunes SVRA, and was a large chick/juvenile (33 days old, not flight capable), This chick was from a 2 chick brood (SP 95 nest) raised just inside the exclosure at the border of the open riding area and near marker post 6. It was seen the morning of July 3rd at 06:50, sitting on the ground just within the shoreline exclosure with eyes closed, feathers ruffled, and breathing somewhat labored. The second chick was nearby with the associated adult, behaving normally. This area is monitored very closely and both chicks were seen foraging normally the previous afternoon. The chick was monitored but the condition did not improve and it was collected and placed in a warm brooder at about 07:30. At 10:10 it was observed standing and walking in the brooder and was fed talitrids. The bird was then taken to Pacific Wildlife Care for rehabilitative care. The chick was examined, determined to be emaciated and tested positive for *Giardia* sp. via fecal swab. The bird was given fluids and fed talitrids, which were eaten immediately. The bird later died in care on July 4th 2017.

CASE SUMMARY

Externally this bird was fresh and in good condition with growing feathers, no visible wounds, slight fecal staining at the vent (Figure 1A, 1B). Internally this bird was emaciated with no subcutaneous or internal adipose, and the pectoral muscle was markedly below the keel (muscle atrophy; Figure 2A). The heart was flaccid with a small amount of pericardial adipose (Figure 2B). The liver was large and red-brown mottled with sharp edges (Figure 2B). The spleen was enlarged, suggestive of infectious or inflammatory disease. The kidneys were unremarkable (Figure 3A). The bird was a chick/juvenile male with light pink testes (Figure 3A). Digesta was evident in the gastrointestinal tract, indicating that the bird had recently eaten. The lungs were wet, spongey and full of blood (Figure 3A). Mild congestion was found at the base of the skull near the occipital condyles (Figure 3B). No other gross abnormalities were found other than the enlarged spleen and mild brain congestion. The case history, fecal swab testing, and findings from gross necropsy are consistent with giardiasis. Histopathology is pending.

COMPLETED TESTS/PROCEDURES

1.) Gross photographs
2.) Gross necropsy (including morphometric measurements)
3.) Histopathology samples
4.) Cryoarchived samples

GROSS FINDINGS

Emaciation, characterized by:

- No subcutaneous or internal adipose (Figure 2A)
- Pectoral muscle markedly below keel (Figure 2A)

Possible infection, characterized by:

- Fecal pasting at vent (potential diarrhea) (Figure 1A)
- Emaciation (Figure 2A)
- Splenomegaly, moderate,
- Congestion at occipital region (Figure 3B)
- Possible *Giardia* spp cysts on antemortem fecal smear
- Antemortem somnolence, depression

INCIDENTAL FINDINGS

N/A

HISTOPATH SUMMARY

Histopathology pending

HISTOPATH DIAGNOSES

Histopathology pending

COMMENT

Pending histopathology, possible enteric +/- systemic infection is suspected

SAMPLES SAVED

-Histopathology samples in formalin: pectoral muscle, esophagus, trachea, thyroid, lung, heart, spleen, liver, kidney, ureters, ovaries, oviduct, gastrointestinal tract, and brain

-Cryoarchived samples -20: pectoral muscle, liver

IMAGES

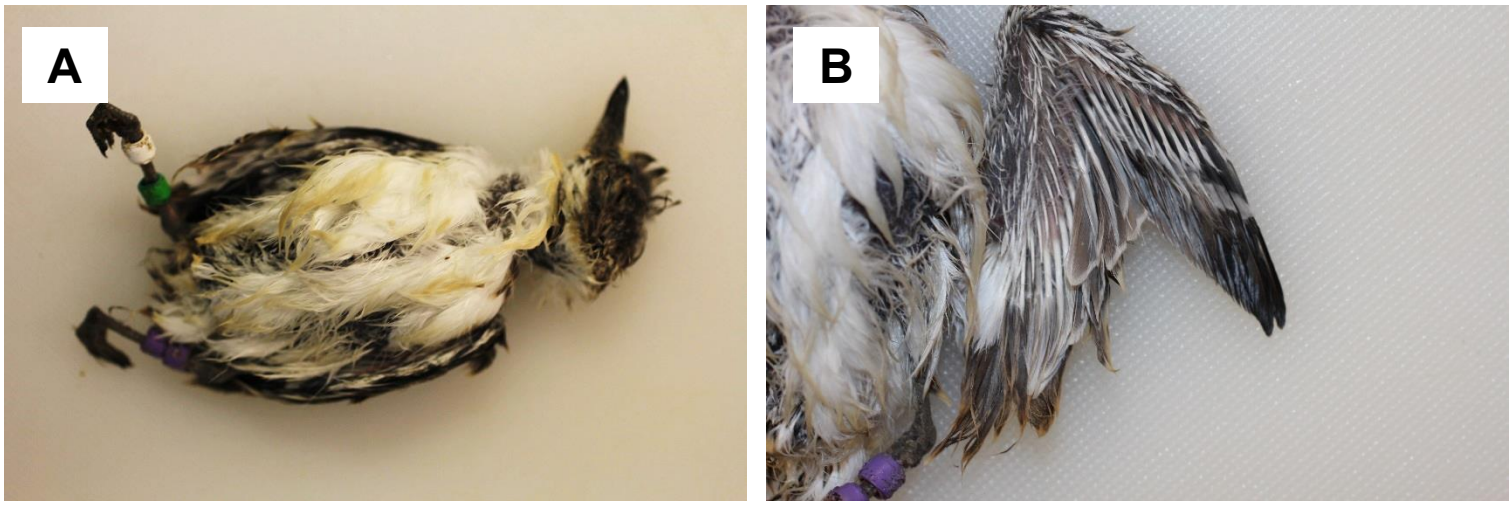


Figure 1A: External ventral view of bird in good postmortem condition, slight feces at vent; 1B. Ventral view of left wing with feathers growing

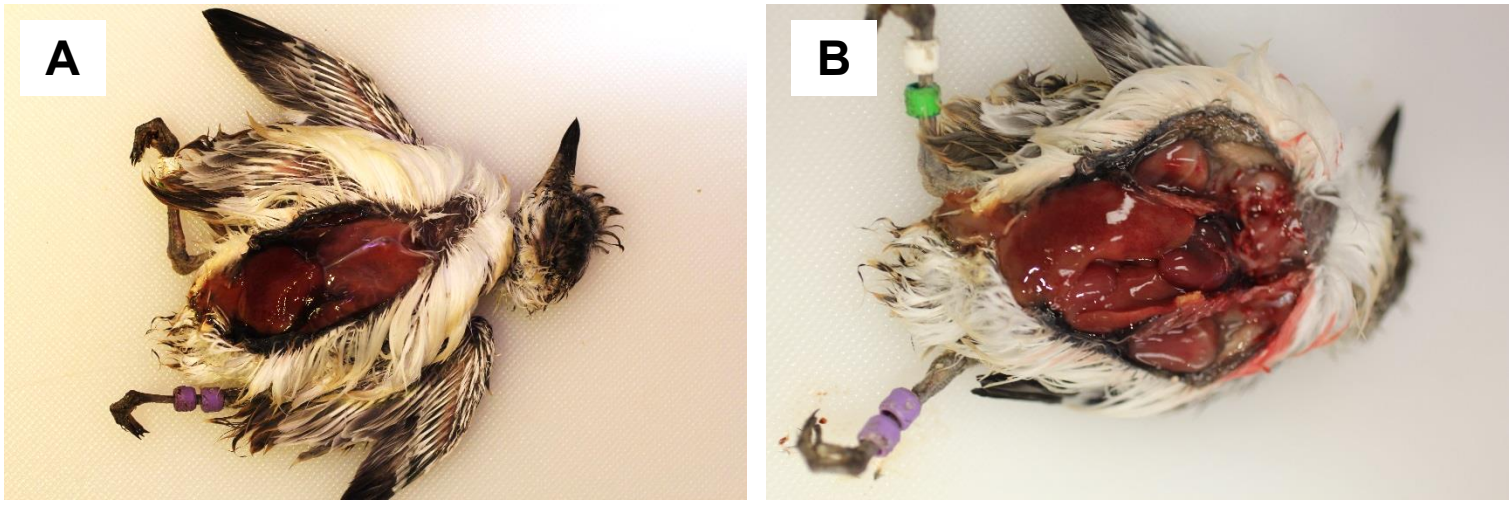


Figure 2A. Internal ventral view of bird with no adipose and pectoral muscle below keel; 2B internal ventral view of bird with keel removed, liver large, heart flaccid with scant pericardial adipose

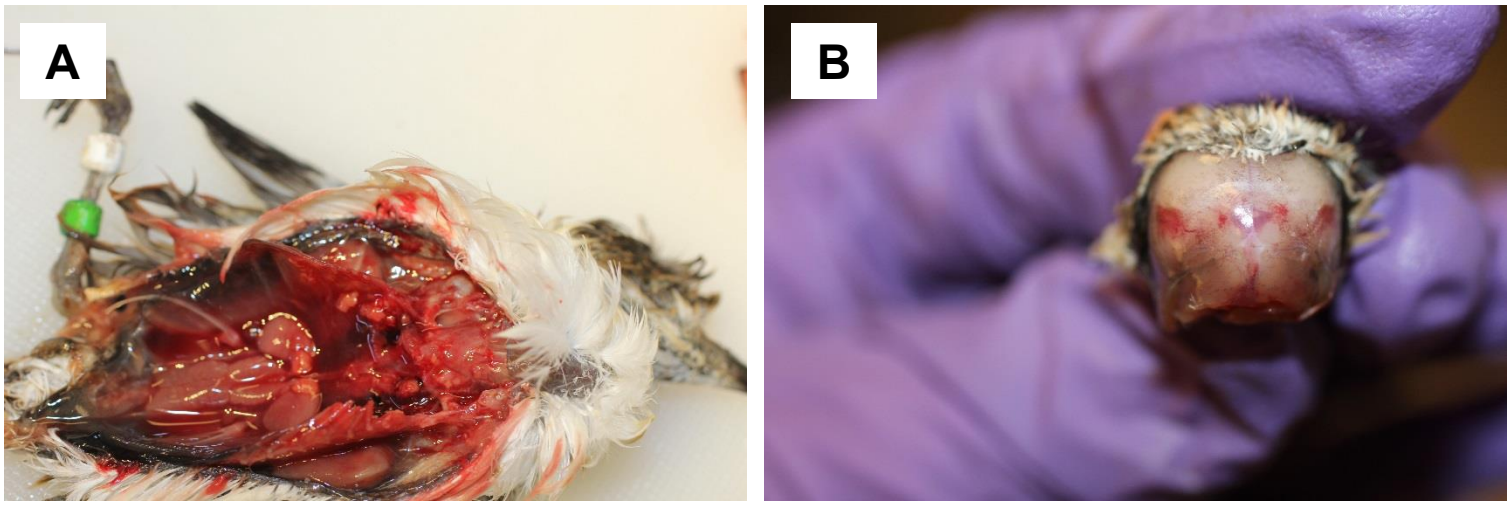


Figure 3A. Internal ventral view with organs removed, testes visible, and lungs wet, spongey, and congested; 3B. View of the occipital portion of the skull with congestion visible through skull

CASE#: 17–1281 SPECIES: SNOWY PLOVER

Date Admitted 7/3/2017 **Band** **Reference Number** **Name**

Rescuer Contact

Rescuer	ODSVRA Oceano Dunes Ranger Station	**Phone**	805-473-7220
Email		**Alt Phone**	
Address	928 Pacific Blvd – CA, Oceano		
Notes About Rescuer	Ryan, biologist who found bird: 805-365-5168		

Intake

Admitted By	Dorothy Correa		
Address Found	Oceano Dunes – CA, Oceano	**Date Found**	7/3/2017
Reasons for Admission	Baby chick		
Care by Rescuer			

Initial Exam

Dehydration	Moderate	**Weight**	17g	**Sex**	Unknown
Age	Hatchling / Chick	**Attitude**	Depressed	**BCS**	Emaciated
MM Color		**Temperature**	0F		

Heart / Lungs wet upper respiratory sounds

Comments Weak, but began eating sand hoppers immediately. Prognosis very guarded due to degree of emaciation and lethargy.

Initial Treatment 1.7 ml LRS w/ B complex SQ

Examiner VM

Treatment Log

7/3/2017	FECAL: Float=Negative, Direct=Positive, D+ 3 giardia
7/3/2017	RX: 0.03ml of 0.03ml Flagyl (25mg/ml) PO BID (50mg/kg) bid from 7/3/2017 until 7/7/2017
7/3/2017	**Intake Exam BW**: 17g, **Temp**: 0F, **Age**: Hatchling / Chick, **Sex**: Unknown, **BCS**: Emaciated, **Dehydration**: Moderate, **Attitude**: Depressed
7/3/2017	Moved to TXR
7/3/2017	Moved to SBR, incubator

Disposition

Disposition	Died in 24hr	**Criminal Activity?**		**Transfer Type**	
Disposition Date	7/3/2017	**Carcass Saved?**		**Release Type**	
Disposition Location	PWC CA				

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CASE#: 17–2014 SPECIES: SNOWY PLOVER

Date Admitted 9/24/2017 **Band** **Reference Number** **Name**

Rescuer Contact

Rescuer	ODSVRA Oceano Dunes Ranger Station	**Phone**	805-473-7220
Email		**Alt Phone**	
Address	928 Pacific Blvd. – Oceano, CA		
Notes About Rescuer			

Intake

Admitted By	Janet Stamm		
Address Found	Oceano Dunes – Oceano, CA	**Date Found**	9/24/2017
Reasons for Admission	injured leg		
Care by Rescuer			

Initial Exam

Dehydration	Mild	**Weight**	33g	**Sex**	Unknown
Age	Adult	**Attitude**	Alert	**BCS**	Thin
MM Color	Pink	**Temperature**	0F		

Feathers / Skin	a few lice present
Legs / Feet	~3 mm constriction wound midshaft R tarsometatarsus. R foot swollen/slightly dark
Comments	Band which possibly caused wound removed by Master Bander @ ODSVRA prior to transport. Remaining yellow band on leg needs removal to avoid irritating wound site, did not remove @ initial exam due to bird's stress level.
Initial Treatment	Flushed sand from wound w/ saline, covered wound in wound gel+tegaderm, 3 ml LRS w/s b complex SQ, meds
Examiner	VM/ES

Treatment Log

9/24/2017	RX: 0.04ml of 0.04ml Tramadol (25mg/ml) PO BID (30mg/kg) bid from 9/24/2017 until 9/26/2017
9/24/2017	FECAL: Float=Negative, Direct=Negative, inconclusive, small sample
9/24/2017	**Intake Exam BW**: 33g, **Temp**: 0F, **Age**: Adult, **Sex**: Unknown, **BCS**: Thin, **Dehydration**: Mild, **MM Color**: Pink, **Attitude**: Alert
9/24/2017	RX: 0.04ml of 0.04ml Meloxicam 1.6mg/ml PO BID bid, reduce dosage to .02 on 9/27 from 9/24/2017 until 9/28/2017
9/24/2017	RX: 0.01ml of 0.01ml DILUTE ivermectin 1mg/ml PO ONCE (0.4mg/kg) sd from 9/24/2017 until 9/24/2017
9/24/2017	RX: 0.03ml of 0.03ml Pentoxifylline 25mg/ml PO BID (20mg/kg) bid from 9/24/2017 until 9/27/2017
9/24/2017	RX: 0.06ml of 0.06ml Clavamox 62.5mg/ml PO BID (125mg/kg) bid from 9/24/2017 until 9/30/2017
9/24/2017	Moved to TXR

9/24/2017	Moved to SBR
9/25/2017	FECAL: Float=Negative, Direct=Negative
9/25/2017	**BW: 33.00g,** All food eaten (beach bugs, krill, bloodworms, mealworms) overnight. VM
9/25/2017	BAR. Decent body condition. Removed tegaderm from constriction wound, R TMT. Wound actually looks quite good. Appears to be filling in w/granulation tissue. Tissue distal to constriction warm and appears viable. Superficial pain perception present in foot. Cleaned wound w/saline and removed small amt superficial debris. Replaced tegaderm. Recheck Wed. SR/VM
9/27/2017	BAR. Bearing weight evenly on both legs. Removed dressing-wound continuing to granulate w/new skin beginning to cover a good portion of the open wound. Minimal oozing from site so left uncovered. Continuing to heal well. SR/VM
9/29/2017	BAR. Decent body condition. Moving very quickly and using both legs well. Wound on R leg continuing to heal well. Tomorrow is last day of ABs. Will recheck on Monday, hoping that bird will be ready to return by Tues. SR/Mariela
10/1/2017	**BW: 37.00g,** ES
10/2/2017	BAR. Good body condition. Good feather condition. Constriction wound R leg nearly healed. Uses both legs equally. Notified ODSVRA that he is ready for release ASAP. SR/VM

Disposition

Disposition	Released	**Criminal Activity?**	**Transfer Type**
Disposition Date	10/4/2017	**Carcass Saved?**	**Release Type**
Disposition Location	Oceano CA		

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CASE#: 17–1829 SPECIES: SNOWY PLOVER

Date Admitted 8/26/2017 **Band** **Reference Number** **Name**

Intake

Admitted By	Betty Cary		
Address Found	Oso Flaco Shoreline – Oceano, CA	**Date Found**	8/26/2017
Reasons for Admission	Injured left leg		
Care by Rescuer	None		

Initial Exam

Dehydration	Mild	**Weight**	27g	**Sex**	Unknown
Age	Adult	**Attitude**	Alert	**BCS**	Reasonable
MM Color		**Temperature**	0F		

Legs / Feet Very lame on L leg, but does place some weight on toes. Open, mid-diaphyseal fracture L TBT. Fracture almost completely stable. ~15 degree angulation of distal leg in anterior direction from fracture. ~3mm proximal end distal fragement protruding through skin. Dry, dark, non-viable.

Comments

Initial Treatment Meloxicam, butorphanol, midazolam, radiographs, debride wound/splint L TBT, clindamycin, enrofloxacin, tramadol, 3ml LRS SQ

Examiner SR/Ciara

Treatment Log

8/26/2017 RX: 0.04ml of 0.04ml Calcium carbonate 100mg/ml PO SID (150mg/kg) from 8/26/2017 until open

8/26/2017 **Intake Exam BW**: 27g, **Temp**: 0F, **Age**: Adult, **Sex**: Unknown, **BCS**: Reasonable, **Dehydration**: Mild, **Attitude**: Alert

8/26/2017 RX: 0.03ml of 0.03ml Clindamycin 25mg/ml PO BID (25mg/kg) from 8/26/2017 until open

8/26/2017 RX: 0.02ml of 0.02ml Enrofloxacin 22.7mg/ml PO BID (15mg/kg) from 8/26/2017 until open

8/26/2017 RX: 0.03ml of 0.03ml Butorphanol 2mg/ml IM ONCE (2mg/kg) from 8/26/2017 until 8/26/2017

8/26/2017 RX: 0.01ml of 0.01ml Midazolam 5mg/ml IM ONCE (2mg/kg) from 8/26/2017 until 8/26/2017

8/26/2017 RX: 0.03ml of 0.03ml Tramadol 25mg/ml PO BID (30mg/kg) from 8/26/2017 until 9/1/2017

8/26/2017 Moved to TXR

8/27/2017 FECAL: Float=Negative, Direct=Negative

8/27/2017 **BW: 28.00g,** BAR, ambulating as well as could be hoped with splint on. Appears to be eating small mealworms and bloodworms. Offered sand-hoppers in afternoon, wt at PM meds= 30 g. VM

8/28/2017 RX: 0.01ml of 0.01ml DILUTE ivermectin 1mg/ml PO ONCE (0.4mg/kg) sd, for feather lice treatment from 8/28/2017 until open

8/28/2017 BAR. Bears weight evenly between feet when standing still, but still favors L leg quite a bit when running. Splint loosening a bit proximally so placed another piece of tape perpendicular to splint to hold in place. Weight stable to increasing. Hydrated. Recheck in a couple of days. SR

8/29/2017 BAR. Splint coming off so decided to remove completely and replace. Removed all tape and splint material. Made small nick in skin w/scissors while removing. Fracture feels completely stable. Wound where bone had been protruding healing well. Flushed wounds w/saline and covered w/tegaderm. Monitor use of leg for next few days. Hoping will be ready for release by

	early next week. SR/Mariela
8/30/2017	Moved to SBR
8/31/2017	BAR. Scooting around enclosure quickly, but still obviously favoring L leg. Seems to have a little bit of difficulty flexing at hock, but definitely can. Tegaderm in place over lateral surface of TBT so left alone. Would like to see better use of leg before release, but would probably be functional as is. Hoping for early next week release. SR
9/2/2017	**BW: 30.00g,** KD/JM
9/5/2017	BAR. Decent body condition. Removed tegaderm from L leg. Wounds have healed well. Getting around better on L leg. Only slight limp. OK to send back to ODSVRA in next couple of days. SR/KD

Disposition

Disposition	Released	**Criminal Activity?**		**Transfer Type**	
Disposition Date	9/7/2017	**Carcass Saved?**		**Release Type**	Returned
Disposition Location	ODSVRA CA				

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