NESTING OF THE CALIFORNIA LEAST TERN AND WESTERN SNOWY PLOVER AT OCEANO DUNES STATE VEHICULAR RECREATION AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA 2019 SEASON

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Cover photo taken by Daniel Johnson, an ODSVRA monitor, on 5 June 2019
Snowy plover female, banded VV:AA, brooding three chicks at Oceano Dunes SVRA.
Chicks are banded GG:OB from the SP85 nest and all three reached fledge age.

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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 2019.

Least tern
In 2019, there were an estimated 31-33 least tern breeding pairs, almost identical to 2018 (30-33 pairs) and in strong contrast to the preceding six-year period 2012-17 with a minimum average of 45 (range=41-48) breeding pairs. In 2017, there was a near complete breeding failure with only seven juveniles produced, due to high egg and chick predation by skunks. Subsequently, it has become evident that a number of ODSVRA banded terns relocated to nearby sites in Santa Barbara County in 2018 and 2019 for breeding.

There were 34 known nesting attempts in 2019, all from known locations in the Southern Exclosure (portion of the park's vehicle riding area seasonally closed for breeding terns and plovers). Of these one nest had an unknown fate (not known if hatched or failed) and two were abandoned. The hatching rate for known location and fate nests was 93.9% (31/33), which is above the average of 83.0% during the previous 14-year period 2005-18.

Fifty-two chicks hatched and of these 41 were color-banded to individual. Thirty-eight chicks (32 banded, six unbanded) are known to have fledged (seen when 21 days old or older), for a fledging rate of 73.1% and an estimated 1.15-1.23 chicks fledged per pair. This compares with an average for the previous 13-year period 2006-18 (banding chicks to individual began in 2006) of 47 juveniles produced per year, a 74.1% chick fledging rate, and 1.12-1.19 chicks fledged per pair.

Snowy plover
There was a minimum of 214 breeding snowy plovers (120 males and 94 females), compared to 201 in 2018, an increase of 6.5%. Ninety-six banded birds with known origins were documented as breeding with 93.4% (90/96) banded as chicks and fledged from ODSVRA.

There were 239 known nesting attempts, including nine identified only by detection of brood (unknown nest location). Of the 230 nests from known locations, 172 (74.8%) were in the Southern Exclosure, 57 (24.8%) in Oso Flaco, and one in Eucalyptus North revegetation area. Of the 220 nests with known location and fate, 149 hatched for a nest hatching rate of 67.7%. This compares to an average of 75.0% for the previous 17-year period 2002-18. Seventy-one nests failed, attributed to the following causes: abandoned pre-term (6); abandoned unknown pre- or post-term (3); abandoned, suspected wind (3); overwashed by tide (8); cause unknown (5); unidentified predator (4); avian (8); coyote (4); skunk (1); corvid (1); common raven (13); gull (14); and northern harrier (1). Avian predation alone was responsible for at least 37 of the 71 failed nests.

Of the 398 hatching chicks, 200 were color-banded to brood with 31.5% (63/200) fledging, and the fate of the 198 unbanded chicks is believed known with 22.7% (45/198) fledging. A total of 108 chicks fledged (seen when 28 days old or older) for a low fledging rate of 27.1%. This compares to 48.5% in 2018 and an average rate of 39.9% for the 17-year period 2002-18. 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 2019, an estimated 0.90 chicks fledged per breeding male at ODSVRA. For the 17-year period 2002-18, average productivity was 1.50 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 1.5 million people in 2018 for a variety of recreational opportunities, including driving vehicles on the beach and dunes.[1] In 2018, an estimated 372,876 street-legal vehicles and 84,598 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 2019 nesting season for least terns and snowy plovers at ODSVRA. A limited amount of data from previous years' reports has been updated in this report to reflect information that is more accurate and conforms to current analysis practices. Maps in figures and appendices use aerial imagery taken in 2018 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 2018 Annual Attendance figures (source ODSVRA)
[2] ODSVRA 2018 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 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 (Guadalupe-Nipomo Dunes NWR). Inside the park, dunes that are open to vehicles extend inland approximately 0.6 to 1.3 miles. Eight numbered marker posts, located approximately 0.5 miles apart, are positioned 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 1.0 mile south of Pier Avenue). In the southern portion of ODSVRA is the Oso Flaco Lake area with an ocean shoreline of approximately 1.7 miles. Pedestrians are allowed at Oso Flaco Lake area, 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 CDFW 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 (*Canis latrans*) and other mammals can easily move through this fencing.

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 above the high tide line on the closed shoreline) for 2019 was approximately 305 acres, compared to a range of 271-302 acres (and an average of 291 acres) between 2004 and 2018. Although the basic configuration of the Southern Exclosure has remained consistent since 2004, changes in dune topography and public safety issues affect the placement of the east fence, resulting in small variations in acreage from year to year. Individually identified areas 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 61.0 acres), first incorporated into the Southern Exclosure for a full season in 2004. Vegetation within the exclosure is overall 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 61.2 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 7.5 revegetation area (4.8 acres, included in the 61.2 total acres) 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 86.2 acres). Habitat includes extensive areas of bare sand in the eastern portion, areas of small to moderately tall vegetated foredune 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 96.5 acres. A portion of the west side (approximately 15.5 acres) has been closed year-round since 2005. Straw bales were placed within the area in 2004 and have mostly been covered by sand. Portions of this area have also developed small to large vegetated hummocks. The east fence of the Boneyard exclosure 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 48.7 acres in the western portion (contiguous with 6, 7, and 8 exclosures and North Oso Flaco) and 47.8 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 shoreline 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. 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 of 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 east of the shoreline has been part of the Seasonal Exclosure and managed in a similar manner with symbolic fencing replaced by predator fencing. Additionally, the shoreline has been closed to the public during the nesting season.

South Oso Flaco: Extends from the boardwalk to the ODSVRA southern boundary (approximately 1.2 miles of shoreline). 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 often receive single nest wire exclosures.

Seasonal Exclosure: The contiguous area enclosed by the predator fencing of Southern Exclosure and North Oso Flaco (does not include the shoreline or the eastern Boneyard area). ODSVRA fences this approximately 266-acre area during the nesting season to exclude coyotes, vehicles, and human trespass from the protected nesting habitat (see section titled Seasonal closure and fencing on page 14, Figure 2, and Figure C.1 in Appendix C). A portion of the North Oso Flaco fence along the boardwalk is left in place year-round, however it is only maintained for predators during the nesting season (labeled as Permanent predator fence in Figure C.8 in Appendix C).

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.6 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. Several named revegetation areas are east or northeast of 6 exclosure including Eucalyptus North (640 feet east) and three areas that make up Pawprint (Heather, Acacia, and Cottonwood, 615 to 1,260 feet east/northeast). Tabletop revegetation area is 1,000 feet east of 7 exclosure and Boy Scout Camp is 0.7 miles east of 8 exclosure. Worm Valley and BBQ Flats revegetation areas are 0.6 to 1.0 mile north of the Southern Exclosure between marker post 4 and 5. The areas are mostly heavily vegetated, but some small portions of the areas were expanded within the last two years for restoration and are lightly scattered with dry straw and widely scattered small plants. 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 2.0 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; tall vegetated dunes and developed RV campground 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.

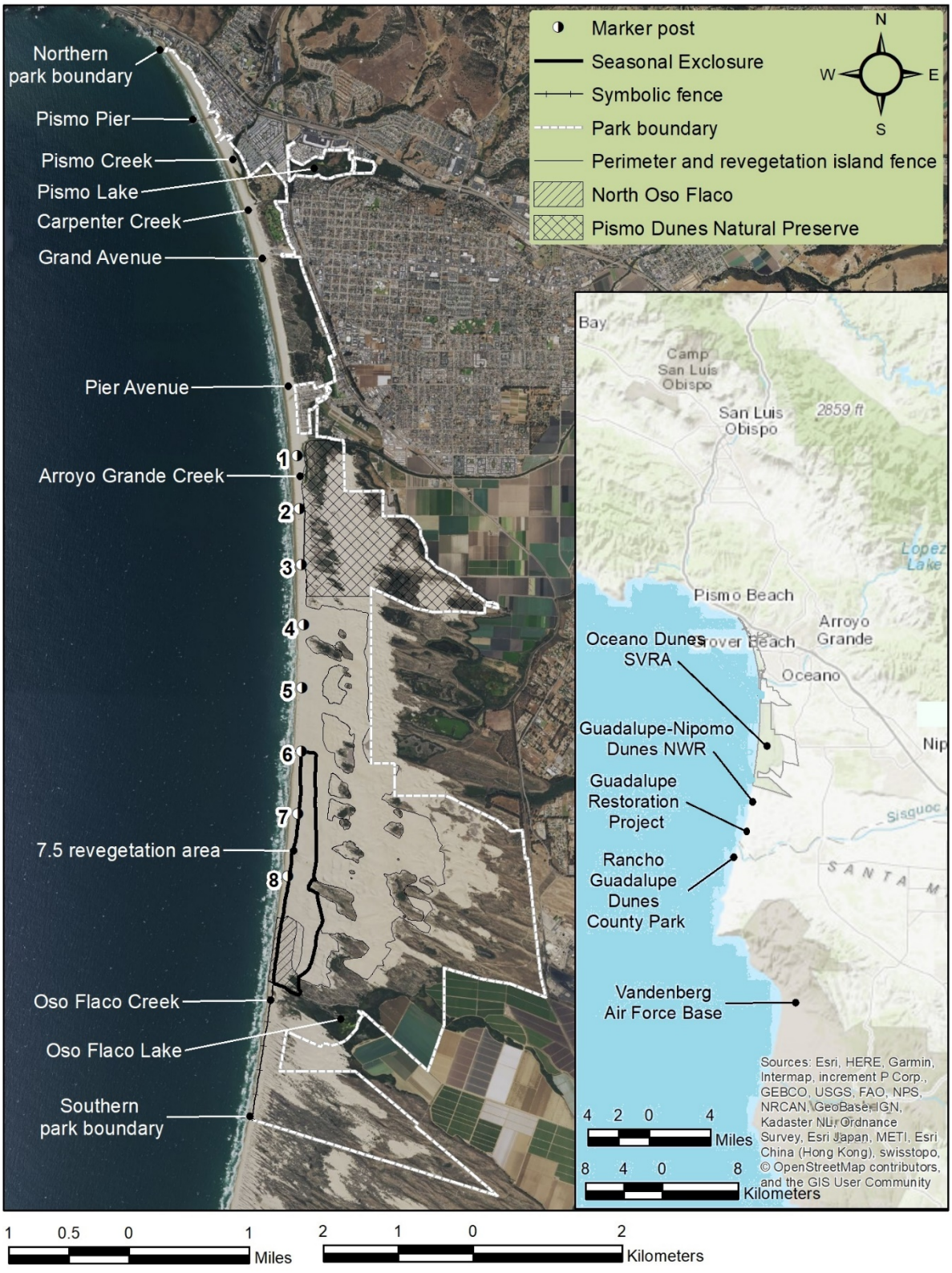

Figure 1. ODSVRA site map.

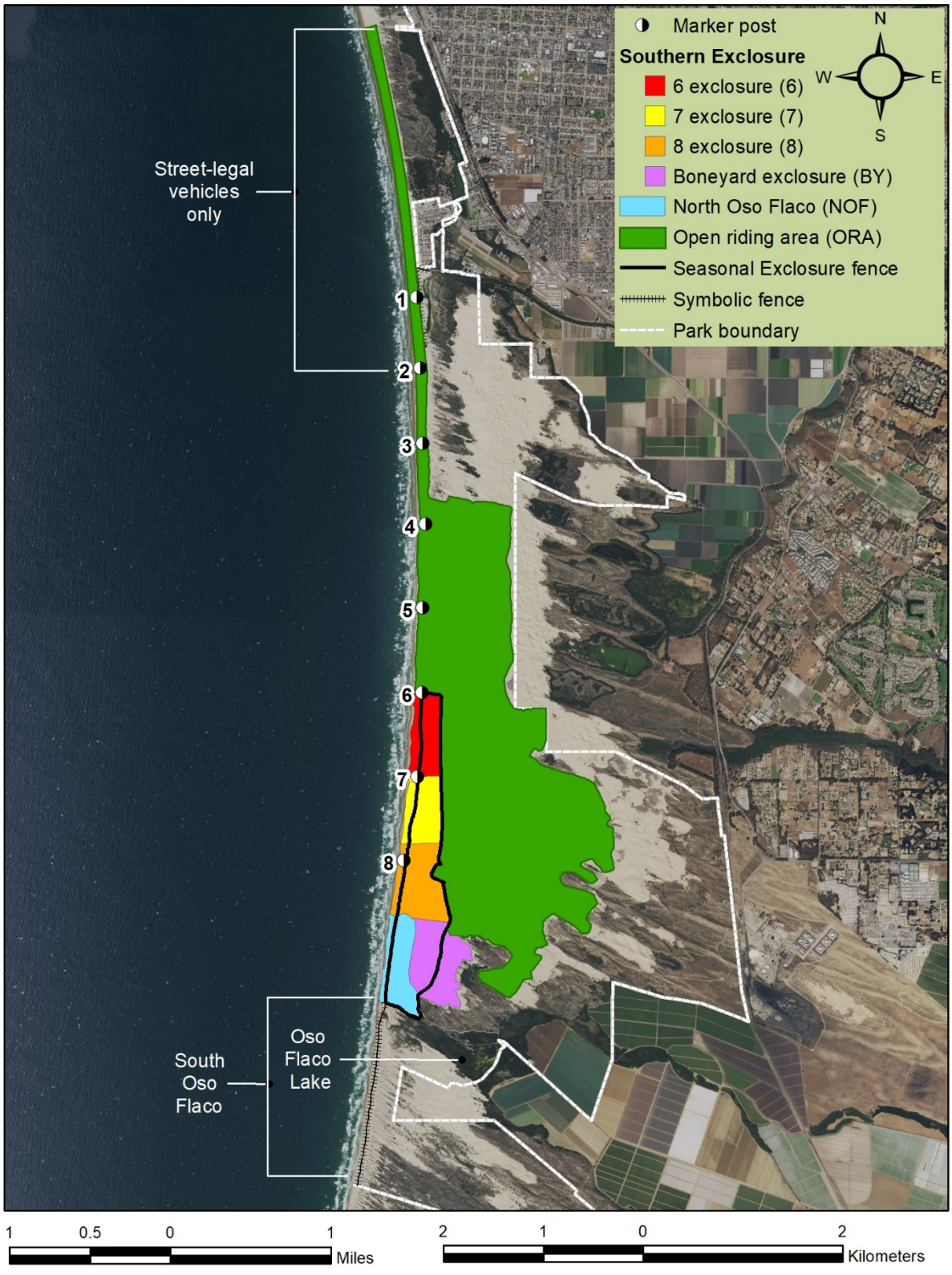

Figure 2. ODSVRA Southern Exclosure, Seasonal Exclosure, and Oso Flaco seasonally protected areas for breeding California least terns and snowy plovers in 2019.

MONITORING AND MANAGEMENT ACTIONS

MONITORING

Daily monitoring occurs from 1 March to 30 September. At a minimum, ODSVRA maintains four 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.

Monitors collect and record data such as: nest status; brood location and count of chicks; fledgling identification; band combinations of chicks, juveniles, and adults; tern night roost location and number of birds; injuries or mortalities; predator sightings or tracks; and visitor infractions. Nest cameras placed on a small number of tern or plover nests provides additional monitoring information such as adult bands, adult behavior, nest attendance, predators, nest fates, nest fate dates, and chick numbers in areas otherwise difficult to access. Data from field notes and from nest cameras are entered into a comprehensive database system that includes a Microsoft Access database, ESRI ArcMap, Microsoft Excel sheets, and paper charts.

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. Staff looks for signs of nesting birds, predator presence or signs, nonpermitted visitor activities (such as off-leash dogs or kites near the exclosure), rescues sick or injured wildlife, and collects deceased wildlife. Areas along transects with plover activity indicating potential nesting interest (scraping or copulating) receive more thorough checks on foot and with increased frequency using binoculars or spotting scope. Monitors pay particular attention to the boundary of the Southern Exclosure, looking each morning for tracks or other signs of tern or plover movement into the open riding area. Close brood monitoring occurs when staff walk within the exclosure, including preventing chick movement toward the open riding area, if necessary, with staff slowly stepping out of the vehicle or walking toward the exclosure. When staff finds chicks in the open riding area, they slowly direct them back into the protected Southern Exclosure using various appropriate measures to allow the brood's safe movement, including: diverting or regulating vehicle traffic flow and visitor foot traffic, flushing threats such as gulls or other predators within the travel corridor, obtaining assistance as necessary from ODSVRA patrol staff, and placing signs and/or symbolic fencing 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 to minimize disturbance to nesting birds and broods. Additional nest searches conducted on foot confirm egg number and document activity at the nest bowl. Staff maps nest locations using a Global Positioning System (GPS).

Estimated initiation date: Initiation date estimates arise from 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. When none of this information is available, staff cannot estimate nest initiation dates.

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 constitute "unknown location nests" and egg numbers from such nests represent minimums derived from the number of chicks first observed (see section titled Assignment of broods to nests within this Monitoring section for more detail). When all chicks in a plover brood hatch over more than one day, this is referred to as a "split hatch." It is common for two- or three-egg tern nests to hatch over more than one day and the term "split hatch" is not applied.

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, staff added the category of "abandoned, suspected due to wind" 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, monitors limit access to nests with nearby young tern and plover broods present, which may result in nests with unknown fate.

Banding chicks: In 2019, least tern chicks received a single size 1A blank aluminum band (covered with orange over white 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 for the season. Weighing chicks occurs immediately prior to banding, typically at one to three days old.

Banding of plover chicks was inconsistent prior to 2001. ODSVRA aims to band as many chicks as possible, with all chicks within one brood given the same color band combination since 2002. From 2010-18, the limited number of combinations available caused ODSVRA to reuse band combinations of birds that may

be alive; therefore, the age of adult plovers with certain ODSVRA band combinations is sometimes unknown. In 2019, additional band combinations became available to ODSVRA and each brood of chicks was given a unique color band combination. To reduce disturbance to chicks, monitors may choose to leave chicks unbanded when broods are in areas with nearby young tern and plover broods. In addition, a number of very young unbanded chicks are lost prior to any banding opportunity. Staff tracks the fates of unbanded chicks with intense brood monitoring; in some instances, the associated adult or sibling chicks may be color-banded.

Assignment of broods to nests: Point Blue bands most chicks at the nest. Unbanded broods found outside of the immediate nest area receive assignment to one of three categories: 1) a hatched preexisting known location nest, 2) a hatched new nest with unknown location and known only from brood, or 3) a hatched unassigned nest (listed as UNA1-UNA14 in Appendix B). Staff assigns unbanded broods to either a preexisting known location nest or a new nest with unknown location based on parent bands, or when adults are unbanded based on the brood location and age of chicks. However, staff cannot assign broods to a specific nest in circumstances where several nearby nests hatch at the same time (hatching chicks confirmed from a distance with a spotting scope), banding at the nest is impossible, and unbanded broods with chicks of similar age appear on the same section of shoreline. Such broods fall within a category of hatched unassigned (UNA) nests.

Chick monitoring: Monitors record chick observation data during daily monitoring activities. In addition, focused searching for broods occurs multiple times each week from vehicle surveys on the Southern Exclosure and Oso Flaco shorelines. 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. Specifically monitoring terns allows estimation of number of juveniles produced as well as identifying potential threats to survival. ODSVRA considers tern chicks surviving to 21 days or older as fledged (21 days after the hatch date, which counts as day zero). Tracking of juvenile terns occurs in the park at the Southern Exclosure, at Oso Flaco Lake, and any temporary daytime roosting areas that may become established. Staff also documented many ODSVRA juvenile terns off-site at Rancho Guadalupe Dunes County Park (RGDCP) in 2019.

The fledgling least 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 counts 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.

ODSVRA considers plover chicks surviving to 28 days or older from the time of hatch as fledged (28 days after the hatch date, which counts as day zero). Staff identifies and records fledglings in the course of chick monitoring as described above. Prior to 2001, monitoring in Oso Flaco and Pismo Dunes Natural Preserve was intermittent, resulting in a lack of fledgling information.

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, ODSVRA represents the number of breeding pairs as a range. The estimated minimum number of pairs equals the maximum number of concurrently active nests and broods. The estimated maximum number of pairs equals the minimum number of pairs plus one-half of the value of the minimum number of pairs subtracted from the total number of nests (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, ODSVRA did not always report the estimated number of breeding pairs or based it only on the number of concurrent nests. These reports, reviewed in 2005, looking at both nests and the limited brood information, resulted in identifying an increase in the minimum number of pairs in some years; ODSVRA provides this revised information 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 derives 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. The minimum estimated number of breeding males equals 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. From 2009 to 2017, staff compiled numbers of color-banded adults confirmed breeding; staff adds any number of this group not accounted for on the same day high count, including nests or broods with unknown adults, to the same day high count for the appropriate sex. Beginning in 2018, using a database query, staff created a more accurate method to determine high counts of unbanded males and females actively associated with a nest on any given day and a total number of uniquely banded males and females associated with a nest at any point in the season.

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. In 2019, staff experimented with using a thermal infrared scope (Trijicon REAP-IR) to monitor the night roost and continue to evaluate the use of the equipment for this task. On occasions when monitors cannot see terns due to darkness after dusk, terns are heard vocalizing as they arrive to roost. ODSVRA considers counts 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. 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 to be swallowed whole). Monitors conduct periodic surveys at Oso Flaco Lake (located on park property approximately 1.5 miles south of the middle of tern colony) during the season, do not monitor Dune Lakes (approximately 1.5 miles to northeast) on private property with no access, and no longer monitor Cypress Ridge Lake (approximately 3.2 miles to northeast) because of terns' absence since 2013. However, staff monitors the tern colony in the Southern Exclosure daily and observations of adults in flight provide information about the direction of foraging sources and, occasionally, fish size.

Wind speed monitoring

Since 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. In 2010-11, ODSVRA placed a portable anemometer with data logger (from WindLog Rainwise, Inc.) in the breeding habitat. Before 2010, monitors periodically measured wind speeds 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 avian and mammalian predators or their sign (e.g., tracks, scat, regurgitated pellets, prey remains, depredated nests), monitors record, as possible, species, type of sign, behavior, duration of observation, direction of travel, and characteristics that may identify an individual.

Measures describing predator activity:

Monitors record predator presence from 1 March to 10 September under the following three categories to better estimate the extent of predator activity, both temporally and spatially, in the protected areas:

> *Number of days detected*: Total number of days different avian and mammalian predators occur in the nesting area (Southern Exclosure and Oso Flaco) during the nesting season.
>
> *Sightings*: Record of avian predator activities, with most detections made by direct observation (with the notable exception of nocturnal owls). In addition, observations of an individual remaining in one area longer than one hour count as multiple sightings (one sighting per hour or portion thereof) in order to account for possible additional impacts.
>
> *Occurrences*: Record of mammalian predator activities, with most detections occurring by tracks and sign. Because direct observation of mammalian predators is very limited, information typically does not include details such as number of individuals, behavior, or duration of presence.

For both sightings and occurrences, this report separates single day detections for the different areas of the Southern Exclosure (6, 7, 8, and Boneyard exclosures) and Oso Flaco (North and South). Note that the number of recorded sightings or occurrences 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.

Gull monitoring: Gulls may depredate snowy plover and least tern eggs and chicks, as well as young plover juveniles. Human activity, with its associated food resources, attracts gulls, making them a subsidized predator. Staff perform general monitoring of gulls around the Southern Exclosure and Oso Flaco to identify potential problem individuals. In addition, monitors count gull numbers at the trash dumpster area near marker post 2 one to two times per week, in the morning on a Sunday and Monday when the trash dumpsters are usually full.

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 to marker post 2 (street-legal vehicles and day use only, no camping);
3) marker post 2 to marker post 6 (street-legal vehicles, off-highway vehicles, and camping allowed year-round);
4) marker post 6 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.

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. Under select circumstances, ODSVRA staff may collect abandoned but potentially viable eggs or chicks for captive-rearing and carcasses may be sent to an approved facility for investigative necropsy.

Informational signage and enforcement of regulations
Staff places interpretive panels and signs at public access points, at bathrooms, on A-frame placards near winter flocks, and to identify 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 Site Description section and 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.

ODSVRA uses the following exclosure types:

Seasonal Exclosure protected area (within Southern Exclosure and North Oso Flaco): ODSVRA encloses with wire mesh fencing this approximately 266-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 entry. Beginning in 2006, an additional layer of fence material attached to overlap the top of the fence increased 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.

Symbolic fencing (Southern Exclosure shoreline, North Oso Flaco shoreline, and South Oso Flaco): Symbolic rope fencing, with the addition of tall posts with large stop signs extending into the intertidal area at marker post 6 and the south end of North Oso Flaco, clearly designate a closed shoreline to visitors. 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). Staff moves the fencing in this area westward for nests found west of or very near the symbolic fence to provide more of a buffer between nests and pedestrians. Nests in this area may also receive some type of single nest wire 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.) ODSVRA may use single nest exclosures of differing sizes to protect snowy plover nests in areas closed to vehicles (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 individual snowy plover nests inside or outside of seasonal fencing for protection from predators, including roosting gull flocks. Permitted monitors use different exclosures based on a variety of factors including, but not limited to, weather, topography, predator threats, and proximity of young broods. Staff closely monitor nests within smaller exclosures since there may be an increase in abandonment due to predation on adult plovers attending the nests or a higher risk that eggs will be buried from sand accumulating inside the fencing during high wind events.

Staff builds the 10-foot by 10-foot exclosure (available for use since 2003) and seven-foot-diameter circular exclosure (used since 2012) with five-foot-high sides with the bottom eight inches buried when located outside of the Seasonal Exclosure. Plastic netting, with 1/2-inch by 1/2-inch mesh, covers the top and protects 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 but circular exclosures have been most commonly used at ODSVRA since 2014.

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 a "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 also monitor tern chicks and the night roost and a bumpout is installed or the size is adjusted if chicks or night roosting birds are observed to remain within 328 feet of the eastern bumpout fence. Staff extends bumpouts when recreational activities continue to cause disturbance to nesting birds and removes bumpouts when nests with bumpouts are no longer active. As nests are initiated over the course of the season, the bumpout fencing may be connected several times, coalescing into one large bumpout with multiple layers of fencing. ODSVRA maintains a safe vehicle corridor adjacent to the east fence and any bumpouts. Nests on the shoreline close to the west fence may be exclosed by two-inch by four-inch mesh fencing extending from the Seasonal Exclosure fence; this type of single nest wire 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 large 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, provide shelter from wind and blowing sand, reduce exposure to predators, and augment potential nesting substrate for terns and plovers. Beginning in February or March, and prior to nest initiation, staff adds natural materials such as driftwood, woodchips, and wrack 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, showed that invertebrate populations on the Southern Exclosure shoreline are greatly depressed during the five months when open to recreational vehicle use (October through February). The studies also showed that invertebrates cannot

effectively recover species diversity and abundance on the Southern Exclosure shoreline in the following seven-month seasonal closure (March through September).

ODSVRA collects wrack in the open riding area and disperses it in the Southern Exclosure. Collection and distribution occurs by hand and relocation by truck and trailer. In addition to providing cover, wrack on the shoreline provides a food resource supporting invertebrates, which in turn become prey for plover chicks, juveniles, and adults. Staff collects talitrids (commonly called beach hoppers) from outside the vehicle use area north of Grand Avenue and from South Oso Flaco, taking care to not deplete talitrid numbers from collection sites. Inoculating the wrack addition areas of the Southern Exclosure shoreline with talitrids establishes 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. Crews spread woodchips in patches, usually 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 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 toward the west fence and upper shoreline west of the fence. 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, single nest wire exclosures, and cover provided by habitat enhancement, park 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 up to 300 feet that makes a loud whistling sound, hazing predatory birds without harming them. In some situations, firing the bird whistler may cause less disruption to plovers and terns compared to approaching an avian predator on foot in the breeding habitat. When ODSVRA requires additional options for managing predators, Bloom Biological, Inc. performs selective live-trapping and relocation of avian predators and USDA Wildlife Services conducts lethal removal of mammalian and avian predators (see section titled Predators and predator management on page 39 for additional information).

Selective collection and transfer of abandoned chicks and potentially viable eggs

ODSVRA staff may collect abandoned but potentially viable eggs or chicks under select circumstances. Monitors will consider 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 exclosure fencing that may have increased the amount of windblown sand deposited on the nest. Monitors will first assess if the collected potentially viable eggs can be transferred to nests which have active incubation but were determined to have nonviable eggs (well past estimated hatch date). When no nest is available, and in consultation with USFWS, staff transport the eggs to the Santa Barbara Zoo for captive-rearing. For collected abandoned chicks, staff may first attempt to reunite them with their associated adults; if not possible, they are transported to the Santa Barbara Zoo for captive-rearing. Staff use a portable brooder to warm the collected eggs or chicks during transport, at an appropriate temperature and as directed by Zoo staff, or may use a portable hand warmer in the field until a brooder is available. Fledglings raised in captivity are color-banded to individual prior to release to facilitate collecting information on movements, survival, and future reproductive success.

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, ODSVRA sends carcasses to UC Davis California Animal Health and Food Safety Laboratory System, Davis, California. Since 2017, under direction from USFWS, ODSVRA places snowy plover carcasses in a freezer for deferred necropsy, if USFWS determines it necessary. If the carcass is fresh and USFWS determines an investigation is not necessary, ODSVRA may refrigerate and then send the carcass by overnight delivery service (within one day when possible to preserve tissue integrity) for testing to determine cause of death.

RESULTS AND DISCUSSION

CALIFORNIA LEAST TERN

Number of breeding pairs

In 2019, least terns were first seen at ODSVRA on 4 May with one flying over the exclosure, and from this date onward terns were seen or heard daily. Terns were last seen on 25 August with one adult on the exclosure shoreline. During the previous 17 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 2019, there was a known minimum of 31 breeding pairs and an estimated maximum of 33 pairs. This is almost identical to the 30-33 pairs in 2018 but noticeably lower than the average of 41-44 pairs (range=23-60) for the 14-year period 2005-18 (Table 1, Figure 3).

Number, clutch size, and distribution of nests

There was a total of 34 nests, with the first nest initiated approximately 23 May and the last 26 June (Appendix A). During the 17-year period 2002-18, there was an average of 48 nests per year (range=22-79) with initiation dates for first nests ranging from 16 May–8 June (median=29 May) (Table 1). In 2019, the number of nests and broods active at the same time was 31 on 19-24 June. Of the 32 nests with known complete clutch size, eight had one egg, 23 had two eggs, and one had three eggs, with an average clutch size of 1.78 eggs. This compares to an average of 1.87 for 2005-18 (range=1.57-2.05), and a reported statewide average of 1.67 from 2007–16 (range=1.60-1.82) (Marschalek 2008-12; Frost 2013-17). Of the 34 nests, 14.7% were in 6 exclosure and 85.3% in 7 exclosure, a noticeable change from the 13-year period 2006-18 average of 64.5% and 28.5% in 6 exclosure and 7 exclosure, respectively (Figure 4).

Clutch hatching rate

Of the 34 nests, 31 hatched, one was abandoned pre-term, one was abandoned, unknown if pre- or post-term, and one had an unknown fate for a clutch hatching rate of 93.9% (31/33) for known fate nests (Table 2). This compares to an average hatching rate of 83.0% (range=64.7-97.9%) for known fate nests during the 14-year period 2005-18 (Table 1). The hatching rate was 100.0% (5/5) in 6 exclosure and 92.9% (26/28) in 7 exclosure. Ten chicks hatched from a minimum of 11 eggs in 6 exclosure, and 42 chicks hatched from a minimum of 48 eggs in 7 exclosure.

Table 1. Nesting success of California least terns at ODSVRA from 1991-2019.

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, banded to brood in 2005, and banded to individual from 2006-19.

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	100	4	0.67	0.80-1.00
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 (16)	3	19	6	0	0	0	0
1998	33-37	40 (32)	26	81	40	60	24	0.60	0.65-0.73
1999	28-31	34 (31)	22	71	42	40	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	78	35	0.92	1.00-1.13
2007	54-60	66 (66)	51	77	90	79	71	1.08	1.18-1.31
2008	55-56	56 (56)	50	89	99	72	71	1.27	1.27-1.29
2009	25-26	26 (26)	23	88	43	77	33	1.27	1.27-1.32
2010	23-23	23 (23)	20	87	35	83	29	1.26	1.26-1.26
2011	33-34	35 (35)	31	89	55	91	50	1.43	1.47-1.52
2012	41-44	46 (39)	32	82	51	82	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
2018	30-33	35 (35)	28	80	42	83	35	1.00	1.06-1.17
2019	31-33	34 (33)	31	94	52	73	38	1.12	1.15-1.23

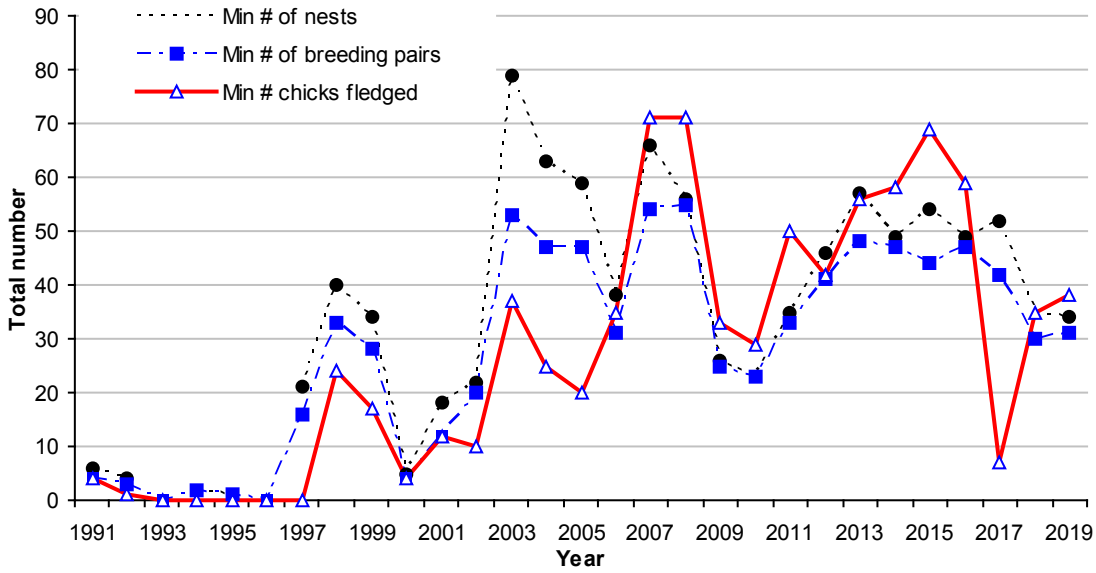

Figure 3. Number of California least tern nests, pairs, and fledglings at ODSVRA from 1991-2019.

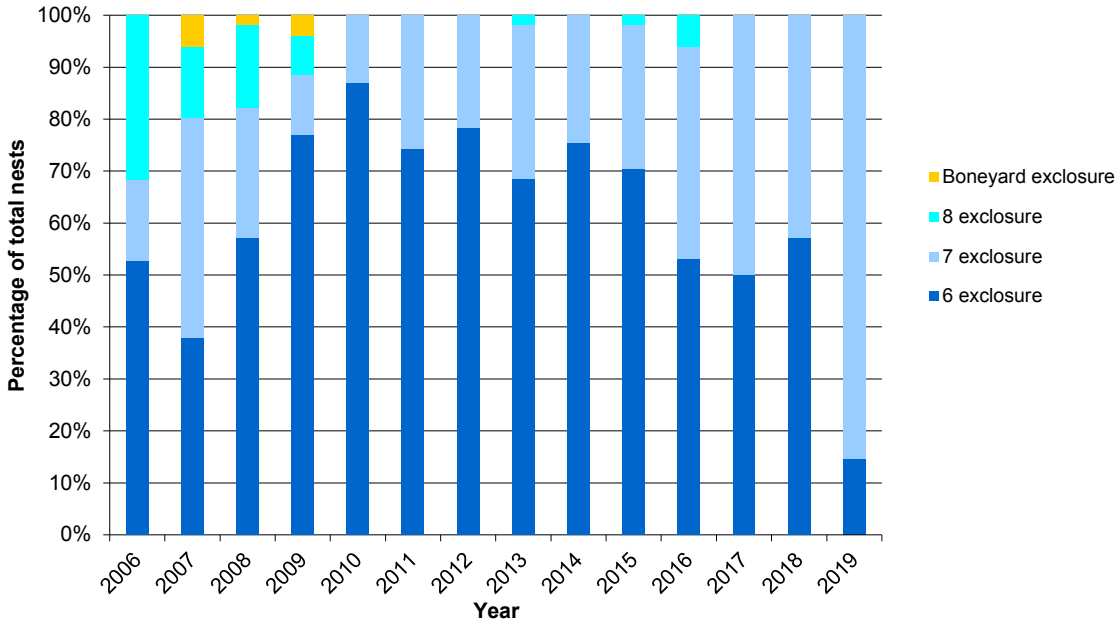

Figure 4. Distribution of least tern nests as a percent of total nests at ODSVRA from 2006-19.

Table 2. Causes of California least tern nest loss at ODSVRA from 2002-19.
Ab. = Abandoned.

Year	Ab. pre-term	Ab. post-term	Ab., suspected 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				5		1				2		14
2004	9	1			3		2				1		16
2005	7	3		4	4						1	1	20
2006	4	3		2							1		10
2007	2	4	4		5								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
2018	4	2			1								7
2019	1			1									2
Total 2002-19	**50 35.5%**	**24 17.0%**	**4 2.8%**	**17 12.1%**	**25 17.7%**	**5 3.5%**	**6 4.3%**	**1 0.7%**	**2 1.4%**	**1 0.7%**	**5 3.5%**	**1 0.7%**	**141**

Chick fledging rate, juveniles produced per pair, and juvenile length of stay on-site
Forty-one of the 52 known hatching chicks were banded with a unique color combination. Thirty-eight of the 52 chicks were seen when 21 days old or older for a fledgling rate of 73.1%. The fledging rate for banded chicks was 78.0% (32/41) and 54.5% (6/11) for unbanded chicks (Appendix A). This fledging rate compares to an average of 74.1% (range=17.9-90.0%) during the previous 13-year period 2006-18 when most chicks were banded to individual. In 2019, 47.4% (9/19) of the two-chick broods fledged both chicks. This compares to an average of 56.0% (range=0-86.0%) of 187 two-chick broods fledging both chicks during the previous 13 years. In 2019, the estimated number of fledglings produced per pair ranged from 1.15-1.23, which is slightly higher than the average of 1.12-1.19 for the previous 13 years (range=0.15-1.57). This is above 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 estimate in 2014 with range=0.37-0.68) (Marschalek 2006-12; Frost 2013-17).

From 2010-15, there were 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. From 2016-19, there were no known such occurrences.

Of the current or recent breeding sites in San Luis Obispo and Santa Barbara counties, banding tern chicks occurs at ODSVRA (since 2003) and VAFB (beginning 2018 with banding to site and year). Banding least tern chicks at ODSVRA, especially 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).

[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.

ODSVRA relies on color band resighting data to derive a more accurate fledging rate and did not conduct three-week counts in 2012-19.

Color banding chicks to brood in 2005 and to individual since 2006 has also provided information on juvenile length of stay at ODSVRA. In 2019, 6.3% (2/32) of color-banded fledglings were documented remaining at ODSVRA for 21 days or longer post-fledging. This is much lower than the average of 30.7% (170/553) during the 13-year period 2006-18 (Table 3). In 2019, unlike many previous years, late season daytime use of Oso Flaco Lake (located in park) by ODSVRA banded adult and juvenile terns was very low, while it was high for RGDCP (approximately 6.0 miles south of the tern colony in the same dunes complex as ODSVRA), resulting in a reduction in number of days juveniles were seen on-site post-fledging (Figure 3). ODSVRA banded terns recorded at RGDCP during the day were typically seen roosting. During this time, conditions at Oso Flaco Lake appeared poor, with an increased amount of algae growth on the lake's surface, and the few adults seen fishing had poor success. In addition, there was repeated presence of hunting peregrine falcons ((peregrine) and a northern harrier (*Circus hudsonius*) (harrier) at the tern colony site in ODSVRA. It is not known if RGDCP was used as a night roost by ODSVRA terns, although night roost numbers at ODSVRA were overall at their highest during this time, and movement of ODSVRA banded adult and juveniles back and forth between the sites was documented.

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 14-year period, 2006-19.

During this period, 585 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	3 (9%)	9 (26%)	7 (20%)	12 (34%)	4 (11%)	0 (0%)
2007	9 (14%)	13 (20%)	15 (23%)	18 (28%)	9 (14%)	1 (2%)
2008	12 (18%)	29 (43%)	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%)	14 (50%)	7 (25%)	0 (0%)	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 (23%)	25 (48%)	10 (19%)	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%)
2018	3 (9%)	5 (15%)	13 (39%)	4 (12%)	8 (24%)	0 (0%)
2019	4 (12%)	16 (50%)	10 (31%)	2 (6%)	0 (0%)	0 (0%)
Total 2006-19	83 (14%)	143 (24%)	187 (32%)	140 (24%)	29 (5%)	3 (1%)

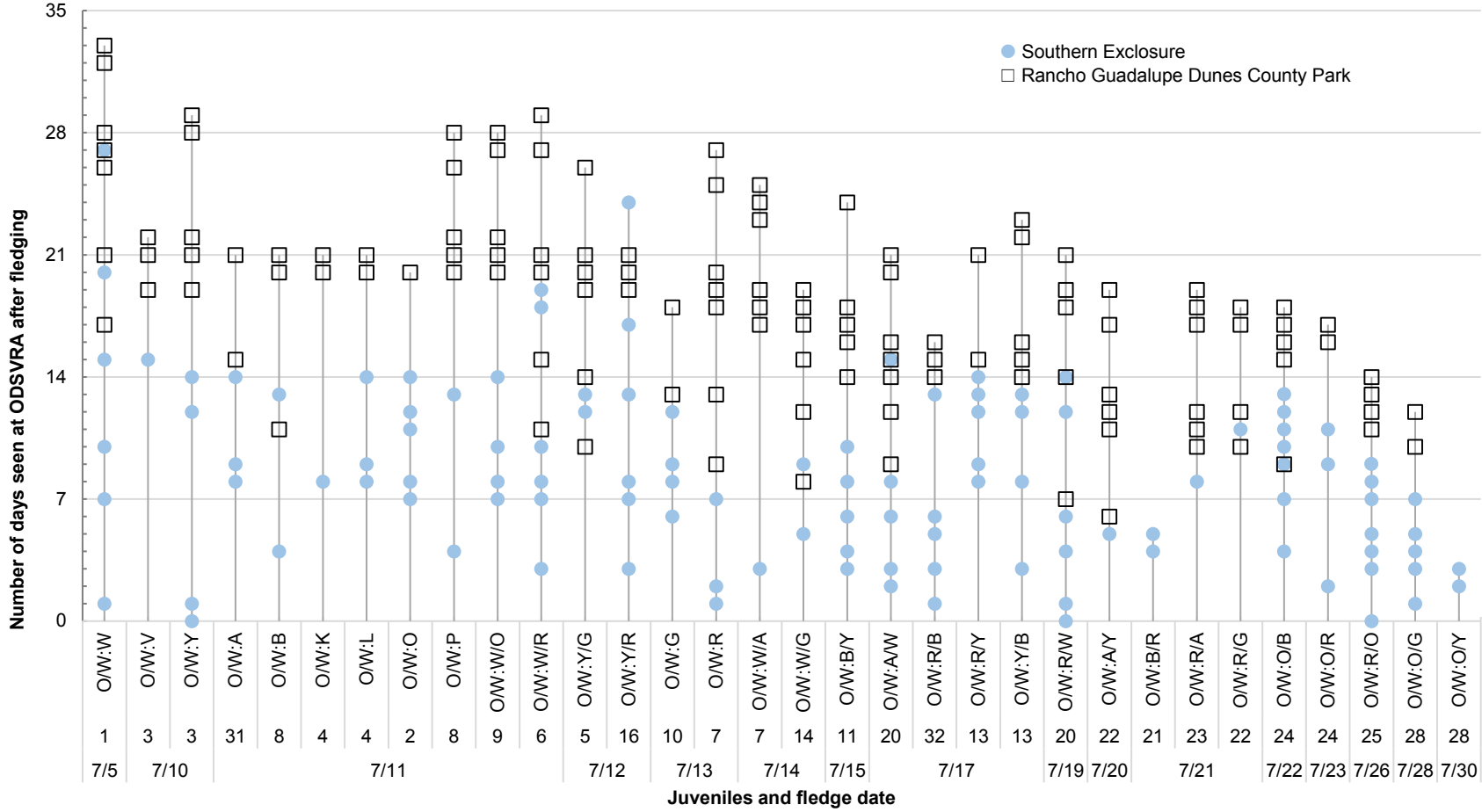

Figure 5. Number of days California least tern juveniles that hatched at ODSVRA in 2019 continued to be seen on-site and at Rancho Guadalupe Dunes County Park after reaching fledge age (21 days old).

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. Rancho Guadalupe Dunes County Park is located approximately 6.0 miles south of ODSVRA tern colony.

Mortality (other than eggs)
There were three documented tern mortalities (other than eggs) at ODSVRA during the 2019 breeding season: feather remains of a juvenile collected 17 July from Boneyard exclosure, at a west fenceline feeding location of a peregrine (stolen from a northern harrier carrying the prey from 7 exclosure); the left wing remains of a juvenile found in the open riding area just outside of 7 exclosure on 10 July; and the intact and fresh carcass of an unbanded juvenile found in 6 exclosure on 23 July (Table H.2 and H.3 in Appendix H).

Least tern use of nearby small freshwater lakes
At ODSVRA nearshore ocean waters are the primary source of prey fish for the tern colony, and in 2019 foraging activity over the ocean was observed throughout the season. During the chick-rearing period small fish may also be taken from freshwater sources. Over the past 13 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 1.5 miles south of the middle of tern colony), the Dune Lakes (1.5 miles northeast), and Cypress Ridge Lake (3.2 miles northeast). Monitoring of sites east of the park is typically done in response to observations of terns from the colony flying toward or returning from the east. In 2019, such observations were limited and small water bodies east of the park were not surveyed. Tern use of Oso Flaco Lake in the later part of the season was much reduced in 2019 compared to most previous years and no banded juveniles were documented.

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 2019, there was a minimum of 38 banded adults documented at ODSVRA. Thirty-seven of these birds were identified as banded at this site as chicks (banding began in 2003). Breeding was documented for a minimum of 23 banded adults and this is likely a substantial underestimate (Appendix A). At least nine of the 23 adults were banded as chicks at ODSVRA; the complete color combinations of the other 14 breeding adults could not be confirmed (Table D.1 in Appendix D).

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 nine two-year-old banded terns have been documented as breeding at ODSVRA from 2012-19 (two in 2012, three in 2013, two in 2014, one in 2016, and one in 2018, all banded as chicks at ODSVRA). In 2005, a two-year-old tern banded as a chick at ODSVRA was documented breeding at VAFB, approximately 22 miles south of the park. The oldest confirmed breeding adults at ODSVRA in 2019 were three nine-year-old terns (W/B:R/Y, W/B:W, and W/B:W/G, all banded as chicks at ODSVRA in 2010).

Least terns banded at other sites and seen at ODSVRA
From 2011 to 2019 there have been two confirmed sightings of banded terns from other sites. One 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. The second was a juvenile (S:B) seen 16-18 August 2018 that was banded at VAFB (2018 was the first year of banding terns at VAFB) (Table D.1 in Appendix D).

Least terns banded at ODSVRA seen at other sites
In 2019, there were 78 least terns (47 adults and 31 juveniles), all banded to individual as chicks at ODSVRA, documented at one or more sites other than ODSVRA. One was seen in south San Francisco Bay at Eden Landing Ecological Reserve, Alameda County, and two each at Camp Pendleton and Naval Base Coronado, both in San Diego County. The majority were seen in Santa Barbara County at nearby RGDCP (63) and VAFB (23) and represented post-season dispersal from the ODSVRA breeding colony. Breeding of ODSVRA banded terns was documented for VAFB. RGDCP reported 17 breeding pairs with monitoring typically done from a distance and limited opportunity to check for bands. Late in the season

an influx of ODSVRA banded terns was noted in a roosting flock at RGDCP, and ODSVRA staff conducted surveys on 11 days from 29 July–15 August with 33 adults and 30 juveniles documented at RGDCP with ODSVRA bands (Table D.2 in Appendix D, Figure 5).

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 116 days between 28 April–28 August in 2019. The night roost was initially located in northern 7 exclosure but later shifted to areas in mid-6 exclosure, and was sometimes 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 2019, there was a high count of 61 birds at the night roost on 31 July (Figure 6). This compares to an average night roost high count of 60 (range=35-95) from 2007-18. Both adults and juveniles were seen but it typically was too dark to distinguish plumage and age class.

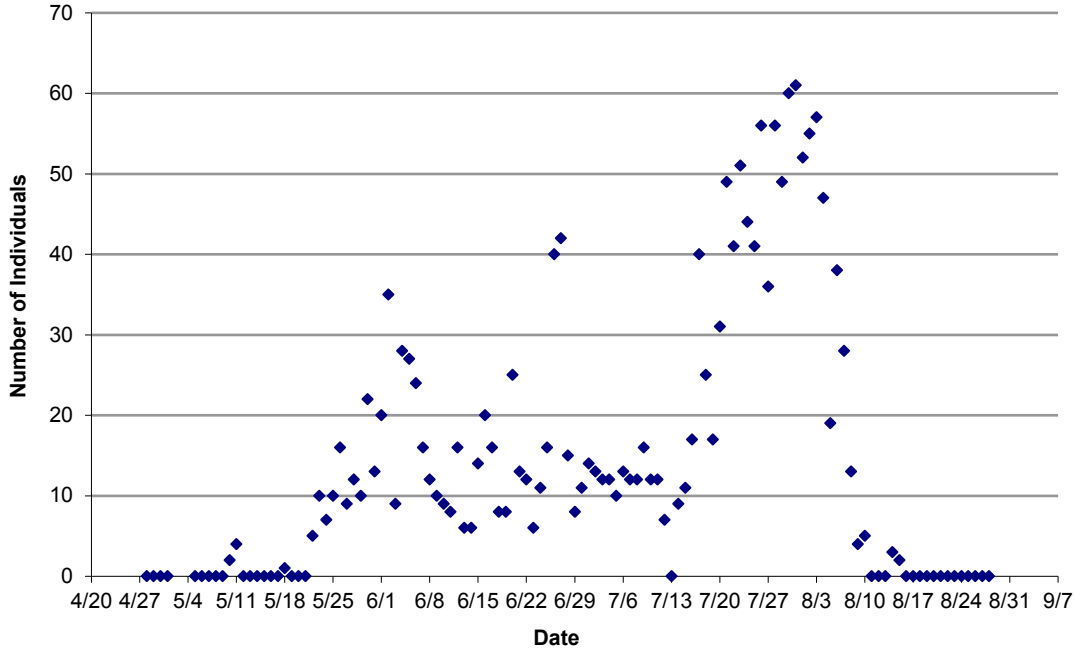

Figure 6. Number of California least terns counted at the ODSVRA night roost in 2019.
First survey on 28 April and roost first detected on 10 May.

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. The RGDCP site, VAFB, and Coal Oil Point Reserve (COPR) are in Santa Barbara County and approximately six, 22, and 85 miles south of the ODSVRA colony, respectively. For

this regional population, ODSVRA has become an important source of productivity. During the 16-year period 2004-19, ODSVRA produced a minimum of 697 juvenile terns while RGDCP, VAFB, and COPR combined reported an estimated 283 juveniles. In 2019, ODSVRA produced 38 juveniles compared to RGDCP (breeding but number of juveniles unknown), VAFB (21 juveniles), and COPR (no breeding). While it's likely RGDCP did produce juveniles in 2019, an influx of banded and potentially unbanded juveniles from ODSVRA made a count difficult, and at the time of writing this repot RGDCP described the number of juveniles produced as unknown (Appendix E, Table 4).

Table 4. 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 2004-19.

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. Beginning in 2018 VAFB banded tern chicks to site and year. Sources: RGDCP (pers. comm. Tom Applegate), VAFB (pers. comm. Samantha Kaisersatt), and COPR (pers. comm. Jessica Nielson).

	ODSVRA		RGDCP, VAFB, and COPR combined	
Year	Est. no. breeding pairs	No. juveniles	Est. 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
2018	30-33	35	70-71	39
2019	31-33	38	59	21[1]
Total juveniles produced		**697**		**283**

[1]RGDCP 2019 juvenile number reported as unknown

WESTERN SNOWY PLOVER

Number of breeding adults

In 2019, there was a minimum of 214 breeding adults (120 males and 94 females) and of these 96 were banded with known origin. This is an increase of 6.5% from a minimum of 201 breeding adults in 2018 and compares to an average of 205 adults for the previous five years and 142 for the 17-year period 2002-18 (Table 5, 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 2019, the survey at ODSVRA counted 154 adult plovers (66 males, 83 females, and five of unknown sex), 72% of the minimum number documented for the entire season by known breeding activity. In 14 of the 15 years from 2005-19, 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 15-year period the window survey count averaged 78% of the known minimum number of breeding adults for the season (Table 6).

Table 5. Number of snowy plover breeding adults, breeding males, fledglings, and chicks fledging per breeding male for the 18-year period 2002-19.

Year	Min. no. breeding adults	Min. no. breeding males	No. fledglings	No. fledges 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	1.4
2008	95	54	72	1.33
2009	114	66	81	1.23
2010	137	78	107	1.37
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
2018	201	115	200	1.74
2019	214	120	108	0.90
Average for 18-year period 2002-19	146	82	121	1.47
Average for 5-year period 2015-19	202	110	183	1.68
Average for 3-year period 2017-19	199	109	161	1.50

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

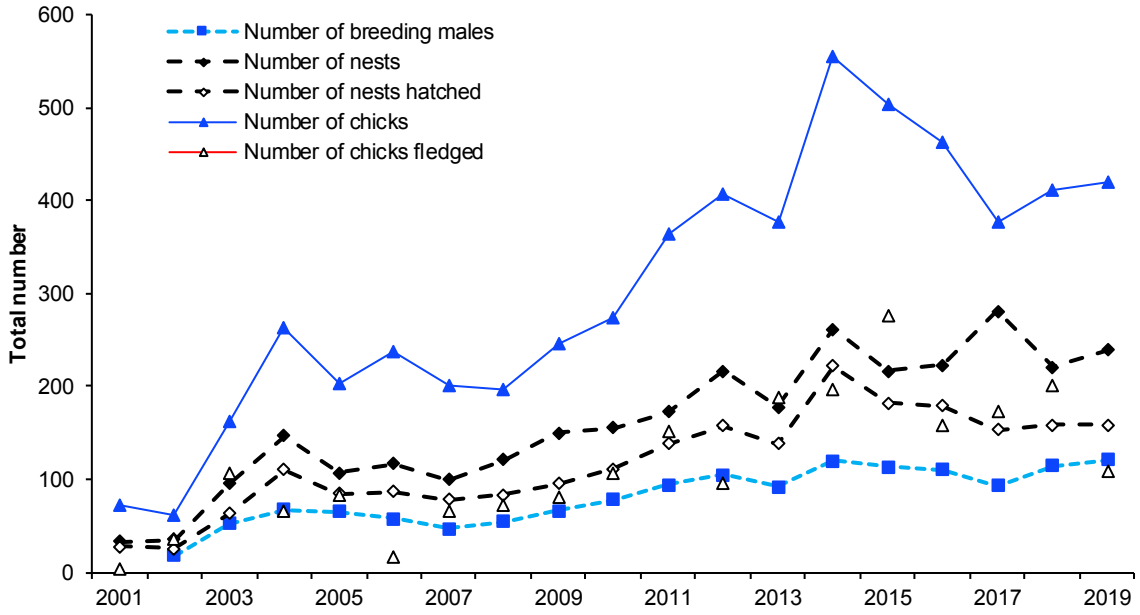

Figure 7. Number of snowy plover breeding males, nests, nests hatched, chicks, and chicks fledged at ODSVRA from 2001-19.
Prior to 2001, monitoring in Oso Flaco and Pismo Dunes Natural Preserve was intermittent and fledgling information was not obtained.

Table 6. Number of adult snowy plovers counted on USFWS breeding season window surveys versus calculated minimum number of breeding adults at ODSVRA from 2005-19.

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%
2018	201	155	77%
2019	214	154	72%

Number and distribution of nests

There were 239 known nesting attempts, including nine with unknown nest location, initiated between 28 March–12 July (Appendix B, see section titled Assignment of broods to nests in the Monitoring and Management Action section for unknown nest location description). Of the 230 nests from known locations, 172 (74.8%) were in the Southern Exclosure, 19 (8.3%) in North Oso Flaco, 38 (16.5%) in South Oso Flaco, and one (0.4%) in Eucalyptus North revegetation area approximately 640 feet east of 6 exclosure. More specifically for the Southern Exclosure, there were 79 nests in 6 exclosure, 54 in 7 exclosure, 30 in 8 exclosure, and nine in Boneyard exclosure. The maximum number of known location nests active at one time was 87 on 18 June, with the highest number in 6 exclosure (26 nests) (Table 7, Table 8, Figure 8, Figure 9, Appendix C, Table F.1 in Appendix F).

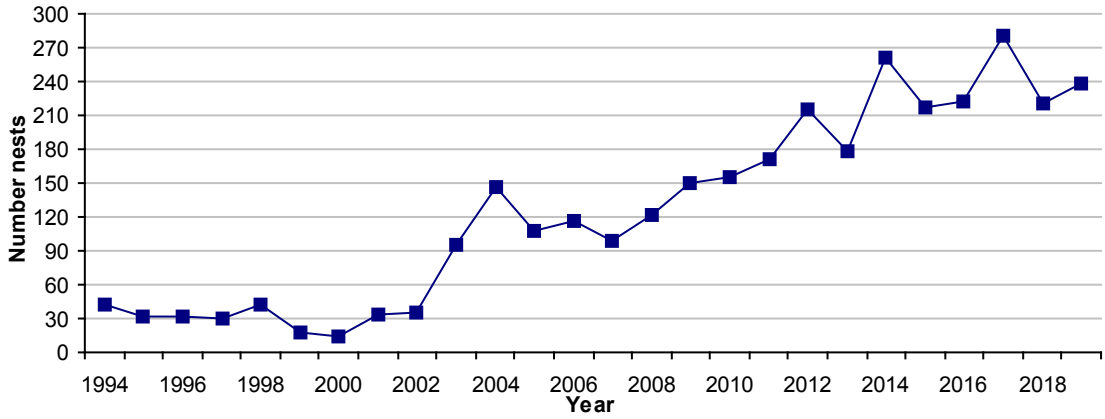

Figure 8. Number of snowy plover nests at ODSVRA from 1994-2019.

Table 7. Snowy plover nest distribution and success at ODSVRA in 2019.

Excludes nine nests known only from detection of broods.

Location	No. nests (no. known location and fate)	Min. no. eggs laid	No. known location and fate nests hatching	Percent known location and fate nests hatching
6 exclosure	79 (76)	221	57	75.0
7 exclosure	54 (50)	148	38	76.0
8 exclosure	30 (28)	79	18	64.3
BY exclosure	9 (9)	25	5	55.6
TOTAL SOUTHERN EXCLOSURE	**172 (163)**	**473**	**118**	**72.4**
North Oso Flaco	19 (19)	56	13	68.4
South Oso Flaco	38 (37)	96	17	45.9
TOTAL OSO FLACO	**57 (56)**	**152**	**30**	**53.6**
Eucalyptus North	1 (1)	3	1	100.0

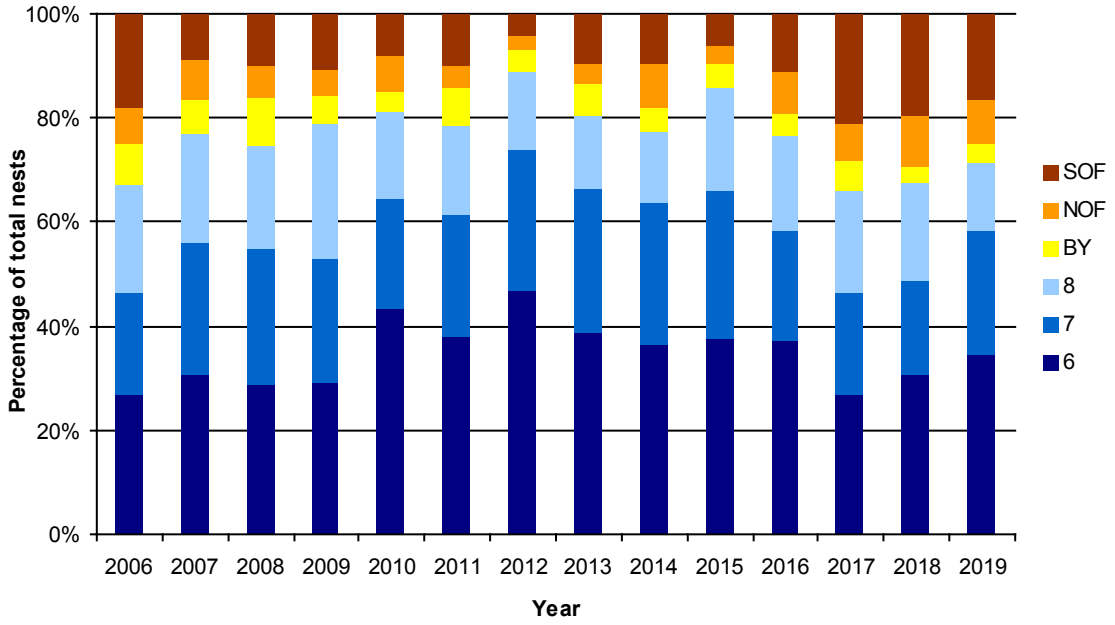

Figure 9. Distribution of snowy plover nests as a percent of total nests at ODSVRA from 2006-19.
Includes all nest with known location in the Southern Exclosure and Oso Flaco (229). 6 = 6 exclosure, 7 = 7 exclosure, 8 = 8 exclosure, BY = Boneyard exclosure, NOF = North Oso Flaco, SOF = South Oso Flaco

Table 8. Nesting success of snowy plovers at ODSVRA from 2001-19.

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 2001-19 is included as Table F.1 in Appendix F.
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 chicks fledged (percent fledged)	No. fledglings per nest	No. fledglings per egg
2001	33 (31)	na	na	27 (27)	87.1	72	3 (4.2)	0.09	na
2002	35 (35)	99	na	25 (25)	71.4	62	35 (56.5)	1.00	0.35
2003	95 (93)	255	na	63 (62)	66.7	162	107 (66.0)	1.13	0.42
2004	147 (140)	415	2.88 (138)	110 (105)	75.0	263	66 (25.1)	0.45	0.16
2005	107 (103)	290	2.86 (96)	84 (80)	77.7	204	82 (40.2)	0.77	0.28
2006	117 (114)	336	2.90 (115)	87 (89)	78.1	230	17 (7.4)	0.15	0.05
2007	99 (91)	288	2.96 (89)	78 (70)	76.9	200	66 (33.0)	0.67	0.23
2008	121 (119)	341	2.88 (113)	83 (81)	68.1	197	72 (36.5)	0.60	0.21
2009	150 (147)	418	2.88 (140)	95 (94)	63.9	245	81 (33.1)	0.54	0.19
2010	155 (150)	431	2.87 (144)	111 (109)	72.7	275	107 (38.9)	0.69	0.25
2011	172 (160)	487	2.90 (157)	138 (131)	81.9	365	152 (41.6)	0.88	0.31
2012	216 (203)	603	2.88 (199)	157 (152)	74.9	386	96 (24.9)	0.44	0.16
2013	178 (167)	502	2.94 (162)	138 (130)	77.8	343	187 (54.5)	1.05	0.37
2014	262 (239)	726	2.88 (234)	222 (206)	86.2	547	196 (35.8)	0.75	0.27
2015	217 (195)	613	2.93 (188)	182 (167)	85.6	494	277 (56.1)	1.28	0.45
2016	223 (193)	613	2.89 (188)	179 (165)	85.5	462	157 (34.0)	0.70	0.26
2017	281 (238)	738	2.88 (228)	153 (145)	60.9	378	174 (46.0)	0.62	0.24
2018	221 (200)	615	2.95 (184)	159 (144)	72.0	412	200 (48.5)	0.90	0.33
2019	239 (220)	649	2.92 (202)	158 (149)	67.7	398	108 (27.1)	0.45	0.17

Average clutch size, clutch loss, and nest hatching rate

There were 239 identified nesting attempts, including nine known only by brood, and of these 158 hatched. For 202 nests with known complete clutch size (and excluding nesting attempts known only by brood) the average number of eggs was 2.92. This compares to the average of 2.90 eggs per clutch (range=2.86-2.96) for the 15-year period 2004-18. Excluding 19 nests (10 with unknown fate and nine detected by brood only), the nest hatching rate was 67.7% (149/220). This compares to an average of 75.0% (range=60.9-86.2%) from 2002-18 (Table 8). The nest hatching rate in 2019 was higher in the Southern Exclosure (72.4%) than in Oso Flaco (53.6%), as has been the case in 16 of the previous 18 years (Table F.1 and Figure F.1 in Appendix F). In 2019, 88.7% (63/71) of nest loss was due to predation (46), nest abandonment (excluding abandoned, suspected wind) (9), or tide (8). Predation alone accounted for 64.8% (46/71) of this loss, attributed to avian predator (37), mammalian predator (5), and unidentified predator (4). For avian predators, gull and common raven (*Corvus corax*) accounted for 27 lost nests (Table 9).

Table 9. Attributed causes of snowy plover nest loss at specific locations at ODSVRA in 2019.
Aband.=Abandoned

Area	Aband. pre-term	Aband. unknown pre- or post-term	Aband., suspected wind	Overwashed by tide	Failed, cause unknown	Unidentified predator	Avian predator	Coyote	Skunk	Corvid	Raven	Gull	Northern Harrier
Southern Exclosure													
6 exclosure	2	1	0	0	0	0	5	0	0	0	2	9	0
7 exclosure	1	1	0	1	2	0	1	0	0	0	5	1	0
8 exclosure	0	0	3	2	0	0	0	0	0	0	4	0	1
Boneyard exclosure	0	0	0	0	1	0	0	0	1	1	1	0	0
TOTAL SOUTHERN EXCLOSURE	3	2	3	3	3	0	6	0	1	1	12	10	1
Oso Flaco													
North Oso Flaco	2		0	1	1	1	0	0	0	0	0	1	0
South Oso Flaco	1	1	0	4	1	3	2	4	0	0	1	3	0
TOTAL OSO FLACO	3	1	0	5	2	4	2	4	0	0	1	4	0
TOTAL ODSVRA	6	3	3	8	5	4	8	4	1	1	13	14	1

Chick fledging rate

Of the 398 snowy plover chicks hatched, 200 were banded and the fate of 198 unbanded chicks is believed known (Appendix B). Chick survival and fledging rates of unbanded chicks are obtained through a combination of intense monitoring of broods, banded associated adults, banded chick(s) in broods with unbanded chick(s), and banded broods present in the same area (reducing density of unbanded broods). Between 31 May–1 August, 14 unbanded broods (23 chicks) were observed on the exclosure shoreline and believed to be from known nests but could not be assigned to a particular nest (listed as UNA1-14 in Appendix B). 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 nine unbanded broods (21 chicks) observed on the shore and believed to be from nests that were not found. Four of the nine broods were subsequently banded (see sections titled Banding chicks and Assignment of broods to nests in the Monitoring and Management Action section for details on banded and unbanded broods). The fledging rate for banded chicks was 31.5% (63/200) and 22.7% (45/198) for unbanded chicks. The fledging rate for all chicks combined was 27.1% (108/398). This compares to 48.5% in 2018, an average rate of 39.9% (range=7.4-66.0%) for the 17-year period 2002-18, and is the fourth lowest fledging rate since predator management began in 2002. Continued poor fledging rates could result in a reduction in population size over time (Table 8, Table F.1 in Appendix F) (CDPR 2007-18).

In 2019, the early season had a higher chick fledging rate (34.1%) compared to the late season (19.4%). In 13 of 17 years during the period 2003-19, the fledging rate of chicks hatching in the early season (prior to 20 June) has been higher, by an average of 19.6 percentage points, than chicks hatching in the late season (20 June or later) (See 2012 report for how early and late seasons were determined.) For all years in the 17-year period 2003-19, the average early season chick fledging rate (44.4%) was 11.9 percentage points higher than the average late season chick fledging rate (32.5%) (Figure 10, Figure 11, Figure 12).

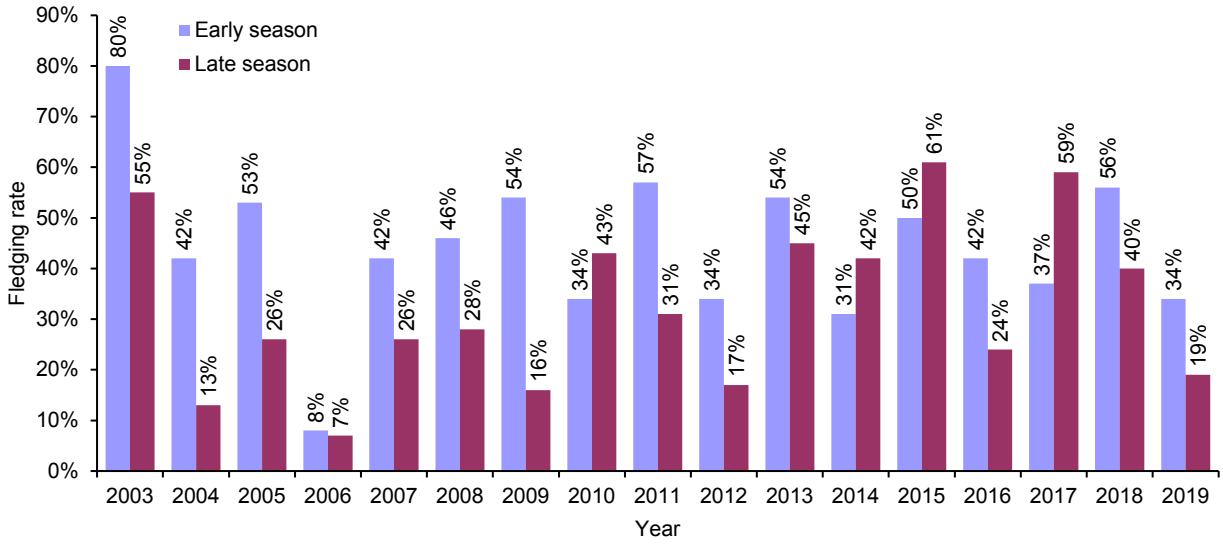

Figure 10. Fledging rate of chicks hatching in early season (prior to 20 June) and late season (20 June or later) at ODSVRA from 2003-19.

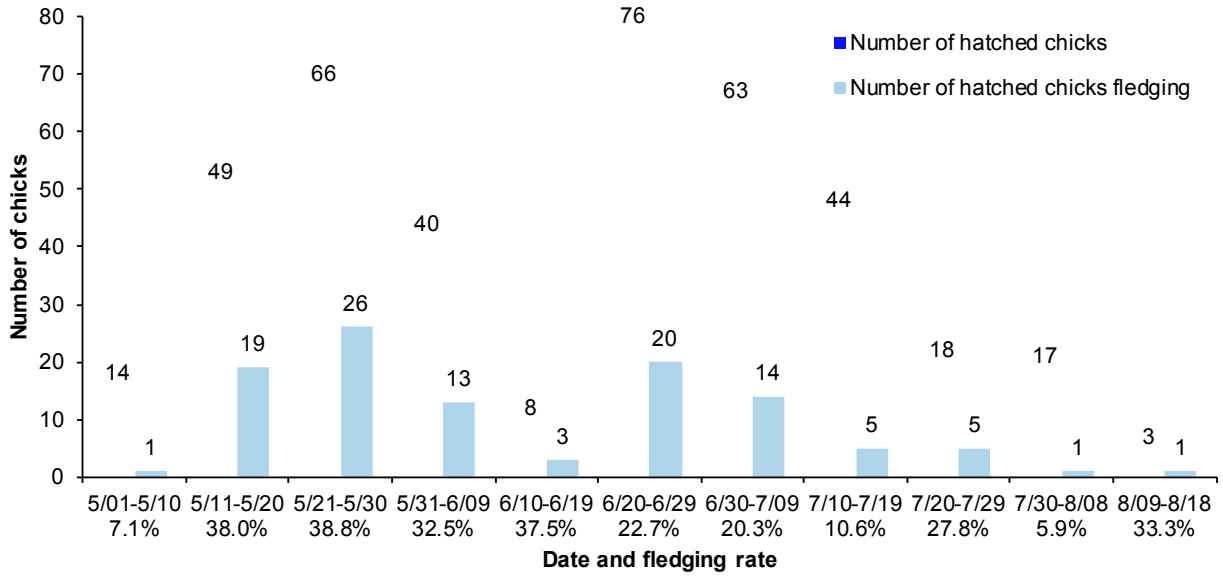

Figure 11. Number of snowy plover chicks hatching per 10-day period and number subsequently fledging at ODSVRA in 2019.

Includes all chicks with known fate (398). For broods that either originated from unknown location (21 chicks from nine broods) or were not assigned to a specific nest (23 chicks from 14 broods) a hatch date was estimated within a 10-day period based on chick size.

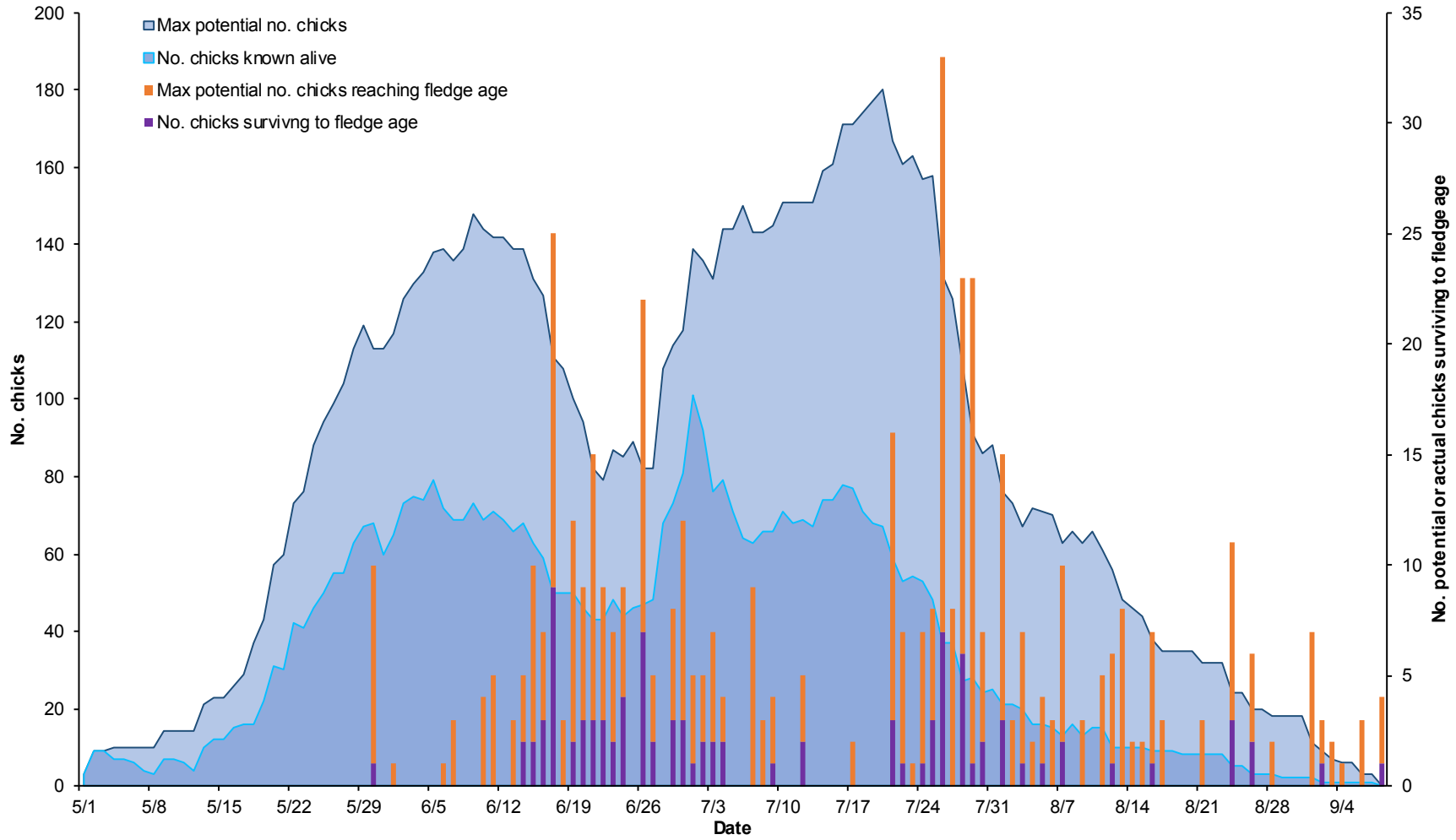

Figure 12. Chick survival and fledge rate from 1 May to 8 September at ODSVRA in 2019.
Of the total of 398 chicks hatching, 385 chicks (excludes 13 chicks that were found when approximately three days old or older) are represented in this figure. Number chicks known alive calculated using date of last sighting during regular surveys of all chicks.

Age of chick loss

Of 202 closely tracked chicks (189 banded and 13 unbanded chicks with banded siblings) from known location nests, 140 were believed lost. As has consistently been the case in previous years, chick loss in 2019 was highest for very young chicks (0-4 days of age), accounting for 52.9% of total loss and similar to an average of 49% (range=38%-64%) from 2009-18 (Figure 13) (CDPR 2018). For 80 chicks reaching 16 days of age in 2019, the fledge rate was 77% (62/80). This is less than the average of 81% (range=71-93%) for the previous 10-year period 2009-18 and is lower 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).

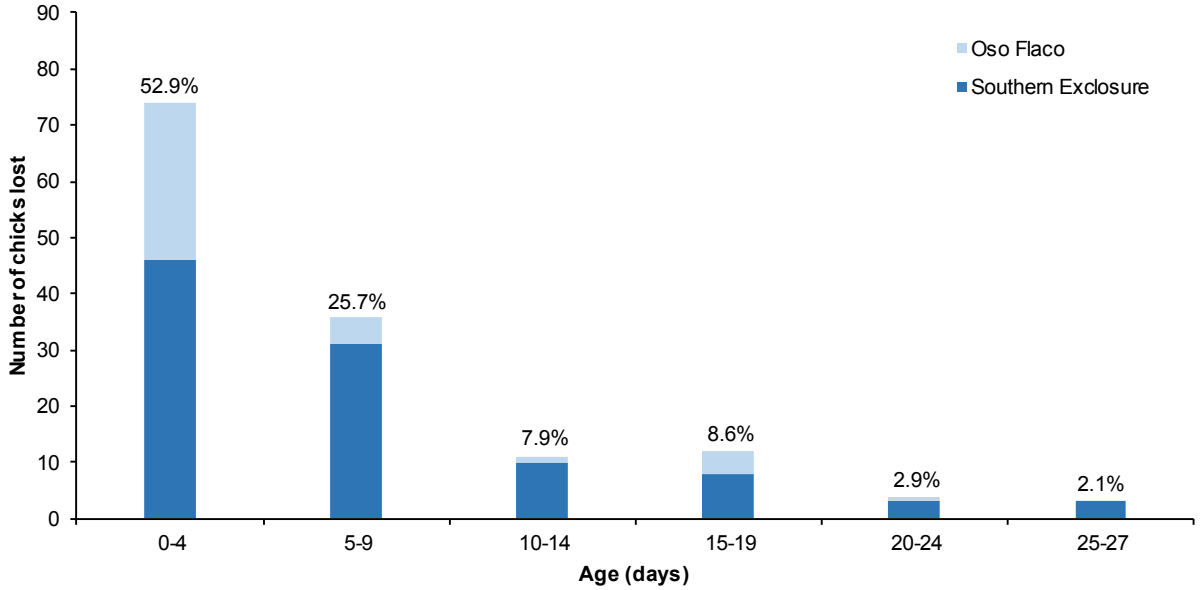

Figure 13. Loss of snowy plover chicks by age and location last seen in the Southern Exclosure and Oso Flaco at ODSVRA in 2019.

Number and percentage of total chicks lost shown for each age group. There were 202 chicks included in the analysis; 140 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 2019, the number of chicks fledging per male was 0.90, the second lowest in the 18-year period 2002-19. For the 17-year period 2002-2018, the average productivity was 1.50 fledglings per male and the number of fledglings produced per male has exceeded 1.2 in 14 of the 17 years (Table 5). (Note that if the number of breeding males is underestimated, the number of chicks fledged per male is an overestimate.) The pronounced low productivity in 2019 will depress natal site recruitment of young birds entering their first breeding season next year. This may result in a reduction in the breeding population at ODSVRA in 2020.

Mortality (other than eggs)

There was a minimum of 27 documented snowy plover mortalities (other than eggs) at ODSVRA from 14 November of 2018 (subsequent to last year's report) to 7 November of 2019. Fifteen of the 27 mortalities were the results of predation. Predators involved were three peregrines (seven chicks, one adult, and one juvenile or adult), one western gull (*Larus occidentalis*) (one chick, one juvenile and two of unknown age),

one Brewer's blackbird (*Euphagus cyanocephalus*) (one chick), and one unidentified predator (one suspected adult). This includes the mortality of three very young chicks from one brood resulting from the observed peregrine predation of a banded male, the sole adult providing parental care for the brood). Documented mortality other than predation included six adults, one juvenile, one adult or juvenile and four chicks. This includes one abandoned chick with limited mobility that died after being taken to the Santa Barbara Zoo (for additional information see Predators and predator management section on page 39, section titled Snowy plover carcasses collected or observed in the Notes section, Table F.4 in Appendix F, Table H.3 and H.4 in Appendix H).

Protection of known location and fate nests

Of the 220 nests from known location and with known fate, 110 were initiated within the wire mesh predator fencing of the Seasonal Exclosure that is installed at the beginning of the season (see Seasonal closure and fencing section description in the Monitoring and Management Actions section). These nests had a 77.3% (85/110) hatch rate.

For the 6, 7, and 8 exclosures and North Oso Flaco, there were an additional 72 nests with known location and fate established on the shoreline outside of the Seasonal Exclosure. This portion of shoreline is protected only by symbolic rope fencing and signage that provides no predator protection but is designed to discourage vehicle and pedestrian trespass. Fourteen of these received an individual circular exclosure: 10 hatched (71.4%); one was abandoned pre-term; one was abandoned, suspected wind; and two were overwashed by tide. Fifty-eight nests did not receive single nest wire fence protection due to a combination of the following factors: avoiding disturbance of nearby broods, concerns of potential nest abandonment due to adult mortality, and a continuing acceptable hatch rate without the use of single nest wire exclosures. Of these nests 62.1% (36/58) hatched.

In South Oso Flaco there were 37 nests from known location and known fate, all ultimately within seasonal symbolic rope fencing (visitor pedestrian use allowed on beach west of symbolic fencing). On several 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. Eight nests did not receive any single nest wire exclosure due to concerns of avoiding disturbance of nearby broods, windblown sand potentially burying eggs, or adult vulnerability to predators. Of these eight nests, two hatched, five were depredated, and one failed from an unknown cause. An additional eight nests were depredated before a planned circular exclosure could be installed. Twenty-one nests received circular exclosures and 71.4% hatched (15/21) (see Table F.3 in Appendix F for additional details of protective fencing measures for nest).

One nest (SP175) was found in the non-predator fenced Eucalyptus North revegetation area, outside the Southern Exclosure and Oso Flaco areas, and was protected with a mini-exclosure and a bumpout (Figure C.4 in Appendix C). The nest hatched three chicks and the brood was successfully guided through the open riding area, using a temporarily fenced corridor closed off to vehicle and visitor traffic, to 6 exclosure (see additional details in Notes section).

Banded snowy plovers breeding at ODSVRA in 2019

Banding of snowy plovers occurs at multiple breeding sites along the Pacific coast. The closest sites to ODSVRA where banding occurs are Monterey Bay in Monterey County, California, to the north and VAFB in Santa Barbara County, California, to the south. In 2019, the minimum number of breeding adults at ODSVRA was 214 birds, and of these 96 (44.9%) were banded with known origins (Figure 14). The great majority (93.4%, 90/96) represent recruitment from chicks banded and fledged from ODSVRA. The remaining six breeding birds were banded as chicks in 2016 and 2017 at VAFB (Table D.4 in Appendix D).

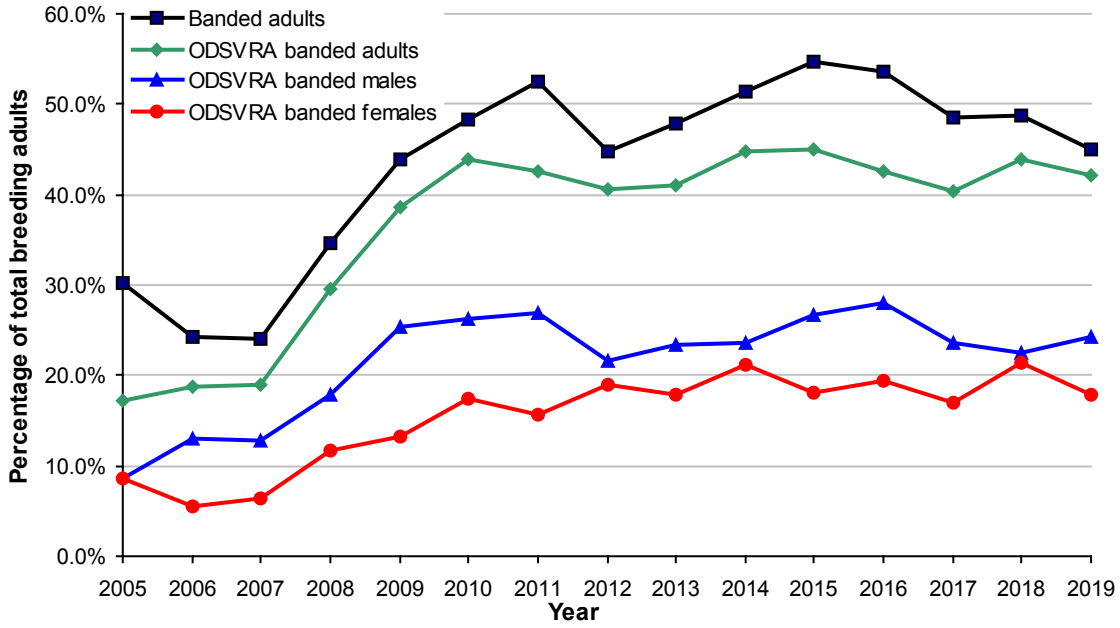

Figure 14. Percentages over the total calculated breeding population at ODSVRA of all known origin banded adults and the sum of males and females originally banded at ODSVRA breeding from 2005-19.

All ODSVRA banded adults were banded on-site when chicks.

Snowy plovers banded at ODSVRA confirmed breeding elsewhere in 2019

Eighteen plovers banded at ODSVRA and breeding away from the park were confirmed in four counties of California: Monterey County (two in Monterey Bay area); San Luis Obispo County (three in Morro Bay area, two at Guadalupe-Nipomo Dunes NWR and two at Guadalupe Restoration Project); Santa Barbara County (seven at VAFB and one at Jalama Beach); and San Diego County (one at Camp Pendleton). There was a minimum of 37 additional adult plovers banded at ODSVRA observed at other sites, ranging from southern Washington State to northern Baja California, during the months of April through June. A portion of these likely represent breeding adults, but breeding was not confirmed (Table D.6 in Appendix D).

Snowy plover surveys at ODSVRA during the nonbreeding season

Surveys for wintering plovers (Pacific coast breeding birds joined by interior breeding birds) were conducted three to six times a month during the five-month period October through February (see Monitoring and Management Actions for survey details). Between 3 October 2018 and 27 February 2019, single day wintering plover counts at ODSVRA ranged from 90-224 birds (single day high count on 25 October 2018). The shore was divided into five beach sections and the monthly average number of plovers (from three to six 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 zero plovers during the winter period (range=0-1); Grand Avenue to marker post 2 had an average of 11 (range=0-19); marker post 2 to marker post 6 had an average of 46 (range=17-63); marker post 6 to the southern boundary of the riding area, closed to public entry during the breeding season, had an average of 38 (range=24-62); and Oso Flaco had an average of 38 (range=24-55) (Figure 15).

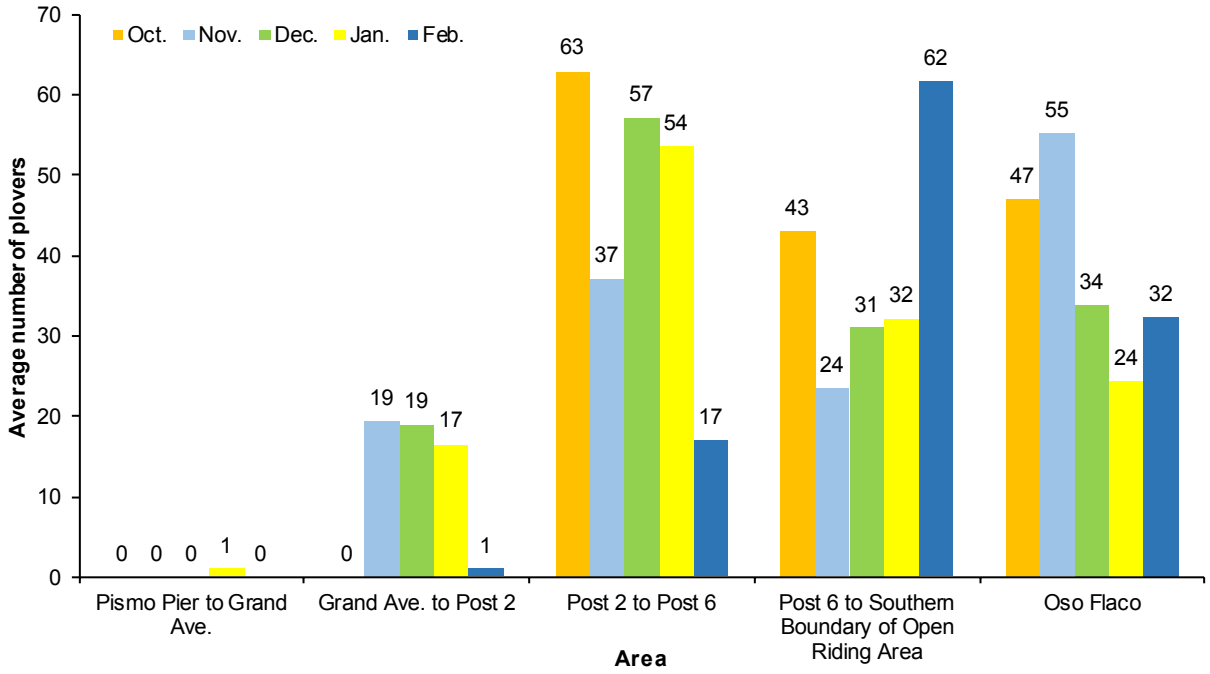

Figure 15. Monthly average number of snowy plovers observed during nonbreeding season surveys at ODSVRA from October 2018 to February 2019.
Surveys conducted three to six times a month.

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 2019, the survey at ODSVRA counted 116 adult plovers and compares to an average of 173 (range 134-246) during the previous 3-year period 2016-2018. During the 16-year period 2004-19 the winter window survey has averaged 156 plovers (range=62-261).

Seventy-one banded snowy plovers were recorded during surveys from 1 October 2018 to 28 February 2019 at ODSVRA. These birds were banded at the following locations: 56 from ODSVRA; five from VAFB in Santa Barbara County, California; six from the Monterey Bay area in Monterey County, California; and four were missing bands and were from unknown locations (Table D.3 in Appendix D).

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 and food resources

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 primarily results in large areas of flattened terrain and barren sand with very limited scattered natural debris and vegetation. In some areas, especially throughout 8 exclosure and the western half of 6 and 7 exclosures, varying sizes of vegetation hummocks persist throughout the year. Areas of patchy cover can benefit plovers and terns during the nesting and chick-rearing periods. To make more such areas available, materials including surf-cast kelp (wrack), branches, driftwood, and woodchips, are placed 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. Nearshore ocean waters provide the primary source of prey fish for the tern colony and nearby small freshwater lakes may provide additional sources of appropriately-sized fish to feed chicks (see paragraph titled Least tern use of freshwater lakes in the Monitoring and Management Actions section).

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 sightings (avian) and occurrences (mammalian) (see Monitoring and Management Actions section for more detail).

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 February until mid-September and USDA Wildlife Services monitoring effort was conducted from early May until mid-September. Two striped skunks (skunk), six coyotes, five common ravens, four American crows (*Corvus brachyrhynchos*) (crow), one herring gull (*Larus argentatus*), and two western gulls were removed lethally. Two peregrines, one American kestrel (*Falco sparverius*) (kestrel), and one northern harrier 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 2019 season included peregrine, northern harrier, gull spp., common raven, American crow, American kestrel, coyote, and skunk.

In 2019, no tern nests were documented lost to predation. Forty-six plover nests were identified lost to the following predators: coyote (4), skunk (1), northern harrier (1), common raven (13), corvid (1), herring gull (1), unidentified gull species (13), unidentified avian (8), and unidentified predator (4). From 2002-19, 2.5% (20/799) of all tern nests with known fate were documented lost to predators (14 mammalian, one gull, and five unidentified predator). During this same 18-year period, 9.3% (262/2807) of plover nests with known location and fate were documented lost to predation (46 mammalian, 167 avian, and 49 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.

Fifteen documented plover and tern losses, other than eggs, to predation in 2019 included: nine plover chicks (one by immature western gull, one by Brewer's blackbird, and seven by peregrine); one juvenile or adult plover (peregrine); one adult plover (peregrine); two plovers of unknown age (immature western gull); one plover, thought to be an adult (unidentified predator); and one juvenile tern (northern harrier) (Table H.2 and H.4 in Appendix H). This compares to 17 documented losses in 2018: 14 plover chicks (nine by immature western gull, two by immature California gull (*Larus californicus*), and three by peregrine); one juvenile or adult plover (peregrine); one adult plover (peregrine); and one juvenile tern (unidentified avian predator). The depredation of a plover chick in 2019 by a Brewer's blackbird was the first such documentation for ODSVRA (see Table H.4 in Appendix H for detail).

Mammalian Predators

Opossum

Virginia opossum (*Didelphis virginiana*) (opossum) tracks were documented on 16 days in the Southern Exclosure and Oso Flaco in 2019 and averaged 12 days per season (range=3-25) from 2007-18 (Figure 16). From 2002-19, known nest loss to opossum was limited to two tern nests, occurring in 2010 and 2013.

Skunk

In 2019, skunk tracks were documented on 36 days in the Southern Exclosure and Oso Flaco compared to an average of 33 days per season (range=2-87) from 2007-18 (Figure 16). There were no known tern nests and one plover nest lost to skunk in 2019 compared to zero in 2018 and 23 (18 plover and five tern) in 2017. 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. In response to continued presence of tracks within sensitive habitat in 2019, and to reduce the chance of high nest lost as seen in 2017, two skunks were removed (Table G.2 in Appendix G).

Raccoon

One non-targeted raccoon (*Procyon lotor*) was caught in a trap intended for skunks and released. Raccoon tracks were documented on 17 days in the Southern Exclosure and Oso Flaco. This compares to an average of 91 days (range=39-145) for 2007-18 (Figure 16). Tracks and scat found over the years indicated that raccoons commonly traveled across the exclosure to forage in the intertidal zone on prey that included mole crabs (*Emerita analoga*). From 2002-19, known nest loss to raccoons was limited to one tern nest in 6 exclosure in 2015, and two plover nests in Oso Flaco in 2010 and 2011.

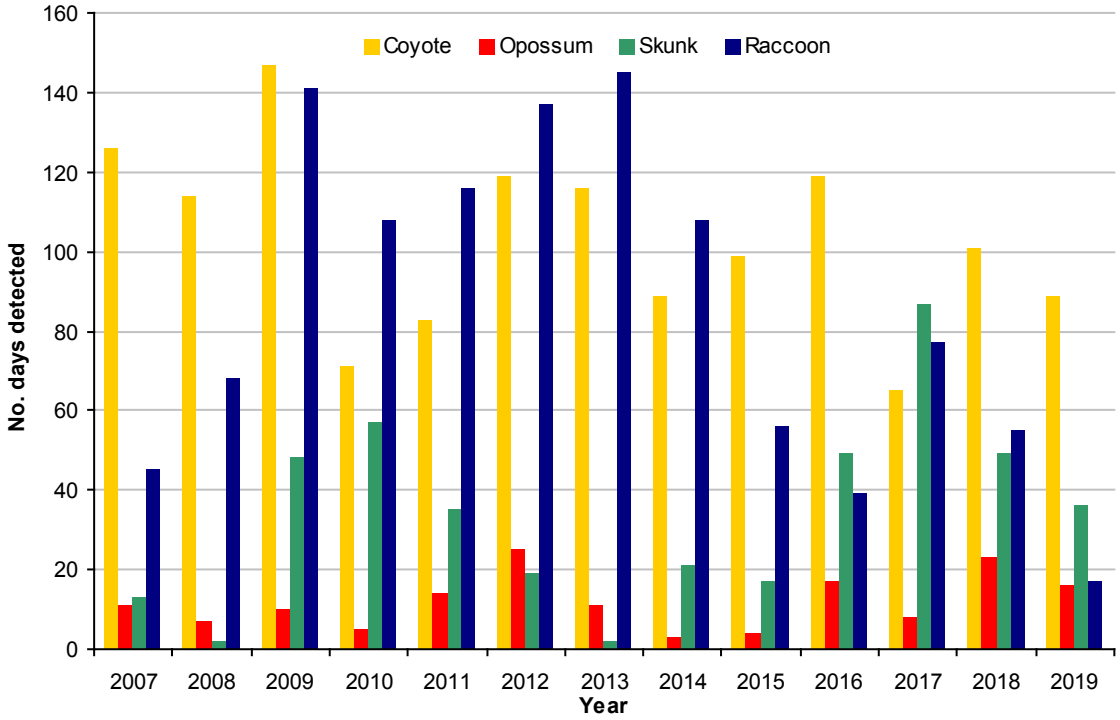

Figure 16. Number of days coyote, opossum, skunk, and raccoon were detected in the Southern Exclosure and Oso Flaco at ODSVRA from 2007-19.

Coyote

Live sightings of coyotes have rarely been documented in the Seasonal 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.

Four coyotes were removed in a targeted effort to reduce the threat of predation and disturbance due to coyote presence documented within sensitive nesting habitat. An additional two coyotes were incidentally removed (one caught in a trap intended for skunks and the other caught in a trap intended for ravens). The six coyotes removed in 2019 is equal to the average of six removed per year from 2007-18 (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 scat piles having 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 2013-19 (CDPR 2013-18).

Documented coyote activity in 2019 was similar to the average of the previous 10 years for the following three measures: 1) recorded on 89 days in 2019 compared to an average of 101 for 2009-18, 2) 93 occurrences specific to the Southern Exclosure shoreline and North Oso Flaco shoreline compared to 103, and 3) 179 occurrences for all areas of the Southern Exclosure and Oso Flaco compared to 190 (Table 10). Additionally, coyote tracks were more common on the Southern Exclosure and North Oso Flaco shoreline later in the season when plover chick survival was poorer and undocumented chick loss to coyotes is suspected (Figure G.1 in Appendix G, Figure 10). 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 2002-19, documented

coyote depredation of nests has been limited to nineteen plover nests and six tern nests (Table 2, Table F.2 in Appendix F).

Table 10. Coyote occurrence in the Southern Exclosure and Oso Flaco at ODSVRA from 2009-19.
Date range is from 1 March to 10 September (a 194-day period). "Predator fenced Seasonal Exclosure" includes all areas inside the Southern Exclosure and North Oso Flaco seasonally exclosed with predator fencing.

Year	Predator fenced Seasonal Exclosure	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 (119)
2017	25	1	4	43	73 (65)
2018	22	55	52	69	198 (101)
2019	17	40	53	69	179 (89)

Avian Predators

In 2019, four raptors were live-trapped and relocated: one adult female American kestrel, one subadult female peregrine, one adult female peregrine, and one juvenile (unknown sex) northern harrier. In addition, one adult herring gull, one immature western gull, one adult western gull, five common ravens, and four American crows were lethally removed. All were individuals targeted for removal with the exception of the kestrel, harrier, and adult western gull. Unsuccessful efforts were made to trap one subadult male northern harrier, one juvenile female peregrine, and one adult male peregrine. Avian predators perched in sensitive areas within the Southern Exclosure and Oso Flaco were hazed when possible.

Loggerhead shrike

From 26 June–13 August, a minimum of one loggerhead shrike (*Lanius ludovicianus*) (shrike) was documented on four days in 2019 in the Southern Exclosure and Oso Flaco. Shrike observations included perch-hunting and flying over 6, 8, and Boneyard exclosures and Oso Flaco.

Merlin

From 5 March–17 April, a minimum of two merlins (*Falco columbarius*) were documented on 10 days (23 sightings) in 2019 actively hunting shorebirds or perching in the Southern Exclosure and Oso Flaco (Table 11, Table G.1 in Appendix G). In the 12-year period 2007-18, merlin activity averaged eight days (range=2-20) a year. From 2004-2019, merlins were documented taking four adult plovers (one in each of the years 2004-06 and one in 2015) at ODSVRA. In 2014, their presence coincided with several plover nests being abandoned pre-term with adult mortality suspected as the cause.

American kestrel

There were 86 documented sightings on 37 days of American kestrels in specific areas of the Southern Exclosure and Oso Flaco (Table 11, Table G.1 in Appendix G). This is higher than the average of 16 days per season (range=6-34) for the 12-year period 2007-18 (CDPR 2007-18). Kestrels were primarily observed June to August perch-hunting and flying over all sensitive areas. Kestrels were hazed out of sensitive areas

on 17 different occasions when perched. On July 29, an adult female kestrel (federal band on right leg) was unintentionally caught while trapping for the subadult male harrier and was relocated the next day to the Kern National Wildlife Refuge, Kern County. This kestrel was previously trapped 8 June 2018 in South Oso Flaco due to persistent hunting behavior near plover broods and incubating adults, and relocated 77 miles northeast to the Kern National Wildlife Refuge.

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 covered quickly 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 (*Bubo virginianus*); barn owls (*Tyto alba*) have also been documented but to a much lesser extent. Burrowing owls (*Athene cunicularia*) have been seen at ODSVRA but tracks would not be confused with other species, and they have typically migrated out of the area before the tern and plover breeding season.

In 2019, owl tracks were periodically documented in sensitive nesting and chick-rearing habitat, with owl presence detected on 27 days with 32 separate sightings (Table 11, Figure 17). In the 12-year period 2007-18, owl activity was documented on an average of 28 days (range=5-53). Trapping efforts were focused on other predator species in 2019 and no effort was made to trap owls.

Red-tailed hawk

Red-tailed hawks (*Buteo jamaicensis*) were primarily observed perching and flying in the North and South Oso Flaco foredunes. In 2019, based on concurrent sightings and age, there was a minimum of three individuals (one adult, one subadult, and one juvenile) observed in the nesting area. Red-tailed hawk presence was documented on 39 days (80 sightings) (Table 11, Figure 17). From 2007-18, activity was recorded on an average of 42 days (range=7-74). Red-tailed hawks perched in the nesting area for an extended period of time were hazed on 20 occasions in 2019 (sometimes requiring repeated efforts before the bird left the nesting area). Hazing red-tailed hawks out of sensitive areas provided temporary relief but did not deter individual hawks from returning to ODSVRA. In 2017, a juvenile red-tailed hawk was observed eating a plover chick. This was the first known predation by a red-tailed hawk at ODSVRA, but they have been a documented predator of plovers and terns at other sites.

Northern harrier

Northern harrier has been documented as a predator of nests, chicks, and juveniles of plovers and/or terns at ODSVRA in past years. In 2019, there were 166 sightings of northern harriers on 60 days, a 93.0% increase from the average of 86 sightings (range=39-133) for the 11-year period 2008-2018 and a 46.3% increase from the average of 41 days detected (range=25-68) for the 12-year period 2007-18 (Table 11, Figure 17) (CDPR 2007-18). Based on age and sex, there was a minimum of four individuals (one adult female, one subadult male, and two juveniles) observed during this season.

A subadult male northern harrier was frequently seen hunting and catching prey in Oso Flaco and 7 and 8 exclosures beginning 25 May through the end of the season. Documented losses to this individual harrier included one plover nest and one juvenile tern (Table 9, Table H.2 in Appendix H). Additionally, on 20 June, plover eggshell fragments were found at a subadult male harrier's feeding site but no known nest was documented at the location. Unsuccessful attempts to trap this bird began 19 June and ended 8 August. On July 27, a juvenile harrier (unknown sex) was unintentionally caught while trapping for the subadult male harrier and was relocated the next day to the Kern National Wildlife Refuge, Kern County.

Table 11. Sightings of merlin, American kestrel, large owl spp., red-tailed hawk, northern harrier, and peregrine in specific areas of the Southern Exclosure and Oso Flaco at ODSVRA in 2019.
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	Total
6 exclosure	0	8	0	3	13	45	**69**
7 exclosure	4	11	3	7	35	36	**96**
8 exclosure	5	14	5	10	39	28	**101**
Boneyard exclosure	7	9	9	9	16	15	**65**
North Oso Flaco	7	29	5	19	42	32	**134**
South Oso Flaco	0	15	10	32	21	33	**111**
TOTAL	**23**	**86**	**32**	**80**	**166**	**189**	**576**

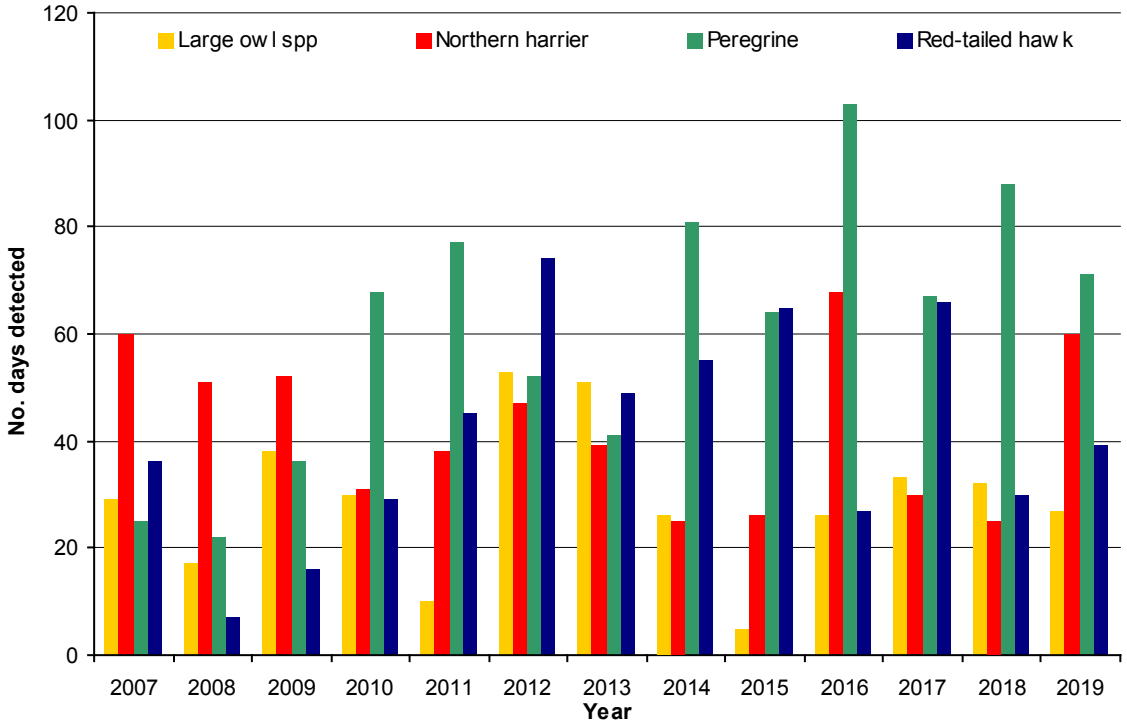

Figure 17. Number of days large owl spp., northern harrier, peregrine, and red-tailed hawk were detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2007-19.
Date range is from 1 March to 10 September (194-day period).

Peregrine

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 25 occasions in 2019 (sometimes requiring repeated efforts before the bird left the nesting area). Hazing peregrines out of sensitive areas provided temporary relief but did not deter individual falcons from returning to ODSVRA.

On 16 May, a subadult female peregrine was seen eating a possible (adult size) plover on 6 exclosure shoreline but prey remains could not be collected and confirmed due to the presence of broods in the area. This bird continued to be seen habitually hunting areas of the Southern Exclosure and Oso Flaco. On 7 June, this peregrine was observed eating two plover chicks on 6 exclosure shoreline (Table H.4 in Appendix H). This peregrine was trapped on 24 June and released the following day in the Owen's Valley near Lone Pine, California, 179 miles northeast of ODSVRA. The bird was banded with a federal band (1947-18002) on the left leg and VID band (W49, white characters on black band) on the right leg.

On 20 June, an adult female peregrine was seen eating two plover chicks on 6 exclosure shoreline. On 28 June, this peregrine was trapped and released on 30 June at the Butte Valley Wildlife Area, Siskiyou County, California, 475 miles north of ODSVRA. The bird was banded with a federal band (1947-18001) on the right leg and VID band (W48, white characters on black band) on the left leg. On 1 August, this bird was observed back on-site and resighted on 21 and 25 August (eating a gull on all three occasions).

On 17 July, a banded adult male peregrine (federal band on left leg, unread black VID band on right leg) was seen stealing prey, a juvenile least tern, from a subadult male northern harrier in the North Oso Flaco foredunes (see Table H.2 in Appendix H for additional details). This same peregrine was also seen hunting shorebirds in the Southern Exclosure and Oso Flaco 8-10 August.

On 26 July, an unbanded female peregrine pursued and caught a banded adult male plover at 7 exclosure shore. Prey carried to 7.5 revegetation area where it was consumed. This predation event also resulted in the loss of three young plover chicks attended solely by the male plover. Approximately two hours later this same peregrine was eating a second banded plover (adult or juvenile) in the North Oso Flaco foredunes (see Table H.4 in Appendix H for additional details). This peregrine was not identified on-site again.

In 2019, there were 189 sightings of peregrines on 71 days, a 35.9% decrease in sightings from the previous year (295 sightings on 88 days). This is close to the average of 180 (range=38-362) sightings from 2008-18. The average number of days peregrines were recorded during the period 2008-18 was 64 (range=22-103) (Table 12).

A minimum of five individual peregrines were identified at ODSVRA this season: one banded adult female (VID band 17D), one banded adult male (federal band on left leg, unread black VID band on right leg), one unbanded juvenile female, one subadult female live-trapped and banded (VID band W48), and one adult female live-trapped and banded (VID band W49). The adult female with VID band 17D was banded as a nestling in 2013 in southern California and has been seen at ODSVRA each year since 2016.

Table 12. Sightings of peregrine in specific areas of the Southern Exclosure and Oso Flaco at ODSVRA from 2008-19.

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

Year	6 exclosure	7 exclosure	8 exclosure	Boneyard exclosure	North Oso Flaco	South Oso Flaco	Total no. sightings (Total no. days detected)
2008	11	11	5	6	4	1	38 (22)
2009	13	13	13	6	9	20	74 (36)
2010	37	29	25	11	24	18	144 (68)
2011	39	45	40	32	37	12	205 (77)
2012	41	37	31	9	27	11	156 (52)
2013	28	23	19	2	14	14	100 (41)
2014	75	85	67	11	69	55	362 (81)
2015	41	31	28	15	19	29	163 (64)
2016	54	50	45	16	32	57	254 (103)
2017	31	35	40	8	37	41	192 (67)
2018	60	55	52	17	55	56	295 (88)
2019	45	36	28	15	32	33	189 (71)

Corvids (American crow and common raven)

American crows and common ravens are efficient predators at many tern and plover nesting sites and can have pronounced impacts over a short period of time. In 2019, there were 31 sightings of crows over 13 days, a 107% increase in sightings from the previous year (15 sightings over seven days) (Table G.1 in Appendix G, CDPR 2018). This also represents a 160% increase in number of days from the annual average of five days (range=1-10) during the 12-year period 2007-18 (CDPR 2007-18). In response to the increased presence in sensitive habitat in 2019, and to reduce the chance of high predation pressures seen at other sites, four crows were lethally removed (Table G.2 in Appendix G).

In 2019, there were 26 sightings of common raven over 10 days, a 117% increase in sightings from the previous year (12 sightings over six days) (Table G.1 in Appendix G, CDPR 2018). During the 12-year period 2007-18, common ravens were seen annually an average of six days (range=1-14) (CDPR 2007-18). In 2019, documented nest loss to raven was 13 plover nests during an 11-day period from 14-24 May and additional plover nest loss is suspected (Table 9). Additionally, on 24 May a raven was seen carrying off a possible plover chick from 8 exclosure but the prey item could not be confirmed. On 10 May, two juveniles were lethally removed at a raven nest site approximately 8.0 miles south of ODSVRA. Two more juvenile ravens were lethally removed from the same nest site on 13 May. On 8 June, an adult raven was lethally removed approximately 3.0 miles east of Oso Flaco Lake (Table G.2 in Appendix G).

Gulls

Thirteen plover nests were documented lost to gull during a 15-day period from 14–28 April and additional nest loss is suspected (Table 9). On 24 April, a nest camera captured an image of an adult herring gull eating eggs at a plover nest. On 26 April, one adult western gull was inadvertently killed while attempting to remove an adult herring gull at South Oso Flaco Creek. On 28 April, an adult herring gull was lethally removed from 6 exclosure shore and no additional nest loss to gulls occurred until 26 May (Table G.2 in Appendix G). On 26 May, a flock of 50 gulls was observed on the ground inside the northern portion of 6 exclosure and one plover nest was lost to a gull during this time.

On 8 July, an immature western gull was observed catching and eating a 37-day-old plover fledgling from the ground on 7 exclosure shore and was lethally removed the same day (Table G.2 in Appendix G). Plover

remains found in the gut, besides this 37-day-old fledgling, included a 16-day old chick and two plovers of unknown age (Table H.4 in Appendix H). Additional chick loss to gulls is suspected.

Gulls can pose a substantial 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 12 of the 16 years from 2004-19, gulls have been documented taking plover chicks. Between 2011-19, gulls took a minimum of 46 plover chicks, juveniles, and unknown age birds (Table H.4 in Appendix H, CDPR 2011-18).

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. Banding of tern and plover chicks also provides 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. Earlier 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. Beginning in 2017, as recommended by CDFW, the minimum distance between least tern nests and the open riding area was increased and bumpouts were used to provide a buffer of 328 feet (100 meters) where needed. Forty-one percent (14/34) of nests were within 328 feet of the exclosure fence in 2019 and bumpouts were installed to increase the buffer from the open riding area. This is lower than in 2018 and

2017 when 60% (21/35) and 54% (28/52) of known location nests, respectively, were within 328 feet of the exclosure fence. In 2017-19, all nests receiving bumpouts were in close proximity and near the eastern side of 6 and 7 exclosures. As additional nests were initiated over the course of the season, the bumpout fencing was moved and connected several times. Each season several nest bumpouts had coalesced into one large bumpout with multiple layers of fencing (Appendix C). Of the nests with bumpouts in 2019, 93% (13/14) were documented to hatch. This is similar to the 95% (18/19) hatch rate for all other tern nests with known fate that did not require a bumpout (those not within 328 feet of the exclosure fence and open riding area) (Appendix A).

For 2020, it is recommended to continue to provide a bumpout for tern nests within 328 feet (100 meters) of the open riding area fencing. 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 and the night roost will also be monitored and the bumpout size may be adjusted if chicks or nocturnal roosting birds 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

Snowy plover nests inside the Southern Exclosure and located within 100 feet of 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. 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 2019, six snowy plover nests were given bumpouts to increase the distance from the nests to the open riding area fence to a minimum of 100 feet. Three were in 6 exclosure, two of which hatched (3 chicks from SP1, two chicks from SP206) and one was depredated by an avian predator (SP10); one nest was in 7 exclosure and hatched 3 chicks (SP127); one nest was in 8 exclosure and was abandoned due to wind (SP109); and one nest was in the Eucalyptus North revegetation area and hatched three chicks (SP175) (Appendix B).

For 2020, it is recommended to continue installing 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 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. Exclosure areas with lower productivity should be identified, and additional habitat enhancement activities should be explored and tested, with the goal of improving nesting and chick-rearing habitat in these areas. Since 2002, wrack has been gathered into trucks or trailers and unloaded into the exclosure by hand. Since 2008, woodchips have been loaded into trucks or trailers using ODSVRA heavy equipment operators and distributed by hand into the exclosure. Past attempts to utilize heavy equipment to collect and distribute large amounts of wrack

from the open riding area to the Southern Exclosure shoreline resulted in more sand than wrack being collected when compared to hand collection. Additionally, in 2018 and 2019, ODSVRA heavy equipment operators used a dump truck to transport and unload large piles of woodchips but these piles still needed to be distributed by hand within our exclosure.

In 2020, it is recommended that methods to better use heavy equipment for wrack collection and woodchip dispersal should be further explored. The goal would be to increase staff efficiency, allow larger amounts of wrack and woodchips to be dispersed, provide broader distribution of shelter from wind and cover from predators, and help maintain larger populations of invertebrate prey over a broader area for snowy plover chicks, fledglings, and adults. The use of heavy equipment also needs to be balanced with other operational needs in the park.

Wrack and woodchip additions could 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 implement and monitor wrack addition to the Southern Exclosure shoreline and inoculation with wrack-associated invertebrates as a means to restore invertebrate species and biomass (these invertebrates are part of the prey base for snowy plover chicks, juveniles, and adults)
A five-year study (2007-11) by Drs. Jenifer Dugan and Mark Page, researchers from the Marine Science Institute at the University of California Santa Barbara (UCSB), examined the responses of invertebrate numbers and diversity in areas where wrack was added to the Southern Exclosure shoreline throughout the breeding season. The unpublished results indicated that the seven-month seasonal closure (March to 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. Invertebrate sampling is done (by Dr. Dugan in 2012 and by park staff since 2013) with one series of transects at the beginning of the season and repeated once at the end of the season. The survey is comprised of 10 transects in the Southern Exclosure and three transects in North Oso Flaco (as a control) and samples are sent to Dr. Dugan at UCSB for analysis. Since 2012, park staff has inoculated wrack added to the shoreline with invertebrates following protocols developed by UCSB. For 2020, it is recommended to continue these inoculation protocols and to continue the beginning and end of season sampling.

Continue to evaluate physical features of the nesting and chick-rearing habitat in the Southern Exclosure using drone equipment
In 2018 and 2019, drone equipment was used to experiment with photographing the Southern Exclosure habitat. Flights in 2018 were performed in March and October, prior to and after the nesting season, and were useful to assess habitat and to record placement of enhancement materials distributed by staff. On 1-2 April in 2019, using protocols developed in consultation with USFWS, 12 flights at an altitude of 200 feet were conducted using a Phantom 4 Pro with DJI Phantom camera (the same equipment used in 2018). All areas with drone flights were continuously monitored for snowy plovers and their behavior. Three plover nests were present, each with an incomplete clutch without sustained incubation, and adults were not on nests prior to or during the flights (all three nests hatched three chicks). The drone deploy and landing zones were at or greater than a horizontal distance of 600 feet from any plover and 800 feet from any plover nest. The plovers were aware of the drone from long distances (up to approximately 500 feet away), but substantial change in behavior was not observed, and the majority of the time they were observed behaving normally. Crouching was observed when the drone was directly overhead, but it was brief and never longer than a minute, and flushing of two groups of three plovers each occurred when the drone was turning at the end of one flight.

On 1-2 October 2019, four drone flights (two each day) were performed over the Southern Exclosure to capture images of the post-nesting habitat. Flights were done by a contractor from Arizona State University

using Wingtra One drone equipment, and flown at 328 feet (100 meters) in altitude to capture high quality images, with a higher resolution camera than the Phantom equipment available to park staff. Flocks of plovers in the surrounding area were monitored closely and crouching was observed when the drone was directly overhead. A flock of 11 birds took flight and quickly re-landed twice during one drone flight and once during another flight, but it was unclear if they were responding to the drone.

It is recommended for 2020 to perform additional experimental beginning and end of season drone flights, in consultation with USFWS, to further develop protocols. Based on the 2019 observations of plover behavior, it is recommended drone flights be flown at altitudes no lower than 250 feet, and if possible early season drone flights will be scheduled prior to the initiation of nests. Prior to any drone flight, the area would be scanned for any roosting or nesting plovers. The USFWS permit would be amended, as necessary, and current monitoring guidelines will be followed, including not allowing drone activity during high winds, rain, high temperatures, or if predators are present. During all drone flights the behavior of plovers would be monitored by park staff, and when appropriate drone activity modified or ended.

Continue weekly gull surveys at the trash dumpster area
Full park monthly gull surveys were done from 2008-15 and daily gull surveys at the trash dumpster area at marker post 2 were done from 2014-17. In 2018 and 2019, surveys were limited to one to two surveys per week at the trash dumpster area. For the 2020 season, it is recommended to conduct two gull surveys per week at the trash dumpster area (see Monitoring and Management section for survey details).

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, eight feet wide, and four foot high with 20 cubic yards 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. The maximum number of gulls present at one time at the dumpster area during the 2019 nesting season was 297 on 7 July.

An experimental cover was designed in 2012 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. More recently staff are meeting with design firms and environmental consultants to determine if a feasible lid design can be found to meet park specifications. In addition, the concept of a designated trash enclosure area where the dumpsters would be housed inside a walk-in structure is being explored, but this idea is still in the early stages of development. It is recommended for 2020 to either enclose all the trash dumpsters in the marker post 2 area, or cover them with lids, in a design to exclude gulls and meet the needs of the ODSVRA staff and visitors.

Ongoing management actions that will continue in 2020

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. Night vision goggles were used for monitoring since 2007 and a thermal scope was used in 2019. The thermal scope will continue to be used and additional equipment options will be explored.
- 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.
- The Seasonal 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 to position a large section of the 6 and 7 shoreline exclosure fence further east (inland by approximately 100 feet of the pre-2012 shoreline fence location) to provide a wider functional shoreline habitat. 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 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 maintain option to salvage and rescue eggs, chicks, juveniles, and adults under very limited circumstances.

- 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.
- Continue to work on outreach methods and informational signage at ODSVRA to increase public awareness of threats to nesting and roosting terns and plovers.
- Efforts to hire and retain skilled monitors throughout the year will continue at ODSVRA.

NOTES

One snowy plover nest in Eucalyptus North revegetation area east of 6 exclosure

Of 230 snowy plover nests with known locations found at ODSVRA in 2019, only one was found outside the Southern Exclosure and Oso Flaco nesting areas. The SP175 three-egg nest was found 12 June on the west side of Eucalyptus North revegetation area, approximately 640 feet east of 6 exclosure and 490 feet east of the 6 exclosure bumpout fencing (Figure C.4 in Appendix C). This area was expanded for plant restoration in the winter of 2018-19 and is surrounded by fencing to keep vehicles and people out (but not coyote), and the nest was found in lightly scattered dry straw and sand substrate, with widely scattered small plants in the surrounding area. After the nest was found, additional signage was added to the existing fence to deter public entry into the revegetation area. The nest was floated when found with an estimated hatch date of 20 June. On 19 June, a mini-exclosure and nest camera were installed at the nest (eggs not yet showing hatching cracks). Chick fencing (plastic fencing with very small mesh size used at several sites to enclose tern chicks, see photo below) was installed in an approximately 50-foot diameter circle around the mini-exclosure (fencing buried and approximately 1.5 feet in height above the ground). To allow the adults easy access to the nest, a large gap was opened at the west side and was used by both adults to consistently incubate the nest. The purpose of the chick fencing was to have a way to keep chicks from moving into the open riding area during times when monitors could not be present (e.g., at night). On 21 June, the gap in the chick fencing was closed and the female was observed approaching and circling the fence, but did not fly over to return to the nest. This gap was immediately re-opened and the adult passed through to the nest.

The eggs had signs of hatching cracks beginning on 22 June. The chick fencing was monitored and adjustments or repairs were made 24-26 June, including shortening the chick fencing to approximately eight inches tall, building up sand in a few areas inside and outside the chick fencing to be used by the adults as ramps over the fence, and making three 6-foot openings in the chick fencing. On the morning of 26 June, the three 6-foot gaps in the chick fencing were blocked with wooden boards and sand ramps were placed on the outside of each 6-foot board for adults to have easier access into the nest area. Sand was also removed from inside those areas of the exclosure where sand had been built up over the fence. Both adults were observed using the ramps and the nest continued to be consistently incubated.

SP175 nest in Eucalyptus North, photo taken 22 June 2019

One egg hatched on 26 June at 12:20 pm (verified by camera) and the other two chicks hatched the following day, with all three chicks observed at the nest early in the morning. This same morning of 27 June public access in the open riding area west of the nest was temporarily blocked off by wire fencing, creating an approximately 200-foot-wide corridor connecting to the 6 exclosure east bumpout fence. Visitor vehicle traffic was directed away prior to approaching the corridor. At this time a large opening was made

in the chick fencing and the three chicks (banded VG:VV) followed the adults west into the fenced corridor in the open riding area. The chicks were gently encouraged west by monitoring staff, giving time for adults to brood chicks. The morning was cool (60) with increasing wind up to 19 mph, and a portable brooder was used occasionally to warm individual chicks that may have become chilled and slow to move. The two adults continued to move the chicks west for a total of two hours and 40 minutes, and the brood entered the east side of 6 exclosure at 12:30 pm. The brood was monitored from a distance for an extended period of time while they continued further west into the exclosure. On 2 July, the three chicks were observed on 6 exclosure shoreline with both adults. Three chicks were last seen together 6 July in the same area, and one chick fledged.

Snowy plover nest moved after flooded by tide in South Oso Flaco

On 4 June, the three-egg SP153 nest was found south of Oso Flaco Creek on the South Oso Flaco shoreline and a circular exclosure was installed the same day. On 18 June, three eggs had been moved up to 20 feet east of the exclosure by the tide and deposited at the edge of the upper high tide line. Two intact eggs (one with small inward dent) were within inches of one another, one of which was in a nest scrape and observed attended by an adult, and a few feet away was a half eggshell of a third egg. The two intact eggs were placed together in the nest scrape and the female returned to incubate. Later the same day, to provide greater distance from the anticipated tide, the two eggs were moved by staff 20 feet further east in small increments, allowing the adults to incubate the eggs between nest movements. When relocation of the nest was completed, the circular exclosure was reinstalled at the nest and an adult returned to incubate. The nest had regular incubation until 28 June when there was no bird on nest, the dented egg was missing, the intact egg remained inside the circular exclosure but not in a defined nest bowl, and there were no plover tracks around the egg. The egg had no hatching cracks (estimated hatch date unknown), was marked, and ultimately determined to be abandoned. When the abandoned egg was examined at a later date it contained an approximately 3-week-old dead embryo.

Snowy plover chicks in the open riding area

<u>Three chicks from two broods in the open riding area north or east of 6 exclosure</u>

On the morning of 19 June, two unbanded chicks (15 days old from SP92 nest) were found in the open riding area approximately 0.25 miles north of 6 exclosure shoreline, between marker posts 5 and 6. The associated male, banded GA:WW, was seen attending the two chicks and no additional chicks were found in the open riding area. The third unbanded chick from this brood was located inside the north end of 6 exclosure shoreline being attended by an unbanded female. Vehicle traffic, visitor foot traffic, and gulls were directed away from the area while the attending adult and chicks were directed back towards the exclosure. When the chicks in the open riding area were closer to the exclosure, the GA:WW male flew to alternately attend both the chick on the 6 exclosure shoreline as well as the chicks in the open riding area. All three chicks were reunited on the north end of 6 exclosure shoreline, approximately two hours after the partial brood was first observed in the open riding area, and the brood continued to be monitored from a distance. Aggression between the associated adults and other adults in the area was documented for multiple days both before and after this event. Three chicks were last seen alive on 25 June, two chicks last seen alive on 30 June, and one chick fledged.

On 13 July, one VV:GB chick (13-14 days old from SP168 nest) was found in the open riding area approximately 150 feet east of 6 exclosure and one foot east of bumpout fencing. Two adult plovers were near the chick, one unbanded female and no details were recorded for the second adult. This brood had typically been seen inside 6 exclosure, approximately 1,700 feet south of marker post 6 and east of the west fence, with the associated BB:GW banded male and unbanded female. The brood was last seen with three chicks (four to five days old) on 4 July. When found in the open riding area, the adults and chick were moving fairly quickly west toward the exclosure. Vehicle traffic was directed away from the area while park staff monitored the brood move into the exclosure. The surrounding open riding area was thoroughly scanned, no other chicks were found, and once inside the exclosure the brood was monitored for an extended

period of time. The following morning, two chicks from this brood were seen inside 6 exclosure attended by both adults and two chicks fledged.

Chicks at north end of 6 exclosure shoreline and movement toward or into 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 signed and 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 and aggression is frequently observed between adults or directed at chicks when multiple broods are in close proximity. Broods raised in this area are monitored closely, often during all daylight hours, and are directed out of or away from the open riding area when necessary. The gull flock that forms at the north end of 6 exclosure shoreline, individual gulls, or other potential predators are also monitored. 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 shore.

In 2019, there were seven broods (19 chicks, 12 fledged) raised close to the open riding area. This compares to five broods (12 chicks, three fledged), four broods (10 chicks, four fledged), and seven broods (16 chicks, five fledged) for 2018, 2017, and 2016, respectively. Of the seven broods raised in this area in 2019, four were observed moving north into the open riding area on multiple occasions on a total of eight different days (Appendix B). In 2018, four of five broods were observed moving into the open riding area on 16 different days; two of four broods moved into the open riding area on four different days in 2017; and three of seven broods moved into the open riding area in 2016, two of them on three days and one on 22 days (CDPR 2016-18).

Injured least tern, none sighted

No injured least terns were observed during the 2019 season.

Injured snowy plover sightings

During the 2019 season, there were three adults, three to four juveniles, and one chick observed with injuries. Details of the injuries are included in Table H.1 in Appendix H.

Least tern carcasses found

Remains of two least tern juveniles were found in 2019 (no carcasses were found 14 November to 31 December 2018, subsequent to the 2018 annual report). Partial remains were found 10 July in the open riding area and cause of death is unknown. The second was found 23 July in 6 exclosure and died from gastrointestinal impaction. For more detail see Table H.3 in Appendix H and the attached necropsy report.

Snowy plover carcasses collected or observed

In 2019, a total of nine plover carcasses were collected (no carcasses were found 14 November to 31 December 2018, subsequent to the 2018 annual report). Of these, five were found in the riding area or open riding area (all adults), three in the Southern Exclosure (one adult, one juvenile, and one chick), and one in North Oso Flaco (adult or juvenile). No clear evidence of predation was observed at any of the carcasses. An average of 6.75 carcasses were found per year in the riding and open riding area during the past four years of 2016 (seven adults), 2017 (seven adults), 2018 (eight adults), and 2019 (five adults) (CDPR 2016-18). This is 2.95 times higher than the average of 2.29 carcasses (range=1-4) found per year in the previous seven-year period 2009-15 (CDPR 2009-15). Two additional chick carcasses were observed on the 6 exclosure shoreline, but not collected due to the proximity of young plover broods. Details on the carcasses are provided in Table H.5 in Appendix H. For carcasses that received a necropsy, reports are attached.

Selective collection and transfer of abandoned chicks and potentially viable eggs

In 2019, one abandoned chick was collected in the field and transported to the Santa Barbara Zoo for captive-rearing. Three nests abandoned pre-term had their eggs (n=8) collected in the field and transported to the Santa Barbara Zoo for captive-rearing. See detailed descriptions in Table F.4 in Appendix F.

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APPENDICES

APPENDIX A. CALIFORNIA LEAST TERN NESTS AT ODSVRA IN 2019.

Least tern chicks were banded with orange over white 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. Eleven chicks from six hatching nests were not banded. Six unbanded chicks were confirmed to fledge: one was found dead on-site on 23 July, five were confirmed in 6 exclosure on 25 July but unknown from which nests (see Table H.3 in Appendix H for details of carcass found). Evidence supports these six unbanded fledglings originated at ODSVRA. One additional O/W:- banded fledgling was documented after it lost the right band and could not be associated with a nest number, but is known to have 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

? = 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. fledged)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
1	7	W/Y:(G/Y)? U	23-May	Hatch	14-Jun	1	1 (1)	O/W:W (6.3)	O/W:W	Seasonal Exclosure	
2	7	B/W:R/W W:G/Y	29-May	Hatch	20-Jun	1	1 (1)	O/W:O (9.8)	O/W:O	Seasonal Exclosure	
3	7	U ?:W	28-May	Hatch	19-Jun	2	2 (2)	O/W:Y (8.5) O/W:V (8.3)	O/W:Y O/W:V	Seasonal Exclosure	
4	7	U U?	29-May	Hatch	20-Jun	2	2 (2)	O/W:L (9.8) O/W:K (8.3)	O/W:L O/W:K	Seasonal Exclosure	
5	7	Banded U	29-May	Hatch	21-Jun	2	1 (1)	O/W:Y/G (11.8)	O/W:Y/G	Bumpout Seasonal Exclosure	One egg with unknown fate showed cracks, but egg or hatched chick not seen subsequently.
6	6	U Y/G:W/B	30-May	Hatch	20-Jun	2	1 (1)	O/W:W/R (10.8)	O/W:W/R	Bumpout Seasonal Exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
7	7	U (G/Y)?:W/B	30-May	Hatch	22-Jun	2	2 (2)	O/W:R (6.0) O/W:W/A (5.4)	O/W:R O/W:W/A	Bumpout Seasonal Exclosure	
8	7	Banded?	29-May	Hatch	20-Jun	2	2 (2)	O/W:B (7.3) O/W:P (7.2)	O/W:B O/W:P	Seasonal Exclosure	
9	7	U W/B:W/G	30-May	Hatch	20-Jun	1	1 (1)	O/W:W/O (9.6)	O/W:W/O	Seasonal Exclosure	

Appendix A. California least tern nests at ODSVRA in 2019 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (no. fledged)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
10	7		31-May	Hatch	22-Jun	1	1 (1)	O/W:G	O/W:G	Seasonal Exclosure	
11	7	W/B:W U	31-May	Hatch	24-Jun	2	2 (1)	O/W:B/O (9.1) O/W:B/Y (8.9)	O/W:B/Y	Bumpout Seasonal Exclosure	O/W:B/O chick last seen when banded on 26 June at 2 days old.
12	7		na	Abandoned pre-term	3-Jun	1	0 (0)			Bumpout Seasonal Exclosure	On 2 June, nest found at 1 egg and seen incubated. No incubation confirmed during period from 3-14 June. Egg marked 6 June and found 75% buried 14 June. No sign of fertilization when egg contents examined.
13	7	U	3-Jun	Hatch	26-Jun	2	2 (2)	O/W:R/Y (8.5) O/W:Y/B (9.7)	O/W:R/Y O/W:Y/B	Bumpout Seasonal Exclosure	
14	7		2-Jun	Hatch	23-Jun	2	2 (1)	O/W:W/G (7.7) O/W:W/Y (7.6)	O/W:W/G	Seasonal Exclosure	O/W:W/Y chick last seen 12 July at 19 days old.
15	7	U B/A:G/Y	2-Jun	Hatch	23-Jun	1	1 (unk)	U		Seasonal Exclosure	One unbanded chick last seen 23 June on date of hatch.
16	7		31-May	Hatch	21-Jun	1	1 (1)	O/W:Y/R (15.8)	O/W:Y/R	Seasonal Exclosure	
17	7	U Banded	8-Jun	Hatch	29-Jun	2	2 (unk)	U U		Seasonal Exclosure	Two unbanded chicks last seen 2 July at 2 and 3 days old.
18	7		8-Jun	Hatch	30-Jun	2	2 (unk)	U U		Seasonal Exclosure	Two unbanded chicks last seen at nest site 1 July at 1 day old.
19	7		7-Jun	Hatch	28-Jun	2	2 (unk)	U U		Seasonal Exclosure	Two unbanded chicks last seen 1 July at 3 days old.
20	6	(R:B)? (B/A:G/Y)?	5-Jun	Hatch	26-Jun	2	2 (2)	O/W:R/W (6.8) O/W:A/W (9.4)	O/W:R/W O/W:A/W	Bumpout Seasonal Exclosure	
21	6	U	9-Jun	Hatch	30-Jun	3	3 (1)	O/W:B/R (8.2) O/W:O/W (7.8) O/W:G/W (5.5)	O/W:B/R	Bumpout Seasonal Exclosure	O/W:G/W chick last seen 18 July at 16 days old. O/W:O/W chick last seen 20 July at 19 days old.
22	7	W/R:W/B ?:B/Y	8-Jun	Hatch	29-Jun	2	2 (2)	O/W:A/Y (23.6) O/W:R/G (21.2)	O/W:A/Y O/W:R/G	Bumpout Seasonal Exclosure	
23	6		9-Jun	Hatch	30-Jun	2	2 (1)	O/W:B/A (7.5) O/W:R/A (9.1)	O/W:R/A	Bumpout Seasonal Exclosure	O/W:B/A chick last seen 2 July at 1 day old.

Appendix A. California least tern nests at ODSVRA in 2019 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (no. fledged)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
24	7	U (G/Y:B/W)?	10-Jun	Hatch	1-Jul	2	2 (2)	O/W:O/B (7.1) O/W:O/R	O/W:O/B O/W:O/R	Bumpout Seasonal Exclosure	
25	7	W/B:R/Y U	14-Jun	Hatch	5-Jul	2	2 (1)	O/W:G/O (5.3) O/W:R/O (5.7)	O/W:R/O	Seasonal Exclosure	O/W:G/O chick last seen 15 July at 10 days old.
26	7	U G/Y:B/W or B/W:G/Y	10-Jun	Hatch	1-Jul	2	2 (0)	O/W:A/B O/W:A/O		Bumpout Seasonal Exclosure	O/W:A/O chick last seen 3 July at 2 days old. O/W:A/B chick last seen 21 July at 20 days old.
27	7	Banded ?:Y/R	10-Jun	Hatch	1-Jul	2	2 (unk)	U U		Seasonal Exclosure	Both unbanded chicks last seen together 6 July at 5 days old. One unbanded chick last seen 15 July at 14 days old.
28	6	U	16-Jun	Hatch	7-Jul	2	2 (2)	O/W:O/G (5.7) O/W:O/Y (6.3)	O/W:O/G O/W:O/Y	Bumpout Seasonal Exclosure	
29	7	W/?:?	11-Jun	Hatch	2-Jul	2	2 (unk)	U U		Seasonal Exclosure	Two unbanded chicks last seen 6 July at 4 days old.
30	7		na	Unknown	(24-Jun)	2	(0)			Seasonal Exclosure	On 20 June, 2 eggs seen at nest (no cracks). Seen incubated 23 June. No incubation confirmed during period from 24-29 June. No eggs found when nest walked to 2 July.
31	7	U U	30-May	Hatch	20-Jun	≥1	1 (1)	O/W:A (8.6)	O/W:A	Seasonal Exclosure	
32	7	-:B/O	5-Jun	Hatch	26-Jun	≥1	1 (1)	O/W:R/B (17.1)	O/W:R/B	Seasonal Exclosure	
33	7		na	Abandoned, unknown if pre- or post-term	na	2	0 (0)			Seasonal Exclosure	On 24 June, nest found as 2 eggs abandoned, unknown if pre- or post- term. One egg had large hole and dried yolk contents. Nest in a location not likely to have been incubated undetected a long enough period to suggest hatch. No sign of fertilization when intact egg contents examined.
34	7	U	26-Jun	Hatch	17-Jul	1	1 (0)	O/W:N (8.3)		Bumpout Seasonal Exclosure	O/W:N chick last seen 23 July at 6 days old.

APPENDIX B. SNOWY PLOVER NESTS AT ODSVRA IN 2019.

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, Euc North = Eucalyptus North revegetation area

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

Nest protection type: see Management Actions for description of Seasonal Exclosure, circular exclosure (excl.), symbolic fence, and bumpout.

na = estimated date not available due to insufficient information

? = unconfirmed band combinations or colors

≥ = minimum of one or two eggs 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	6	F=U M=VG:AY	28-Mar	Hatch	2-May	3	3 (0)	3 GG:PA	Bumpout Seasonal Exclosure	
2	6	F=U M=GG:OR	30-Mar	Hatch (Split)	1-May	3	3 (1)	3 BB:GV	Seasonal Exclosure	One 5- to 6-day-old chick adopted by SP7 brood beginning 7 May and fledged.
3	SOF	F= M=	31-Mar	Depredated	9-Apr	3	0 (0)		Symbolic fence	Lost during period of high nest loss to gull predation.
4	8	F=U M=PV:YB	30-Mar	Hatch	2-May	3	3 (0)	3 PG:YO	Seasonal Exclosure	
5	6	F=U M=U	6-Apr	Depredated, avian	20-Apr	≥2	0 (0)		Seasonal Exclosure	Lost during period of high nest loss to gull predation.
6	NOF	F=U M=	31-Mar	Failed, unknown cause	9-Apr	3	0 (0)		Seasonal Exclosure	Lost during period of high nest loss to gull predation.
7	7	F=U M=U	2-Apr	Hatch	4-May	3	1 (0)	1 PG:WV	Seasonal Exclosure	Two eggs unknown fate. On 7 May, male adopted a 5- to 6-day-old BB:GV chick from SP2 brood. This chick fledged.
8	SOF	F=U M=	na	Depredated	9-Apr	3	0 (0)		Symbolic fence	Lost during period of high nest loss to gull predation.
9	7	F=U M=U	6-Apr	Depredated, avian	11-Apr	3	0 (0)		Symbolic fence	Lost during period of high nest loss to gull predation.
10	6	F=U M=U	na	Depredated, avian	13-Apr	≥1	0 (0)		Bumpout Seasonal Exclosure	Lost during period of high nest loss to gull predation.
11	6	F=U M=U	11-Apr	Depredated, gull	14-Apr	≥2	0 (0)		Symbolic fence	
12	6	F=U M=U	11-Apr	Hatch (Split)	13-May	3	3 (0)	2 VV:VV 1 unbanded	Circular excl. with top Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2019 (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=U	11-Apr	Depredated, avian	20-Apr	3	0 (0)		Seasonal Exclosure	Lost during period of high nest loss to gull predation.
14	6	F=(PG:BW)? M=Banded	na	Depredated, gull	14-Apr	3	0 (0)		Symbolic fence	
15	SOF	F=U M=U	11-Apr	Hatch	14-May	3	2 (0)	2 GG:RA	Circular excl. with top Symbolic fence	One egg (without cracks) abandoned post-term.
16	NOF	F=U M=	5-Apr	Depredated, gull	14-Apr	3	0 (0)		Symbolic fence	
17	8	F=GA:OY M=PG:VG	7-Apr	Hatch (Split)	9-May	3	3 (0)	1 BB:AA 2 unbanded	Seasonal Exclosure	
18	6	F= M=	1-Apr	Depredated, gull	14-Apr	3	0 (0)		Seasonal Exclosure	
19	SOF	F=U M=	na	Depredated, gull	16-Apr	≥1	0 (0)		Symbolic fence	
20	SOF	F= M=	na	Depredated, gull	16-Apr	≥1	0 (0)		Symbolic fence	
21	6	F=U M=U	15-Apr	Depredated, gull	24-Apr	3	0 (0)		Symbolic fence	On 24 April, nest camera confirms adult herring gull ate eggs at nest at 7 am.
22	6	F=GG:AB M=U	na	Depredated, avian	21-Apr	≥2	0 (0)		Seasonal Exclosure	Lost during period of high nest loss to gull predation.
23	NOF	F=U M=BB:AR	16-Apr	Hatch	18-May	3	3 (0)	3 BB:BV	Circular excl. with top Symbolic fence	
24	8	F=Banded M=U	18-Apr	Unknown	20-May	3	(0)		Seasonal Exclosure	On 19 May, 1 egg missing and remaining 2 eggs showed cracks, but eggs or hatched chicks not seen subsequently.
25	8	F=PG:PB M=U	17-Apr	Hatch	19-May	2	1 (1)	1 BB:YO	Seasonal Exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
26	8	F=U M=U	7-Apr	Hatch	9-May	3	1 (0)	1 BB:WW	Seasonal Exclosure	One egg with unknown fate showed cracks, but egg or hatched chick not seen subsequently. One egg (without cracks) abandoned post-term. Approximately 2-week-old embryo in egg when contents examined.
27	6	F=U M=RR:AW	18-Apr	Hatch	20-May	3	3 (1)	3 BB:AV	Seasonal Exclosure	
28	8	F=U M=VV:WR	16-Apr	Hatch	19-May	3	3 (2)	3 BB:GA	Seasonal Exclosure	
29	6	F=U M=U	na	Depredated, gull	15-Apr	≥1	0 (0)		Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2019 (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=BB:VG M=U	na	Depredated, avian	20-Apr	≥2	0 (0)		Seasonal Exclosure	Lost during period of high nest loss to gull predation.
31	7	F= M=U	15-Apr	Hatch	17-May	3	3 (1)	3 unbanded	Seasonal Exclosure	On 22 May, male adopted a 2-day-old GG:BG chick from SP40 brood. This chick last seen on 27 May at 7 days old.
32	7	F=BB:G(O)? M=U	14-Apr	Hatch	16-May	3	3 (0)	3 GG:BV	Seasonal Exclosure	
33	6	F=NR:YG M=GA:AR	18-Apr	Hatch	20-May	3	3 (3)	3 unbanded	Seasonal Exclosure	
34	SOF	F=U M=VV:VB	18-Apr	Hatch	21-May	3	3 (0)	3 GA:GA	Circular excl. with top Symbolic fence	
35	SOF	F= M=NR:WB	na	Depredated, gull	23-Apr	≥1	0 (0)		Symbolic fence	
36	6	F=NB:OY M=VV:YG	na	Depredated, gull	27-Apr	≥1	0 (0)		Symbolic fence	
37	7	F=U M=U	20-Apr	Hatch	22-May	3	3 (0)	3 unbanded	Seasonal Exclosure	On 31 May, SP37 male with four similar sized unbanded chicks. Four chicks not seen subsequent to this date.
38	6	F=U M=U	18-Apr	Hatch	20-May	3	2 (1)	2 VV:BV	Seasonal Exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
39	6	F=U M=RR:AB	23-Apr	Hatch	26-May	3	3 (1)	3 BB:GO	Seasonal Exclosure	On 25 June, a 30-day-old BB:GO fledgling brooded by RR:AB male at SP186 nest (see Table H.4 in Appendix H).
40	6	F=U M=GA:WR	18-Apr	Hatch	20-May	3	3 (0)	3 GG:BG	Seasonal Exclosure	One 2-day-old chick adopted by SP31 brood beginning 22 May, chick last seen 27 May at 7 days old.
41	7	F= M=U	na	Depredated, gull	26-Apr	≥1	0 (0)		Symbolic fence	
42	7	F=U M=	24-Apr	Overwashed by tide	19-May	3	0 (0)		Symbolic fence	
43	BY	F=U M=U	20-Apr	Hatch	22-May	2	2 (1)	2 unbanded	Seasonal Exclosure	
44	SOF	F=U M=U	17-Apr	Hatch (Split)	19-May	3	2 (1)	2 unbanded	Circular excl. with top Symbolic fence	On 12 May, 3 eggs recentered in circular exclosure. One egg abandoned post-term. No sign of fertilization when egg contents examined.
45	7	F=PV:AW M=U	20-Apr	Hatch (Split)	22-May	3	3 (2)	3 BB:PV	Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2019 (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
46	SOF	F=U M=	21-Apr	Overwashed by tide	19-May	3	0 (0)		Circular excl. with top Symbolic fence	
47	SOF	F=VG:RG M=GA:OR	22-Apr	Hatch	24-May	3	3 (2)	3 BB:WA	Circular excl. with top Symbolic fence	
48	SOF	F=PG:OW M=U	24-Apr	Depredated, coyote	1-May	≥2	0 (0)		Symbolic fence	
49	7	F=VO:BW M=PV:WY	20-Apr	Hatch	22-May	3	2 (1)	2 GG:VV	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
50	7	F=U? M=U	20-Apr	Hatch	22-May	3	3 (0)	3 GG:WA	Seasonal Exclosure	
51	SOF	F=U M=U	20-Apr	Hatch	25-May	3	3 (0)	3 GG:GA	Circular excl. with top Symbolic fence	
52	8	F=GA:OR M=GG:(R)?R	22-Apr	Unknown	21-May	3	(0)		Symbolic fence	Nest fate occurred during period of high nest loss to raven predation.
53	6	F=(??):YB M=U	23-Apr	Depredated, gull	27-Apr	3	0 (0)		Symbolic fence	
54	7	F=U M=PG:VB	22-Apr	Hatch	24-May	3	3 (1)	3 unbanded	Seasonal Exclosure	
55	6	F=PV:PR M=U	25-Apr	Hatch	27-May	2	2 (1)	2 GA:BW	Seasonal Exclosure	
56	7	F=RR:PW M=(Y-:GO)?	22-Apr	Depredated, raven	21-May	3	0 (0)		Seasonal Exclosure	
57	6	F=RR:BW M=BB:VY	22-Apr	Hatch	24-May	3	3 (0)	2 GA:BG 1 unbanded	Seasonal Exclosure	
58	6	F=GG:AB M=U	27-Apr	Depredated, gull	26-May	2	0 (0)		Seasonal Exclosure	
59	NOF	F=U M=U	27-Apr	Hatch	29-May	3	3 (0)	3 BB:WO	Circular excl. with top Symbolic fence	
60	NOF	F=U M=U	25-Apr	Hatch (Split)	28-May	3	3 (2)	2 PG:AG 1 unbanded	Circular excl. with top Symbolic fence	On 29 May, 3 chicks near nest bowl, 2 mobile and 1 immobile. Immobile chick placed in brooder and taken to Santa Barbara Zoo. Chick did not survive (see Table F.4 in Appendix F).
61	6	F=U M=	na	Depredated, gull	28-Apr	3	0 (0)		Symbolic fence	
62	7	F=BB:VW M=GG:GB	24-Apr	Hatch	26-May	3	2 (1)	1 BB:PB 1 unbanded	Seasonal Exclosure	One egg unknown fate. Banded chick fledged.
63	6	F=U M=U	23-Apr	Hatch	25-May	3	3 (3)	3 unbanded	Seasonal Exclosure	Brood raised on northern 6 exclosure and entered the open riding area 13 June (see report Notes section).

Appendix B. Snowy plover nests at ODSVRA in 2019 (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
64	6	F=VG:BW M=BB:RB	24-Apr	Hatch	27-May	3	3 (3)	3 PG:GB	Seasonal Exclosure	Three fledglings last seen alive on 24 June at 28 days old. On 1 July, carcass of PG:GB fledgling found on 6 shore at high tide line (see Table H.5 in Appendix H).
65	6	F=PV:- M=U	18-Apr	Hatch	20-May	3	3 (3)	3 GG:AV	Seasonal Exclosure	Brood raised on northern 6 exclosure shoreline near the open riding area (see report Notes section).
66	SOF	F= M=GA:WW	27-Apr	Abandoned pre-term	12-May	3	0 (0)		Circular excl. with top Symbolic fence	On 12 May, 3 eggs found fully buried. Eggs unburied and placed in nest bowl. Camera confirmed eggs not attended and eggs taken to Santa Barbara Zoo on 13 May. One egg was nonviable and two eggs hatched. Both chicks fledged and were banded VV:AV and VV:BO (see Table F.4 in Appendix F).
67	SOF	F=U M=U	28-Apr	Overwashed by tide	16-May	2	0 (0)		Circular excl. with top Symbolic fence	On 1 May, symbolic fence moved west to decrease possible pedestrian disturbance.
68	6	F=U? M=U	26-Apr	Hatch (Split)	28-May	3	3 (1)	2 GG:YB 1 unbanded	Seasonal Exclosure	Banded chick fledged.
69	6	F=U M=U	26-Apr	Hatch (Split)	28-May	3	3 (1)	3 BB:PA	Seasonal Exclosure	On 7 June, peregrine observed eating 2 chicks in area SP69 brood seen previous day with 3 chicks. One chick present in area two hours after predation.
70	7	F= M=	24-Apr	Abandoned pre-term	17-May	3	0 (0)		Seasonal Exclosure	
71	7	F= M=NY:W(A)?	16-Apr	Hatch	18-May	3	2 (0)	2 unbanded	Seasonal Exclosure	One egg unknown fate.
72	8	F=U M=U	27-Apr	Overwashed by tide	19-May	3	0 (0)		Symbolic fence	
73	6	F= M=	23-Apr	Unknown	23-May	3	(0)		Seasonal Exclosure	Nest fate occurred during period of high nest loss to raven predation.
74	8	F= M=	na	Abandoned, suspected wind	3-May	≥1	0 (0)		Seasonal Exclosure	On 4 May, 1 egg found buried at nest, egg marked and reset in nest bowl. No evidence of adult attendance subsequently. No sign of fertilization when egg contents examined.
75	7	F= M=U	30-Apr	Hatch	2-Jun	3	3 (1)	3 GG:OA	Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2019 (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
76	BY	F=(VV:BG)? M=RR:OR	11-Apr	Hatch	13-May	3	1 (0)	1 GA:GG	Seasonal Exclosure	Two eggs abandoned post-term. On 18 May, a live 5-day-old GA:GG chick was picked up and carried away by a Brewer's blackbird at North Oso Flaco. The chick was not seen again (see Table H.4 in Appendix H).
77	BY	F=U M=	30-Apr	Failed, unknown cause	22-May	3	0 (0)		Seasonal Exclosure	On 22 May, 2 eggs missing pre-term and 1 egg remains in nest bowl. Approximately 3-week-old embryo in egg when contents examined.
78	BY	F= M=BB:VR	16-Apr	Hatch	18-May	3	3 (2)	3 unbanded	Seasonal Exclosure	
79	6	F=NR:BR M=BB:YB	1-May	Hatch	2-Jun	3	3 (2)	3 BB:OA	Seasonal Exclosure	
80	6	F=U M=	29-Apr	Depredated, raven	24-May	3	0 (0)		Symbolic fence	
81	6	F=BB:VG M=U	28-Apr	Hatch	30-May	3	3 (2)	3 GG:BO	Seasonal Exclosure	
82	8	F=U M=	28-Apr	Abandoned, suspected wind	29-May	3	0 (0)		Circular excl. with top Symbolic fence	On 30 May, 3 eggs found fully buried, 1 egg cracked with adhering dried blood and sand. Eggs taken to Santa Barbara Zoo, 2 hatched and both fledged. Chicks were banded VV:WO and VV:WA (see Table F.4 in Appendix F).
83	SOF	F=U M=BB:PY	27-Apr	Overwashed by tide	19-May	3	0 (0)		Circular excl. with top Symbolic fence	
84	SOF	F=U M=	na	Depredated, coyote	6-May	3	0 (0)		Symbolic fence	
85	6	F=VV:AA M=BB:RR	27-Apr	Hatch	29-May	3	3 (3)	3 GG:OB	Mini-exclosure Seasonal Exclosure	Brood raised on northern 6 exclosure shoreline near the open riding area and territorial adult aggression seen on several occasions. On 4 days between 2-25 June the brood was observed to enter the open riding area (see report Notes section).
86	6	F=NB:O(N)? M=VV:YG	30-Apr	Hatch	1-Jun	3	2 (0)	2 unbanded	Seasonal Exclosure	One egg unknown fate.

Appendix B. Snowy plover nests at ODSVRA in 2019 (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
87	7	F=VG:VG M=VG:BW	30-Apr	Hatch	1-Jun	3	3 (3)	2 GG:GO 1 GG:OL	Seasonal Exclosure	On 8 July, one 37-day-old GG:GO fledgling observed depredated by western gull (see Table H.4 in Appendix H). On the same day, a second 37-day-old GG:GO fledgling observed favoring right leg. Bird was trapped 10 July, taken to Pacific Wildlife Care, and examination determined it to be releasable. It was rebanded GG:OL and released at ODSVRA later the same day. The fledgling continued to be seen favoring right leg until 15 July but appeared to walk normally on 22 July (see Table H.1 in Appendix H).
88	BY	F=U M=G(?:??)	5-May	Depredated, raven	23-May	3	0 (0)		Seasonal Exclosure	
89	NOF	F=U M=U	11-Apr	Hatch	13-May	3	3 (0)	3 GG:GG	Seasonal Exclosure	
90	6	F=U M=U	2-May	Hatch	3-Jun	3	2 (1)	2 VV:BA	Seasonal Exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
91	8	F= M=	30-Apr	Depredated, raven	23-May	3	0 (0)		Seasonal Exclosure	
92	6	F=U M=GA:WW	3-May	Hatch	4-Jun	3	3 (1)	3 unbanded	Seasonal Exclosure	Brood raised on northern 6 exclosure shoreline near the open riding area and territorial adult aggression seen on several occasions. On 6 and 19 June the brood was observed to enter the open riding area (see report Notes section).
93	6	F=U M=U	1-May	Hatch	2-Jun	3	3 (0)	3 PG:AB	Seasonal Exclosure	
94	6	F= M=U	7-May	Hatch (Split)	8-Jun	3	3 (0)	3 unbanded	Symbolic fence	On 14 May, 1 egg found buried at nest bowl, egg marked and reset with other eggs.
95	7	F=RR:BB M=GG:WW	5-May	Hatch	6-Jun	2	2 (2)	2 GG:BA	Seasonal Exclosure	
96	6	F=U M=U	21-Apr	Hatch	23-May	3	3 (1)	3 unbanded	Seasonal Exclosure	On 19 June, unbanded 27-day-old chick broods with adults at active nest, SP180.
97	7	F=U M=	4-May	Failed, unknown cause	24-May	3	0 (0)		Symbolic fence	Lost during period of high nest loss to raven predation.
98	6	F=BB:AR M=U	2-May	Hatch	3-Jun	3	2 (0)	2 unbanded	Symbolic fence	One egg unknown fate.

Appendix B. Snowy plover nests at ODSVRA in 2019 (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
99	6	F= M=	5-May	Depredated, raven	24-May	3	0 (0)		Symbolic fence	
100	7	F=Banded M=	3-May	Depredated, raven	22-May	3	0 (0)		Symbolic fence	
101	NOF	F=U M=GN:RR	10-May	Overwashed by tide	19-May	3	0 (0)		Circular excl. with top Symbolic fence	
102	SOF	F=PG:OW M=U	7-May	Overwashed by tide	20-May	3	0 (0)		Circular excl. with top Symbolic fence	
103	7	F= M=	4-May	Depredated, raven	22-May	2	0 (0)		Seasonal Exclosure	
104	SOF	F= M=U	na	Depredated, raven	14-May	≥1	0 (0)		Symbolic fence	
105	8	F=U M=	na	Depredated, raven	21-May	2	0 (0)		Seasonal Exclosure	
106	6	F=U M=U	4-May	Hatch	5-Jun	3	3 (0)	3 unbanded	Symbolic fence	
107	8	F=(GA:YR)? M=(PV:YY)?	6-May	Overwashed by tide	19-May	3	0 (0)		Circular excl. with top Symbolic fence	On 14 May, prior to installation of circular exclosure, 2 eggs in nest bowl and third egg 10 feet to the southwest, cracked open with yolk spilling out.
108	8	F= M=	na	Depredated, raven	19-May	≥1	0 (0)		Seasonal Exclosure	
109	8	F=U M=GG:OY	12-May	Abandoned, suspected wind	21-May	3	0 (0)		Bumpout Seasonal Exclosure	Three eggs had approximately 1-week-old embryos when contents examined. Initiation date determined using egg-laying period and embryo growth.
110	6	F=U M=PV:RB	10-May	Hatch	11-Jun	3	3 (1)	3 GG:VW	Seasonal Exclosure	
111	Unknown	F= M=U	na	Hatch	(13-May)	3	3 (3)	3 BB:BA		On 16 May, found as brood of 3 small chicks on North Oso Flaco shoreline.
112	7	F=U M=	10-May	Failed, unknown cause	21-May	3	0 (0)		Symbolic fence	Lost during period of high nest loss to raven predation.
113	7	F=U M=RR:BW	22-Apr	Hatch	24-May	3	3 (0)	3 BB:BO	Seasonal Exclosure	
114	6	F=VV:AB M=GG:OY	8-May	Hatch	9-Jun	3	3 (0)	3 BB:WV	Seasonal Exclosure	
115	6	F=U M=U	18-May	Unknown	22-Jun	3	(0)		Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2019 (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
116	6	F= M=	8-May	Hatch	9-Jun	3	3 (0)	3 unbanded	Symbolic fence	
117	6	F=GG:GR M=NB:OY	8-May	Hatch (Split)	9-Jun	3	3 (0)	3 GA:VG	Seasonal Exclosure	
118	7	F=U M=U	13-May	Hatch	14-Jun	3	3 (2)	2 VG:BA 1 -:BA	Seasonal Exclosure	On 18 June, 1 chick missing left bands and had -:BA band combination. Chick did not fledge.
119	7	F= M=	na	Depredated, raven	21-May	≥1	0 (0)		Symbolic fence	
120	7	F= M=	na	Depredated, raven	21-May	3	0 (0)		Symbolic fence	
121	8	F= M=	na	Depredated, raven	23-May	≥2	0 (0)		Seasonal Exclosure	
122	6	F=PG:PG M=U	4-May	Hatch	5-Jun	3	2 (2)	2 GG:GV	Symbolic fence	Peeping heard at 1 egg with unknown fate, but egg or hatched chick not seen subsequently.
123	7	F=U M=U	22-May	Hatch	23-Jun	3	3 (0)	3 unbanded	Seasonal Exclosure	
124	7	F=U M=	na	Unknown	23-Jun	≥1	(0)		Symbolic fence	Nest location known by multiple observations of incubating adult. To avoid disturbing young snowy plover and least tern broods, nest not walked to and total egg number unknown.
125	7	F=U M=GG:AY	22-May	Hatch	23-Jun	3	2 (2)	2 unbanded	Seasonal Exclosure	One egg abandoned post-term. No sign of fertilization when egg contents examined.
126	7	F= M=U	25-May	Unknown	27-Jun	3	(0)		Seasonal Exclosure	
127	7	F=U M=U	25-May	Hatch	26-Jun	3	3 (1)	3 GG:VA	Bumpout Seasonal Exclosure	
128	6	F=U M=U	25-May	Abandoned pre-term	10-Jun	3	0 (0)		Symbolic fence	Adult mortality suspected. Three eggs with approximately 3-week-old embryos when contents examined. Initiation date determined using egg-laying period and embryo growth.
129	7	F= M=	na	Abandoned, unknown if pre- or post-term	30-May	≥2	0 (0)		Seasonal Exclosure	No sign of fertilization when contents of both eggs examined.
130	6	F=U M=U	24-May	Hatch (Split)	25-Jun	3	3 (0)	3 VG:GA	Seasonal Exclosure	Brood raised on northern 6 exclosure shoreline near the open riding area (see report Notes section).

Appendix B. Snowy plover nests at ODSVRA in 2019 (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
131	7	F=BB:GG M=U	23-May	Hatch	24-Jun	3	3 (1)	3 PG:GV	Seasonal Exclosure	One 4-day-old chick adopted by UNA5 brood beginning 28 June, chick last seen 17 July at 23 days old and not known to fledge.
132	6	F=U M=	27-May	Hatch	28-Jun	3	1 (0)	1 unbanded	Seasonal Exclosure	Two eggs unknown fate.
133	7	F=BB:GR M=U	29-May	Hatch	30-Jun	3	3 (1)	3 unbanded	Seasonal Exclosure	
134	6	F=PG:WB M=(GA:W?)?	22-May	Hatch (Split)	23-Jun	3	3 (0)	3 GG:AA	Seasonal Exclosure	
135	7	F=U M=U	27-May	Hatch	28-Jun	3	3 (1)	3 unbanded	Symbolic fence	
136	SOF	F=U M=U	27-May	Hatch	28-Jun	3	3 (0)	3 unbanded	Circular excl. with top Symbolic fence	On 3 June, symbolic fence moved west to decrease possible pedestrian disturbance.
137	8	F=PG:OG M=U	27-May	Hatch	28-Jun	3	3 (1)	3 unbanded	Circular excl. with top Symbolic fence	
138	NOF	F=U M=U	30-May	Hatch	1-Jul	3	2 (0)	2 unbanded	Circular excl. with top Symbolic fence	One egg abandoned post-term. Approximately 1-week-old embryo in egg when contents examined.
139	6	F=BB:OW M=U	29-May	Hatch	30-Jun	3	2 (2)	2 GA:AA	Seasonal Exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
140	6	F=U M=GG:WW	29-May	Hatch (Split)	30-Jun	3	2 (0)	2 GA:WB	Seasonal Exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
141	7	F=Banded M=U	28-May	Unknown	1-Jul	3	(0)		Seasonal Exclosure	
142	8	F=U M=U	30-May	Hatch	1-Jul	≥2	2 (1)	2 unbanded	Symbolic fence	Nest location known by multiple observations of incubating adult. To avoid disturbing young snowy plover and least tern broods, nest not walked to and total egg number unknown.
143	SOF	F=GA:PR M=U	27-May	Hatch	28-Jun	3	2 (0)	2 unbanded	Circular excl. with top Symbolic fence	One egg abandoned post-term. Approximately 3-week-old embryo when egg contents examined.
144	NOF	F=U M=BB:AR	30-May	Hatch	1-Jul	3	2 (0)	2 unbanded	Seasonal Exclosure	One egg abandoned post-term. No sign of fertilization when egg contents examined.

Appendix B. Snowy plover nests at ODSVRA in 2019 (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	SOF	F=PG:OW M=U	27-May	Hatch	28-Jun	2	2 (1)	2 unbanded	Circular excl. with top Symbolic fence	
146	8	F=U M=PV:YB	27-May	Hatch	28-Jun	3	2 (1)	2 unbanded	Seasonal Exclosure	One egg abandoned post-term. No sign of fertilization when egg contents examined.
147	6	F=PG:YB M=U	25-May	Hatch (Split)	26-Jun	3	2 (2)	2 unbanded	Symbolic fence	One egg unknown fate.
148	6	F=-:(PB)? M=U	28-May	Hatch	29-Jun	3	2 (0)	2 unbanded	Symbolic fence	One egg abandoned post-term. No sign of fertilization when egg contents examined.
149	8	F= M=	30-May	Hatch	1-Jul	3	1 (0)	1 unbanded	Seasonal Exclosure	Two eggs unknown fate.
150	8	F=U M=VV:AY	29-May	Hatch	30-Jun	3	3 (1)	3 unbanded	Seasonal Exclosure	
151	BY	F= M=	4-Jun	Depredated, skunk	21-Jun	3	0 (0)		Seasonal Exclosure	
152	BY	F=PV:(V)? M=	28-May	Depredated, corvid	15-Jun	3	0 (0)		Seasonal Exclosure	On 15 June, corvid tracks leading to nest bowl overtracked by plover and 1 abandoned egg remains. On 23 June, remaining egg missing and skunk tracks lead to and from nest.
153	SOF	F=U M=U	31-May	Abandoned, unknown if pre- or post-term	27-Jun	3	0 (0)		Circular excl. with top Symbolic fence	On 18 June, 2 eggs (1 with small dent in top of egg) and shell fragments of a third egg had been moved by the tide east of circular exclosure. To provide a greater distance from the tide, 2 eggs were moved further east. Circular exclosure moved to new nest location on same day and nest consistently incubated subsequently. Dented egg missing and 1 intact egg abandoned on 27 June (see report Notes section). Approximately 3-week-old embryo when egg contents examined. Initiation date determined using egg-laying period and embryo growth.
154	6	F= M=	27-May	Unknown	30-Jun	3	(0)		Seasonal Exclosure	
155	6	F=U M=	26-May	Hatch (Split)	27-Jun	3	3 (0)	3 unbanded	Seasonal Exclosure	
156	6	F= M=U	27-May	Hatch	28-Jun	3	2 (0)	2 unbanded	Seasonal Exclosure	One egg unknown fate.

Appendix B. Snowy plover nests at ODSVRA in 2019 (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
157	6	F=GA:WY M=VG:AY	28-May	Hatch (Split)	29-Jun	3	3 (0)	3 unbanded	Seasonal Exclosure	
158	7	F=Banded M=U	24-May	Hatch	25-Jun	≥1	1 (0)	1 unbanded	Symbolic fence	Nest location known by multiple observations of incubating adult. To avoid disturbing young snowy plover and least tern broods, nest not walked to and total egg number unknown.
159	SOF	F=PG:WB M=U	27-May	Hatch	28-Jun	3	3 (1)	3 unbanded	Circular excl. with top Symbolic fence	
160	7	F=Banded M=VG:WY	27-May	Hatch	28-Jun	2	2 (1)	2 GA:WA	Seasonal Exclosure	
161	8	F=U M=VG:YG	30-May	Hatch	1-Jul	3	3 (unk)	3 unbanded	Symbolic fence	
162	6	F=B(?:??) M=GA:RY	21-May	Hatch (Split)	22-Jun	3	3 (0)	3 unbanded	Symbolic fence	
163	6	F=U M=GA:YB	2-Jun	Hatch	4-Jul	3	3 (0)	3 unbanded	Seasonal Exclosure	
164	NOF	F=U M=U	3-Jun	Abandoned pre-term	4-Jul	3	0 (0)		Symbolic fence	Adult mortality suspected. Three eggs had approximately 3.5-week-old embryos when contents examined. Initiation date determined using egg-laying period and embryo growth.
165	6	F=U M=U	30-May	Hatch	1-Jul	3	2 (0)	2 unbanded	Seasonal Exclosure	One egg abandoned post-term. No sign of fertilization when egg contents examined.
166	6	F=U M=U	29-May	Hatch	30-Jun	3	3 (0)	3 unbanded	Seasonal Exclosure	
167	8	F=U M=VG:VY	2-Jun	Hatch	4-Jul	3	2 (0)	2 unbanded	Symbolic fence	One egg abandoned post-term. No sign of fertilization when egg contents examined.
168	6	F=U M=BB:GW	28-May	Hatch (Split)	29-Jun	3	3 (2)	3 VV:GB	Seasonal Exclosure	On 13 July, one 13- to 14-day-old chick, VV:GB was found in the open riding area east of the Southern Exclosure (see report Notes section).
169	7	F=VO:BW M=PV:WY	8-Jun	Hatch	10-Jul	3	3 (0)	3 unbanded	Seasonal Exclosure	On 25 June and 14-16 July, associated PV:WY male observed with a left foot injury (see Table H.1 in Appendix H).
170	7	F=U M=U	10-Jun	Hatch	12-Jul	3	3 (0)	3 unbanded	Seasonal Exclosure	
171	6	F=Banded M=	2-Jun	Hatch	4-Jul	3	2 (0)	2 unbanded	Seasonal Exclosure	One egg unknown fate.

Appendix B. Snowy plover nests at ODSVRA in 2019 (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
172	NOF	F=PV:AW M=VG:RW	30-May	Hatch	1-Jul	3	3 (0)	3 unbanded	Symbolic fence	
173	SOF	F=U M=BB:PY	27-May	Hatch	28-Jun	3	2 (0)	2 unbanded	Circular excl. with top Symbolic fence	One egg abandoned post-term. No sign of fertilization when egg contents examined.
174	8	F=GA:OR M=U	28-May	Hatch	29-Jun	3	2 (0)	2 unbanded	Seasonal Exclosure	One egg unknown fate.
175	Euc North	F=U M=U	25-May	Hatch (Split)	26-Jun	3	3 (1)	3 VG:VV	Bumpout Mini-exclosure Symbolic fence	Nest established in new vegetation area created east of 6 exclosure in winter of 2018-19. On 27 June, an area open to riding was closed to allow chicks to move across to the Southern Exclosure (see report Notes section). On 29 July, associated unbanded male observed not putting weight on the right leg (see Table H.1 in Appendix H).
176	SOF	F=U M=	10-Jun	Failed, unknown cause	29-Jun	3	0 (0)		Symbolic fence	
177	SOF	F=U M=	28-May	Hatch	29-Jun	2	1 (0)	1 unbanded	Symbolic fence	One egg unknown fate.
178	8	F=U M=GA:OW	2-Jun	Hatch (Split)	4-Jul	3	3 (0)	3 unbanded	Symbolic fence	
179	7	F=RR:BW M=VG:YG	4-Jun	Hatch	6-Jul	3	3 (1)	3 unbanded	Symbolic fence	
180	6	F=U M=U	na	Abandoned, unknown if pre- or post-term	23-Jun	3	0 (0)		Symbolic fence	No sign of fertilization when contents of all three eggs examined. On 19 June, an unbanded 27-day-old chick from SP96 broods with adults at SP180 nest.
181	SOF	F= M=U?	na	Depredated	30-Jun	≥1	0 (0)		Symbolic fence	
182	6	F=U M=U	27-May	Hatch	28-Jun	3	1 (1)	1 BB:OV	Seasonal Exclosure	Two eggs (without cracks) abandoned post-term. One egg had approximately 2.5-week-old embryo with malformed bill and 1 egg had no sign of fertilization when egg contents examined.
183	SOF	F=U M=NR:WB	2-Jun	Hatch	4-Jul	3	3 (2)	3 unbanded	Circular excl. with top Symbolic fence	On 16 June, symbolic fence moved west to decrease possible pedestrian disturbance.

Appendix B. Snowy plover nests at ODSVRA in 2019 (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
184	NOF	F= M=	30-May	Depredated	30-Jun	3	0 (0)		Seasonal Exclosure	On 25 June, 1 egg described as having a small circular area of discoloration and a pinhole in outer shell layer.
185	SOF	F=VG:GW M=GA:WW	18-May	Hatch	19-Jun	3	2 (0)	2 unbanded	Symbolic fence	One egg (without cracks) abandoned pre-term. No sign of fertilization when egg contents examined.
186	8	F=VG:BW M=RR:AB	17-Jun	Hatch	19-Jul	3	3 (0)	3 unbanded	Symbolic fence	On 25 June, 30-day-old fledgling BB:GO from SP39 broods with RR:AB male at SP186. RR:AB male was also associated male with SP39.
187	6	F=Banded M=U	14-Jun	Hatch (Split)	16-Jul	3	2 (0)	2 PG:VW	Seasonal Exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined. Brood raised on northern 6 exclosure shoreline near the open riding area and territorial adult aggression seen on several occasions (see report Notes section). On 23 July, both chicks observed alive. On 25 July, 1 PG:VW chick carcass observed dragged by adult male. The remaining chick was observed having difficulty walking on 26 July and an additional chick carcass was observed on 27 July in the area chick was last seen alive (see Table H.5 in Appendix H).
188	SOF	F=U M=U?	16-Jun	Depredated, coyote	13-Jul	3	0 (0)		Symbolic fence	
189	SOF	F=U M=	3-Jun	Depredated, avian	29-Jun	3	0 (0)		Symbolic fence	
190	8	F= M=	na	Depredated, northern harrier	19-Jun	≥1	0 (0)		Seasonal Exclosure	
191	NOF	F=U M=U	4-Jun	Hatch	6-Jul	3	3 (0)	3 unbanded	Symbolic fence	
192	SOF	F=NB:OY M=VV:VB	6-Jun	Depredated, coyote	25-Jun	3	0 (0)		Symbolic fence	
193	NOF	F=U M=U	7-Jun	Hatch	9-Jul	3	3 (0)	3 unbanded	Circular excl. with top Symbolic fence	
194	6	F=(OV:BR)? M=U	13-Jun	Hatch	15-Jul	3	2 (1)	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 2019 (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
195	6	F=U M=U	30-May	Hatch	1-Jul	3	2 (0)	2 unbanded	Symbolic fence	One egg abandoned post-term. No sign of fertilization when egg contents examined.
196	7	F=U M=GG:AY	5-Jun	Hatch	7-Jul	3	2 (unk)	2 unbanded	Symbolic fence	One egg abandoned post-term. Approximately 3-week-old embryo when egg contents examined.
197	7	F=U M=U	12-Jun	Hatch	14-Jul	3	3 (0)	3 unbanded	Symbolic fence	
198	6	F=VV:AB M=U	15-Jun	Hatch (Split)	17-Jul	3	2 (0)	2 VG:WB	Seasonal Exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
199	7	F=U M=GA:Y-	30-May	Hatch (Split)	1-Jul	3	2 (2)	2 unbanded	Symbolic fence	One egg abandoned post-term. Approximately 3.5-week-old embryo when egg contents examined.
200	7	F=RR:BB M=U	12-Jun	Hatch (Split)	14-Jul	3	3 (0)	3 GA:BA	Seasonal Exclosure	
201	8	F=U M=U?	12-Jun	Hatch	14-Jul	3	2 (0)	2 GG:PV	Symbolic fence	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
202	8	F=U M=U	30-May	Hatch	1-Jul	≥2	2 (0)	2 unbanded	Symbolic fence	Nest location known by multiple observations of incubating adult. To avoid disturbing young snowy plover broods, nest not walked to and total egg number unknown.
203	7	F=U M=U	30-May	Hatch (Split)	1-Jul	3	3 (0)	3 VV:VA	Seasonal Exclosure	
204	NOF	F=VV:AA M=U	16-Jun	Hatch (Split)	18-Jul	3	3 (1)	2 VG:VA 1 unbanded	Circular excl. with top Symbolic fence	Banded chick fledged.
205	7	F= M=	na	Unknown	2-Jul	≥1	(0)		Seasonal Exclosure	Nest not walked to when active to avoid disturbing young least tern broods. One egg found abandoned after adult stopped incubating. No sign of fertilization when egg contents examined.

Appendix B. Snowy plover nests at ODSVRA in 2019 (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
206	6	F=GG:AB M=U	2-Jun	Hatch	4-Jul	3	2 (1)	1 PG:VV 1 unbanded	Bumpout Seasonal Exclosure	One egg abandoned post-term. No sign of fertilization when egg contents examined. On 4 July, 2 chicks hatched and 1 chick left unbanded due to small skin tag on leg. Brood raised on northern 6 exclosure shoreline and entered the open riding area on 31 July, territorial adult aggression seen on several occasions. Unbanded chick was small for age at time of fledge (see report Notes section).
207	NOF	F=U M=GG:RB	6-Jun	Hatch	8-Jul	3	3 (1)	3 VV:GV	Symbolic fence	
208	6	F=U M=VV:YG	14-Jun	Hatch	16-Jul	3	3 (0)	3 unbanded	Symbolic fence	On 2 August, one of two 17-day-old chicks observed with bloated abdomen and splayed legs. Both chicks last seen on 4 August (see Table H.1 in Appendix H).
209	7	F=U M=PG:VG	23-Jun	Hatch (Split)	25-Jul	3	3 (1)	2 BB:RV 1 unbanded	Seasonal Exclosure	Unbanded chick fledged.
210	6	F=BB:AR M=U	29-Jun	Hatch	31-Jul	2	2 (0)	2 VV:VR	Symbolic fence	
211	7	F=U M=U	14-Jun	Hatch	16-Jul	3	3 (0)	3 unbanded	Symbolic fence	
212	7	F=PG:PG M=PG:VB	18-Jun	Hatch	20-Jul	3	3 (0)	3 unbanded	Symbolic fence	
213	SOF	F=U M=U	25-Jun	Hatch	27-Jul	2	2 (0)	2 GA:BV	Circular excl. with top Symbolic fence	
214	7	F=BB:VG M=U	7-Jun	Hatch (Split)	9-Jul	3	2 (1)	2 PV:GV	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
215	6	F=U? M=U	27-Jun	Hatch	29-Jul	2	2 (0)	2 unbanded	Symbolic fence	
216	7	F=U M=U	14-Jun	Hatch	16-Jul	3	2 (0)	2 unbanded	Symbolic fence	One egg abandoned post-term. No sign of fertilization when egg contents examined.
217	8	F=U M=U	8-Jun	Hatch	10-Jul	3	3 (1)	3 unbanded	Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2019 (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	6	F=U M=GG:OY	21-Jun	Hatch (Split)	23-Jul	3	3 (0)	3 PG:BV	Seasonal Exclosure	On 26 July, associated male GG:OY observed depredated by a subadult female peregrine. At time of predation, the male was attending 3 chicks. The 3 chicks (2- to 3-days old) were seen on the same day after the predation event without an adult and a single unattended chick was last seen on 27 July.
219	BY	F=U M=	27-Jun	Hatch	29-Jul	2	2 (2)	2 GA:VV	Seasonal Exclosure	
220	7	F=U M=U	5-Jul	Hatch	6-Aug	3	2 (0)	2 GA:AV	Symbolic fence	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
221	BY	F=U? M=U	3-Jul	Hatch	4-Aug	3	3 (0)	3 BB:LL	Seasonal Exclosure	
222	NOF	F=U M=GG:RB	1-Jul	Abandoned pre-term	2-Aug	2	0 (0)		Circular excl. with top Symbolic fence	On 4 August, 2 eggs determined to be abandoned and taken to Santa Barbara Zoo. Both eggs hatched and both chicks fledged. Chicks banded BB:LB and VV:LV (see Table F.4 in Appendix F).
223	NOF	F=VG:GW M=U	23-Jun	Hatch (Split)	25-Jul	3	3 (2)	1 BB:YV 2 unbanded	Circular excl. with top Symbolic fence	Two unbanded chicks fledged.
224	SOF	F=PG:VR M=PG:OW	10-Jul	Depredated, avian	14-Jul	≥2	0 (0)		Symbolic fence	
225	6	F=U M=	12-Jul	Abandoned pre-term	10-Aug	≥1	0 (0)		Symbolic fence	Nest not walked to when active to avoid disturbing young snowy plover broods. One egg found abandoned after adult stopped incubating. Approximately 3-week-old embryo when egg contents examined.
226	NOF	F=U M=	7-Jul	Hatch (Split)	8-Aug	3	3 (0)	3 VG:BV	Circular excl. with top Symbolic fence	
227	SOF	F=U M=	6-Jul	Hatch	7-Aug	3	1 (0)	1 unbanded	Circular excl. with top Symbolic fence	One egg unknown fate and one egg (without cracks) abandoned post-term.
228	SOF	F=U M=	3-Jul	Hatch	4-Aug	2	2 (0)	2 GG:LL	Circular excl. with top Symbolic fence	
229	SOF	F=U M=GA:OR	3-Jul	Hatch	4-Aug	3	2 (0)	2 VV:LL	Circular excl. with top Symbolic fence	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
230	7	F=GG:RB M=VV:WR	9-Jul	Hatch (Split)	10-Aug	3	3 (1)	2 VG:AV 1 unbanded	Symbolic fence	Banded chick fledged.

Appendix B. Snowy plover nests at ODSVRA in 2019 (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
231	Unknown	F= M=RR:AW	na	Hatch	(5-Aug)	≥2	2 (1)	2 VG:WV		On 7 August, found as brood of 2 small chicks on 8 exclosure shoreline.
232	SOF	F= M=	na	Unknown	na	≥2	(0)		Symbolic fence	On 30 August, nest found as 2 eggs abandoned, unknown if pre- or post-term. No sign of fertilization when egg contents examined.
233	Unknown	F=U M=	na	Hatch	(17-May)	3	3 (1)	3 unbanded		On 21 May, found as brood of 3 small chicks on South Oso Flaco shoreline.
234	Unknown	F= M=U	na	Hatch	(29-May)	≥1	1 (0)	1 unbanded		On 4 June, found as brood of 1 small chick on 7 exclosure shoreline.
235	Unknown	F=U M=U	na	Hatch	(22-Jun)	3	3 (1)	3 BB:YA		On 25 June, found as brood of 3 small chicks on 7 exclosure shoreline. On 8 July, one approximately 16-day-old BB:YA chick observed depredated by western gull (see Table H.4 in Appendix H).
236	Unknown	F=U M=U	na	Hatch	(22-Jun)	≥2	2 (0)	2 GA:VA		On 25 June, found as brood of 2 small chicks on North Oso Flaco shoreline.
237	Unknown	F=U M=U	na	Hatch	(23-Jun)	≥2	2 (1)	2 unbanded		On 25 June, found as brood of 2 small chicks on 8 exclosure shoreline.
238	Unknown	F=U M=GN:RR	na	Hatch	(29-Jun)	3	3 (0)	3 unbanded		On 2 July, found as brood of 3 small chicks on North Oso Flaco shoreline.
239	Unknown	F=NR:BR M=U	na	Hatch	(11-Jul)	≥2	2 (1)	2 unbanded		On 18 July, found as brood of 2 chicks on 6 exclosure shoreline.

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.
UNA = unassigned nest

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
UNA1	Unknown	F= M=U	na	Hatch	(20-May)	-	1 (0)	1 unbanded	-	
UNA2	Unknown	F= M=	na	Hatch	(22-May)	-	1 (0)	1 unbanded	-	
UNA3	Unknown	F=U M=U	na	Hatch	(22-June)	-	2 (0)	2 unbanded	-	
UNA4	Unknown	F=U M=VG:GR	na	Hatch	(23-Jun)	-	3 (0)	3 unbanded	-	

Appendix B. Snowy plover nests at ODSVRA in 2019 (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
UNA5	Unknown	F=GA:RG M=U	na	Hatch	(24-Jun)	-	1 (0)	1 unbanded	-	On 28 June, adults adopted a 4-day-old PG:GV chick from SP131. This chick was last seen on 17 July at 23 days old.
UNA6	Unknown	F=U M=GA:GB	na	Hatch	(24-Jun)	-	1 (0)	1 unbanded	-	
UNA7	Unknown	F= M=U	na	Hatch	(25-Jun)	-	1 (0)	1 unbanded	-	
UNA8	Unknown	F=U M=GA:YB	na	Hatch	(28-Jun)	-	3 (1)	3 unbanded	-	
UNA9	Unknown	F= M=U (sex?)	na	Hatch	(29-Jun)	-	1 (1)	1 unbanded	-	
UNA10	Unknown	F=U M=GG:GB	na	Hatch	(1-Jul)	-	1 (0)	1 unbanded	-	
UNA11	Unknown	F= M=GA:WR	na	Hatch	(5-Jul)	-	2 (2)	2 unbanded	-	On 14-16 July, associated GA:WR male was observed with a left foot injury (see Table H.1 in Appendix H).
UNA12	Unknown	F= M=GG:OR	na	Hatch	(6-Jul)	-	1 (1)	1 unbanded	-	
UNA13	Unknown	F=GA:O- M=U	na	Hatch	(7-Jul)	-	2 (0)	2 unbanded	-	
UNA14	Unknown	F= M=PG:YB	na	Hatch	(13-Jul)	-	3 (0)	3 unbanded	-	

APPENDIX C. MAPS OF ALL CALIFORNIA LEAST TERN AND SNOWY PLOVER NEST LOCATIONS AT ODSVRA IN 2019.

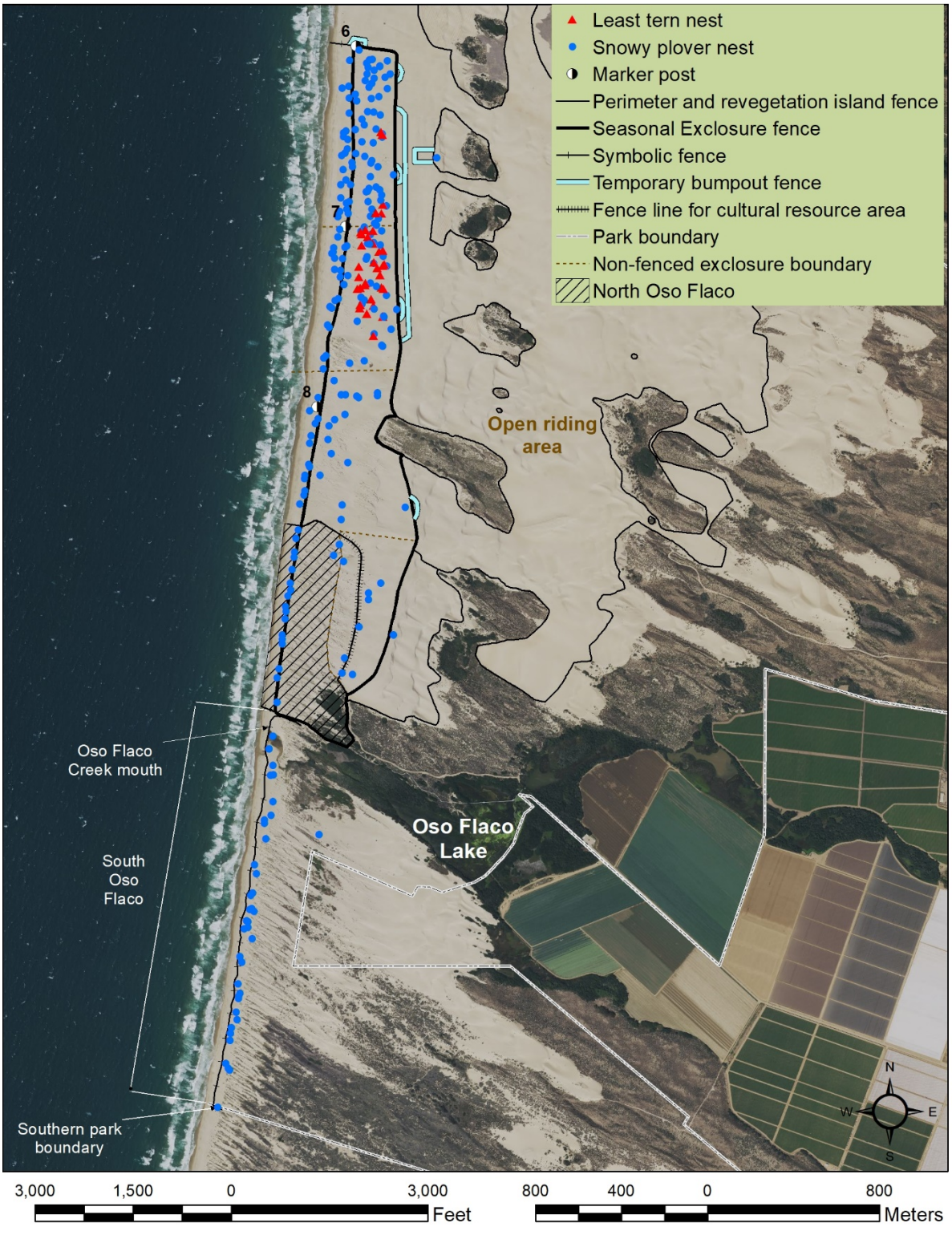

Figure C.1. California least tern and snowy plover nest locations at ODSVRA in 2019.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2019 (continued).

Figure C.2. California least tern nest locations at ODSVRA 6 exclosure in 2019.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2019 (continued).

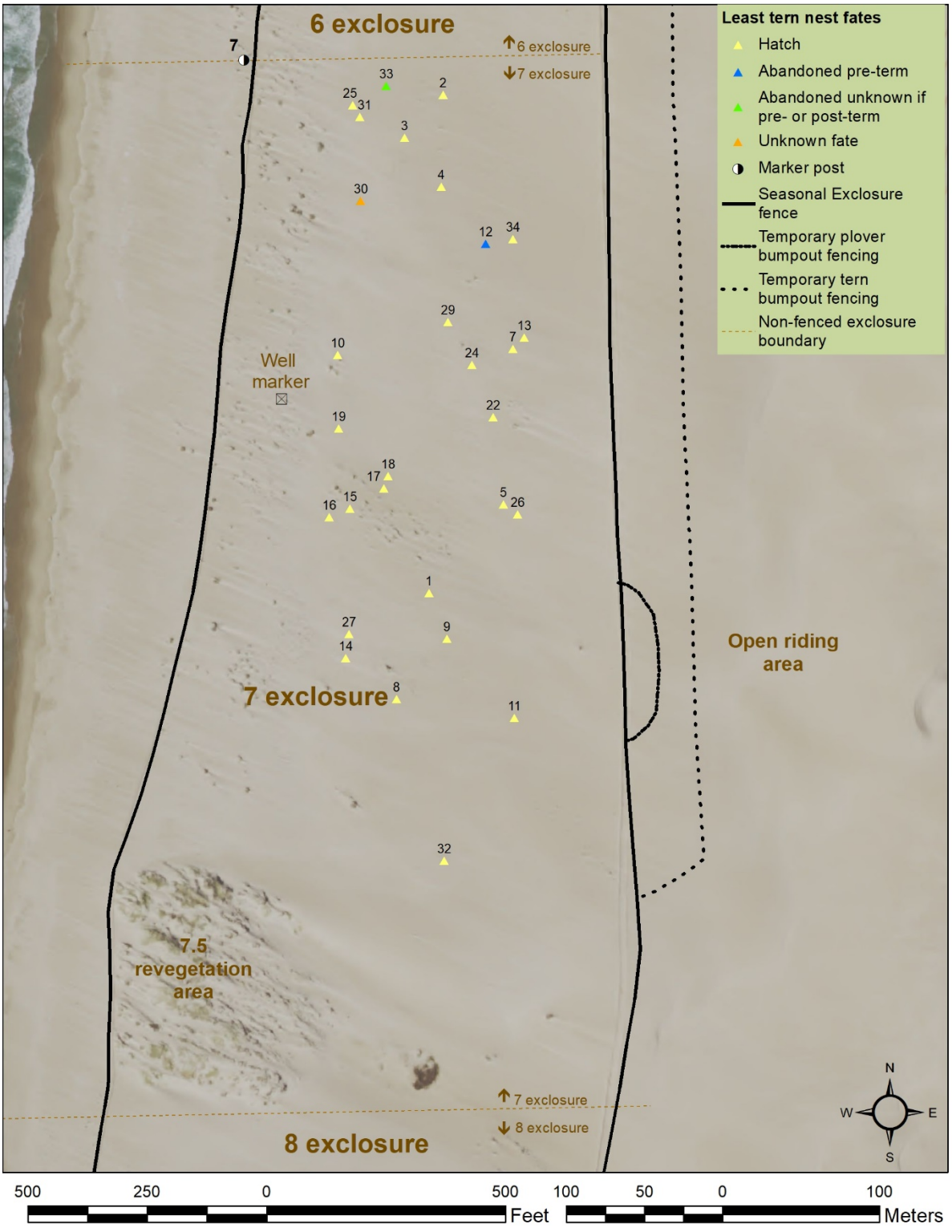

Figure C.3. California least tern nest locations at ODSVRA 7 exclosure in 2019.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2019 (continued).

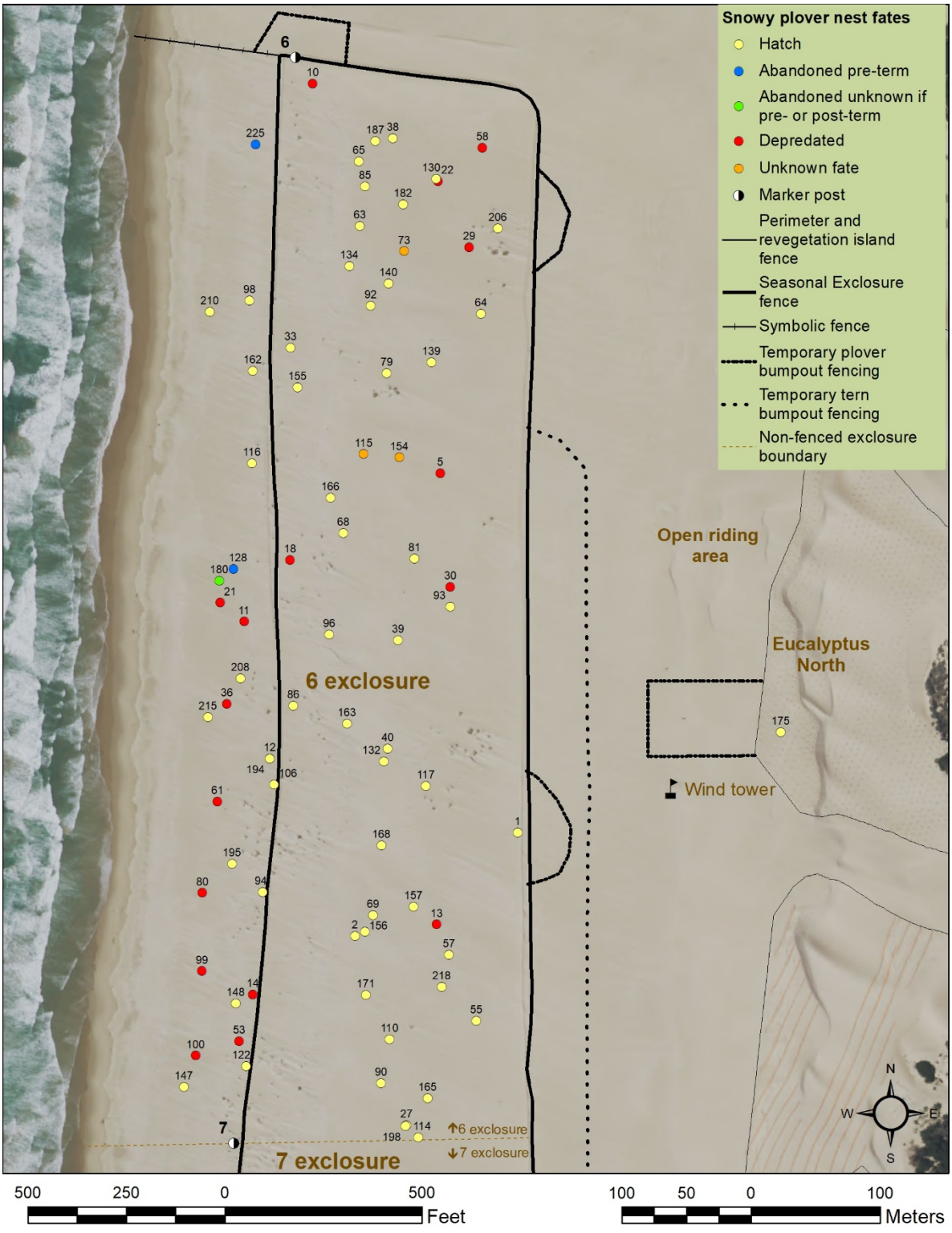

Figure C.4. Snowy plover nest locations at ODSVRA 6 exclosure and Eucalyptus North revegetation area in 2019.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2019 (continued).

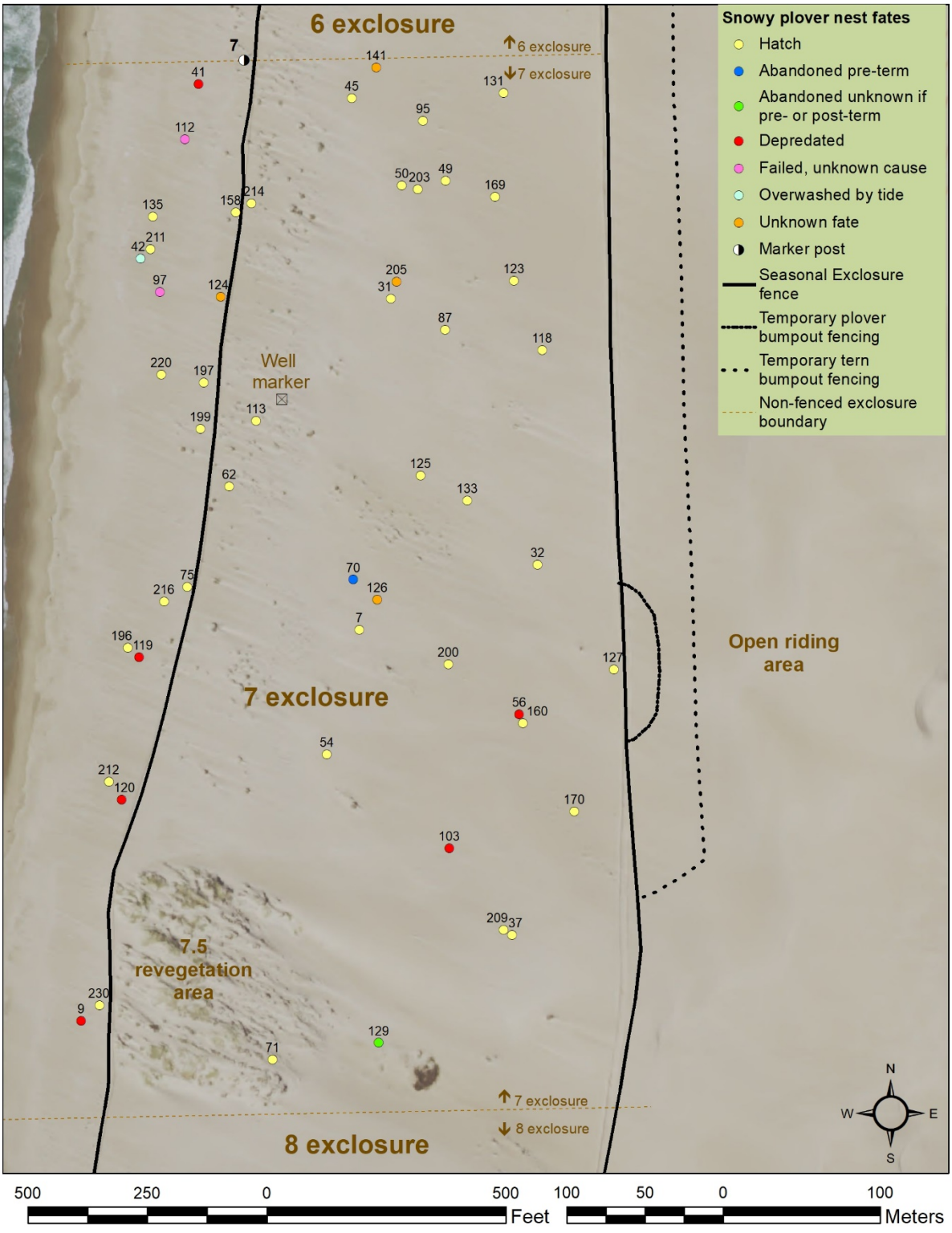

Figure C.5. Snowy plover nest locations at ODSVRA 7 exclosure in 2019.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2019 (continued).

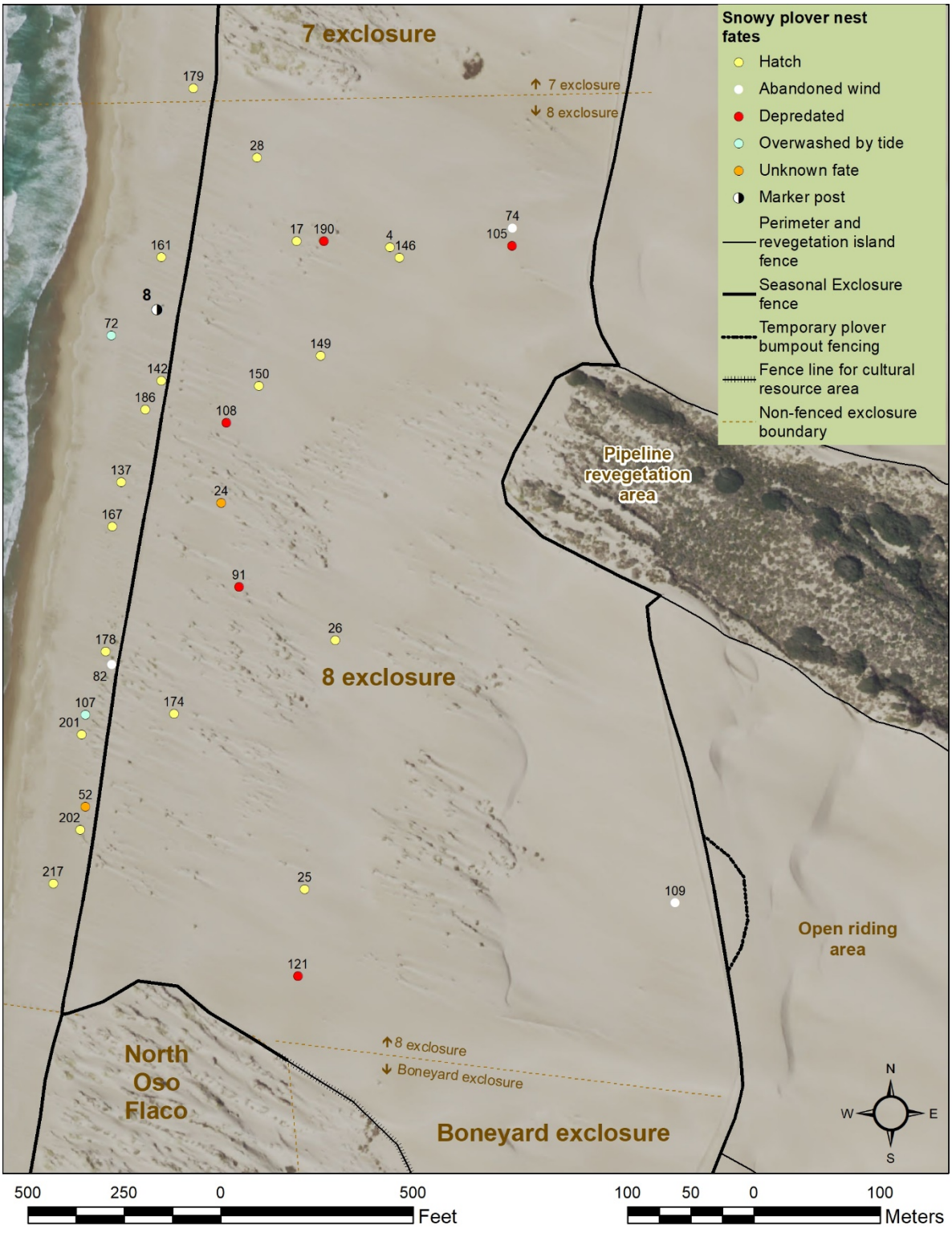

Figure C.6. Snowy plover nest locations at ODSVRA 8 exclosure in 2019.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2019 (continued).

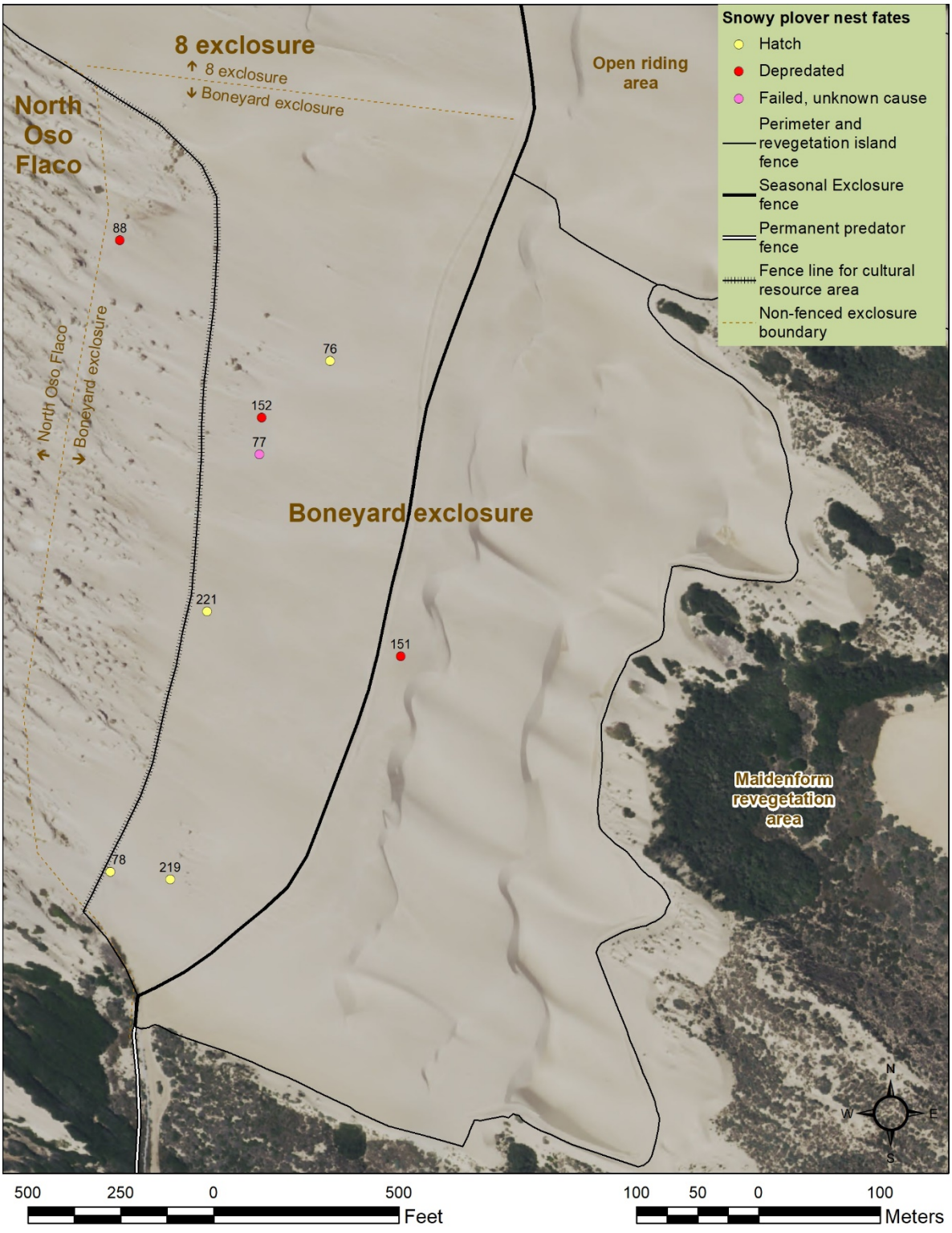

Figure C.7. Snowy plover nest locations at ODSVRA Boneyard exclosure in 2019.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2019 (continued).

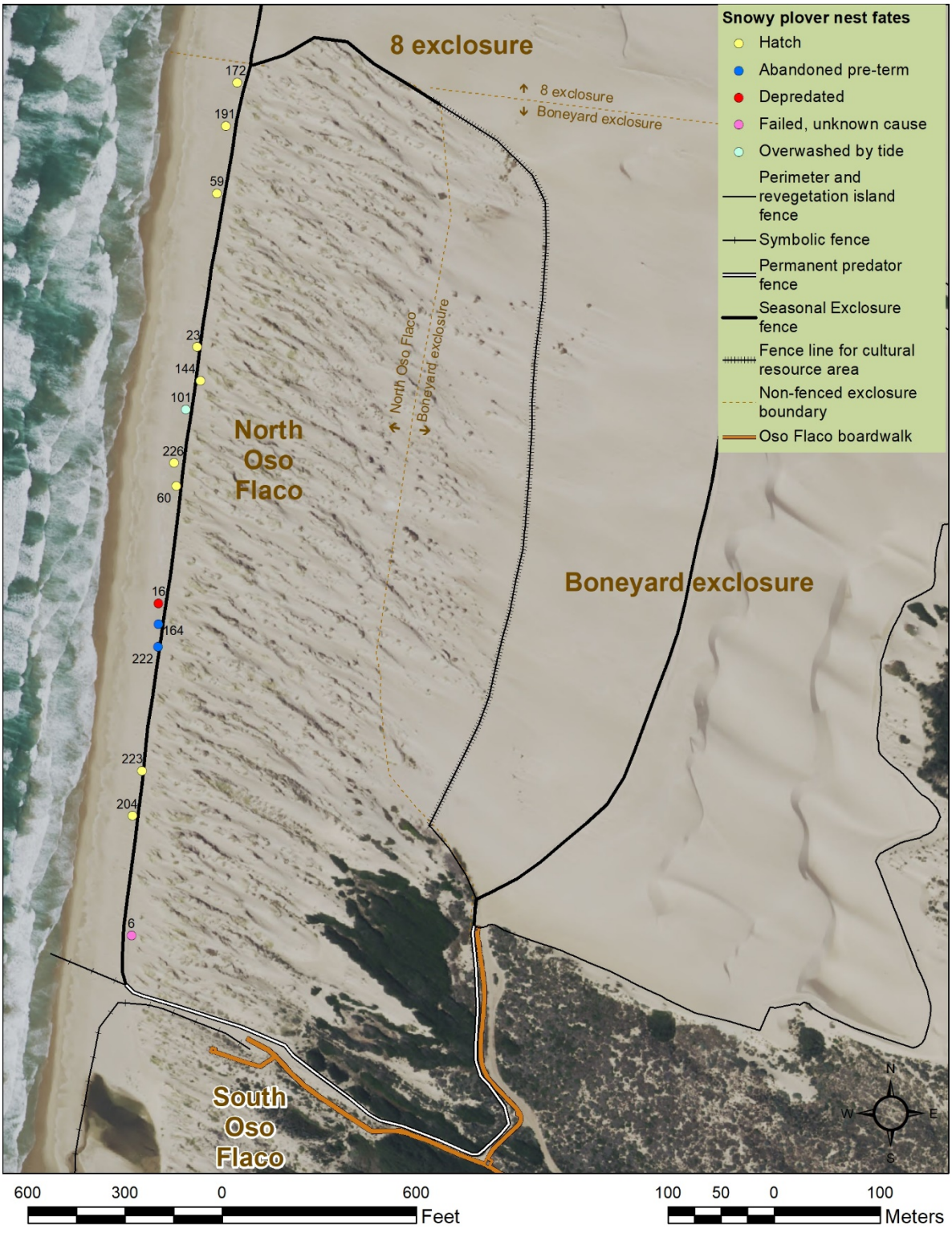

Figure C.8. Snowy plover nest locations at ODSVRA North Oso Flaco in 2019.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2019 (continued).

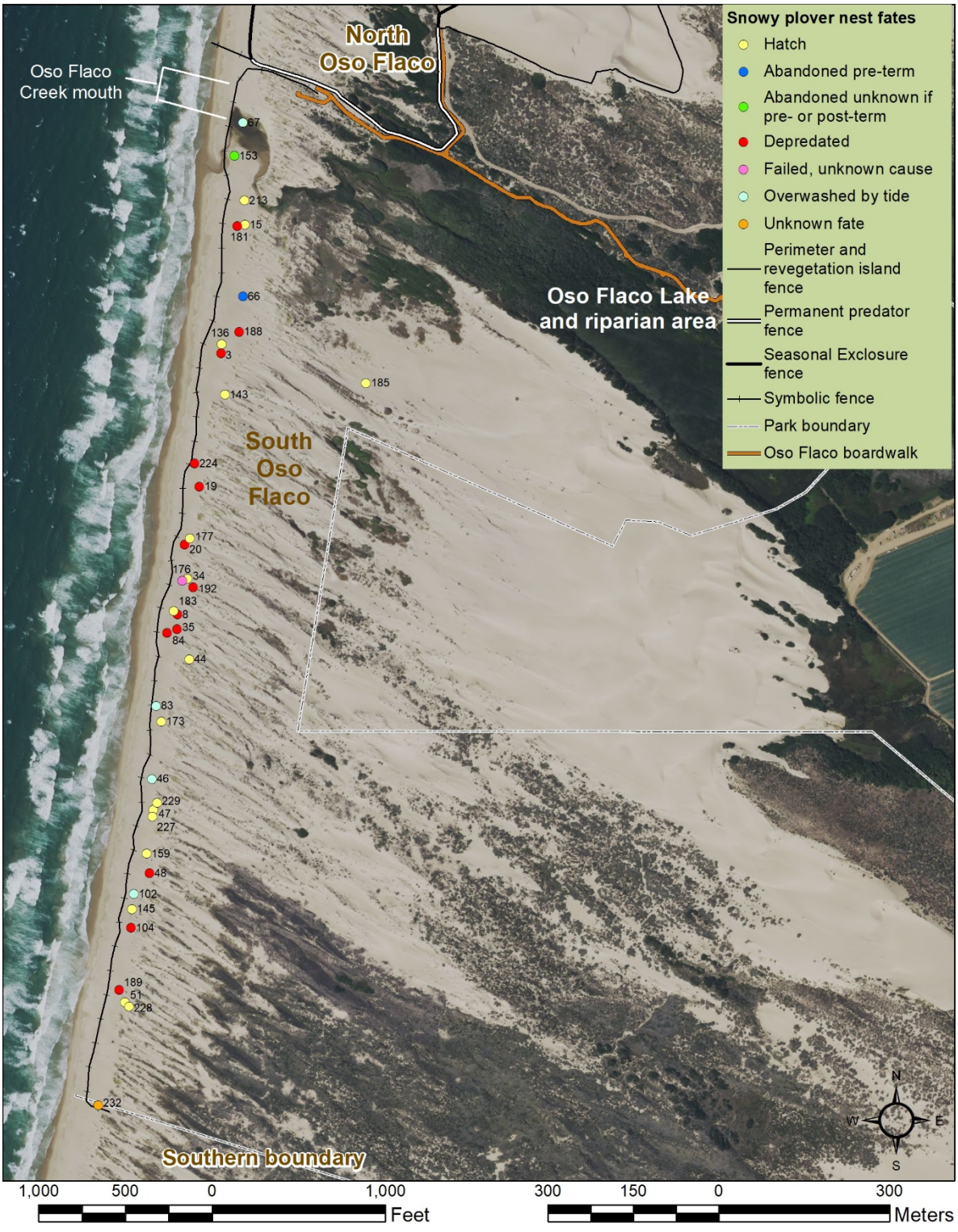

Figure C.9. Snowy plover nest locations at ODSVRA South Oso Flaco in 2019.

APPENDIX D. BANDED LEAST TERNS AND SNOWY PLOVERS.

Table D.1. Banded least terns recorded at ODSVRA in 2019.

Juveniles fledged from ODSVRA in 2019 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	Origin and Year Banded	Dates Seen	Notes
-:A/B	ODSVRA unknown year	6/3, 6/9, 7/30	Multiple birds banded at ODSVRA with A/B on the right leg.
-:B/O	ODSVRA 2011	7/29	Originally banded B/W:B/O. **LT32 breeding adult.**
-:G/O	ODSVRA 2008 or 2011	5/19, 5/21, 7/31	G/Y:G/O in 2008 or B/W:G/O in 2011.
A/B:G/Y	ODSVRA 2014	5/12, 5/28	
A/R:Y/G	ODSVRA 2005 or 2015	6/4	
A/Y:B/W	ODSVRA 2012	7/15	
B/A:G/Y	ODSVRA 2014	7/25	**LT15 breeding adult.**
B/O:-	ODSVRA unknown year	7/25, 8/1	Multiple birds banded at ODSVRA with B/O on the left leg.
B/R:B/W	ODSVRA 2012	7/18, 7/25	
B/R:Y/G	ODSVRA 2015	5/13, 5/21	
B/W:O/W	ODSVRA 2011	5/25, 7/25	
B/W:O/Y	ODSVRA 2011	7/31	
B/W:P	ODSVRA 2011	7/25	
B/W:R/W	ODSVRA 2011	5/30	**LT2 breeding adult.**
B/W:Y/G	ODSVRA 2011 or 2015	7/24	
B/Y:Y/G	ODSVRA 2015	6/11	
G/O:Y/G	ODSVRA 2015	7/25	
G/W:Y/G	ODSVRA 2015	7/25	
G/Y:S	ODSVRA 2004 or unknown year	7/25	Multiple birds banded at ODSVRA with this combo in 2004, or any G/Y banded bird with tape loss on right leg.
G:B/W	ODSVRA 2012	6/11	
N:G/Y	ODSVRA 2014	5/12, 5/24, 7/29	
O/G:B/W	ODSVRA 2012	5/13, 5/23	
R/W:W/B	ODSVRA 2009 or 2013	6/9, 7/18, 7/25	
S:B	Unknown origin and year	7/25	Adult plumage, therefore not a VAFB 2018 bird, so tape loss occurred on either leg. Multiple birds banded at ODSVRA with B on right leg.
S:G/Y	ODSVRA 2003 or unknown year	7/25	Multiple birds banded at ODSVRA with this combo in 2003, or any G/Y banded bird with tape loss on left leg.
W/B:R/Y	ODSVRA 2010	5/17, 5/21, 5/31, 7/28, 7/31, 8/3	**LT25 breeding adult.**
W/B:W	ODSVRA 2010	7/18, 7/19, 7/25	**LT11 breeding adult.**
W/B:W/A	ODSVRA 2010	7/25	
W/B:W/G	ODSVRA 2010	5/25, 5/27, 7/25	**LT9 breeding adult.**
W/R:B/W	ODSVRA 2012	5/31, 7/22, 7/31	
W/R:W/B	ODSVRA 2013	7/5, 7/25, 7/29, 8/1	**LT22 breeding adult.**
W:G/Y	ODSVRA 2007 or 2014	5/13, 7/19	**LT2 breeding adult.**

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

Table D.1. Banded least terns recorded at ODSVRA in 2019 (continued).

Band	Origin and Year Banded	Dates Seen	Notes
Y/G:B/W	ODSVRA 2006, 2012, or 2016	5/30, 6/5, 6/7, 6/22, 7/25, 7/29, 7/31, 8/1, 8/3	
Y/G:O/A	ODSVRA 2016	7/25	
Y/G:R/B	ODSVRA 2016	6/5, 7/31	
Y/G:W/B	ODSVRA 2006, 2013, or 2016	7/29	**LT6 breeding adult.**
Y/G:W/R	ODSVRA 2006 or 2016	8/1	
Y/G:W/Y	ODSVRA 2006 or 2016	5/12, 5/31	

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

Table D.2. Least terns banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2019.

This is a partial list based on information received from monitors and managers. ODSVRA parks resource staff made specific trips to survey terns at RGDCP. All birds from ODSVRA were banded as chicks and some combinations have been used multiple years and it is possible to have more than one bird with the same combination. A number of birds had a band on only one leg, and 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.

RGDCP = Rancho Guadalupe Dunes County Park (six miles south of ODSVRA in same dune complex), VAFB = Vandenberg Air Force Base

Band Combination	Year Banded	Location Seen	County	Dates Seen	Notes
B/W:B/W	2011	Eden Landing	Alameda, CA	7/4	Nest camera photo. Breeding adult.
-:B/O	2011	RGDCP	Santa Barbara, CA	7/31, 8/8	Originally banded B/W:B/O.
-:G/O	2008 or 2011	RGDCP	Santa Barbara	8/6, 8/8	G/Y:G/O in 2008 or B/W:G/O in 2011.
-:W/A	2006, 2008, 2010, or 2011	RGDCP	Santa Barbara	7/26	Y/G:W/A in 2006, G/Y:W/A in 2008, W/B:W/A in 2010, or B/W:W/A in 2011.
-:Y	Unknown year	RGDCP	Santa Barbara	8/2	Multiple birds banded at ODSVRA with yellow on the right leg.
-:Y/R	2006, 2008, 2010, or 2011	RGDCP	Santa Barbara	8/7	Y/G:Y/R in 2006, G/Y:Y/R in 2008, W/B:Y/R in 2010, or B/W:Y/R in 2011.
A/Y:B/W	2012	RGDCP	Santa Barbara	7/31	
A/Y:G/Y	2007 or 2014	RGDCP	Santa Barbara	7/31	
B/A:G/Y	2014	RGDCP	Santa Barbara	7/31, 8/2, 8/7, 8/8	
B/O:-	Unknown year	RGDCP	Santa Barbara	8/7	Multiple birds banded at ODSVRA with B/O on the left leg.
B/R:B/W	2012	RGDCP	Santa Barbara	7/31, 8/2	
B/W:O/Y	2011	RGDCP	Santa Barbara	8/7	
B/W:W/B	2009, 2011 or 2013	RGDCP	Santa Barbara	7/31, 8/6	
B:G/Y	2007 or 2014	RGDCP	Santa Barbara	7/26	
B:W/B	2009 or 2013	RGDCP	Santa Barbara	7/26, 7/31	
G/Y:B/W	2008, 2012 or 2018	RGDCP	Santa Barbara	7/31, 8/2	
G/Y:G/Y	2008, 2014, or 2017	RGDCP	Santa Barbara	7/31	
O/G:B/W	2012	RGDCP	Santa Barbara	8/6, 8/7	
O/W:A	2019	RGDCP	Santa Barbara	7/26, 8/1	Juvenile.
O/W:A/W	2019	RGDCP	Santa Barbara	7/26, 7/29, 7/31, 8/1, 8/2, 8/6, 8/7	Juvenile.
O/W:A/Y	2019	RGDCP	Santa Barbara	7/26, 7/31, 8/1, 8/2, 8/6, 8/8	Juvenile.
O/W:B	2019	RGDCP	Santa Barbara	7/22, 7/31, 8/1	Juvenile.
O/W:B/Y	2019	RGDCP	Santa Barbara	7/29, 7/31, 8/1, 8/2, 8/8	Juvenile.
O/W:G	2019	RGDCP	Santa Barbara	7/26, 7/31	Juvenile.
O/W:K	2019	RGDCP	Santa Barbara	7/31, 8/1	Juvenile.
O/W:L	2019	RGDCP	Santa Barbara	7/31, 8/1	Juvenile.
O/W:O	2019	RGDCP	Santa Barbara	7/31	Juvenile.
O/W:O/B	2019	RGDCP	Santa Barbara	7/31, 8/6, 8/7, 8/8, 8/9	Juvenile.
O/W:O/G	2019	RGDCP	Santa Barbara	8/7, 8/9	Juvenile.
O/W:O/R	2019	RGDCP	Santa Barbara	8/8, 8/9	Juvenile.
O/W:P	2019	RGDCP	Santa Barbara	7/31, 8/1, 8/2, 8/6, 8/8	Juvenile.
O/W:R	2019	RGDCP	Santa Barbara	7/22, 7/26, 7/31, 8/1, 8/2, 8/7, 8/9	Juvenile.
O/W:R/A	2019	RGDCP	Santa Barbara	7/31, 8/1, 8/2, 8/7, 8/8, 8/9	Juvenile.
O/W:R/B	2019	RGDCP	Santa Barbara	7/31, 8/1, 8/2	Juvenile.
O/W:R/G	2019	RGDCP	Santa Barbara	7/31, 8/2, 8/7, 8/8	Juvenile.
O/W:R/O	2019	RGDCP	Santa Barbara	8/6, 8/7, 8/8, 8/9	Juvenile.
O/W:R/W	2019	RGDCP	Santa Barbara	7/26, 8/2, 8/6, 8/7, 8/9	Juvenile.
O/W:R/Y	2019	RGDCP	Santa Barbara	8/1, 8/7	Juvenile.

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

Table D.2. Least terns banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2019 (continued).

Band Combination	Year Banded	Location Seen	County	Dates Seen	Notes
O/W:V	2019	RGDCP	Santa Barbara	7/29, 7/31, 8/1	Juvenile.
O/W:W	2019	RGDCP	Santa Barbara	7/22, 7/26, 7/31, 8/1, 8/2, 8/6, 8/7	Juvenile.
O/W:W/A	2019	RGDCP	Santa Barbara	7/31, 8/1, 8/2, 8/6, 8/7, 8/8	Juvenile.
O/W:W/G	2019	RGDCP	Santa Barbara	7/22, 7/26, 7/29, 7/31, 8/1, 8/2	Juvenile.
O/W:W/O	2019	RGDCP	Santa Barbara	7/31, 8/1, 8/2, 8/7, 8/8	Juvenile.
O/W:W/R	2019	RGDCP	Santa Barbara	7/22, 7/26, 7/31, 8/1, 8/7, 8/9	Juvenile.
O/W:Y	2019	RGDCP	Santa Barbara	7/29, 7/31, 8/1, 8/7, 8/8	Juvenile.
O/W:Y/B	2019	RGDCP	Santa Barbara	7/31, 8/1, 8/2, 8/8, 8/9	Juvenile.
O/W:Y/G	2019	RGDCP	Santa Barbara	7/22, 7/26, 7/31, 8/1, 8/2, 8/7	Juvenile.
O/W:Y/R	2019	RGDCP	Santa Barbara	7/31, 8/1, 8/2	Juvenile.
O:B/W	2012	RGDCP	Santa Barbara	7/22	
R/B:W/B	2009	RGDCP	Santa Barbara	7/22	
W/B:B/Y	2010	RGDCP	Santa Barbara	7/26	
W/B:R/Y	2010	RGDCP	Santa Barbara	8/7	
W/B:W	2010	RGDCP	Santa Barbara	7/26	
W/B:W/G	2010	RGDCP	Santa Barbara	7/31	
W/R:B/W	2012	RGDCP	Santa Barbara	8/8	
W:G/Y	2007 or 2014	RGDCP	Santa Barbara	7/22	
W:Y/G	2015	RGDCP	Santa Barbara	7/31	
Y/G:B/W	2006, 2012, or 2016	RGDCP	Santa Barbara	7/26, 8/7, 8/9	
Y/G:R/B	2016	RGDCP	Santa Barbara	8/7	
Y/G:W/R	2006 or 2016	RGDCP	Santa Barbara	8/7	
Y/G:W/R/W	2016	RGDCP	Santa Barbara	7/31, 8/2, 8/8, 8/9, 8/15	
Y/G:W/Y	2006 or 2016	RGDCP	Santa Barbara	7/31, 8/2	
Y/G:Y/A	2016	RGDCP	Santa Barbara	7/26	
Y/W:Y/G	2015	RGDCP	Santa Barbara	7/31	
A:Y/G	2015	VAFB	Santa Barbara	8/7	
B/R:Y/G	2015	VAFB	Santa Barbara	6/5, 8/7	
B:W/B	2009 or 2013	VAFB	Santa Barbara	8/16	
G/Y:B/W	2008 or 2012	VAFB	Santa Barbara	8/7	VAFB breeding adult.
K:W/B	2013	VAFB	Santa Barbara	7/31	
O/G:G/Y	2007 or 2014	VAFB	Santa Barbara	6/17	
O/W:A/W	2019	VAFB	Santa Barbara	8/16	Juvenile.
O/W:G	2019	VAFB	Santa Barbara	8/7	Juvenile.
O/W:L	2019	VAFB	Santa Barbara	8/7, 8/9, 8/16	Juvenile.
O/W:O/G	2019	VAFB	Santa Barbara	8/16	Juvenile.
O/W:O/Y	2019	VAFB	Santa Barbara	8/16	Juvenile.
O/W:R/O	2019	VAFB	Santa Barbara	8/16	Juvenile.
O/W:R/W	2019	VAFB	Santa Barbara	8/16	Juvenile.
W/A:Y/G	2015	VAFB	Santa Barbara	7/31	VAFB breeding adult.
W/B:W	2010	VAFB	Santa Barbara	7/31	
W/G:Y/G	2015	VAFB	Santa Barbara	6/17, 7/31	
W/O:G/Y	2007 or 2014	VAFB	Santa Barbara	8/9	
W/R:W/B	2013	VAFB	Santa Barbara	6/5, 8/16	
W/Y:W/B	2009 or 2013	VAFB	Santa Barbara	7/31	
W:Y/G	2015	VAFB	Santa Barbara	8/7, 8/16	
Y/A:Y/G	2005 or 2015	VAFB	Santa Barbara	8/16	

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

Table D.2. Least terns banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2019 (continued).

Band Combination	Year Banded	Location Seen	County	Dates Seen	Notes
Y/G:W/B	2006, 2013, or 2016	VAFB	Santa Barbara	6/17	
Y/G:W/R	2006 or 2016	VAFB	Santa Barbara	8/16	
O/G:B/W	2012	Camp Pendleton	San Diego, CA	8/12	
O/W:W/O	2019	Camp Pendleton	San Diego	8/12, 8/15	Juvenile.
-:A/R, rebanded W.M14:S	2006	Coronado	San Diego	7/7	Originally banded Y/G:A/R at ODSVRA as chick in 2006. Trapped in 2019 as -:A/R and rebanded W.M14:S (white band with M14 black alphanumeric on left).
Y/O:Y/G	2015	Coronado	San Diego	5/7	

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

Table D.3. Banded snowy plovers recorded at ODSVRA 1 October 2018 to 28 February 2019.

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, NWR = National Wildlife Refuge

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
OW:GL	Elkhorn Slough 2016	Monterey, CA	10/1, 10/8, 10/13, 10/14, 10/17, 10/27, 11/13, 11/16, 11/21, 12/5	
AG:AV	Salinas River NWR 2017	Monterey	10/1, 10/9, 10/10, 10/16, 10/18, 10/20, 10/22, 10/25, 10/27, 11/2, 11/3, 11/7, 11/13, 11/14, 11/21, 12/5, 12/12, 1/16, 1/22, 2/19, 2/21, 2/27	
OL:GP	Salinas River NWR 2009	Monterey	11/5, 12/5, 12/11, 12/25, 1/16, 1/22, 2/21, 2/27	
YP:OL	Salinas River NWR 2008	Monterey	10/3, 10/11, 10/18, 10/19, 10/20, 10/22, 10/25, 11/3, 11/7, 11/16, 12/26	
WR:BA	Salinas River Mouth 2018	Monterey	12/26, 1/16, 1/22	
YG:WL	Reservation Road 2016	Monterey	10/2, 10/3, 10/5, 10/7, 10/10, 10/27, 11/1, 11/2, 11/21, 12/5, 12/11, 12/26, 12/31, 1/8, 1/16, 2/19, 2/20	
BB:GR	ODSVRA 2012 or 2015	SLO, CA	12/12	
BB:OB	ODSVRA 2014 or 2016	SLO	10/2, 10/3, 10/7	
BB:VG	ODSVRA 2017 or 2018	SLO	10/2, 10/3, 10/10, 10/20, 10/25, 12/5, 12/9, 1/16, 2/7, 2/21	
BB:VR	ODSVRA 2011, 2013, or 2014	SLO	10/2, 10/25, 11/2, 11/7, 11/14, 2/19, 2/21, 2/27	
BB:VY	ODSVRA 2016 or 2017	SLO	10/4, 10/8, 10/9, 10/17, 10/25, 10/27, 11/4, 12/5, 12/11, 12/26, 1/16, 1/22, 2/21	
BB:YW	ODSVRA 2013	SLO	10/1, 10/9, 10/10, 10/11, 10/18, 10/26, 11/2, 11/21, 11/28, 12/5, 1/8, 1/16	
GA:AR	ODSVRA 2015	SLO	1/3	
GA:BB	ODSVRA 2017 or 2018	SLO	10/1, 10/8, 10/14, 10/18, 10/19, 10/25, 11/1, 11/2, 12/11, 12/31, 1/16, 2/21	
GA:OY	ODSVRA 2014 or 2015	SLO	10/9, 10/16, 10/17, 10/20, 10/21, 10/25, 11/2, 11/14, 11/28, 12/26, 12/31, 1/3, 1/8, 1/16, 2/7, 2/21	
GA:PR	ODSVRA 2016 or 2017	SLO	10/25, 11/2, 11/14, 11/21, 12/12, 1/16, 2/7	
GA:RG	ODSVRA 2015 or 2016	SLO	10/1, 10/3, 10/17, 10/25, 11/2, 11/7, 11/14, 11/21, 11/28, 12/12, 1/3, 1/8, 2/7	
GA:RY	ODSVRA 2017	SLO	10/1, 10/4, 10/6, 10/9, 10/10, 10/14, 10/17, 10/19, 10/27, 10/30, 11/1, 11/4, 11/14, 11/16, 11/21, 11/28, 12/3, 12/5, 12/12, 12/19, 1/22, 1/30, 2/7, 2/27	
GA:WW	ODSVRA 2016 or 2017	SLO	10/3, 10/25, 11/2, 11/28, 12/12, 1/3, 1/8, 1/27, 1/29, 2/7	
GA:YG	ODSVRA 2018	SLO	10/9	
GA:YY	ODSVRA 2017 or 2018	SLO	10/2, 10/4, 10/21, 10/26, 10/27, 10/30, 11/2, 11/3, 11/7, 11/21, 11/28, 12/11, 1/16	
GG:OR	ODSVRA 2014 or 2015	SLO	10/1, 10/2, 10/3, 10/8, 10/9, 10/13, 10/14, 10/18, 10/20, 10/21, 10/25, 10/27, 10/28, 11/2, 11/3, 11/4, 11/7, 11/14, 11/27, 12/5, 12/12, 1/3, 1/16, 1/22, 2/7, 2/19, 2/21	
GG:PW	ODSVRA 2013 or 2014	SLO	10/5, 10/6, 10/16, 10/17, 10/18, 10/25, 10/30, 11/1, 11/2, 11/3, 11/7, 11/16, 11/21	

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

Table D.3. Banded snowy plovers recorded at ODSVRA 1 October 2018 to 28 February 2019 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
GG:RB	ODSVRA 2016 or 2018	SLO	10/2, 10/3, 10/4, 10/8, 10/9, 10/13, 10/14, 10/18, 11/2, 11/14, 11/21, 11/28, 12/3, 12/25, 12/26, 12/31, 1/8, 1/16, 1/22, 2/7, 2/19, 2/20	
GG:RW	ODSVRA 2014 or 2015	SLO	10/20, 10/21, 10/24, 11/13	
GG:WW	ODSVRA 2018	SLO	11/7	
PG:-	ODSVRA Unknown	SLO	12/12, 12/27, 1/8, 1/16	
PG:BY	ODSVRA 2017 or 2018	SLO	10/3, 10/25, 10/27, 12/12, 12/27, 1/8, 1/16, 1/22, 2/7	
PG:OG	ODSVRA 2015	SLO	10/1, 10/9, 10/11, 10/14, 10/17, 10/25, 11/13, 11/14, 12/5, 1/8, 1/16, 2/7, 2/19, 2/21	
PG:OW	ODSVRA 2015 or 2016	SLO	10/3, 10/25, 11/2, 11/4, 11/7, 11/14, 11/21, 12/12, 12/27, 1/8, 1/22, 2/7, 2/27	
PG:PG	ODSVRA 2014 or 2015	SLO	10/25, 1/16	
PG:PW	ODSVRA 2012 or 2014	SLO	10/2, 10/3, 10/4, 10/5, 10/6, 10/9, 10/10, 10/14, 10/18, 10/30, 11/2	
PG:RB	ODSVRA 2016 or 2018	SLO	10/21, 10/24	
PG:VG	ODSVRA 2014 or 2015	SLO	10/2, 10/3, 10/6, 10/14, 10/16, 10/17, 10/21, 10/22, 10/25, 10/26, 10/27, 11/3, 11/7, 11/14, 11/21, 11/28, 12/26, 1/3, 1/16, 2/7, 2/19	
PG:VR	ODSVRA 2018	SLO	10/3, 10/25, 11/2, 11/21, 12/12, 12/27, 1/8, 2/7	
PG:YY	ODSVRA 2015	SLO	10/2, 10/25, 12/27, 1/8, 2/7	
PV:-	ODSVRA Unknown	SLO	10/2, 10/3, 10/9, 10/17, 10/21, 11/2, 11/14, 11/16, 12/5, 12/26, 12/31, 1/16, 1/22, 1/29, 2/4, 2/7	
PV:GW	ODSVRA 2015 or 2017	SLO	11/2, 11/4, 11/14, 11/28, 12/12	
PV:GY	ODSVRA 2018	SLO	1/22	
PV:OB	ODSVRA 2015 or 2017	SLO	10/25, 12/19, 2/7	
PV:OG	ODSVRA 2018	SLO	10/1	
PV:OR	ODSVRA 2015 or 2017	SLO	1/16	
PV:PG	ODSVRA 2015 or 2017	SLO	10/25, 11/2	
PV:PR	ODSVRA 2017 or 2018	SLO	10/26, 10/27, 10/28, 10/30, 11/1, 11/7, 11/16, 11/21, 11/28, 12/11, 12/31, 1/8, 2/7, 2/20, 2/21	
PV:VY	ODSVRA 2009	SLO	10/9	
RR:BB	ODSVRA 2016 or 2017	SLO	10/1, 10/4, 10/13, 10/19, 10/21, 10/25, 10/26, 10/27, 10/30, 11/3, 11/7, 11/13, 11/14, 11/21, 11/27, 11/28, 12/5, 12/11, 12/26, 1/8, 1/16, 1/22, 2/21	
RR:BW	ODSVRA 2016 or 2017	SLO	10/3, 10/4, 10/8, 10/10, 10/14, 10/17, 10/27, 10/30, 11/2, 11/13, 11/14, 11/16, 11/21, 11/28, 12/5, 12/11, 12/25, 12/26, 1/16, 1/22, 2/21	
VG:AG	ODSVRA 2017 or 2018	SLO	10/3, 10/10, 10/17	
VG:AW	ODSVRA 2011 or 2013	SLO	2/7	
VG:AY	ODSVRA 2018	SLO	10/2, 10/4, 10/6, 10/9, 10/11, 10/16, 10/17, 10/20, 10/27, 11/16, 11/21, 11/28, 12/3, 12/16, 1/16, 2/21	
VG:BW	ODSVRA 2016 or 2017	SLO	10/2, 10/4, 10/17, 10/19, 10/20, 10/21, 10/30, 11/1, 11/17, 11/27, 12/5, 12/11, 12/25, 12/26, 1/8, 1/16, 1/22, 2/7, 2/21	
VG:GW	ODSVRA 2011 or 2013	SLO	10/25, 11/21, 12/27, 1/8, 2/7	
VG:RG	ODSVRA 2017 or 2018	SLO	10/25, 11/2, 11/21, 11/28, 12/5, 12/19, 1/8, 2/7	
VG:VG	ODSVRA 2018	SLO	11/7, 11/21, 11/28, 12/12, 12/27, 1/8, 1/22, 2/7, 2/27	

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

Table D.3. Banded snowy plovers recorded at ODSVRA 1 October 2018 to 28 February 2019 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
VG:VR	ODSVRA 2018	SLO	11/7, 11/28, 12/27	
VG:YG	ODSVRA 2018	SLO	10/2, 10/4	
VG:YW	ODSVRA 2017 or 2018	SLO	10/2, 10/3, 10/10, 10/11, 11/16, 11/21, 12/5, 12/26	
VV:AA	ODSVRA 2011	SLO	10/9, 10/11, 10/14, 10/27, 11/1, 11/21, 11/28, 12/12, 12/26, 1/16, 2/7, 2/21	
VV:AG	ODSVRA 2018	SLO	10/1, 10/2, 10/3, 10/4, 10/5, 10/13, 10/18, 10/25, 11/7, 11/14, 11/21, 12/5	
VV:BB	ODSVRA 2011 or 2013	SLO	12/12	
VV:BG	ODSVRA 2013	SLO	10/2, 10/3, 10/4, 10/10, 10/20, 10/22, 10/28, 10/30, 11/13, 11/14, 11/21, 11/27, 12/5, 12/11, 1/8, 1/16, 1/22, 2/7, 2/21	
VV:VB	ODSVRA 2011 or 2013	SLO	10/1, 10/3, 11/2, 11/7, 11/14, 12/5, 1/8, 1/16, 1/29, 2/7	
O-:AG	VAFB 2013	Santa Barbara, CA	10/2, 10/3, 10/6, 10/16, 10/18, 11/21	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.
NB:BW	VAFB 2016	Santa Barbara	10/1, 10/2	On federal service band on left leg there is exposed metal above blue tape.
A:G/O/G	VAFB 2017	Santa Barbara	11/21, 1/8	On federal service band on left leg there is exposed metal above aqua tape.
NR:YG	VAFB 2017	Santa Barbara	10/3, 10/4, 10/9, 10/10, 10/13, 10/14, 10/18, 10/21, 10/27, 11/21, 11/28, 12/25, 12/26, 12/31, 1/8, 1/16, 1/22, 2/7, 2/19	On federal service band on left leg there is exposed metal above red tape.
O:G/O/G	VAFB 2017	Santa Barbara	10/6	
-:Y/G	Unknown	Unknown	11/2, 11/21, 1/8, 1/22	
-:YG	Unknown	Unknown	10/2, 10/3, 12/12	
B-:G-	Unknown	Unknown	1/8, 2/7	On federal service band on left leg there is exposed metal below blue tape.
G-:AY	Unknown	Unknown	10/8	

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2019.

Juveniles fledged from ODSVRA in 2019 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, NWR = National Wildlife Refuge

F = Female, M = Male

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
W/A/W:B		Tahkenitch 2019	Douglas, OR	9/20, 9/21, 9/24, 9/25, 9/27, 9/29, 9/30	Juvenile.
B/R:B		New River 2019	Coos, OR	9/24, 9/27	Juvenile.
RY:BY		South Spit 2018	Humboldt, CA	7/14, 7/19	Rebanded as an adult in 2019.
AG:YB		Moss Landing Salt Ponds 2014	Monterey, CA	5/27	
Sy:rb		Marina Beach 2015	Monterey	7/31, 8/2	Originally banded By:rb as an adult in 2015. Silver band on left leg on upper leg segment.
WR:WA		Marina Beach 2018	Monterey	5/15	
WG:AO		Salinas River SB 2019	Monterey	7/30	Juvenile.
OL:GP		Salinas River NWR 2009	Monterey	3/2	
YG:WL		Reservation Road 2016	Monterey	9/11, 9/15, 9/16, 9/17, 9/18, 9/20, 9/24, 9/25, 9/26, 9/29, 9/30	
Y-:GO		Fort Ord 2007	Monterey	4/11, 4/16, 4/20, 5/8	Originally banded PY:GO.
BB:AR	M	ODSVRA 2017 or 2018	SLO, CA	3/25, 4/17, 4/19, 4/20, 4/24, 5/4, 5/9, 5/11, 5/20, 5/23, 5/24, 6/3, 6/6, 6/7, 6/12, 6/16, 6/24, 6/25, 7/9, 7/10, 7/11, 7/12, 7/15, 7/17	ODSVRA breeding male.
BB:AW		ODSVRA 2015 or 2016	SLO	7/7	
BB:BB		ODSVRA 2018	SLO	4/15	
BB:BR		ODSVRA 2017 or 2018	SLO	4/14	
BB:BW		ODSVRA 2018	SLO	6/4, 6/18, 7/13	
BB:GG	F	ODSVRA 2013 or 2014	SLO	4/25, 5/21, 6/29	ODSVRA breeding female.
BB:GR	F	ODSVRA 2012 or 2015	SLO	7/2, 7/5, 7/7, 7/8, 7/10, 7/11, 7/12, 7/14, 7/15, 7/16	ODSVRA breeding female.
BB:GW	M	ODSVRA 2018	SLO	5/16, 5/27, 6/7, 6/10, 6/11, 6/13, 6/20, 6/24, 6/25, 6/28, 6/30, 7/6, 7/10, 7/15, 7/17	ODSVRA breeding male.
BB:OB		ODSVRA 2014 or 2016	SLO	4/18, 4/19, 4/21, 4/22, 4/24, 5/15, 5/31, 6/7	
BB:OR		ODSVRA 2016 or 2017	SLO	4/7, 5/21	
BB:OW	F	ODSVRA 2015 or 2016	SLO	6/2, 6/3, 7/2, 7/9	ODSVRA breeding female.
BB:PW	F	ODSVRA 2014 or 2016	SLO	5/29	ODSVRA breeding female.
BB:PY	M	ODSVRA 2017	SLO	3/28, 5/6, 5/13, 7/16, 7/20	ODSVRA breeding male.

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2019 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
BB:RB	M	ODSVRA 2015	SLO	3/21, 3/22, 3/28, 4/2, 4/3, 4/8, 4/10, 4/11, 4/14, 4/23, 4/24, 4/25, 4/26, 4/30, 5/2, 5/3, 5/9, 5/14, 5/20, 5/25, 5/27, 6/4, 6/9, 6/18, 7/2, 7/3	ODSVRA breeding male.
BB:RR	M	ODSVRA 2016 or 2017	SLO	4/15, 4/22, 4/23, 4/30, 5/6, 5/14, 5/19, 6/1, 6/2, 6/3, 6/4, 6/6, 6/9, 6/10, 6/11, 6/12, 6/15, 6/16, 6/17, 6/18, 6/20, 6/25, 6/28, 6/29, 6/30, 7/1, 7/2, 7/3, 7/4, 7/5, 7/7, 7/9, 7/14, 9/29	ODSVRA breeding male.
BB:RW		ODSVRA 2014 or 2015	SLO	6/12, 7/9	
BB:VG	F	ODSVRA 2017 or 2018	SLO	4/15, 4/19, 5/4, 5/31, 7/8, 7/10, 7/14, 7/15, 7/16, 7/23, 7/27, 8/2, 8/5, 8/10	ODSVRA breeding female. On 28 August 2019, carcass found at ODSVRA (see Table H.5 in Appendix H).
BB:VR	M	ODSVRA 2011, 2013, or 2014	SLO	4/2, 4/26, 5/20, 5/24, 5/31, 6/15, 6/17, 6/18, 6/24, 7/26, 7/30, 7/31, 8/1, 8/3, 8/4, 8/6, 8/16, 8/19, 9/6	ODSVRA breeding male.
BB:VW	F	ODSVRA 2018	SLO	4/2, 4/4, 5/28	ODSVRA breeding female.
BB:VY	M	ODSVRA 2016 or 2017	SLO	3/5, 3/6, 3/7, 3/26, 3/27, 5/2, 5/19, 5/22, 5/29, 6/1, 6/3, 7/19, 7/22, 8/1, 8/2, 8/10, 8/15, 8/20, 8/21, 8/26, 9/4, 9/7, 9/12, 9/17, 9/18, 9/24, 9/26, 9/27, 9/28, 9/30	ODSVRA breeding male.
BB:YB	M	ODSVRA 2011, 2013 or 2015	SLO	4/5, 4/17, 5/5, 5/19, 5/24, 5/25, 5/28, 5/30, 6/4, 6/6, 6/18, 7/3	ODSVRA breeding male.
BB:YW		ODSVRA 2013	SLO	4/21	
GA:AR	M	ODSVRA 2015	SLO	4/20, 5/3, 5/6, 5/21, 5/22, 5/23, 5/24, 5/25, 5/29, 5/31, 6/1, 6/2, 6/6, 6/9, 6/10, 6/11, 6/12, 6/15, 6/17, 6/18, 6/24, 7/1, 7/8, 7/9	ODSVRA breeding male.
GA:AY		ODSVRA 2018	SLO	3/31	
GA:GB	M	ODSVRA 2018	SLO	6/28, 6/29, 7/1, 7/2, 7/5, 7/16	ODSVRA breeding male.
GA:O-	F	ODSVRA Unknown	SLO	3/26, 3/31, 6/4, 7/14, 7/15, 7/18	ODSVRA breeding female. Bird missing right foot.
GA:OR	M & F	ODSVRA 2016 or 2017	SLO	4/18, 4/19, 4/24, 4/25, 4/26, 4/27, 5/1, 5/21, 6/12, 6/17, 6/29, 7/19, 8/2, 8/5, 8/14, 8/15, 8/16	ODSVRA breeding male and female.
GA:OW	M	ODSVRA 2013 or 2014	SLO	3/26, 3/29, 4/20, 5/8, 6/2, 7/5	ODSVRA breeding male.
GA:OY	F	ODSVRA 2014 or 2015	SLO	5/8, 5/28, 8/6, 8/7, 8/10, 8/12, 8/14, 8/16, 8/18, 8/19, 8/23, 8/24, 8/27, 8/30, 8/31, 9/3, 9/4, 9/6, 9/7, 9/10, 9/16, 9/17, 9/20, 9/23, 9/24, 9/25, 9/26, 9/28, 9/29	ODSVRA breeding female.
GA:PR	F	ODSVRA 2016 or 2017	SLO	4/5, 4/11, 4/15, 4/18, 7/26, 8/16, 9/6	ODSVRA breeding female.
GA:RG	F	ODSVRA 2015 or 2016	SLO	4/2, 4/14, 7/2, 7/7, 7/15, 7/31, 8/2, 8/27, 8/31, 9/6	ODSVRA breeding female.
GA:RY	M	ODSVRA 2017	SLO	4/11, 4/15, 4/18, 4/19, 4/20, 4/21, 4/26, 5/3, 5/10, 5/12, 5/16, 5/25, 7/2, 8/12, 8/14, 8/19, 9/6	ODSVRA breeding male.
GA:WR	M	ODSVRA 2015 or 2016	SLO	4/1, 4/12, 4/13, 5/9, 5/20, 6/4, 7/12, 7/14, 7/15, 7/16, 7/17, 7/19, 7/21, 7/22, 7/28, 7/29, 8/1, 8/2, 8/4	ODSVRA breeding male. On 14-16 July, 1 GA:WR male observed with left foot injury (see Table H.1 in Appendix H).

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2019 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
GA:WW	M (2)	ODSVRA 2016 or 2017	SLO	4/25, 4/27, 4/28, 4/30, 5/1, 5/12, 5/14, 5/22, 5/31, 6/3, 6/6, 6/8, 6/12, 6/15, 6/22, 6/23, 6/25, 6/27, 6/28, 6/29, 6/30, 7/2, 7/3, 7/6, 7/20, 7/23, 7/26, 9/6	ODSVRA breeding males (2).
GA:WY	F	ODSVRA 2018	SLO	3/10, 5/21, 5/28, 6/6, 7/2, 7/3, 7/8, 7/14, 8/12, 8/14, 8/16, 8/18, 8/26, 8/30, 9/6, 9/7, 9/19, 9/21	ODSVRA breeding female.
GA:Y-	M	ODSVRA Unknown	SLO	4/29, 4/30, 5/9, 7/2, 7/19, 7/22, 7/26, 7/27, 7/29, 7/30, 8/8, 8/10, 8/11, 8/14, 8/16	ODSVRA breeding male.
GA:YB	M (2)	ODSVRA 2017 or 2018	SLO	4/27, 5/8, 5/31, 6/1, 6/4, 6/7, 6/17, 6/20, 6/29, 6/30, 7/1, 7/2, 7/3, 7/9, 7/10, 7/11, 7/14, 7/15, 7/16, 7/18, 7/19, 7/22, 7/25, 7/27, 7/28, 7/29, 7/30, 8/1, 8/5, 8/7, 8/10, 8/11	ODSVRA breeding males (2)
GA:YR		ODSVRA 2014	SLO	5/14	
GG:AB	F	ODSVRA 2015 or 2016	SLO	4/1, 4/10, 4/11, 4/14, 4/17, 4/18, 4/24, 5/11, 5/29, 5/30, 5/31, 6/3, 6/5, 6/30, 7/5, 7/6, 8/2, 8/4, 8/7, 8/9, 8/10, 8/15, 8/16, 8/20, 8/21, 8/24, 8/25, 8/27, 8/30, 8/31, 9/4, 9/6, 9/16, 9/17, 9/18, 9/21, 9/24	ODSVRA breeding female.
GG:AW		ODSVRA 2017 or 2018	SLO	4/11, 4/30	
GG:AY	M (2)	ODSVRA 2012 or 2013	SLO	4/15, 4/23, 4/29, 4/30, 5/9, 5/12, 7/3, 7/7, 7/8, 7/10, 7/11, 7/12, 7/14, 7/16, 7/21, 7/22, 7/27, 7/28, 7/29, 7/30, 8/2, 8/4, 8/5, 8/7, 8/10, 8/12	ODSVRA breeding males (2).
GG:BB		ODSVRA 2018	SLO	5/15, 5/23, 5/27, 5/31, 6/4, 6/5, 6/7, 6/8, 6/9, 6/12, 6/15, 6/18, 6/19, 6/20, 6/26, 6/29, 7/3	
GG:GB	M (2)	ODSVRA 2016 or 2018	SLO	4/8, 4/23, 4/24, 4/25, 5/31, 6/2, 6/4, 6/6, 6/21, 6/23, 7/12, 7/23, 7/30, 8/3	ODSVRA breeding male (2).
GG:GR	F	ODSVRA 2011 or 2013	SLO	6/10, 6/17, 6/29, 7/8	ODSVRA breeding female.
GG:OR	M	ODSVRA 2014 or 2015	SLO	3/29, 4/1, 4/18, 4/19, 4/26, 4/27, 5/3, 5/4, 5/5, 5/6, 5/7, 5/8, 5/9, 5/11, 5/12, 5/13, 5/14, 5/16, 5/18, 5/19, 5/20, 5/31, 6/6, 6/15, 7/30, 8/1, 8/2, 8/3, 8/4, 8/5, 8/6, 8/7, 8/9, 8/12, 8/14, 8/15, 8/19, 8/21, 8/25, 8/31, 9/17, 9/20, 9/26, 9/28, 9/29, 9/30	ODSVRA breeding male.
GG:OY	M (2)	ODSVRA 2018	SLO	3/29, 4/7, 4/18, 4/25, 4/26, 4/29, 5/13, 5/18, 6/4, 6/6, 6/8, 6/9, 6/18, 7/13, 7/17, 7/18, 7/26, 9/27	ODSVRA breeding males (2). One GG:OY male associated with SP218 depredated by peregrine falcon on 26 July.
GG:PY		ODSVRA 2017 or 2018	SLO	4/17, 5/2, 5/3	
GG:RB	M (2) & F	ODSVRA 2016 or 2018	SLO	3/16, 5/9, 6/3, 6/15, 6/26, 7/3, 7/4, 7/7, 7/8, 7/10, 7/12, 7/18, 7/22, 7/25, 7/30, 8/1, 8/3, 8/4, 8/5, 8/6, 8/9, 8/19, 8/23, 8/27, 9/3, 9/6, 9/8, 9/10, 9/13, 9/18, 9/21, 9/24, 9/25, 9/26, 9/27, 9/29	ODSVRA breeding males (2) and female.
GG:RR		ODSVRA 2017	SLO	5/9, 9/21	

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2019 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
GG:WW	M (2)	ODSVRA 2018	SLO	4/20, 4/26, 4/29, 5/5, 5/12, 5/15, 5/21, 5/27, 5/28, 5/31, 6/3, 6/4, 6/7, 6/11, 6/13, 6/15, 6/16, 6/17, 6/19, 6/24, 6/28, 7/1, 7/2, 7/3, 7/7, 7/10, 7/16, 7/17, 7/18	ODSVRA breeding males (2).
PG:AR		ODSVRA 2014	SLO	7/16, 7/22, 8/11, 8/16	
PG:BY		ODSVRA 2017 or 2018	SLO	3/28, 4/11, 4/26, 7/16, 7/30, 8/30	
PG:OG	F	ODSVRA 2015	SLO	4/18, 4/22, 5/28, 6/2, 6/28, 6/29, 7/5, 8/1, 8/13, 8/18	ODSVRA breeding female. On 23 August, carcass found at ODSVRA (see Table H.5 in Appendix H).
PG:OW	M & F	ODSVRA 2015 or 2016	SLO	3/28, 4/11, 4/26, 4/27, 4/28, 5/1, 5/5, 5/20, 5/21, 6/12, 6/20, 6/24, 7/4, 7/6, 7/8, 7/10, 7/11, 7/12, 7/23, 7/26, 7/30, 8/2, 8/7, 8/8, 8/19, 8/30	ODSVRA breeding male and female.
PG:PB	F	ODSVRA 2014 or 2015	SLO	4/17, 5/20, 6/15, 6/23, 8/4, 8/19, 9/5, 9/6	ODSVRA breeding female.
PG:PG	F	ODSVRA 2014 or 2015	SLO	3/27, 4/1, 4/16, 4/22, 6/6, 6/15, 6/18, 7/20	ODSVRA breeding female.
PG:RG		ODSVRA 2018	SLO	5/29	
PG:VB	M	ODSVRA 2015 or 2016	SLO	3/22, 4/25, 6/12, 6/15, 6/16, 6/17, 7/17, 7/25	ODSVRA breeding male.
PG:VG	M	ODSVRA 2014 or 2015	SLO	4/26, 5/8, 5/11, 5/12, 6/3, 7/8, 7/10, 7/22, 7/30, 8/1, 8/7, 8/8, 8/9, 8/11, 8/14, 8/19, 8/20, 8/23, 8/24, 8/25, 8/26, 8/27, 8/30, 9/4, 9/8, 9/10, 9/12, 9/18, 9/21, 9/24, 9/30	ODSVRA breeding male.
PG:VR	F	ODSVRA 2018	SLO	7/12, 7/23, 7/31, 8/8, 9/29	ODSVRA breeding female.
PG:WB	F (2)	ODSVRA 2018	SLO	5/21, 5/23, 5/27, 6/11, 6/26, 6/28, 7/1, 7/16, 7/17, 7/23, 7/26, 7/28, 8/2, 8/12, 8/15, 8/20, 8/27, 8/29, 9/3	ODSVRA breeding females (2).
PG:YB	M & F	ODSVRA 2015 or 2017	SLO	4/1, 4/16, 4/18, 4/23, 4/30, 5/29, 7/2, 7/3, 7/8, 7/9, 7/12, 7/14, 7/15, 7/17, 7/18, 7/22, 7/23, 7/25, 7/27, 8/2	ODSVRA breeding male and female.
PV:-	F	ODSVRA unknown	SLO	4/15, 5/1, 5/20, 6/3, 7/16, 7/20, 8/1, 8/19, 8/20, 8/21, 8/25, 8/29, 9/4, 9/8, 9/11, 9/12, 9/17, 9/19, 9/20, 9/21, 9/26, 9/30	ODSVRA breeding female.
PV:AW	F	ODSVRA 2016 or 2017	SLO	3/27, 4/23, 5/23, 7/9, 7/10	ODSVRA breeding female.
PV:BY		ODSVRA 2015	SLO	4/15, 4/27	
PV:OB		ODSVRA 2015 or 2017	SLO	7/20, 8/30, 9/6	
PV:OG		ODSVRA 2018	SLO	4/11, 4/14, 4/18, 4/27, 5/8, 5/10, 6/4, 6/21, 7/5, 7/9	
PV:PR	F	ODSVRA 2017 or 2018	SLO	3/27, 3/31, 4/1, 4/4, 4/16, 4/19, 4/23, 4/26, 5/10, 5/21, 5/24, 5/29, 5/30, 8/1, 8/12, 8/14, 8/21, 8/26, 8/27, 8/30, 9/6, 9/7, 9/12, 9/16, 9/19, 9/25, 9/26, 9/29, 9/30	ODSVRA breeding female.
PV:RB	M	ODSVRA 2016	SLO	4/12, 4/18, 4/23, 5/18, 5/23, 6/7, 6/25, 6/29, 7/2, 7/5, 7/9, 7/15, 7/30, 8/7, 8/11, 8/13, 9/29	ODSVRA breeding male.
PV:WR		ODSVRA 2015	SLO	4/5	

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2019 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
PV:WY	M	ODSVRA 2014 or 2015	SLO	3/31, 4/2, 5/31, 6/4, 6/6, 6/17, 6/25, 7/14, 7/15, 7/16, 7/23, 7/28, 7/31, 8/2	ODSVRA breeding male. On 25 June and 14-16 July, PV:WY male observed with a left foot injury (see Table H.1 in Appendix H).
PV:YB	M	ODSVRA 2012	SLO	4/2, 4/17, 4/24, 4/29, 5/2, 5/4, 5/5, 5/6, 5/7, 5/8, 5/9, 5/11, 5/12, 5/13, 5/14, 5/19, 5/31, 7/23, 7/25	ODSVRA breeding male.
PV:YY		ODSVRA 2015 or 2017	SLO	5/14	
RR:AB	M	ODSVRA 2016 or 2017	SLO	5/17, 5/18, 5/23, 5/28, 5/31, 6/3, 6/4, 6/7, 6/11, 6/16, 6/23, 7/8, 7/9, 7/18	ODSVRA breeding male.
RR:AW	M	ODSVRA 2017	SLO	4/1, 4/26, 5/8, 5/31, 6/4, 6/5, 6/7, 6/10, 6/13, 6/18, 7/9, 7/10, 7/18, 7/19, 7/26, 8/7, 8/8, 8/9, 8/11, 8/13, 8/14, 8/16, 8/19, 8/21, 8/23, 8/24, 8/25, 8/26, 8/27, 8/30, 8/31	ODSVRA breeding male.
RR:BB	F	ODSVRA 2016 or 2017	SLO	3/27, 4/19, 5/9, 5/21, 5/23, 5/28, 6/23, 7/15, 7/16, 8/13, 8/14, 8/19, 8/21, 8/23, 8/26, 8/27, 8/30, 9/3, 9/4, 9/6, 9/10, 9/11, 9/12, 9/16, 9/17, 9/19, 9/20, 9/21, 9/24, 9/26, 9/27, 9/30	ODSVRA breeding female.
RR:BW	M & F	ODSVRA 2016 or 2017	SLO	4/18, 4/22, 4/29, 5/2, 5/25, 5/30, 6/3, 6/4, 6/15, 7/7, 7/12, 7/14, 7/17, 7/20, 7/22, 8/9, 8/10, 8/12, 8/20, 8/25, 8/26, 9/6, 9/10, 9/11, 9/13, 9/15, 9/19, 9/21, 9/24, 9/27, 9/28, 9/30	ODSVRA breeding male and female.
RR:OR	M	ODSVRA 2010	SLO	5/16, 5/20, 6/15, 6/23, 7/23, 7/26	ODSVRA breeding male.
RR:PW	F	ODSVRA 2014	SLO	4/11, 4/16, 5/19, 5/23, 5/31	ODSVRA breeding female.
VG:AW	F	ODSVRA 2011 or 2013	SLO	4/15, 4/25	ODSVRA breeding female.
VG:AY	M	ODSVRA 2018	SLO	3/22, 3/26, 3/28, 3/31, 4/2, 4/11, 4/17, 4/18, 5/3, 5/4, 5/5, 5/6, 5/21, 6/20, 6/24, 7/2, 7/4, 7/7, 7/8, 7/14, 8/12, 8/14, 8/19, 8/21, 8/25, 8/26, 8/27, 8/30, 9/6, 9/20, 9/21, 9/24, 9/27, 9/28, 9/29, 9/30	ODSVRA breeding male.
VG:BW	M & F	ODSVRA 2016 or 2017	SLO	3/7, 3/11, 3/21, 3/28, 4/2, 4/4, 4/8, 4/10, 4/11, 4/13, 4/14, 4/19, 4/25, 4/26, 4/30, 5/2, 5/6, 5/9, 5/20, 5/27, 5/31, 6/2, 6/4, 6/7, 6/8, 6/18, 6/26, 7/2, 7/9, 7/10, 7/15, 7/19, 7/22, 8/1, 8/8, 8/9, 8/12, 8/16, 8/18, 8/25, 8/26, 8/27, 8/29, 8/30, 9/8, 9/19, 9/20, 9/21, 9/24, 9/28, 9/29, 9/30	ODSVRA breeding male and female.
VG:GR	F	ODSVRA 2017	SLO	7/2, 7/3, 7/5	ODSVRA breeding female.
VG:GW	F	ODSVRA 2011 or 2013	SLO	4/24, 5/8, 6/20, 7/25, 7/30	ODSVRA breeding female.
VG:OG		ODSVRA 2011	SLO	8/12	
VG:PG		ODSVRA 2018	SLO	5/6, 7/10, 7/12, 7/19, 7/23, 7/26, 9/17, 9/19	
VG:RG	F	ODSVRA 2017 or 2018	SLO	4/25, 4/26, 7/23, 7/26, 7/31, 8/14, 8/19, 9/6	ODSVRA breeding female.
VG:RW	M	ODSVRA 2018	SLO	4/22, 5/8, 5/10, 5/11, 5/16, 5/23, 5/24, 6/3, 6/20, 7/10, 7/12, 7/15, 7/19, 7/21	ODSVRA breeding male.

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2019 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
VG:VG	F	ODSVRA 2018	SLO	3/25, 3/26, 4/2, 4/5, 4/9, 4/20, 4/25, 4/29, 5/3, 5/18, 7/5, 8/14, 8/16, 8/20, 8/23, 8/26, 8/29, 8/30, 9/3, 9/16	ODSVRA breeding female.
VG:VY	M	ODSVRA 2015 or 2016	SLO	4/18, 5/8, 5/9, 5/10, 6/29, 7/7, 7/8, 7/9, 7/10, 7/19, 7/23	ODSVRA breeding male.
VG:WY	M	ODSVRA 2017	SLO	5/28, 6/15, 6/23, 6/25, 7/10, 7/20, 7/29	ODSVRA breeding male.
VG:YG	M (2)	ODSVRA 2018	SLO	4/23, 5/3, 5/4, 5/8, 5/10, 5/12, 5/18, 5/28, 6/3, 6/4, 6/11, 6/12, 6/23, 7/3, 7/7, 7/8, 7/9, 7/10, 7/12, 7/14, 7/15, 7/17, 7/19, 7/23, 7/25, 7/29, 7/30, 8/1, 8/2, 8/5, 8/7, 8/14, 8/16, 8/19	ODSVRA breeding males (2).
VG:YW		ODSVRA 2017 or 2018	SLO	6/20	
VG:YY		ODSVRA 2016 or 2018	SLO	5/20, 6/4, 7/17	
VO:BW	F	ODSVRA 2014 or 2015	SLO	5/31, 7/14, 7/15, 7/16, 7/18, 7/22, 7/23, 7/25, 7/30	ODSVRA breeding female.
VV:AA	F	ODSVRA 2011	SLO	3/7, 3/14, 4/15, 4/22, 4/23, 4/27, 4/29, 6/1, 6/2, 6/3, 6/4, 6/6, 6/9, 6/12, 7/20, 7/22, 7/26, 7/30, 8/2, 8/5, 8/12, 8/14, 8/16, 8/19, 8/26, 9/3, 9/4, 9/11, 9/12, 9/17, 9/18, 9/19, 9/20, 9/21, 9/23, 9/24, 9/26, 9/27	ODSVRA breeding female.
VV:AB	F	ODSVRA 2017 or 2018	SLO	4/18, 4/29, 5/18, 5/21, 5/30, 6/2, 6/7, 6/13, 7/9	ODSVRA breeding female.
VV:AG		ODSVRA 2018	SLO	9/6	
VV:AW		ODSVRA 2013 or 2014	SLO	7/2	
VV:AY	M	ODSVRA 2018	SLO	5/8, 5/11, 5/31, 6/4, 7/12, 7/22, 7/24, 7/26, 7/27, 7/29, 7/30, 7/31	ODSVRA breeding male.
VV:BB		ODSVRA 2011 or 2013	SLO	4/22, 7/23	
VV:BW		ODSVRA 2014 or 2015	SLO	4/19, 4/24, 4/30, 6/3, 7/8, 8/7	
VV:GR		ODSVRA 2012 or 2013	SLO	5/23	
VV:VB	M	ODSVRA 2011 or 2013	SLO	5/3, 5/16, 5/21, 5/22, 5/29, 6/24, 7/4, 7/6	ODSVRA breeding male.
VV:WR	M	ODSVRA 2015 or 2016	SLO	4/10, 4/29, 5/8, 5/28, 5/31, 6/4, 6/9, 6/11, 6/17, 6/21, 6/23, 7/28, 8/10, 8/12, 8/16, 8/19, 8/25, 8/26, 8/29, 8/30, 8/31, 9/6	ODSVRA breeding male.
VV:WW		ODSVRA 2018	SLO	6/6, 6/7, 6/28, 7/7, 7/12, 7/21, 7/31, 8/2	
VV:YG	M	ODSVRA 2013 or 2015	SLO	4/14, 4/16, 4/22, 4/24, 4/27, 4/28, 5/6, 5/25, 6/6, 7/1, 7/16, 7/21, 7/23, 7/24, 7/26, 7/29	ODSVRA breeding male.
GN:RR	M	VAFB 2017	Santa Barbara, CA	5/16, 5/31, 6/6, 7/3, 7/10, 7/12, 7/15, 7/16, 7/19, 7/21, 7/22, 7/23	ODSVRA breeding male. On federal service band on left leg there is exposed metal above brown tape.
NB:OG		VAFB 2015	Santa Barbara	4/16	
NB:OY	M & F	VAFB 2016	Santa Barbara	4/22, 4/23, 4/27, 5/14, 5/21, 6/7, 6/17, 6/24	ODSVRA breeding male and female.

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2019 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
NR:BR	F	VAFB 2016	Santa Barbara	7/18, 7/19, 7/20, 7/21, 7/23	ODSVRA breeding female. On federal service band on left leg there is exposed metal below red tape.
NR:WB	M	VAFB 2016	Santa Barbara	4/15, 4/21, 4/22, 4/23, 5/6, 5/21, 6/8, 6/15, 7/9, 7/16, 7/19, 7/22, 7/23, 7/24, 7/25, 7/26, 7/31, 8/1, 8/2, 8/7, 8/9	ODSVRA breeding male.
NR:YG	F	VAFB 2017	Santa Barbara	5/21, 5/23, 5/25, 5/27, 5/28, 5/30, 5/31, 6/4, 8/2, 8/5, 8/7, 8/26, 9/3, 9/6, 9/8, 9/10, 9/15, 9/17, 9/19, 9/20, 9/21, 9/23, 9/24, 9/25, 9/28, 9/29	ODSVRA breeding female. On federal service band on left leg there is exposed metal above red tape.
NW:RR		VAFB 2018	Santa Barbara	5/21, 5/29, 6/3, 6/8, 6/17	
NY:WG		VAFB 2017	Santa Barbara	3/26, 3/28	
-:Y/G		Unknown	Unknown	7/16	
-:YG		Unknown	Unknown	4/26, 5/3, 6/12, 8/30, 9/16	
B-:G-		Unknown	Unknown	5/22	On federal service band on left leg there is exposed metal below blue tape.
V-:A-		Unknown	Unknown	4/4, 4/23, 4/25	

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 October 2018 to 28 February 2019.

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, Guadalupe NWR = Guadalupe-Nipomo Dunes National Wildlife Refuge, SB = State Beach, SP = State Park

Band Combination	Year Banded	Location Seen	County	Dates Seen
GA:OR	2016 or 2017	Salmon Creek Beach	Sonoma, CA	12/28
GG:PY	2017 or 2018	Natural Bridges State Marine Reserve	Santa Cruz, CA	11/11
GA:PB	2016 or 2017	San Carpoforo	SLO, CA	11/10
BB:AR	2017 or 2018	Arroyo De La Cruz	SLO	12/12
GG:PB	2012 or 2013	Arroyo De La Cruz	SLO	12/12, 1/10, 1/29
GG:PR	2017	Arroyo De La Cruz	SLO	12/12
PV:AW	2016 or 2017	Arroyo De La Cruz	SLO	12/21, 1/29
PV:GY	2018	Arroyo De La Cruz	SLO	12/12, 1/10, 1/29
VG:AR	2018	Arroyo De La Cruz	SLO	12/12
VV:GW	2015 or 2017	Arroyo De La Cruz	SLO	1/10, 1/29
VV:RR	2016 or 2018	Arroyo De La Cruz	SLO	1/4, 1/10
GA:RY	2017	Arroyo Laguna	SLO	10/9
GG:PB	2012 or 2013	Arroyo Laguna	SLO	10/9
GG:PR	2017	Arroyo Laguna	SLO	10/23
PG:RG	2018	Arroyo Laguna	SLO	10/3
PV:RB	2016	Arroyo Laguna	SLO	10/4, 10/9, 10/23
VG:AR	2018	Arroyo Laguna	SLO	10/23
VG:YW	2017 or 2018	Arroyo Laguna	SLO	10/23
VV:GW	2015 or 2017	Arroyo Laguna	SLO	10/4, 10/9
PV:AW	2016 or 2017	San Simeon SP	SLO	12/24
GG:PB	2012 or 2013	Santa Rosa Creek	SLO	2/15
PV:GY	2018	Santa Rosa Creek	SLO	12/2, 2/20
BB:AR	2017 or 2018	Villa Creek	SLO	10/9, 10/23, 1/8, 2/6, 2/19
BB:VG	2017 or 2018	Morro Strand SB	SLO	12/11
PG:GY	2016 or 2018	Morro Strand SB	SLO	10/23, 1/2, 1/18
PV:GY	2018	Morro Strand SB	SLO	10/23
RR:AG	2017	Morro Strand SB	SLO	12/11, 1/2, 1/8
V-:W-	2008	Morro Strand SB	SLO	12/11
BB:OB	2014 or 2016	Morro Bay Spit	SLO	11/25
BB:WR	2018	Morro Bay Spit	SLO	10/23
GA:RY	2017	Morro Bay Spit	SLO	1/29
GG:OG	2013 or 2014	Morro Bay Spit	SLO	10/23
VG:AR	2018	Morro Bay Spit	SLO	10/9
PG:YY	2015	Guadalupe NWR	SLO	1/29
BB:BB	2018	Guadalupe Restoration Project	SLO	1/29
RR:WG	2012	Guadalupe Restoration Project	SLO	1/29
GG:YR	2017 or 2018	Rancho Guadalupe Dunes County Park	Santa Barbara, CA	1/30
PV:YB	2012	Rancho Guadalupe Dunes County Park	Santa Barbara	1/30
VG:BG	2011 or 2013	Rancho Guadalupe Dunes County Park	Santa Barbara	1/30
BB:RG	2018	VAFB	Santa Barbara	10/17
BB:RR	2016 or 2017	VAFB	Santa Barbara	10/17

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 October 2018 to 28 February 2019 (continued).

Band Combination	Year Banded	Location Seen	County	Dates Seen
GA:PB	2016 or 2017	VAFB	Santa Barbara	10/4, 10/17
GA:YG	2018	VAFB	Santa Barbara	10/16
GG:AW	2017 or 2018	VAFB	Santa Barbara	10/8
GG:RB	2016 or 2018	VAFB	Santa Barbara	10/17, 12/29
RR:AW	2017	VAFB	Santa Barbara	10/17
RR:LY	2010	VAFB	Santa Barbara	10/16
VG:AG	2017 or 2018	VAFB	Santa Barbara	10/5, 10/8, 10/10, 10/11, 10/16, 2/20
VG:PB	2015 or 2017	VAFB	Santa Barbara	10/17
VG:RB	2017 or 2018	VAFB	Santa Barbara	10/17
VV:VY	2018	VAFB	Santa Barbara	10/16
GA:OR	2016 or 2017	Dangermond Preserve	Santa Barbara	1/18
BB:AR	2017 or 2018	Hollywood Beach	Ventura, CA	10/11, 10/22, 11/5
PV:AW	2016 or 2017	Hollywood Beach	Ventura	1/28, 2/11
RR:OR	2010	Hollywood Beach	Ventura	10/22, 11/16, 12/18, 12/24, 2/11, 2/23
VG:AG	2017 or 2018	Hollywood Beach	Ventura	10/11, 10/22, 12/18
VV:AY	2018	Ormond Beach	Ventura	10/22
GG:OY	2018	Point Mugu	Ventura	11/1, 11/26
VV:AY	2018	Point Mugu	Ventura	1/29
GG:PG	2018	Malibu Lagoon	Los Angeles, CA	10/5
VG:WY	2017	San Clemente SB	Orange, CA	1/25, 1/30
BB:VB	2011, 2013 or 2014	Camp Pendleton	San Diego, CA	1/2, 1/9, 1/14, 1/23, 2/6, 2/13
BB:WR	2018	Camp Pendleton	San Diego	1/23
PG:VB	2015 or 2016	Ensenada	Baja California, Mexico	1/18
GA:BB	2017 or 2018	San Quintin	Baja California	1/26
GA:YB	2017 or 2018	San Quintin	Baja California	1/26
GA:YG	2018	San Quintin	Baja California	1/26
GG:GB	2016 or 2018	San Quintin	Baja California	1/26
GG:RB	2016 or 2018	Guerrero Negro	Baja California Sur, Mexico	1/22

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

Table D.6. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2019.
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, Guadalupe NWR = Guadalupe-Nipomo Dunes National Wildlife Refuge, NWR = National Wildlife Refuge, SB = State Beach, VAFB = Vandenberg Air Force Base, Bolsa Chica = Bolsa Chica Ecological Reserve
M = male, F = female.

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
PV:YG	2015		Tsoo-Yess Beach	Clallam, WA	5/22	
RR:AG	2017		Eden Landing	Alameda, CA	5/28, 6/3	
GG:PY	2017 or 2018		Seabright SB	Santa Cruz, CA	4/1	
PV:AG	2015 or 2016	M	Moss Landing SB	Monterey, CA	4/15, 5/6	Moss Landing SB breeding male.
PG:BG	2015 or 2016	F	Salinas River SB	Monterey	4/23, 6/6, 6/7, 8/5	Salinas River SB breeding female.
GG:YB	2019		San Carpoforo	SLO, CA	8/28	Juvenile.
GG:AV	2019		Arroyo Laguna	SLO	8/24, 8/28, 8/31	Juvenile.
GG:PB	2012 or 2013		Arroyo Laguna	SLO	9/24	
GG:YB	2019		Arroyo Laguna	SLO	9/10, 9/11	Juvenile.
VV:GW	2015 or 2017		Arroyo Laguna	SLO	8/28, 9/10, 9/18	
VG:RW	2018		Santa Rosa Creek	SLO	7/31, 8/6, 8/13	
PV:GY	2018		Santa Rosa Creek	SLO	4/25	
GG:YB	2019		Santa Rosa Creek	SLO	8/12	Juvenile.
BB:AR	2017 or 2018		Villa Creek	SLO	3/6, 3/8, 3/11, 3/14, 3/15, 3/18, 3/19, 3/22, 3/26, 3/27, 3/28, 3/29, 4/1, 4/3, 4/5, 6/10, 8/1, 8/2, 8/5, 8/7, 8/9, 8/12, 8/13, 8/14, 9/10, 9/12, 9/18, 9/19, 9/20, 9/21	
PV:GY	2018		Villa Creek	SLO	5/1	
RR:AG	2017		Villa Creek	SLO	3/25, 3/26, 3/28, 4/1, 4/2, 4/3, 4/18	
BB:BA	2019		Morro Strand SB	SLO	8/13, 8/28	Juvenile.
BB:GA	2019		Morro Strand SB	SLO	7/27, 9/5	Juvenile.
BB:WA	2019		Morro Strand SB	SLO	8/10	Juvenile.
GA:WY	2018		Morro Strand SB	SLO	3/26, 3/27, 3/28	
GG:AV	2019		Morro Strand SB	SLO	8/28, 9/5	Juvenile.
GG:BA	2019		Morro Strand SB	SLO	8/2, 8/6, 8/9, 8/28	Juvenile.
PG:GY	2016 or 2018		Morro Strand SB	SLO	3/20, 3/28, 4/5, 4/10, 4/11	
PV:RB	2016		Morro Strand SB	SLO	3/15, 3/29, 4/2, 4/3, 4/4, 4/5	
RR:AG	2017		Morro Strand SB	SLO	3/12, 3/19, 3/20, 4/9, 4/11, 4/12, 4/16, 4/19, 8/1, 8/8, 9/18	
VV:OR	2015 or 2016	M	Morro Strand SB	SLO	3/15, 3/22, 3/25, 4/2, 4/4, 4/8, 4/10, 4/11, 4/12, 4/19, 4/22, 4/23, 4/24, 4/30, 5/1, 5/7, 5/13, 5/14, 5/17, 5/20, 5/21, 5/22, 5/26, 5/28, 5/29, 6/2, 6/5, 6/6, 6/9, 6/10, 6/11, 6/12, 6/13, 6/14, 6/15, 6/16, 6/17, 6/18, 6/20, 6/21, 6/22, 6/23, 6/25, 6/26, 6/27, 6/28, 7/28, 8/1, 8/2, 8/5	Morro Strand breeding male.
B-:AO	2019		Morro Bay Sandspit	SLO	9/18, 9/20	Juvenile. Originally banded BB:AO, lost band as chick.

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

Table D.6. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2019 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
GG:OG	2013 or 2014	M	Morro Bay Sandspit	SLO	3/11, 3/13, 3/14, 3/18, 3/20, 3/21, 3/22, 3/25, 3/27, 3/28, 3/29, 4/1, 4/2, 4/8, 4/9, 4/12, 4/15, 4/19, 4/22, 4/25, 4/26, 4/29, 4/30, 5/1, 5/2, 5/3, 5/6, 5/7, 5/9, 5/10, 5/11, 5/13, 5/15, 5/16, 5/17, 5/20, 5/22, 5/23, 5/24, 5/27, 5/28, 5/29, 5/30, 5/31, 6/3, 6/4, 6/7, 6/16, 6/19, 6/20 ,6/21, 6/26, 6/27, 7/29, 7/30, 7/31, 8/1, 8/2, 8/5, 8/6, 8/7, 8/8, 8/12, 8/13, 8/14, 8/15, 9/3, 9/5, 9/10, 9/18	Morro Bay Sandspit breeding male.
GG:PB	2012 or 2013	F	Morro Bay Sandspit	SLO	3/20, 3/21, 3/22, 3/25, 3/26, 3/29, 4/1, 4/3, 4/4, 4/5, 4/8, 4/9, 4/10, 4/18, 5/1, 5/2, 5/3, 5/6, 5/7, 5/8, 5/9, 5/10, 5/14, 5/15, 5/16, 5/17, 5/22, 5/28, 5/29, 5/31, 6/3, 6/4, 6/5, 6/6, 6/7, 6/18, 6/21, 6/26, 6/27, 7/31, 8/7, 8/8, 8/9, 8/28, 9/5, 9/10	Morro Bay Sandspit breeding female.
PG:AG	2019		Morro Bay Sandspit	SLO	8/26, 9/12	Juvenile.
PG:GY	2016 or 2018		Morro Bay Sandspit	SLO	3/8, 3/11, 3/21, 4/9, 4/15, 4/17, 4/18, 4/26, 4/30, 5/2, 5/6, 5/7	
PV:AW	2016 or 2017		Morro Bay Sandspit	SLO	4/15	
PV:GY	2018		Morro Bay Sandspit	SLO	3/21	
PV:RB	2016		Morro Bay Sandspit	SLO	3/19, 3/22	
B-:AO	2019		Guadalupe NWR	SLO	8/26	Juvenile. Originally banded BB:AO, lost band as chick.
BB:AV	2019		Guadalupe NWR	SLO	7/23, 8/1	Juvenile.
BB:BA	2019		Guadalupe NWR	SLO	6/26, 7/23, 7/31, 8/8	Juvenile.
BB:OA	2019		Guadalupe NWR	SLO	8/26, 8/28	Juvenile.
BB:VW	2018		Guadalupe NWR	SLO	3/26	
GA:GB	2018		Guadalupe NWR	SLO	6/4	
GA:GR	2015 or 2016		Guadalupe NWR	SLO	8/28	
GA:OR	2016 or 2017		Guadalupe NWR	SLO	7/31	
GA:PR	2016 or 2017		Guadalupe NWR	SLO	3/26, 5/14, 5/22, 7/9, 7/31, 8/9, 8/28	
GA:WR	2015 or 2016		Guadalupe NWR	SLO	7/31	
GA:YR	2014		Guadalupe NWR	SLO	8/1	
GG:AR	2011		Guadalupe NWR	SLO	8/26	
GG:OA	2019		Guadalupe NWR	SLO	7/31	Juvenile.
GG:OY	2018	F	Guadalupe NWR	SLO	7/9	Guadalupe NWR breeding female.
GG:RB	2016 or 2018		Guadalupe NWR	SLO	7/31	
GG:WR	2014 or 2016		Guadalupe NWR	SLO	8/8	
GG:YR	2017 or 2018	F	Guadalupe NWR	SLO	3/26, 4/9, 7/9, 8/1	Guadalupe NWR breeding female.
PG:AG	2019		Guadalupe NWR	SLO	7/9	Juvenile.
PG:BY	2017 or 2018		Guadalupe NWR	SLO	3/26	
PG:YB	2015 or 2017		Guadalupe NWR	SLO	7/31	
PG:YY	2015		Guadalupe NWR	SLO	4/23, 6/4, 7/9	
PV:OB	2015 or 2017		Guadalupe NWR	SLO	3/26, 5/28, 6/4	
PV:WY	2014 or 2015		Guadalupe NWR	SLO	6/26, 6/27, 7/5	

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

Table D.6. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2019 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
PV:YB	2012		Guadalupe NWR	SLO	7/5	
VG:BA	2019		Guadalupe NWR	SLO	7/31	Juvenile.
VV:BA	2019		Guadalupe NWR	SLO	7/31	Juvenile.
BB:BB	2018	M	Guadalupe Restoration Project	SLO	3/1, 3/15, 3/19, 4/5, 5/6, 5/21, 6/21	Guadalupe Restoration Project breeding male.
GA:GR	2015 or 2016	M	Guadalupe Restoration Project	SLO	4/19, 5/6, 5/13, 5/15, 5/21, 5/28, 7/3, 8/28	Guadalupe Restoration Project breeding male.
GA:PW	2014 or 2015		Guadalupe Restoration Project	SLO	3/19, 4/19, 5/15, 6/10, 6/25, 7/8	
GA:RW	2015		Guadalupe Restoration Project	SLO	4/12, 5/13, 6/5	
GG:AV	2019		Guadalupe Restoration Project	SLO	8/26	Juvenile.
GG:BB	2018		Guadalupe Restoration Project	SLO	7/19	
GG:OB	2019		Guadalupe Restoration Project	SLO	7/19	Juvenile.
GG:PW	2013 or 2014		Guadalupe Restoration Project	SLO	7/19	
GG:VA	2019		Guadalupe Restoration Project	SLO	8/26	Juvenile.
GG:WG	2014 or 2015		Guadalupe Restoration Project	SLO	6/21	
GG:WR	2014 or 2016		Guadalupe Restoration Project	SLO	7/3	
GG:YR	2017 or 2018		Guadalupe Restoration Project	SLO	3/18, 3/19	
GG:YY	2018		Guadalupe Restoration Project	SLO	4/12	
PV:BY	2015		Guadalupe Restoration Project	SLO	6/12, 6/21, 8/26	
PV:YR	2017 or 2018		Guadalupe Restoration Project	SLO	4/19, 4/24, 5/6, 5/9, 5/13, 6/10	
RR:BY	2010		Guadalupe Restoration Project	SLO	6/14, 7/15	
RR:WG	2012		Guadalupe Restoration Project	SLO	3/22, 5/15, 6/10, 6/14, 6/25, 7/3, 7/8	
VV:GW	2015 or 2017		Guadalupe Restoration Project	SLO	6/12	
VG:BA	2019		Rancho Guadalupe County Park	Santa Barbara, CA	8/2	Juvenile.
BB:AW	2015 or 2016		VAFB	Santa Barbara	8/16	
BB:BA	2019		VAFB	Santa Barbara	7/9, 7/11	Juvenile.
BB:GA	2019		VAFB	Santa Barbara	7/31, 8/2	Juvenile.
BB:GO	2019		VAFB	Santa Barbara	7/31, 8/7	Juvenile.
BB:OR	2016 or 2017	M	VAFB	Santa Barbara	4/8, 4/15, 5/6, 5/24, 6/5, 6/10, 6/19, 6/24, 6/26, 7/10, 7/24, 7/26	VAFB breeding male.

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

Table D.6. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2019 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
BB:OV	2019		VAFB	Santa Barbara	9/27	Juvenile.
BB:PA	2019		VAFB	Santa Barbara	7/31, 8/7, 8/16	Juvenile.
BB:PB	2019		VAFB	Santa Barbara	7/23, 8/2	Juvenile.
BB:WA	2019		VAFB	Santa Barbara	7/16, 7/23, 8/2, 8/6	Juvenile.
GA:OR	2016 or 2017		VAFB	Santa Barbara	3/11, 3/15, 3/25	
GA:PB	2016 or 2017	M	VAFB	Santa Barbara	3/7, 4/16, 4/30, 5/24, 6/4, 6/11, 6/14, 6/24, 6/25, 7/2, 7/18, 7/25, 7/26, 8/1, 8/7, 8/30, 9/5, 9/19	VAFB breeding male.
GA:PG	2015 or 2017		VAFB	Santa Barbara	7/23	
GA:PR	2016 or 2017		VAFB	Santa Barbara	7/25, 8/21	
GA:WY	2018		VAFB	Santa Barbara	5/10, 5/13	VAFB breeding adult.
GG:AB	2015 or 2016		VAFB	Santa Barbara	7/10	
GG:AV	2019		VAFB	Santa Barbara	7/25, 8/1, 8/8, 8/16, 9/10	Juvenile.
GG:AW	2017 or 2018	F	VAFB	Santa Barbara	3/7, 3/26, 5/23, 5/30, 6/4, 6/18, 6/20, 6/23, 7/2, 7/23, 8/1, 8/8, 8/28, 9/10, 9/27	VAFB breeding female.
GG:AY	2012 or 2013		VAFB	Santa Barbara	6/18	
GG:OA	2019		VAFB	Santa Barbara	8/16, 8/28, 9/10, 9/27	Juvenile.
GG:OY	2018		VAFB	Santa Barbara	4/15, 7/18	
GG:PR	2017	F	VAFB	Santa Barbara	3/7, 3/14, 3/26, 4/2, 4/16, 4/23, 4/25, 5/21, 5/23, 6/4, 6/18, 6/23, 6/27, 7/5, 7/18, 7/23, 7/25, 8/28, 9/10, 9/27	VAFB breeding female.
GG:RB	2016 or 2018	F	VAFB	Santa Barbara	3/26, 4/7, 5/23, 5/28, 6/4, 6/6, 6/18, 6/27, 8/28, 9/10	VAFB breeding female.
GG:WG	2014 or 2015		VAFB	Santa Barbara	8/28	
PG:GV	2019		VAFB	Santa Barbara	9/27	Juvenile.
PV:AR	2014 or 2015		VAFB	Santa Barbara	3/25	
PV:YR	2017 or 2018	F	VAFB	Santa Barbara	3/18, 4/1, 4/3, 4/15, 4/17, 5/17, 5/29, 5/31, 6/10, 6/12, 6/14, 6/19, 6/28, 7/10, 7/12	VAFB breeding female.
VG:AG	2017 or 2018		VAFB	Santa Barbara	3/8, 3/21, 3/25, 3/28, 3/29, 4/3, 4/17, 5/24, 7/5, 7/25, 8/2, 8/7, 8/12, 9/3, 9/5, 9/19, 9/25	
VG:RW	2018		VAFB	Santa Barbara	4/10, 4/16	
VG:YG	2018		VAFB	Santa Barbara	3/4, 3/8, 3/16, 6/28	
VV:BV	2019		VAFB	Santa Barbara	7/26	Juvenile.
BB:BA	2019		Jalama Beach	Santa Barbara	8/5	Juvenile.
BB:OR	2016 or 2017		Jalama Beach	Santa Barbara	5/16	
GA:AW	2018		Jalama Beach	Santa Barbara	3/4, 3/11, 8/1, 8/5, 8/19, 8/26, 9/11	
GG:AW	2017 or 2018		Jalama Beach	Santa Barbara	5/7	
GG:RB	2016 or 2018		Jalama Beach	Santa Barbara	5/7	
PG:AG	2019		Jalama Beach	Santa Barbara	8/5	Juvenile.
PV:YR	2017 or 2018	M	Jalama Beach	Santa Barbara	5/6, 5/13, 7/22, 8/1, 8/5, 8/12, 8/19, 8/26, 9/11	Jalama Beach breeding male.
GA:PB	2016 or 2017		Coal Oil Point Reserve	Santa Barbara	3/20	
VV:YW	2011 or 2013		Coal Oil Point Reserve	Santa Barbara	8/6	
GG:OY	2018		Point Mugu	Ventura, CA	8/7, 8/19, 9/20	
VV:AY	2018		Point Mugu	Ventura	8/21	
BB:GO	2019		Malibu Lagoon	Los Angeles, CA	8/16	Juvenile.
VV:BV	2019		Playa Del Rey	Los Angeles	7/31	Juvenile.

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

Table D.6. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2019 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
VG:WY	2017		Bolsa Chica	Orange, CA	4/30	
BB:WA	2019		Newport Beach	Orange	9/4	Juvenile.
VG:WY	2017		San Clemente SB	Orange	4/20	
BB:PB	2019		Camp Pendleton	San Diego, CA	8/9	Juvenile.
BB:WA	2019		Camp Pendleton	San Diego	8/29	Juvenile.
GA:AY	2018		Camp Pendleton	San Diego	4/29, 6/8	
GG:BB	2018		Camp Pendleton	San Diego	5/11	
GG:PG	2018	F	Camp Pendleton	San Diego	4/16, 4/19, 4/23, 4/26, 5/3, 5/21, 5/23, 6/1, 6/4, 6/8, 6/11, 6/15, 6/18, 6/20, 6/22, 6/25, 6/27, 6/29, 7/2, 7/4, 7/6, 7/9, 7/11, 7/13, 7/16	Camp Pendleton breeding female.
VG:WY	2017		Camp Pendleton	San Diego	4/26, 5/2	
GA:GB	2018		Coronado	San Diego	5/7	
GG:AW	2017 or 2018		Coronado	San Diego	4/29	
PG:BB	2011, 2013, or 2014		Coronado	San Diego	8/19	
PG:WB	2018		Coronado	San Diego	5/10	
VG:BW	2016 or 2017		Coronado	San Diego	7/16	
VV:BW	2014 or 2015		Coronado	San Diego	3/11	
GA:AY	2018		Ensenada	Baja California, Mexico	5/9	

APPENDIX E. CALIFORNIA LEAST TERN REPRODUCTIVE SUCCESS REPORTED FOR CURRENT OR RECENT BREEDING SITES IN SAN LUIS OBISPO AND SANTA BARBARA COUNTIES FROM 2004-19.

Note that chicks are not banded at Rancho Guadalupe Dunes County Park (RGDCP) or Coal Oil Point Reserve (COPR) and other methods are used to estimate number of juveniles produced. In 2019 the number of juveniles at RGDCP was unknown, therefore number of juveniles per nest and per pair are also unknown (unk). In 2018 Vandenberg Air Force Base (VAFB) began banding chicks to site and year. Sources: RGDCP (pers. comm. Tom Applegate), VAFB (pers. comm. Samantha Kaisersatt), and COPR (pers. comm. Jessica Nielson).

Year	Site	No. pairs	No. nests	No. nests hatching	No. chicks	No. juveniles	No. juveniles per total no. nest	No. juveniles per pair
2004	ODSVRA	47	63	44	69	25	0.40	0.53
	RGDCP	8	8	3	7	0	0.00	0.00
	VAFB[1]	1	1	0	0	0	0.00	0.00
	COPR	6	6	0	0	0	0.00	0.00
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[2]	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

Appendix E. California Least Tern reproductive success for San Luis Obispo and Santa Barbara Counties from 2004-19 (continued).

Year	Site	No. pairs	No. nests	No. nests hatching	No. chicks	No. juveniles	No. juveniles per total no. nest	No. juveniles per pair
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
2018	ODSVRA	30-33	35	28	42	35	1.00	1.06-1.17
	RGDCP	10-11	11	5	10	4	0.36	0.36-0.40
	VAFB	60	83	33	57	35	0.42	0.58
	COPR	0	0	0	0	0	0.00	0.00
2019	ODSVRA	31-33	34	31	52	38	1.12	1.15-1.23
	RGDCP	17	17	8	15	unk	unk	unk
	VAFB	42	47	36	63	21	0.45	0.50
	COPR	0	0	0	0	0	0.00	0.00

[1,2] Minimum counts of adult terns at the VAFB colony site were 60 and 40 in 2004 and 2006, respectively, but nesting was limited.

APPENDIX F. ADDENDUMS TO SNOWY PLOVER NESTING SUCCESS.

Table F.1. Nesting success of snowy plovers in identifiable areas at ODSVRA, 2001-19.

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 miles 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 3.

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 fledged	% chicks known fledged
	Open Riding Area	1	1	0	0	0	0	0
	Arroyo Grande Excl. [1]	3	3	3	100	9	0	0
	Southern Exclosure	25	25	22	88	57	2	4
	Oso Flaco	4	2	2	100	6	1	17
2001	**Total**	**33**	**30**	**26**	**87**	**71**	**3**	**4**
	Southern Exclosure	33	33	25	76	62	35	56
	Oso Flaco	2	2	0	0	0	0	0
2002	**Total**	**35**	**35**	**25**	**71**	**62**	**35**	**56**
	Dunes Preserve	1	1	1	100	3	0	0
	Open Riding Area	1	1	1	100	3	3	100
	Pipeline Revegetation	3	3	2	67	4	2	50
	East of BY Exclosure [2]	2	2	1	50	3	2	67
	Southern Exclosure	74	73	52	71	136	91	68
	Oso Flaco	13	13	5	38	11	7	64
2003	**Total**	**94**	**93**	**62**	**67**	**160**	**106**	**67**
	Open Riding Area	1	1	0	0	0	0	0
	Pipeline Revegetation	1	1	1	100	3	0	0
	Southern Exclosure	113	111	87	78	208	59	29
	Oso Flaco	27	27	17	63	40	7	18
2004	**Total**	**142**	**140**	**105**	**75**	**251**	**66**	**27**
	East of BY Exclosure [2]	2	2	2	100	6	2	33
	Southern Exclosure	79	79	60	76	142	57	40
	Oso Flaco	22	22	18	82	49	23	47
2005	**Total**	**103**	**103**	**80**	**78**	**197**	**82**	**42**
	Open Riding Area	1	1	0	0	0	0	0
	Southern Exclosure	87	84	65	77	173	8	5
	Oso Flaco	29	29	22	76	57	9	16
2006	**Total**	**117**	**114**	**87**	**76**	**230**	**17**	**7**
	Southern Exclosure	76	76	61	80	159	58	37
	Oso Flaco	15	15	9	60	20	4	20
2007	**Total**	**91**	**91**	**70**	**77**	**179**	**62**	**35**
	Southern Exclosure	100	100	73	73	172	64	37
	Oso Flaco	19	19	8	42	19	5	26
2008	**Total**	**119**	**119**	**81**	**68**	**191**	**69**	**36**

Table F.1. Nesting success of snowy plovers in identifiable areas at ODSVRA, 2001-19 (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 fledged	% chicks known fledged
	Pismo Lagoon	1	1	0	0	0	0	0
	Southern Exclosure	125	124	86	69	221	79	36
	Oso Flaco	23	22	8	36	22	2	9
2009	**Total**	**149**	**147**	**94**	**64**	**243**	**81**	**33**
	Carpenter Creek	1	1	0	0	0	0	0
	Arroyo Grande Creek	3	3	0	0	0	0	0
	Open Riding Area	1	1	1	100	2	2	100
	Southern Exclosure	126	123	95	77	234	86	37
	Oso Flaco	22	22	13	59	33	15	45
2010	**Total**	**153**	**150**	**109**	**73**	**269**	**103**	**38**
	Open Riding Area	2	2	2	100	5	1	20
	Southern Exclosure	140	135	113	84	300	129	43
	Oso Flaco	23	23	16	70	40	18	45
2011	**Total**	**165**	**160**	**131**	**82**	**345**	**148**	**43**
	Open Riding Area	3	3	0	0	0	0	0
	Southern Exclosure	194	186	143	77	353	85	24
	Oso Flaco	14	14	9	64	21	4	19
2012	**Total**	**211**	**203**	**152**	**75**	**374**	**89**	**24**
	Southern Exclosure	147	144	115	80	286	123	43
	Oso Flaco	23	23	15	65	39	25	64
2013	**Total**	**170**	**167**	**130**	**78**	**327**	**172**	**53**
	Open Riding Area	1	1	0	0	0	0	0
	Southern Exclosure	201	194	173	89	428	142	33
	Oso Flaco	44	44	33	75	86	35	41
2014	**Total**	**246**	**239**	**206**	**86**	**514**	**177**	**34**
	Arroyo Grande Creek[3]	1	-	1	-	2	0	0
	Southern Exclosure	182	175	153	87	401	215	54
	Oso Flaco	20	20	14	70	39	24	62
2015	**Total**	**203**	**195**	**168**	**86**	**442**	**239**	**54**
	Arroyo Grande Creek[3]	1	-	1	-	2	1	50
	Southern Exclosure	169	156	136	87	326	94	29
	Oso Flaco	40	37	29	78	82	36	44
2016	**Total**	**210**	**193**	**166**	**85**	**410**	**125**	**30**
	Arroyo Grande Creek	1	1	0	0	0	0	0
	Southern Exclosure	195	165	107	65	252	105	42
	Oso Flaco	77	72	38	53	96	55	57
2017	**Total**	**273**	**238**	**145**	**61**	**348**	**160**	**46**
	Southern Exclosure	145	139	111	80	274	131	48
	Oso Flaco	61	61	33	54	84	43	51
2018	**Total**	**206**	**200**	**144**	**72**	**358**	**174**	**49**
	Eucalyptus North	1	1	1	100	3	1	33
	Southern Exclosure	172	163	118	72	299	81	27
	Oso Flaco	57	56	30	54	75	13	17
2019	**Total**	**230**	**220**	**149**	**68**	**377**	**95**	**25**

[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 wire 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 F.2. Attributed causes of snowy plover nest loss in Southern Exclosure and Oso Flaco at ODSVRA from 2002-19.

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 18-year period 2002-19. 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 2010-18.
So. Excl. = Southern Exclosure, Aband.=Abandoned

Year	Area	Aband. pre-term	Aband. post-term	Aband., suspected wind	Aband. unknown pre- or post-term	Failed, cause unknown	Unidentified predator	Avian predator	Gull	Corvid	Raven	Northern harrier	Peregrine	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**

Table F.2. Attributed causes of snowy plover nest loss in Southern Exclosure and Oso Flaco at ODSVRA from 2002-19 (continued).

Year	Area	Aband. pre-term	Aband. post-term	Aband., suspected wind	Aband. unknown pre- or post-term	Failed, cause unknown	Unidentified predator	Avian predator	Gull	Corvid	Raven	Northern harrier	Peregrine	Coyote	Raccoon	Skunk	Flooded	Total
	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**
	So. Excl.	9	3		5	2		3			5						1	**28**
2018	Oso Flaco	2		3	2		2	10	5					4				**28**
	So. Excl.	3		3	2	3		6	10	1	12	1				1	3	**45**
2019	Oso Flaco	3			1	2	4	2	4		1			4			5	**26**
		139	**37**	**38**	**33**	**62**	**31**	**50**	**18**	**7**	**28**	**9**	**1**	**8**	**0**	**17**	**12**	**490**
	So. Excl.	28.4%	7.6%	7.8%	6.7%	12.7%	6.3%	10.2%	3.7%	1.4%	5.7%	1.8%	0.2%	1.6%	0.0%	3.5%	2.4%	
2002-19 Total nest loss		**45**	**4**	**11**	**10**	**26**	**18**	**23**	**15**	**2**	**13**	**1**	**0**	**11**	**2**	**8**	**16**	**205**
	Oso Flaco	22.0%	2.0%	5.4%	4.9%	12.7%	8.8%	11.2%	7.3%	1.0%	6.3%	0.5%	0.0%	5.4%	1.0%	3.9%	7.8%	
2002-19 Grand Total So. Excl. and Oso Flaco		**184**	**41**	**49**	**43**	**88**	**49**	**73**	**33**	**9**	**41**	**10**	**1**	**19**	**2**	**25**	**28**	**695**
		26.5%	5.9%	7.1%	6.2%	12.7%	7.1%	10.5%	4.7%	1.3%	5.9%	1.4%	0.1%	2.7%	0.3%	3.6%	4.0%	

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

Table F.3. Nest protection used in Southern Exclosure and Oso Flaco at ODSVRA in 2019.

Nests with unknown location and unknown fate nests are excluded. Also excluded is one nest found in Eucalyptus North revegetation area to the east of the exclosure. Circular = single nest circular exclosure; Mini = single nest mini-exclosure; gul = gull, unknown species; rav = common raven; nh = northern harrier; av = avian; un = unknown predator; sku = skunk; coy = coyote; pre = abandoned pre-term; ukp = abandoned unknown pre- or post-term; win = abandoned, suspected wind; fld = flooded; unk = failed, cause unknown.

	Seasonal Exclosure			Symbolic fencing	
Area	No additional fencing	Bumpout	Mini	No additional fencing	Circular
6 exclosure	**47**	**3**	**1**	**24**	**1**
Nests hatched	40 (80%)	2 (66%)	1 (100%)	13 (54%)	1 (100%)
Nests depredated	7 (3 gul, 4 av)	1 (1 av)		8 (6 gul, 2 rav)	
Nests failed other causes				3 (2 pre, 1 ukp)	
7 exclosure	**29**	**1**	**0**	**20**	**0**
Nests hatched	25 (86%)	1 (100%)		12 (60%)	
Nests depredated	2 (2 rav)			5 (1 gu, 3 rav, 1 av)	
Nests failed other causes	2 (1 pre, 1 ukp)			3 (1 fld, 2 unk)	
8 exclosure	**15**	**1**	**0**	**9**	**3**
Nests hatched	9 (60%)			8 (89%)	1 (33%)
Nests depredated	5 (4 rav, 1 nh)				
Nests failed other causes	1 (1 pre, 1 win)	1 (win)		1 (1 fld)	2 (1 pre, 1 fld)
Boneyard	**9**	**0**	**0**		
Nests hatched	5 (62%)				
Nests depredated	3 (1 rav, 1 cor, 1 sku)				
Nests failed other causes	1 (1 unk)				
SOUTHERN EXCLOSURE TOTALS	**100**	**5**	**1**	**53**	**4**
Nests hatched	79 (80%)	3 (60%)	1 (100%)	33 (62%)	2 (50%)
Nests depredated	17 (3 gul, 7 rav, 1 cor, 1 nh, 4 av, 1 sku)	1 (1 av)		13 (7 gul, 5 rav, 1 av)	
Nests failed other causes	4 (1 pre, 1 ukp, 1 win, 1 unk)	1 (1 win)		7 (2 pre, 1 ukp, 2 fld, 2 unk)	2 (1 pre, 1 fld)
North Oso Flaco	**4**	**0**	**0**	**5**	**10**
Nests hatched	2 (50%)			3 (60%)	8 (80%)
Nests depredated	1 (1 un)			1 (1 gul)	
Nests failed other causes	1 (unk)			1 (1 ukp)	2 (1 pre, 1 fld)
South Oso Flaco				**16**	**21**
Nests hatched				2 (13%)	15 (71%)
Nests depredated				13 (3 gul, 1 rav, 2 av, 4 coy, 3 un)	
Nests failed other causes				1 (1 unk)	6 (1 pre, 1 ukp, 4 fld)
OSO FLACO TOTALS	**4**	**0**	**0**	**21**	**31**
Nests hatched	2 (50%)			5 (24%)	23 (74%)
Nests depredated	1 (1 un)			14 (4 gul, 1 rav, 2 av, 4 coy, 3 un)	
Nests failed other causes	1 (unk)			2 (1 ukp, 1 unk)	8 (2 pre, 1 ukp, 5 fld)
GRAND TOTAL	**104**	**5**	**1**	**74**	**35**
Nests hatched	81 (79%)	3 (60%)	1 (100%)	38 (51%)	25 (81%)
Nests depredated	18 (3 gul, 7 rav, 1 cor, 1 nh, 4 av, 1 sku, 1 un)	1 (1 av)		27 (11 gul, 6 rav, 3 av, 4 coy, 3 un)	
Nests failed other causes	5 (1 pre, 1 ukp, 1 win, 2 unk)	1 (1 win)		9 (2 pre, 2 ukp, 2 fld, 3 unk)	10 (3 pre, 1 ukp, 6 fld)

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

Table F.4. Selective transfer of abandoned snowy plover chicks and potentially viable eggs to Santa Barbara Zoo in 2019.
All fledglings were released at Coal Oil Point Reserve, Santa Barbara County, CA.

No. chicks or eggs	Date collected	No. hatched	Band combinations of fledglings	Release date (age)	Notes
1 chick	29 May				On the morning of 29 May, a chick hatched from the SP60 nest on the North Oso Flaco shoreline and was observed remaining immobile and unattended near the nest bowl with the two mobile one-day-old sibling chicks nearby. The chick was placed in a box warmed with a portable hand warmer, but it remained immobile and did not appear capable of coordinated movements. The chick was transferred to the Santa Barbara Zoo in a warmed brooder the same day. The condition of the chick did not improve and it died on 31 May (see attached necropsy report).
3 eggs	13 May	2	VV:AV VV:BO	18 July (50 days)	On 30 April, two-egg SP66 nest found in South Oso Flaco, a circular exclosure was installed the following day, and the nest was incubated by an adult after the installation. Nest remained at two eggs when floated on 7 May and had an estimated hatch date of 23-26 May. On 12 May, no bird was seen, no eggs or nest bowl present in the circular exclosure, and the area was buried due to high winds the night before. Three eggs were found buried in the nest location, with one egg more deeply buried and separated by three inches from the other two eggs. Camera was installed at nest, and the eggs were marked and left in a shallow bowl. On 13 May, camera confirmed eggs not attended and abandoned eggs transported to the Santa Barbara Zoo the same day. Upon examination, one egg was determined to be nonviable and two eggs had active embryos. Two chicks hatched on 29 May, both reached fledge age, were individually banded and released.
3 eggs	30 May	2	VV:WO VV:WA	18 July (45 days)	On 5 May, three-egg SP82 nest found on 8 exclosure shoreline. On 28 May, a bird was on nest and two eggs had slight hatching cracks (one egg disappeared after 6 May). A circular exclosure was installed 28 May for avian predator protection and a bird returned to the nest after installation. The following day, no bird was seen on the nest and no eggs were visible at the nest. On 30 May, no bird was seen and three eggs were found buried, one of which was cracked with adhering dried blood and sand. The eggs, including the cracked egg, were collected and transported to the Santa Barbara Zoo. Two chicks hatched from the intact eggs on 3 June, both reached fledge age, were individually banded and released.
2 eggs	4 August	2	BB:LB VV:LV	3 October (54 days)	On 10 July, a bird was observed on the SP222 nest in North Oso Flaco and two eggs were confirmed on 12 July. The nest remained at two eggs, eggs were floated on 15 July giving an estimated hatch date of 2-3 August, and a circular exclosure was installed on 18 July. Daily incubation was observed until 30 July, but from 30 July to 1 August, 2 eggs were visible in the circular exclosure and a female was inconsistently seen on the nest. There was no incubation on 2-3 August, the two eggs were still in the center of the circular exclosure on 3 August, but one was 75% buried. The marked eggs were unmoved the following day and were taken to the Santa Barbara Zoo the same day. Two chicks hatched 10 August, both reached fledge age, were individually banded and released.

APPENDIX G. PREDATOR SUMMARY TABLES AND FIGURES.

Table G.1. Summary of predators detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2019.

Observations from 1 March to 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	5 Mar	6 Sep	89	-	Most common on North Oso Flaco shoreline and in South Oso Flaco. Tracks also present on the Southern Exclosure shoreline (primarily during July and August). Four plover nests in South Oso Flaco documented depredated by coyote. Noted inside the Seasonal Exclosure on 13 days (17 occurrences).
Opossum	9 May	4 Sep	16	-	Activity primarily noted in the Southern Exclosure and North Oso Flaco during July to September.
Raccoon	4 May	3 Sep	17	-	Activity noted throughout all areas of the Southern Exclosure and Oso Flaco.
Skunk	25 Mar	30 Aug	36	-	Activity primarily noted in 8 exclosure, Boneyard exclosure, and North Oso Flaco during June to August. Tracks also present in 7 exclosure and South Oso Flaco.
Avian					
American crow	26 Mar	30 Aug	13	4	Primarily observed in June and July throughout the Southern Exclosure and Oso Flaco in flight and perching, sometimes over an extended time period. More sightings than seen in previous years.
American kestrel	8 Mar	28 Aug	37	3	Frequent sightings from June to August. Observed hunting in all areas of the Southern Exclosure and Oso Flaco (primarily in 8 exclosure and North Oso Flaco). Minimum of three individuals (based on bands and sex characteristics) observed during season: one female with unique federal metal band, one unbanded male, and one unbanded female.
Common raven	26 Mar	25 May	10	1	Primarily observed flying over exclosure areas in May. No more than one raven seen at a time over the exclosure areas. Thirteen plover nests documented lost to raven from 14-24 May. No additional sightings of ravens after 25 May.
Gull spp.	Present daily throughout season				Gulls were present the length of the shoreline of the Southern Exclosure and Oso Flaco. Herring gull and western gull documented depredating plover nests, chicks, or juveniles (see Table H.4 in Appendix H).
Loggerhead shrike	26 Jun	13 Aug	4	1	All observations in 6, 8, and Boneyard exclosures, and Oso Flaco.
Merlin	5 Mar	17 Apr	10	2	Primarily observed hunting over North Oso Flaco and Boneyard exclosure. Also present in 7 exclosure on three days and 8 exclosure on four days. Two merlins seen at the same time on 30 March. Only sex identified was male.
Northern harrier	14 Mar	31 Aug	60	4	Observed throughout the Southern Exclosure and Oso Flaco (primarily in NOF, 8, and 7 exclosures) in flight and perching, sometimes over an extended time period. Observed multiple times pursuing and/or consuming prey inside exclosures. Northern harrier documented taking one juvenile tern (see Table H.2 in Appendix H). One plover nest in 8 exclosure documented depredated by harrier. Minimum of four individuals (based on age and sex characteristics) observed during season: one adult female, one sub-adult male, and two juveniles.

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

Table G.1. Summary of predators detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2019 (continued).

Species	First date observed	Last date observed	No. days detected	Min. no. individ.	Notes
Osprey	Common throughout 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. Hazed as appropriate.
Large owl spp.	11 Mar	29 Aug	27		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 South Oso Flaco and Boneyard exclosure. Noted inside 7 exclosure on three days, 8 exclosure on five days, and North Oso Flaco on five days.
Peregrine	8 Mar	7 Sep	71	5	Observed throughout the Southern Exclosure and 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 exclosures. Peregrines were documented taking one adult plover, one adult or juvenile plover, and four plover chicks (see Table H.4 in Appendix H). Minimum of five individuals (based on bands and/or age and sex characteristics) observed during season.
Red-tailed hawk	11 Mar	22 Aug	39	3	Observed primarily in Oso Flaco foredunes. Minimum of three individuals (based on age characteristics) observed during season: one adult, one subadult, and one juvenile.

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

Table G.2. Mammalian and avian predators removed under predator management actions for least terns and snowy plovers at ODSVRA in 2019.

Six coyotes, two striped skunks, five common ravens, four American crows, one herring gull, and two western gulls were lethally removed. One western gull was inadvertently killed while attempting to remove a herring gull. Two coyotes were caught in traps intended for skunks and ravens and were euthanized. One American kestrel (non-targeted individual), one northern harrier (non-targeted individual), and two peregrines were live-trapped and relocated. The relocation date is given in parenthesis. All animals trapped or removed were within ODSVRA boundaries, with the exception of five ravens removed off-site with the permission of the landowner.

ORA=open riding area

Date	Species	Age/Sex	Location
Lethally removed			
26 April	western gull	adult	Oso Flaco Creek
28 April	herring gull	adult	6 exclosure
10 May	common raven	juvenile	Brown Road, Santa Maria
10 May	common raven	juvenile	Brown Road, Santa Maria
13 May	common raven	juvenile	Brown Road, Santa Maria
13 May	common raven	juvenile	Brown Road, Santa Maria
8 June	common raven	adult	three miles east of Oso Flaco Lake
24 June	American crow	adult	ORA
26 June	coyote	adult female	Pawprint revegetation area
28 June	American crow	adult	South Oso Flaco Boardwalk area
3 July	American crow	adult	west end of Pipeline revegetation area
8 July	American crow	subadult	Pawprint revegetation area
8 July	western gull	immature	6 exclosure
24 July	striped skunk	subadult female	East Boneyard
25 July	coyote	adult female	South Oso Flaco
25 July	coyote	juvenile male	South Oso Flaco
31 July	striped skunk	subadult male	East Boneyard
2 August	coyote	adult male	South Oso Flaco
3 August	coyote	adult male	South Oso Flaco
13 August	coyote	adult female	East Boneyard
Live-trapped and relocated			
24 Jun (25 Jun)	peregrine	subadult female	ORA just south of BBQ Flats revegetation area
28 June (30 Jun)	peregrine	adult female	Arroyo Grande Creek
27 Jul (28 Jul)	northern harrier	juvenile	North Oso Flaco foredunes
29 Jul (30 Jul)	American kestrel	adult female	North Oso Flaco foredunes

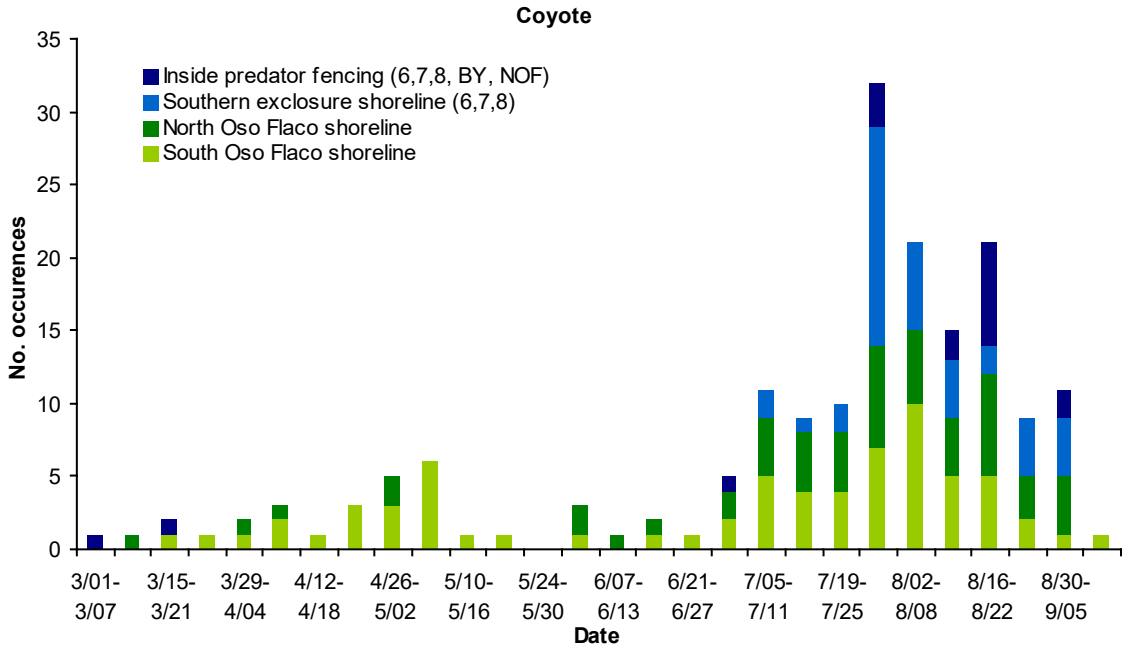

Figure G.1. Coyote occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2019.

Observations from 1 March to 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.

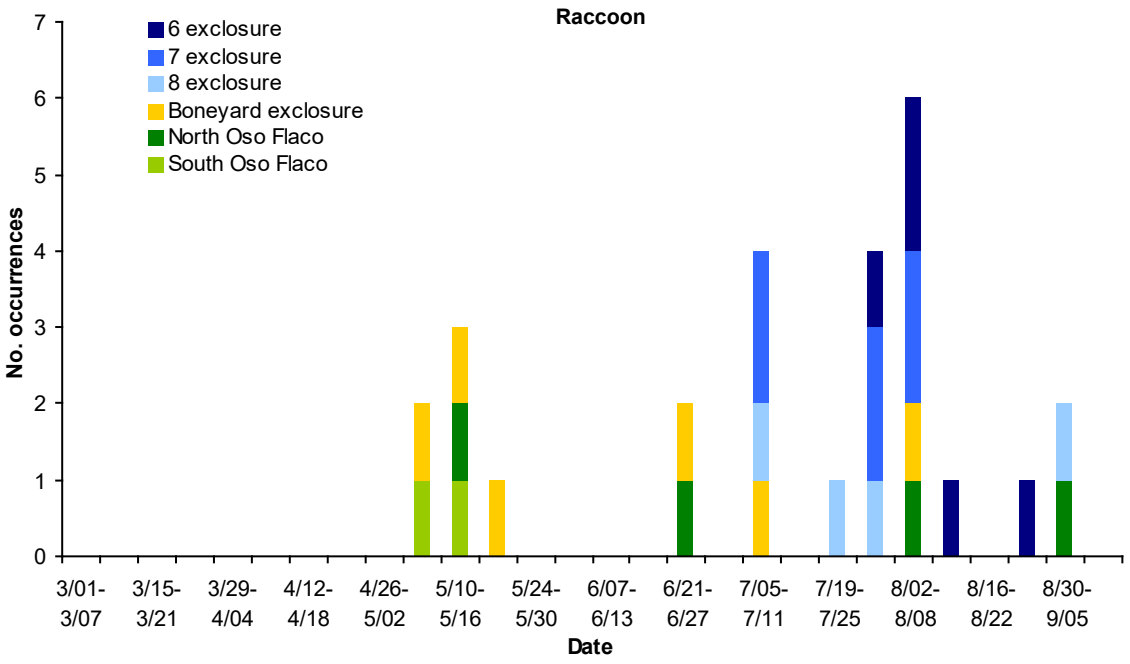

Figure G.2. Raccoon occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2019.

Observations from 1 March to 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.

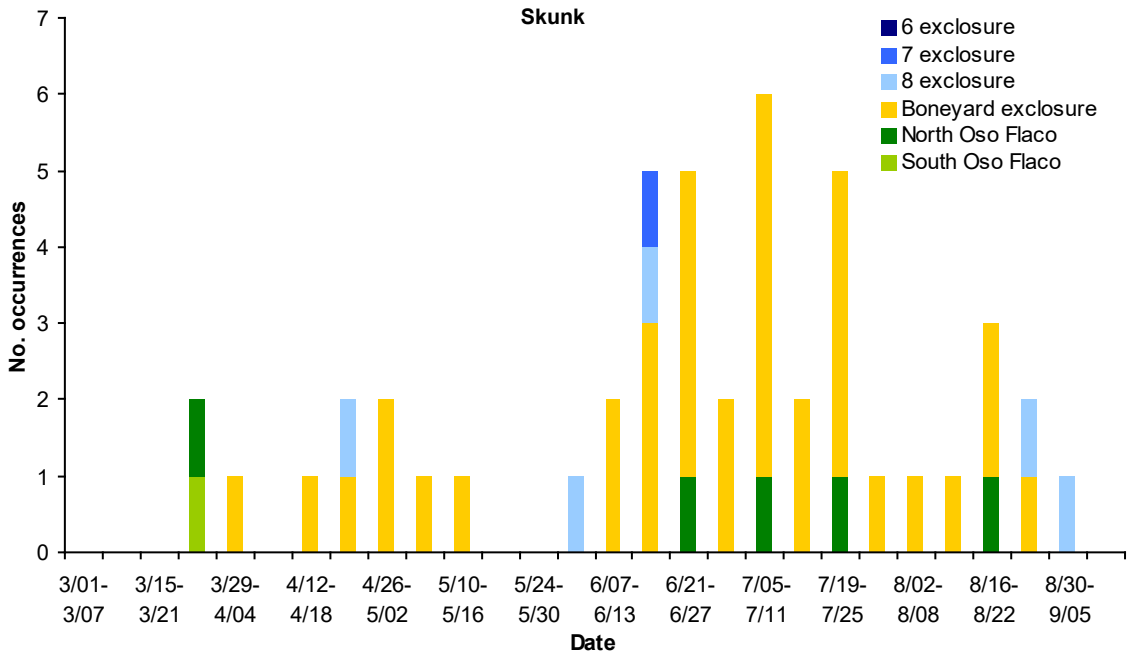

Figure G.3. Skunk occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2019.

Observations from 1 March to 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.

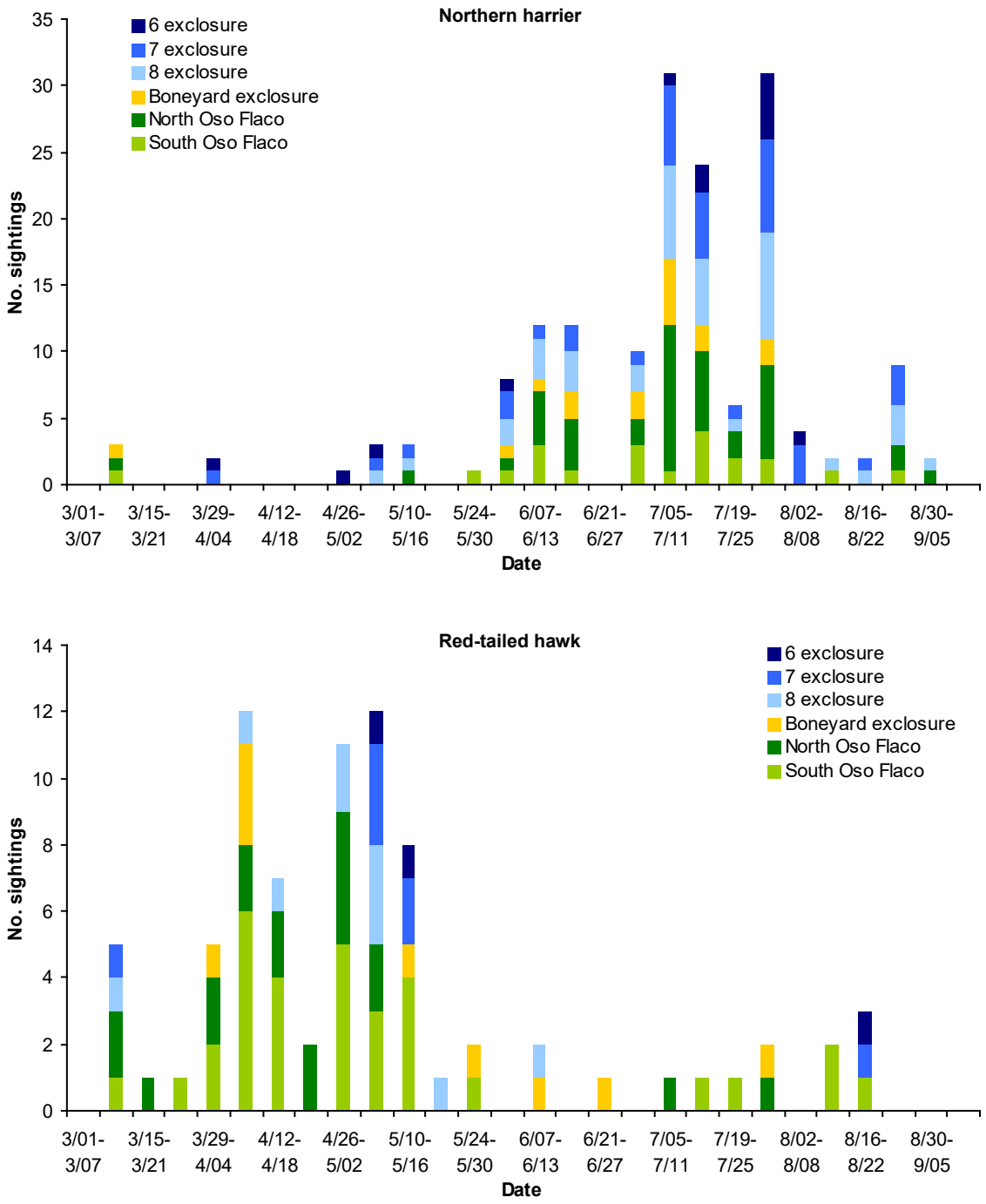

Figure G.4. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2019.

Observations from 1 March to 10 September (a 194-day period).

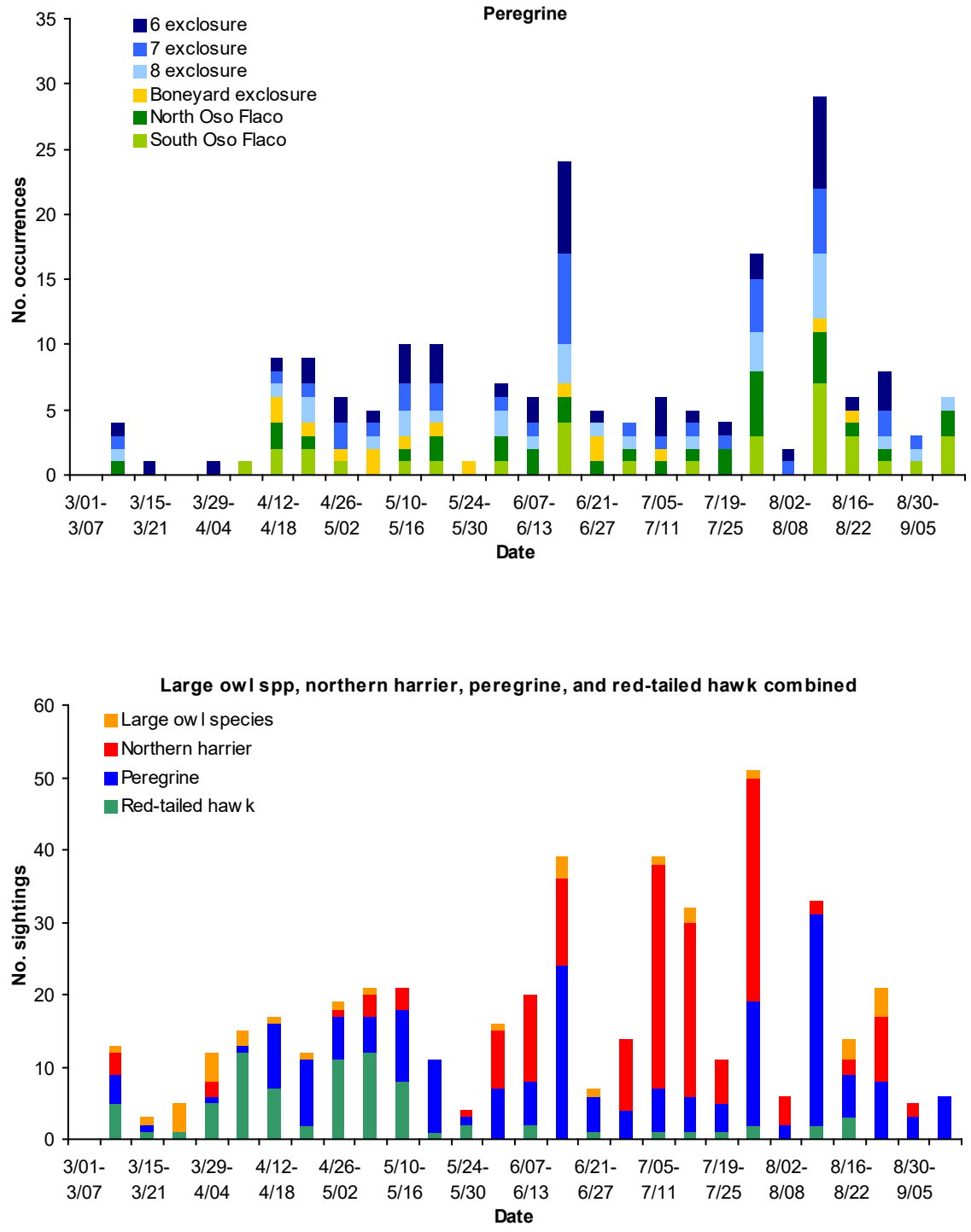

Figure G.4. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2019 (continued).
Observations from 1 March to 10 September (a 194-day period).

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

Table H.1. Sightings of injured snowy plovers in 2019.

(No injured least terns were observed during the 2019 season.)

No. (age)	Location	Notes
1 (adult)	7 exclosure	On 25 June, a male plover, banded PV:WY and associated with the SP169 nest, was observed on the 7 exclosure shoreline with a left foot injury. It was putting no weight on the left leg and the middle toe on the left foot was swollen. The left leg was not swollen and the bands appeared to move freely. The injured bird was again seen 14 July with the three SP169 chicks on the 7 exclosure shoreline and occasionally putting some weight on the left leg while walking. On 15-16 July, the bird was only limping slightly and the foot looked near normal, and was last seen 28 July with no noticeable injury.
1 (juvenile)	7 exclosure	On 8 July, a 37-day-old juvenile plover banded GG:GO from the SP87 nest was seen on the 7 exclosure shoreline putting very little weight on the right leg. There was no swelling and the bands appeared to move freely. The injured bird was seen with its two juvenile siblings, but later that morning one was depredated by a western gull (see Table H.4). The condition did not change and on 10 July the bird was captured and transported to Pacific Wildlife Care in Morro Bay the same day. The veterinarian examined the bird, did not find an injury, and it was released back to the 7 exclosure shoreline later that day (bird rebanded GG:OL). The bird continued to walk and run with a noticeable limp until 15 July, but was observed on 22 July without a limp.
1 (adult)	7 exclosure	On 14-16 July, a male plover banded GA:WR was observed on the 7 exclosure shoreline with a left foot injury. Bird attending two chicks from the UNA11 brood (both chicks fledged). It was limping slightly and there was swelling to the middle toe. The bird was last seen 4 August walking fairly normally. A GA:WR male was reported with a similar injury description in 2018 and is assumed to be the same bird.
1 (adult)	6 exclosure	On 29 July, an unbanded male, associated with the SP175 fledgling (32 to 33 days old), was observed on the 6 exclosure shoreline not putting weight on the right leg. An unbanded bird matching this description was not seen subsequently.
1 (chick)	6 exclosure	On 2 August, one of two 17-day-old unbanded chicks from the SP208 nest was observed on the 6 exclosure shoreline with a bloated abdomen and splayed legs. The condition of the chick remained unchanged and both chicks were last seen on 4 August.
1 to 2 (1 juvenile, 1 juvenile or adult)	8 exclosure, open riding area	On 5 August, an unbanded juvenile plover was observed on the 8 exclosure shoreline with a left leg injury. The bird was putting very little weight on the left leg or foot and mostly hopping on the right. On 29 August, an unbanded snowy plover (adult or juvenile) was seen in the open riding area north of marker post 5 with a similar injury description and possibly may be the same bird.
1 (juvenile)	8 exclosure	On 16 August, an unbanded juvenile plover was observed on the 8 exclosure shoreline with a right leg injury. The bird was putting no weight on the right leg, holding it off the ground while hopping, and the toes appeared swollen or deformed. An unbanded bird matching this description was not seen subsequently.

Table H.2. Documented predation of least terns from 1 March to 30 September 2019.

No. (age)	Predator	Location	Notes
1 (juvenile)	Northern harrier (subadult male)	7 exclosure	On 17 July, a subadult male northern harrier was observed landing in 7 exclosure and carrying off prey (suspected least tern) to the North Oso Flaco foredunes. Soon after a banded adult male peregrine (federal band on left leg, unread black VID band on right leg) was observed stealing the prey from the harrier on the ground and carrying the prey to a perch on the west Boneyard exclosure fence to consume it. Feather remains collected at the perch location confirmed a juvenile least tern.

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

Table H.3. Mortality, other than documented predation, of least terns from 1 March to 30 September 2019.

No. (age)	Location	Notes
1 (juvenile)	Open riding area	On 10 July, wing and feather remains of a juvenile least tern were found approximately 15 feet east of 7 exclosure in the open riding area. Fresh raccoon tracks circled the tern remains but there was no indication from the tracks that the raccoon depredated the tern. The remains were dry and desiccated, not appropriate for necropsy, and cause of death is unknown.
1 (juvenile)	6 exclosure	On 23 July, a dead unbanded juvenile least tern was found in 6 exclosure approximately 220 feet east of the west fence. The intact and fresh carcass was on the surface of the sand next to a sea rocket plant. Necropsy results indicate it died from gastrointestinal impaction from what appeared to be a large piece of felt fabric (see attached report).

Table H.4. Documented predation of snowy plovers from 1 March to 30 September 2019.

No. (age)	Predator	Location	Notes
1 (chick)	Brewer's blackbird	North Oso Flaco	On 18 May, a Brewer's blackbird was observed pecking a five-day-old banded plover chick from the SP76 nest inside the North Oso Flaco foredunes. The chick ran north and the blackbird followed it, picked it up, and then flew quickly out of sight with the chick in its bill. Chick not seen again.
2 (chick)	Peregrine (subadult female "Scruffy Nape[1]")	6 exclosure	On 7 June, a subadult female peregrine identified as the "Scruffy Nape" individual was observed eating two chicks (one banded and one unknown if banded) on 6 exclosure shoreline. Based on location the two chicks are suspected to be from the SP69 brood. The falcon was trapped on 24 June and released on 25 June in the Owens Valley of California, 179 miles northeast of ODSVRA. A black VID band with white lettering "W49" was affixed to the right leg and a USFWS band was affixed to the left leg.
2 (chick)	Peregrine (adult female "Turtle Beak[1]")	6 exclosure	On 20 June, an adult female peregrine identified as the "Turtle Beak" individual was observed eating two plover chicks on the 6 exclosure shoreline. The falcon was trapped on 28 June and released on 30 June at the Butte Valley Wildlife Area, Siskiyou County, 475 miles north of ODSVRA. A black VID band with white lettering "W48" was affixed to the left leg and a USFWS band was affixed to the right leg. On 1 August, this bird was observed back on-site.
4 (1 chick, 1 juvenile, and 2 unknown age)	Western gull (immature)	6 exclosure	On 8 July at 9:54 am, an immature western gull was observed flying low over the high tide line on 8 shoreline while being chased by multiple adult plovers in flight. The gull turned and was seen catching and eating a plover juvenile (SP87 nest, 37 days old) on the ground west of 7.5 revegetation area. The gull flew to the north end of 6 shoreline where it was lethally removed by USDA Wildlife Services at 10:21 am. Plover remains found in the gut, besides the one fledgling from the SP87 nest, included one 16-day-old banded chick from the SP235 nest, and two unbanded birds of unknown age.
5 (3 chicks, 1 adult and 1 juvenile or adult)	Peregrine (juvenile female)	7 exclosure and North Oso Flaco	On 26 July, an unbanded juvenile female peregrine was observed catching and eating an adult male plover, banded GG:OY, on the 7 exclosure shoreline. At the time of predation the GG:OY male plover was the sole adult attending three chicks from the SP218 nest. The three chicks (2- to 3-days old) were seen on the same day after the predation event without an adult and a single unattended chick was last seen on 27 July (these chicks lost due to the peregrine's predation of the adult and are included here). On 26 July, the falcon was later observed eating a banded plover (juvenile or adult) in the North Oso Flaco foredunes (prey remains collected included a bill and right leg with bands YY).
1 (suspected adult)	Unknown	Open riding area	On 14 August, the head of a snowy plover, suspected adult, was found in the open riding area north of Maidenform revegetation area. There was a small amount of red blood on ground, head appeared fairly fresh when found, and bird assumed depredated. No other remains were located.

[1]Name derived from physical characteristics allowing recognition of individual in field.

Table H.5. Mortality, other than documented predation, of snowy plovers in 2019.

No carcasses were found 14 November to 31 December 2018, subsequent to the 2018 annual report. Not included is an abandoned chick in poor condition taken to Santa Barbara Zoo, where it later died, see Table F.4 in Appendix F for details.

No. (age)	Location	Notes
1 (juvenile)	6 exclosure	On 1 July, the carcass of a young juvenile snowy plover, banded PG:GB from the SP64 nest, was found on the 6 exclosure shoreline at the high tide line. The carcass was intact with no sign of injury. The two sibling fledglings were seen nearby the carcass foraging normally. All three chicks from the SP64 nest were last seen alive on 24 June when 28 days old. The carcass was sent to CDFW OSPR for necropsy. Radiographs of the carcass did not show any fractures and it was too desiccated for additional analysis (see attached report). The remains were donated to the California Academy of Sciences in San Francisco, California.
2 (chick)	7 exclosure	On 25 July, an adult male plover was observed dragging the carcass of a PG:VW chick at the north end of the 6 exclosure shore. Chick is from the two-chick SP187 brood (being raised at the north end of 6 exclosure shore) and was last seen alive with its sibling on 23 July, when 6-7 days old. On 26 July, the remaining chick (9-10 days old) in this brood was observed having difficulty walking and was seen dead on 27 July within 50 feet of the earlier described chick carcass. Both carcasses could not be recovered due to the proximity of young plover broods.
1 (adult)	Open riding area	On 19 August, a dead unbanded adult snowy plover was found in the open riding area approximately 200 feet northeast of 6 exclosure. The carcass was extremely decomposed and the left wing was detached from the body and found nearby.
1 (chick)	7 exclosure	On 19 August, partial remains of a small decomposed chick carcass, with one white band on the right leg, was found in 7 exclosure.
1 (adult)	Open riding area	On 23 August, a dead female plover banded PG:OG was found in the open riding area between marker posts 5 and 6, east of the camping area. The carcass was in two pieces, flattened, and in an area with multiple tire tracks. This adult fledged from ODSVRA in 2015 (only one chick known fledged) and was confirmed breeding at our site in 2017 and 2019. It was last seen alive five days earlier on 18 August east of marker post 6 in the open riding area.
1 (adult)	Open riding area	On 24 August, a dead unbanded adult plover was found in the open riding area south of marker post 4 in the camping area. The carcass was fresh and intact, in an area with multiple tire tracks, but not found in recent vehicle tracks.
1 (juvenile or adult)	North Oso Flaco	On 27 August, a decomposed wing of a snowy plover of unknown age (juvenile or adult) was found approximately 15 feet west of the exclosure fence on the North Oso Flaco shoreline. The wing had coyote tracks nearby and may have been scavenged.
1 (adult)	Open riding area	On 28 August, a dead adult plover banded BB:VG, was found in the riding area north of marker post 1 and west of the Arroyo Grande Creek lagoon. The carcass was initially found by park visitors and reported to park staff. It was extremely desiccated, appeared scavenged, and was flattened with multiple vehicle tracks nearby. The left leg banded BB was detached and buried under the body. The violet plastic band on the right leg had a number identifying the adult was one of two chicks that fledged from ODSVRA in 2017. A female with the BB:VG combination was known to be breeding at our site in 2018 and 2019 and was last observed alive 10 August in the open riding area. A male with the BB:VG combination was infrequently seen and last observed on 10 July in North Oso Flaco.
1 (adult)	7 exclosure	On 1 September, the carcass of an unbanded female plover was found at the waterline on the 7 exclosure shoreline. The carcass was intact, appeared fresh, was wet and washed by tide, and had a large area of exposed internal tissue on the back of the neck.
1 (adult)	Riding area	On 3 November, a dead adult plover banded AG:AV, was found in the riding area south of marker post 8 in the camping area. The carcass was fresh and intact, in an area with multiple tire tracks. This adult fledged from the Salinas River National Wildlife Refuge in 2017 and was confirmed wintering at our site in 2017-19. It was last seen alive the day before on 2 November at the shoreline near marker post 8.

Oceano Dunes State Vehicular Recreation Area

2019 Predator Management Report

Submitted To:

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Submitted By:

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&
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Introduction

Prior to the 2019 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 January 8, 2019 and worked through August 30, 2019.

Methods of Predator Management

Multiple methods were used for CLTE and SNPL protection throughout the nesting season. Activities included surveying, trapping, shooting 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 Pawprint , 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 2019 nesting season. Methods of trapping included the use of foot snares, Collarums® and Woodstream® #3 and #1 1/2 padded jaw leg-hold traps for predators such as coyotes (*Canis latrans),* red fox (*Vulpes vulpes)*, 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. Quail eggs and hard boiled chicken eggs were also used for bait in an attempt to trap ravens.

The model of firearm used to euthanize trapped wildlife, with the exception of striped skunks, was a Marlin® Model 39A chambered in .22 long rifle. Ammunition used to euthanize trapped wildlife was 22 caliber CCI® Short Range Green that fired a 21 grain non-lead projectile. Striped skunks were euthanized with an injection of sodium pentobarbital.

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 six foot long copper rod with a collar fitting that is 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 in accordance with 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 copper pipe 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.

Ravens were removed with a Benelli® M1 12 gauge shotgun that fired Federal® brand 3 inch shotgun shells with #2 steel shot.

Optics used on the site included 10 X 42mm Goldring® binoculars by Leupold Optics.

Baiting efforts to attract common ravens using hard boiled chicken eggs were employed in an attempt to entice ravens to a location to feed on the 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. 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 this 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 it can take up to three days for birds to die.

Results of Predator Management Methods

When predator management efforts by Wildlife Services began for the 2019 season, the SNPL nesting season had not yet commenced. The main predation concerns this season were by common ravens, gulls, northern harrier, peregrine falcon, coyotes 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 commonly occur. 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). A minimal amount of coyote activity along the shoreline of the North Oso Flaco and Southern Exclosure was documented by

observations of coyote tracks in those areas early in the season. However, coyote activity on the exclosure shoreline became more prevalent during the latter portions of the season and likely played a role in the low chick survival during that time. Multiple SNPL nests were confirmed to have been predated by coyotes in South Oso Flaco during the nesting season.

Six coyotes were lethally removed during the 2019 season using #3 and #1.5 foot hold traps and foot snares (Table 1). The first coyote was trapped in the Pawprint vegetation island east of the six exclosure. It was captured in a padded jaw leg-hold trap set placed for ravens using quail eggs as bait. The second through fifth coyotes were trapped in the northern reaches of South Oso Flaco, east of the lagoon and flats area. Three of these coyotes were captured in foot snares and one in a padded jaw leg-hold trap. The sixth coyote was trapped in a padded jaw leg-hold trap set for skunks in the southern end of the East Boneyard Exclosure.

The 2019 nesting season continued to experience common raven (*Corvus corax*) predation events on SNPL nests as well as an increase in American crow (*Corvus brachyrhynchos*) visitation in and within close proximity of nesting areas. Multiple sightings were observed of individual birds frequenting the exclosure areas throughout the park with documented nest losses to raven(s). Snowy plover nesting sites south of OSDVRA were also experiencing serious predation from ravens. Aggressive trapping efforts using replicated plover nest sets baited with quail eggs was attempted. Baiting efforts using hard boiled chicken eggs was attempted in an effort to attract ravens to feed on the eggs with enough consistency to later treat the eggs with the corvicide DRC 1339. Motion activated cameras were placed at each trap site and bait site to verify any raven visitation. The use of 1-1/2 padded jaw leg-hold traps baited with hard boiled chicken eggs or quail eggs were placed in various locations along the shoreline and exclosure areas. It is believed most ravens traveled north from the south or from the east via the Oso Flaco agriculture fields. Ravens failed to visit any of the quail egg sets or chicken egg bait sites. No DRC-1339 egg baits were utilized this season. However, control work conducted off site near the Oso Flaco agriculture fields and at a known raven nest resulted in the removal of one adult raven, and four juvenile ravens.

Highly proactive predator watch shifts were employed at this time by State Parks resources staff and by WS Schaefer. Raven activity on nearby farms, as well as sites to the south of ODSVRA property allowed WS Schaefer to focus effort toward removing ravens when given a safe opportunity. WS Schaefer signed an agreement with a neighboring ranch in order to gain access to a known raven nest on that property. On May 10, WS Schaefer removed two juvenile ravens at the known nest site on a neighboring ranch off of Brown Road in Santa Barbara County. On May 13, he returned and was able to remove an additional two juvenile ravens. Efforts to take the adults were unsuccessful due to their loose proximity to the nest of near fledge age chicks. On June 8, WS Schaefer was patrolling the fields of neighboring farms for ravens when he successfully removed one adult raven. During this time, ODSVRA and neighboring nesting sites to the south were experiencing severe predation by what was likely one individual raven coming from the south of the Guadalupe-Nipomo Dunes County Park. This bird was attributed to having taken high numbers of SNPL nests and possibly one plover chick from ODSVRA's nesting areas. Trapping efforts

were unsuccessful and an ideal shooting opportunity was never presented to WS Schaefer in order to remove this individual. All predation eventually ceased.

An increased number of American crow visitations in or near nesting habitat was also experienced this season. Between June 24 and July 8, four crows were observed flying over and/or foraging on the shoreline and nesting exclosure. The four crows were lethally removed to reduce the threat to nesting plovers and terns.

Gull predation to SNPL chicks at ODSVRA is a concern and may potentially be a reason for significant nest and chick loss during the 2019 season. During April, an adult Herring gull (*Larus argentatus*) had been identified as predating on large numbers of SNPL nests. On April 26, one adult Herring gull was observed in South Oso Flaco among a group of other gulls. WS Schaefer was requested to remove that individual Herring gull. State Parks resources staff and WS Schaefer convened where the gull was being tracked but due to confusion in communication between both parties, WS Schaefer removed an adult Western gull *(Larus occidentalis)* believing it was the target animal due to the similar plumage between both gulls. On April 28, an adult Herring gull was observed on the 6 exclosure shoreline by State Parks resources staff. WS Schaefer was unavailable to respond to the call and a park ranger was requested to remove the gull. The individual gull was successfully removed and later confirmed to match the Herring gull characteristics observed on a camera trap taking a SNPL plover nest. All gull attributed nest predation ceased after this event until May 26. On May 26, a large group of gulls landed briefly in north 6 exclosure and opportunistically took one plover nest. On July 8, State Parks resources staff observed a sub-adult Western gull take one plover chick on the shoreline. WS Schaefer was called to the area and was successful in removing the target gull. Upon necropsy, the gull was found to have consumed four SNPL plover chicks (one 37-day-old juvenile, one 16-day-old chick, and two of unknown age).

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 State Park resources staff and Bloom Biological Inc. (BBI) contractor 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 located.

Skunks are documented predators of plover and tern nests at ODSVRA. In 2019, trapping efforts targeting skunks occurred in East Boneyard after regular observations of tracks were observed entering the nesting exclosure in this area. Two striped skunks (*Mephitis mephitis*) were removed using #1 1/2 padded leg-hold traps during the 2019 season.

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.

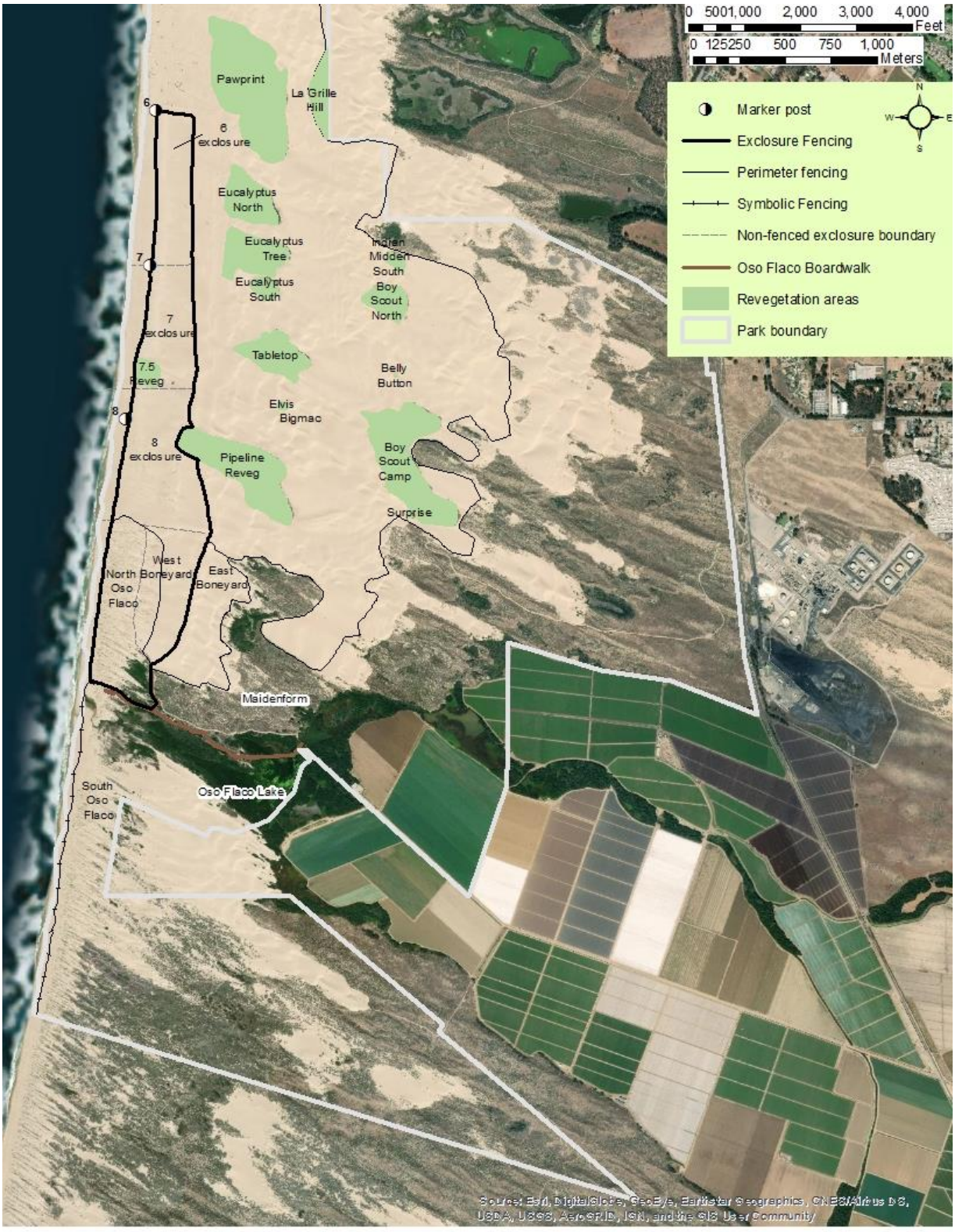
Table 1: Predator Removal Summary

Date	Species	Age/Sex	Location
4/26/19	Western gull	Adult/NA	South Oso Flaco
4/28/19	Herring gull	Adult/NA	6 Exclosure Shoreline
5/10/19	Raven	Juvenile/NA	Brown Rd. in Santa Barbara County
5/10/19	Raven	Juvenile/NA	Brown Rd
5/13/19	Raven	Juvenile/NA	Brown Rd
5/13/19	Raven	Juvenile/NA	Brown Rd
6/8/19	Raven	Adult/NA	Ag Fields East of Oso Flaco
6/24/19	American Crow	Adult/NA	Open Riding Area
6/26/19	Coyote	Adult/Female	Pawprint
6/28/19	American Crow	Adult/NA	South Oso Flaco Boardwalk Area
7/3/19	American Crow	Adult/NA	West Pipeline Reveg.
7/8/19	American Crow	Sub Adult/NA	Pawprint
7/8/19	Western gull	Sub Adult/NA	6 Exclosure Shoreline
7/24/19	Striped Skunk	Adult/Female	East Boneyard
7/25/19	Coyote	Adult/Female	South Oso Flaco
7/25/19	Coyote	Juvenile/Male	South Oso Flaco
7/31/19	Striped Skunk	Subadult/Male	East Boneyard Exclosure
8/2/19	Coyote	Adult/Male	South Oso Flaco
8/3/19	Coyote	Adult/Male	South Oso Flaco
8/13/19	Coyote	Adult/Female	East Boneyard Exclosure

Alexander Schaefer, Wildlife Specialist
San Luis District
CA Wildlife Services

Eric Covington, District Supervisor
Barry Lowry, Assistant 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

RESTRICTED USE PESTICIDE

Due to High Acute Inhalation Toxicity and Eye and Skin Corrosiveness to Humans; High Acute Toxicity to Nontarget Birds and Aquatic Invertebrates; and the Need for Highly Specialized Applicator Training.

For retail sale to and use only by USDA APHIS Certified Applicators trained in bird control or by persons under their direct 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 or the young of Federally-designated Threatened or Endangered Species or of other species designated to be in need of special protection or that damage and feed on the contents of silage/fodder bags.

ACTIVE INGREDIENT:	
DRC-1339, 3-chloro-p-toluidine hydrochloride:	97.0%
OTHER INGREDIENTS:	3.0%
TOTAL:	100.0%

KEEP OUT OF REACH OF CHILDREN

DANGER-PELIGRO

POISON

FIRST AID

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. If you need immediate medical attention call the Poison Control Center at 1-800-222-1222 or a doctor. For non-emergency information concerning this product, call the National Pesticide Information Center at 1-800-858-7378.

If swallowed	- Call a poison control center or doctor immediately for treatment advice. - Have person sip a glass of water if able to swallow. - Do not induce vomiting unless told to do so by the poison control center or doctor. - Do not give anything to an unconscious person.
If on skin or clothing	- Take off contaminated clothing. - Rinse skin immediately with plenty of water for 15-20 minutes. - Call a poison control center or doctor immediately for treatment advice
If inhaled	- Move person to fresh air. - If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. - Call a poison control center or doctor immediately for treatment advice.
If in eyes	- Hold eye open and rinse slowly and gently with water for 15-20 minutes. - Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. - Call a poison control center or doctor immediately for treatment advice.

NOTE TO PHYSICIAN AND VETERINARIAN: Probable mucosal damage may contraindicate the use of gastric lavage. See additional "**PRECAUTIONARY STATEMENTS**" on right panel. If pet eats bait, call a veterinarian at once.

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

Acute Hazards: Fatal if inhaled. Corrosive. Causes irreversible eye damage and skin burns. May be fatal if swallowed. Harmful if absorbed through skin. Prolonged or frequently repeated skin contact may cause allergic reactions in some people.

Hazard Avoidance: Do not get in eyes, on skin, or on clothing. Do not breathe dust. Wear protective clothing, 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 (PPE):

Handlers who mix packages containing 1 lb (0.45 kg) or more of this product must wear:
- Coveralls over long-sleeved shirt and long pants
- Chemical-resistant gloves (such as waterproof or rubber gloves)
- Chemical-resistant footwear plus socks
- Protective eyewear (goggles or face shield)
- A NIOSH approved particulate respirator with any N, R, or P filter with NIOSH approval number prefix TC-84A

Handlers who mix packages containing less than 1 lb (0.45 kg) of this product must wear:
- Long-sleeved shirt and long pants
- Chemical-resistant gloves (such as waterproof or rubber gloves)
- Protective eyewear (goggles or face shield)

Applicators who handle bait must wear:
- Long-sleeved shirt and long pants
- Chemical-resistant gloves (such as waterproof or rubber gloves)

User Safety Requirements:
- Follow manufacturer's instructions for cleaning/ maintaining PPE. If no such instructions are provided for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.
- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS:

This product is very highly toxic to birds and aquatic invertebrates. Do not use in any manner that may endanger nontarget and protected bird species. Runoff may be hazardous to aquatic organisms in neighboring areas. Do not apply when runoff is likely to occur. Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water by the cleaning of equipment or disposal of waste.

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
4700 River Road, Unit 149
Riverdale, MD 20737

EPA Reg. No. 56228-29
EPA Est. No. 56228-ID-1
Net Contents: _____
Batch Code No.: _____

Registration No. 56228-29, Page 1 of 3

ENDANGERED SPECIES CONSIDERATIONS:

Before undertaking any control operations with the product, consult with local, State, and Federal Wildlife authorities to ensure the use of this product presents no hazard to any Threatened or Endangered Species. **DO NOT** apply treated baits where there is a danger that Threatened or Endangered Species will consume baits unless special precautions are taken to limit such exposures.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

READ THIS LABEL:
Read the entire label. This product must be used strictly in accordance with this label's precautionary statements and use directions, as well as with all applicable State and Federal laws and regulations.

Before using this product, contact the U.S. Fish and Wildlife Service and the applicable State wildlife agency and obtain all necessary kill or collecting permits. Use only for the sites, pests, and application methods described on this label.

PRODUCT INFORMATION:

This product contains a slow-acting avicide which kills target bird species (see list below) in 1 to 3 days. As many types of nontarget birds are potentially vulnerable to DRC-1339, it is necessary to use care and to follow the requirements of this label to minimize impacts to nontarget species.

USE RESTRICTIONS:

Baits made from Compound DRC-1339 - Livestock, Nest & Fodder Depredations may only be used to control the following species:

- Common raven *(Corvus corax),*
- Chihuahuan raven *(Corvus cryptoleucus),*
- American crow *(Corvus brachyrhynchos),*
- Black-billed magpie *(Pica hudsonia),* and
- Fish crow *(Corvus ossifragus).*

This product may be used to prepare egg or meat-cube baits to control the target species listed above in the following use sites:

- Rangeland and pastureland areas where ravens or crows prey upon newborn livestock;

- Refuges or other areas 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

- Within 25 feet (7.6 m) of silage/fodder bags that have been damaged or are likely to be damaged by crows, ravens, or black-billed magpies.

Baits must be prepared and applied as specified on this label. DO NOT apply baits made from this product by air or by use of any mechanical equipment designed to broadcast baits or other pesticides. Users of this product must follow all limitations indicated on this label regarding the placement and monitoring of treated baits.

Before baits made from this product are applied, sites that are to be treated **must be observed** for evidence of nontarget activity **and must be prebaited** (see specific instructions for these activities). **DO NOT** apply treated baits 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 observation of baited sites and use of hazing tactics to frighten away Threatened or Endangered Species that otherwise might feed upon baits.

DIRECTIONS FOR USE, continued

USE RESTRICTIONS, continued:

DO NOT apply treated baits within 50 feet (15.2 m) of permanent manmade or natural bodies of water, unless baited sites are under constant observation while baits are exposed.

DO NOT exceed a maximum application rate of 0.083 lbs of active ingredient per acre (0.93 g active ingredient/100 m^2), or a maximum yearly application rate of 0.5 lb of active ingredient per acre (5.61 g active ingredient/100 m^2).

DO NOT store treated bait in locations accessible to children, pets, domestic animals, or nontarget wildlife.

Prior to application, and during the time between the conclusion of application and the disposal of unconsumed bait, **DO NOT** temporarily place treated bait in locations accessible to children, pets, domestic animals, or nontarget wildlife. Follow the directions in "**ENTRY RESTRICTIONS**" to avoid exposure to children, pets, or domestic animals during application. Follow the directions in "**PRETREATMENT OBSERVATIONS**" to mitigate exposure to nontarget wildlife during application.

DO NOT apply bait in a way that will contact workers or other persons.

DO NOT use treated baits as food or feed.

DO NOT apply baits made from this product in any way that could contaminate human food or animal feed.

ENTRY RESTRICTIONS:

Only protected applicators may be in the area during bait application. Keep pets and livestock, and persons other than authorized handlers away from the bait at all times, and exclude all unauthorized persons from application sites during prebaiting and baiting. For example, post signage near, in the vicinity of, or at main entrances or commonly used access points to prebaiting and baiting sites that warns persons not to pick up or handle any baits and to keep pets and livestock away from bait.

PRETREATMENT OBSERVATIONS:

Prior to application, carefully observe target birds' feeding habits to locate their preferred feeding sites, determine the optimum time of application, and evaluate potential hazards of the application to nontarget and protected species.

PREBAITING:

Prebaiting with untreated bait materials (or use of a draw station) is necessary to promote feeding by target species and to assess potential for exposure of nontarget species. Apply prebait using the same procedures that are prescribed below for the type of bait ("**EGG BAITS**" or "**MEAT BAITS**") that is to be used for toxic baiting.

Observe baited areas (from blinds) early in prebaiting period to determine whether nontarget species are approaching baits. Haze away Threatened or Endangered and nontarget species that might consume baits. Remove baits if such nontarget species continue to approach them.

(See next page for additional "DIRECTIONS FOR USE")

DIRECTIONS FOR USE, continued

BAIT PREPARATION:

MEAT BAITS:

MEAT BAIT PREPARATION:
Mix 0.027 oz (0.75 g) of this product with 0.18 oz (5.0 g) of powdered sugar.
Pour or sprinkle concentrate-sugar mixture over 200 meat cubes that measure about 0.5 in (1.3 cm) on each side.
Mix or tumble bait slowly until all meat cubes appear to be evenly covered.

MEAT BAIT APPLICATION:

NOTE: During application, wear all PPE as listed under "PERSONAL PROTECTIVE EQUIPMENT."

Control of crows, magpies, and ravens with meat baits prepared from this product is limited to the sites indicated above under "**USE RESTRICTIONS**." Wear rubber gloves while handling baits. Place no more than 75 meat cube baits at each baited site. Place 5 to 10 baits in clusters over an area not to exceed 1,000 ft^2 (93 m^2) where control of ravens, magpies, and/or crows is to be affected. **Draw stations** (fresh, unpoisoned animal carcasses) may be needed to attract ravens, magpies, and/or crows to the locations selected for bait exposure. If draw stations are used, place meat baits on or within a few feet of the animal carcasses.

WHILE TREATED MEAT BAITS ARE EXPOSED, BAITED AREAS MUST BE OBSERVED CONTINUOUSLY FROM A DISTANCE OF NO MORE THAN 1,000 YARDS (914 m) TO DETECT APPROACHES BY THREATENED OR ENDANGERED SPECIES AND OTHER NONTARGET OR PROTECTED ANIMALS LIKELY TO EAT BAITS. Because of wariness of target bird species, it may be necessary to observe baits from behind natural or specially-constructed blinds. Haze away Threatened or Endangered and nontarget species that might consume baits. Remove baits if such nontarget species continue to approach them.

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

EGG BAITS:

EGG BAIT PREPARATION:

Dissolve 0.07 oz (2 g) of the product in 0.2 pint (100 ml) of warm potable water at 110 °F (43.3 °C) to make an approximately 2% solution; or dissolve 0.14 oz (4 g) of the product in 0.2 pint (100 ml) of warm potable water at 110 °F (43.3 °C) to make an approximately 4% solution; or in other proportions to produce a 2% or 4% solution.

Using an 18-gauge hypodermic needle or similarly-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-gauge hypodermic needle, slowly inject 0.002 pints (1 ml) of the 2% solution (or 0.001 pints 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.

DIRECTIONS FOR USE, continued

EGG BAIT APPLICATION:

NOTE: During application, wear all PPE as listed under "PERSONAL PROTECTIVE EQUIPMENT."

Control of crows, magpies, and ravens with egg baits prepared from this product is limited to the sites indicated above under "**USE RESTRICTIONS**". Place all egg baits to be used at one baited site within 25 ft (7.6 m) of the center of the site or within 25 ft (7.6 m) 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 10 ft (3 m) from the carcass. Wherever practical, bait sets should be made in "dummy" nests created by making small depressions in the ground. Dummy nests may be partially hidden by vegetation or other debris. In other situations, eggs may be placed on elevated wooden platforms 1 to 2 ft^2 (0.1 to 0.2 m^2) in area. Eggs placed on platforms must be restrained by wire to prevent them from falling off platforms or being removed by birds. Apply 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.

Observe baited areas (from blinds) early in baiting period to determine whether nontarget species are approaching egg baits. Haze away Threatened or Endangered and nontarget species that might consume baits. Remove baits if such nontarget species continue to approach them.

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 7 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.

POSTTREATMENT CLEAN-UP (Meat and Egg Baits):

NOTE: During clean-up, wear long-sleeved shirt and long pants and chemical-resistant gloves (such as waterproof or rubber gloves). To further reduce the potential for exposure, use appropriate implements such as scoops or other tools to collect carcasses or uneaten bait.

Collect unconsumed and leftover meat daily, and unconsumed and leftover egg baits, dying birds, and carcasses within 7 days of treatment. Dispose of such baits and carcasses by burning or burial, as authorized by applicable laws and ordinances.

STORAGE AND DISPOSAL

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

PESTICIDE STORAGE: Store only in original container, in a dry place inaccessible to children, pets, 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 HANDLING: Nonrefillable container. Do not reuse or refill this container. Offer for recycling, if available. Completely empty bags by shaking and tapping sides and bottom to loosen clinging particles. Empty residue into application equipment. If bags are not to be recycled, dispose of bags in a sanitary landfill or by incineration if allowed by State and local authorities. If burned, stay out of smoke.

Revised: 05-06-2016

Appendix 3: Safety Data Sheet for DRC-1339

USDA APHIS

Safety Data Sheet

Issue Date: 2-Feb-2004 **Revision Date:** 21-Dec-2017 **Version** 4

1. IDENTIFICATION

Product Identifier

Product Name

Compound DRC-1339 Concentrate – Feedlots
Compound DRC-1339 Concentrate – Gulls
Compound DRC-1339 Concentrate – Pigeons
Compound DRC-1339 Concentrate – Livestock, Nest & Fodder Depredations
Compound DRC-1339 Concentrate – Staging Areas
Compound DRC-1339 Concentrate – Bird Control
DRC-1339 Technical

Other Means of Identification

SDS # USDA-0001

Synonyms

Starlicide
3-chloro-p-toluidine hydrochloride
3-chloro-4-methylamine hydrochloride
3-chloro-4-methylbenzeamine hydrochloride
CPTH

Registration Number(s)

EPA Reg. # 56228-10: Compound DRC-1339 Concentrate – Feedlots
EPA Reg. # 56228-17: Compound DRC-1339 Concentrate – Gulls
EPA Reg. # 56228-28: Compound DRC-1339 Concentrate – Pigeons
EPA Reg. # 56228-29: Compound DRC-1339 Concentrate – Livestock, Nest & Fodder Depredations
EPA Reg. # 56228-30: Compound DRC-1339 Concentrate – Staging Areas
EPA Reg. # 56228-63: Compound DRC-1339 Concentrate – Bird Control
EPA Reg. # 56228-59: DRC-1339 Technical

Recommended Use of the Chemical and Restrictions on Use

Recommended Use Restricted Use Pesticide: For retail sale to and use only by USDA APHIS Certified Applicators trained in bird control or by persons under their direct supervision.

Uses Advised Against Any use(s) not strictly adhering to the Directions for Use on the EPA-approved labels is strongly advised against and a violation of federal law.

Details of the Supplier of the Safety Data Sheet

Registrant Address
United States Department of Agriculture
Animal & Plant Health Inspection Service
4700 River Road
Riverdale, MD 20737

Manufacturer Address
Pocatello Supply Depot
238 E. Dillon Street
Pocatello, ID 83201-6623

Emergency Telephone Number

Company Phone Number 1-208-236-6920

Emergency Telephone (24 hr)
INFOTRAC: 1-352-323-3500 (International)
INFOTRAC: 1-800-535-5053 (North America)
National Pesticide Information Center Hotline: 1-800-858-7378
Poison Control Center: 1-800-222-1222

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2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: HAZARDOUS TO HUMANS AND DOMESTIC ANIMALS: Fatal if inhaled, harmful if swallowed, causes severe skin burns and serious eye damage, may be harmful in contact with skin, and may cause an allergic skin reaction. This chemical is a product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and for workplace labels of non-EPA registered chemicals. Please see Section 15 for additional EPA information.

Appearance Off-white to yellow powder **Physical State** Powder **Odor** Moth ball

Classification

Acute toxicity - Oral	Category 4
Acute toxicity - Inhalation (Dusts/Mists)	Category 1
Skin corrosion/irritation	Category 1C
Serious eye damage/eye irritation	Category 1
Skin sensitization	Category 1B
Hazardous to aquatic environment, Acute	Category 1
Hazardous to aquatic environment, Chronic	Category 1

Hazards Not Otherwise Classified (HNOC)

Signal Word
Danger

Hazard Statements
Fatal if inhaled.
Harmful if swallowed.
Causes severe skin burns and eye damage.
May cause an allergic skin reaction.
Very toxic to aquatic life with long lasting effects.

Precautionary Statements - Prevention
Wash face, hands and any exposed skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Do not breathe dust/fume/gas/mist/vapors/spray.
Use only outdoors or in a well-ventilated area.
Wear respiratory protection.
Wear protective gloves/protective clothing/eye protection/face protection.
Contaminated work clothing should not be allowed out of the workplace.
Avoid release into the environment.

Precautionary Statements - Response
Immediately call a poison center or doctor/physician.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Immediately call a poison center or doctor/physician.
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
Wash contaminated clothing before reuse.
If skin irritation or rash occurs: Get medical advice/attention.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician.
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. Rinse mouth. Do not induce vomiting.
Collect spillage. Hazardous to the aquatic environment.

Precautionary Statements - Storage
Store in a well-ventilated place. Keep container tightly closed.
Store locked up.

Precautionary Statements - Disposal
Dispose of contents/container to an approved waste disposal plant.

WHMIS Classification
This product was classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations, and the SDS contains all the information required by these regulations.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms

3-chloro-p-toluidine hydrochloride
3-chloro-4-methylaniline hydrochloride
3-chloro-4-methylbenzeamine hydrochloride
CPTH
DRC-1339
Starlicide

Chemical Name	CAS No	Weight-%
3-chloro-p-toluidine hydrochloride	7745-89-3	97

Chemical Additions Other ingredients make up 3% of this product.
Molecular Weight 178.06 g/mol
Molecular Formula $C_7H_9NCl_2$

4. FIRST-AID MEASURES

First Aid Measures

General Advice Immediately call a poison center or doctor/physician.

Eye Contact Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.

Skin Contact IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. Immediately call a poison center or doctor/physician.

Inhalation IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician. If person is not breathing, call an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible.

Ingestion IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. DO NOT induce vomiting, unless directed by medical personnel. Have victim rinse mouth thoroughly with water and sip a glass of water, if conscious and able to swallow. Never give anything by mouth to a victim who is unconscious.

Self-Protection of the First Aider Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know locations of rescue equipment before the need arises.

Most Important Symptoms and Effects

Symptoms	Overexposure or poisoning symptoms include: central nervous system depression, hematuria, diuresis, and burning of skin and eyes.

Indication of Any Immediate Medical Attention and Special Treatment Needed

Notes to Physician	Treat symptomatically. Possible mucosal damage may contraindicate the use of gastric lavage.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Water spray. Dry chemical. Carbon dioxide (CO_2).

Unsuitable Extinguishing Media	Not determined.

Specific Hazards Arising from the Chemical
Non-flammable. Non-explosive. Can release hazardous vapors during a fire. Nitrogen oxides (NO_x). Hydrochloric gas (HCl(g)).

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

Personal Precautions	Handle only with protective gloves, clothing and face mask or respirator.
For Emergency Responders	Use personal protection recommended in Section 8: Exposure Controls/Personal Protection.
Environmental Precautions	Prevent from entering ditches, sewers, waterways and/or groundwater. See Section 12: Ecological Information. Notify authorities if spill has entered watercourse or sewer or has contaminated soil or vegetation.

Methods and Material for Containment and Cleaning Up

Methods for Containment	Prevent further leakage or spillage if safe to do so.
Methods for Clean-Up	Pick up spillage mechanically and place in suitable, closed, properly labeled container for recovery or disposal. For waste disposal, see Section 13: Disposal Considerations.

7. HANDLING AND STORAGE

Precautions for Safe Handling

Advice on Safe Handling	Wash face, hands, and any exposed skin thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. Wear respiratory protection. Wear protective gloves/protective clothing and eye/face protection. Contaminated work clothing should not be allowed out of the workplace.

Conditions for Safe Storage, Including Any Incompatibilities

Storage Conditions	Keep/store only in original container. Store locked up. Keep container tightly closed and store in a cool, dry and well-ventilated place. Keep away from children, pets and domestic animals. Keep away from other chemicals. Store away from food stuffs. Do not contaminate water, food or feed by storage.
Incompatible Materials	Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate Engineering Controls

Engineering Controls	Engineering methods to prevent or control exposure are preferred. Methods include process or personnel enclosure, mechanical ventilation (dilution and local exhaust), and control of process conditions. In using this material follow suitable precautions to control dust, this helps to prevent fire and health hazards.

Individual Protection Measures, Such as Personal Protective Equipment

Eye/Face Protection	ALL USERS: Protective eyewear (goggles or face shield).
Skin and Body Protection	ALL USERS: Chemical-resistant gloves. USERS MIXING PACKAGES CONTAINING 1 LB OR MORE OF THIS PRODUCT: Long sleeved shirt and long pants. Chemical-resistant gloves. Chemical-resistant footwear plus socks. USERS MIXING PACKAGES CONTAINING LESS THAN 1 LB OF THIS PRODUCT: Long sleeved shirt and long pants. Chemical-resistant gloves.
Respiratory Protection	USERS MIXING PACKAGES CONTAINING 1 LB OR MORE OF THIS PRODUCT: Respirator with a dust/mist filtering respirator (MSHA NIOSH approval number prefix TC-21C or NIOSH approved respirator with any N, R, P or HE filter). USERS MIXING PACKAGES CONTAINING LESS THAN 1 LB OF THIS PRODUCT: No special protection required.
General Hygiene Considerations	Handle in accordance with good industrial hygiene and safety practice. Keep away from food, drink and animal feeding stuffs. Do not eat, drink or smoke when using this product. Wash face, hands and any exposed skin thoroughly after handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	Powder		
Appearance	Off-white to yellow powder	**Odor**	Moth ball
Color	Off-white to yellow	**Odor Threshold**	No data available

Property	**Values**	**Remarks • Method**
pH	2.67	
Melting Point/Freezing Point	Sublimes 220-230 °C (428-446 °F)	@ 760 mmHg
Boiling Point/Boiling Range	No data available	
Flash Point	No data available	
Evaporation Rate	No data available	
Flammability (Solid, Gas)	No data available	
Upper Flammability Limits	No data available	
Lower Flammability Limit	No data available	
Vapor Pressure	1.408 x 10^{-2} Pa (1.06 x 10^{-4} mmHg)	@ 25 °C

Vapor Density	No data available	
Specific Gravity	No data available	
Water Solubility	9.1 g/100 ml water	@ 30 °C
Solubility in Other Solvents	0.5 g/100 ml n-octanol	@ 30 °C
	0.013 g/100 ml acetonitrile	@ 30 °C
Partition Coefficient	0.022	estimated
Auto-Ignition Temperature	No data available	
Decomposition Temperature	No data available	
Kinematic Viscosity	No data available	
Dynamic Viscosity	No data available	
Explosive Properties	No data available	
Oxidizing Properties	No data available	
Density	0.44 g/ml or g/cm^3	

10. STABILITY AND REACTIVITY

Reactivity
Not reactive under normal conditions.

Chemical Stability
Stable under recommended storage conditions.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous Polymerization Hazardous polymerization does not occur.

Conditions to Avoid
Keep out of reach of children. Contact with incompatible materials. Heat above 300 °C (570 °F) will cause release of nitrogen oxides (NO_x) and hydrochloric gas (HCl(g)).

Incompatible Materials
Strong oxidizing agents.

Hazardous Decomposition Products
No data available.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information The EPA did not require a subchronic toxicity study for DRC-1339 Concentrate based on the low volumes used and restricted use nature of its application. The agency does not believe the potential exists for significant exposure of production workers or applicators to DRC-1139 Concentrate.

Eye Contact Causes severe eye damage. Contact causes burning, redness, and severe damage, including blindness.

Skin Contact Corrosive to skin. Causes severe skin irritation, dermatitis, and chemical burns. May cause an allergic skin reaction. May be absorbed through the skin in harmful amounts.

Inhalation Fatal if inhaled. Inhalation of dusts may be severely irritating and may cause chemical burns to the respiratory tract.

Ingestion Harmful if swallowed.

Component Information

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
3-chloro-p-toluidine hydrochloride 7745-89-3	302–350 mg/kg (rat)	>2,000 mg/kg (rabbit)	No data available

Information on Physical, Chemical and Toxicological Effects

Symptoms Please see Section 4: First-Aid Measures for symptoms.

Delayed and Immediate Effects and Chronic Effects from Short- and Long-Term Exposure

Sensitization May cause an allergic skin reaction.

Germ Cell Mutagenicity Negative test results in three mutagenicity studies.

Carcinogenicity This product does not contain any carcinogens or potential carcinogens as listed by OSHA, IARC or NTP.

Reproductive Toxicity The EPA did not require a developmental toxicity study based on the use characteristics of DRC-1339 Concentrate. The agency does not believe the potential exists for repeat oral, dermal or inhalation exposures to production workers or applicators.

Numerical Measures of Toxicity
Not determined.

12. ECOLOGICAL INFORMATION

Ecotoxicity
This product is very highly toxic to birds and aquatic invertebrates. This product is toxic to fish.

Chemical Name	Algae/Aquatic Plants	Fish LC_{50}	Toxicity to Microorganisms	Crustacea EC_{50}
3-chloro-p-toluidine hydrochloride 7745-89-3	No data available	9.7 mg/l: *Oncorhynchus mykiss* (rainbow trout); 10.5 mg/l: *Lepomis macrochirus* (bluegill sunfish)	No data available	0.07 mg/l: *Daphnia magna* (water flea)

Persistence/Degradability
No data available.

Bioaccumulation
Slightly accumulates in bluegill sunfish (*Lepomis macrochirus*).

Mobility
No data available.

Other Adverse Effects
Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.

13. DISPOSAL CONSIDERATIONS

Waste Treatment Methods

Disposal of Wastes	Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinse 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 Hazardous Waste representative at the nearest EPA regional office. Never place any unused product down an indoor or outdoor drain. Do not contaminate water, food or feed by disposal.
Contaminated Packaging	Completely empty bag in application equipment. Then dispose of empty bag in a sanitary landfill or by incineration or if allowed by state and local authorities, by burning. If burned, stay out of smoke. Do not reuse or refill this container.

14. TRANSPORT INFORMATION

Note	Please see current shipping paper for most up to date shipping information, including exemptions and special circumstances.

DOT

UN/ID No	UN2239
Proper Shipping Name	Chlorotoluidines, solid
Hazard Class	6.1 (over 66 lbs)
Packing Group	III (over 66 lbs)

IATA

UN/ID No	UN2239
Proper Shipping Name	Chlorotoluidines, solid
Hazard Class	6.1
Packing Group	III

IMDG

UN/ID No	UN2239
Proper Shipping Name	Chlorotoluidines, solid
Hazard Class	6.1
Packing Group	III
EmS-No	F-A, S-A

TDG

UN/ID No	UN2239
Proper Shipping Name	Chlorotoluidines, solid
Hazard Class	6.1
Packing Group	III

15. REGULATORY INFORMATION

International Inventories

This product is excluded/exempt from TSCA regulation under FIFRA section 3(2)(B)(ii) when used as a pesticide (EPA Reg. # 56228-10, 56228-17, 56228-28, 56228-29, 56228-30, and 56228-63) and from DSL listing as it is regulated under the Pesticide Control Products Act when used as a pesticide.

TSCA	Exempt
DSL	Excluded

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

U.S. Federal Regulations

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

U.S. State Regulations

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
3-chloro-p-toluidine hydrochloride 7745-89-3		X	

EPA Pesticide Registration Numbers

EPA Reg. # 56228-10: Compound DRC-1339 Concentrate – Feedlots
EPA Reg. # 56228-17: Compound DRC-1339 Concentrate – Gulls
EPA Reg. # 56228-28: Compound DRC-1339 Concentrate – Pigeons
EPA Reg. # 56228-29: Compound DRC-1339 Concentrate – Livestock, Nest & Fodder Depredations
EPA Reg. # 56228-30: Compound DRC-1339 Concentrate – Staging Areas
EPA Reg. # 56228-63: Compound DRC-1339 Concentrate – Bird Control
EPA Reg. # 56228-59: DRC-1339 Technical

EPA Statement

This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and for workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label:

EPA Pesticide Label

SIGNAL WORD: Danger
PICTOGRAM: Skull and crossbones
ACUTE ORAL TOXICITY: May be fatal if swallowed.
ACUTE DERMAL TOXICITY: Harmful if absorbed through skin.
ACUTE INHALATION TOXICITY: Fatal if inhaled (EPA accepted Category I in lieu of animal testing data).
SKIN IRRITATION/CORROSION: Corrosive.
EYE DAMAGE/EYE IRRITATION: Causes irreversible eye damage and skin burns.
SENSITIZATION: Mild to moderate sensitizer. Prolonged or frequently repeated skin contact may cause allergic reactions in some people.
ENVIRONMENTAL HAZARDS: This product is very highly toxic to birds and aquatic invertebrates. Runoff may be hazardous to aquatic organisms in neighboring areas. Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark.

16. OTHER INFORMATION

NFPA	**Health Hazards**	**Flammability**	**Instability**	**Special Hazards**
	3	0	0	None
HMIS	**Health Hazards**	**Flammability**	**Physical Hazards**	**Personal Protection**
	3	0	0	E

Issue Date: 2-Feb-2004
Revision Date: 21-Dec-2017
Revision Note: Information updated

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet

BLOOM BIOLOGICAL INC.
research | consulting | conservation

October 30, 2019

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 2019 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 ('APS') 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 2019 plover and tern breeding season.

INTRODUCTION

The presence and behavior of avian predators changed with time throughout the Project term, 1 February -6 September 2019 (i.e., '2019 Season'). This report summarizes avian predator observations made by Bloom Biological contractors within this date range. See predator results in the 2019 season report (Predators and predator management section) for quantitative details of sightings for the 2019 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 is the result of the operation of a single trap for 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 persuade 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 or in a vehicle. **Bird Whistlers®** are a pyrotechnic deterrent device that makes a very loud 'SCREECH' sound designed to scare away pest birds and wildlife.

SUMMARY OF PREDATOR OBSERVATIONS AND TRAPPING ACTIVITIES

During the 2019 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 four peregrine falcons (*Falco peregrinus*) and one Northern harrier *(Circus hudsonius*).

Justification for trapping and relocation of the peregrine falcons was based on the observed predation of plover adults/fledglings and/or chicks along with the habitual disturbance to the nesting colonies. The male Northern harrier was authorized for removal based on its perpetual hunting in plover and tern nesting and brood rearing habitat.

Two of the peregrines, a sub-adult female visual identification band (VID) white on black 'W/49' right, USFWS 1947-18002 silver left, and an adult female, VID white on black 'W/48' left, USFWS 1947-18001 right, were trapped; the sub-adult female on 24 June and the adult female on 28 June, the sub-adult just south of BBQ Flats in the open riding area (ORA, 35°04'09.76" N 120°37'19.48" W) and the adult female near the mouth of Arroyo Grande Creek (35°05'50.14" N, 120°37'47.24" W). The sub-adult female 'W/49' was released on 25 June in the Owen's Valley of California (36°33'35.88" N 118°03'28.15" W), 179 miles to the northeast. The 'W/48' adult female was released on 30 June at the Butte Valley Wildlife Area, Siskiyou County (41°51'21.60" N, 122°04'21.54" W), 475 miles to the north. The method used in trapping peregrine falcon 'W/49', and to an extent 'W/48', was such that 'trap hours' do not apply, 'trapping attempt' is more applicable. The sub-adult peregrine falcon 'W/49' required three 'trapping attempts'. The first two attempts elicited a response from the target bird but failed to secure it. The third attempt however was successful. Peregrine falcon 'W/48' required 4 'trap hours' and one 'trapping attempt.'

Two other peregrine falcons were authorized for capture and relocation; a juvenile female on 27 July that was observed predating two banded plovers. This bird was never documented onsite again. A second peregrine falcon, an adult male banded silver left, black VID right, was authorized on 12 August. This individual was observed kleptoparasitizing a California least tern from a male Northern harrier. This same assumed individual was observed on three consecutive days, 8-10 August but was not observed onsite after that date.

A sub-adult Northern harrier was authorized for trapping on 11 June. This bird had been observed onsite since 1 February, being seen sporadically in the Oso Flaco Creek area and the dunes to the east. The bird was in juvenal plumage at that time and molted throughout the spring and summer into adult plumage, making it uniquely identifiable. This individual was a nearly daily, consistent disturbance to the breeding colonies and nesting exclosures. Trapping commenced on 19 June and ceased on 8 August; comprising 34 active trapping days and 353.75 'trap hours' (196 bow-net, 157.75 bal-chatri). Although this individual was actively hunting very near various traps with various lures, he showed no interest in them.

Two birds were incidentally trapped while targeting the sub-adult male Northern harrier. A juvenile female Northern harrier was trapped on a bal-chatri deployed in the North Oso Flaco (NOF) foredunes on 27 July (35°02'28.24" N, 120°39'50.46" W) and relocated to the Kern National Wildlife Refuge (34°44'01" N, 119°35'21" W) on 28 July. A female American kestrel previously trapped 8 June 2018 and banded 1363-51019 right was re-trapped in the NOF foredunes on 29 July (same location as previous bird). The kestrel was released on 30 July at the Pine Mountain Club, CA in Southwest Kern county (34°50'46" N, 119°09'22" W). Details on the female American kestrel from the 2018 report;

"A female American kestrel, an 'after second year' (ASY) adult, was identified for trapping and relocation due to its persistent foraging in a sensitive area, South Oso Flaco (SOF), where newly hatched plover chicks were present

(35°00’45.57” N, 120°38’08.01” W). This female was observed hunting in this location, at the south boundary of the Project, on several occasions. No food carry was observed, and its continued presence identified this bird to be a floater with no nest attachment. This individual was trapped on 8 June on one trapping day comprising .25 trap hours. The bird was relocated to the Kern National Wildlife Refuge (35°44’00.65” N, 119°35’21.04” W), 77 miles to the northeast.”

Table 1. Raptors Captured and Relocated During 2019 Season

Sp.	Sex/Age	Band #	Trap Method	Trap Date	Trap Site	Trap Location	Release Date	Release Site	Release Location	Dist.
PEFA	Sub-adult/F	1947-18002 L W/49 R	Noosed harness	6/24/2019	BBQ Flats	35°04’09.76” N 120°37’19.48” W	6/25/2019	Lone Pine, CA	36°33'35.88" N 118°03'28.15" W	179 mi
PEFA	Adult/F	1947-18001 R W/48 L	Noosed harness	6/28/2019	Arroyo Grande Creek	35°05'50.14" N 120°37'47.24" W	6/30/2019	Butte Valley Wildlife Area	41°51'21.60" N 122°04'21.54" W	475 mi
NOHA	Juvenile/F	745-36931 R	Bal-chatri	7/27/2019	NOF Foredunes	35°02'28.24" N 120°37'50.46" W	7/28/2019	Kern National Wildlife Area	34°44'01" N 119°35'21" W	77 mi
AMKE	Adult/F	1363-51019 R	Bal-chatri	7/29/2019	NOF Foredunes	35°02'28.24" N 120°37'50.46" W	7/30/2019	Pine Mountain Club, CA	34°50'46" N 119°09'22" W	98 mi

SUMMARY OF PREDATOR SPECIES OCCURENCE

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 throughout the Project area, particularly early and late in the season, February (n=9), March (n=8) and July/August (n=6). Nesting was suspected at the Phillips 66 refinery adjacent to the Project to the east, with numerous observations of territorial behavior and food carry. At least one pair was believed to have nested on the refinery grounds in the refinery structure itself. Dead willow trees (*Salix spp.*) at Long Valley and Jack Lake, located offsite just west of the Phillips 66 refinery, provide numerous cavities, suitable for kestrel nesting, but no nests or nesting activity was documented. During the 2019 Season, observations were documented through the wintering and pre-nesting period, 1 February through 10 April. Observations of kestrels declined beginning in April (n=1) and declined or stayed steady until late July and August when post-breeding dispersal saw birds pass through the Project area (n=6). A definitive south to north movement was noted and seemed to be made up of juvenile birds. This phenomenon was documented in 2018 also. The decline of American kestrel observations this season (n= 28), over last season's (n= 45), was spurious due to this observer focus on the trapping efforts of other species well into August. Observations of individuals continued through 28 August, with many of these observations occurring in sensitive areas. One female was incidentally trapped and relocated (see 'Summary of Predator Observations and Trapping Activities').

Merlin

Merlins (*Falco columbarius*) winter in the Project area and migrate out of San Luis Obispo County, typically becoming casual by 1 April annually and vagrant after 1 May. Ten observations of Merlins were documented during the 2019 Season, down significantly from the 22 observations in 2018, on par with 2017's six observations, and down from 2016's 16 observations. This appears to support a cyclic year-to-year pattern. Male Merlins were documented six times, from 8 February through to 15 April and female Merlins four times from 8 February through 18 March. No Merlins were documented after 15 April and had not returned to the Project area as of 6 September. One male Merlin was bird-whistled on 15 April perched on a fence post in West Boneyard exclosure by park staff.

Peregrine Falcon

As described above (see 'Summary of Predator Observations and Trapping Activity'), two peregrine falcons were trapped, with CDFW and USFWS authorization, on 24 June and 28 June. The first bird, 'Scruffy Nape' (so named due to missing feathers on its nape), a sub-adult of unknown sex prior to capture, later determined to be a female, was trapped just south of BBQ Flats revegetation island and released the next day in the Owen's Valley near Lone Pine, CA. The bird was banded VID 'W/49' right, USFWS silver 1947-18002 left. The second bird, an adult female, 'Turtle Beak' (so named due to the upper mandible's tip having broken off giving it a 'Turtle Beak' look) was trapped at Arroyo Grande Creek mouth and released two days later at the Butte Valley Wildlife Area near Macdoel, CA. The bird was affixed with a VID 'W/48' left, USFWS silver 1947-18001 right. This individual was documented onsite 32 days after release at the mouth of Arroyo Grande Creek mouth, the very spot where trapped.

Through the Project term, peregrine falcons are definitively the most numerous raptors onsite with 56 unique sightings documented from 4 February through 6 September, down significantly from 96 sightings in 2018. This observer documented an average of 8 birds per month with a high of 12 in June and a low of 2 in July. This data most likely represents a low estimate due to the APS' focus on trapping efforts and not observations. Peregrine falcons were hazed out of sensitive areas multiple times by Park staff in 2019.

Every age class was noted with the first juvenile documented onsite 12 June. Red-tailed hawks and great horned owls, while numerous, are mainly non-migratory residents and their numbers remain relatively stable from year-to-year, restricted by available appropriate habitat. Peregrine falcons wander greatly, primarily during the 'wintering' and 'post-breeding dispersal' periods. Being avian hunters, they are a significant threat to plovers and terns. The precise number of peregrine falcons observed is impossible to ascertain but anecdotally numbers seem to increase each year. Along with un-banded individuals, only one uniquely banded bird was identified: VID '17/D' black right,

1687-2214 silver left, an adult female banded in Southern California in 2013. This large female has been documented each of the last 4 seasons and is a frequent visitor.

Peregrine falcon observations occurred throughout the Project area, from Pismo Creek to the north, south to the Guadalupe-Nipomo Dunes National Wildlife Refuge border and east to the Project limits, this includes the protected and sensitive areas. Common locales for resting birds were the creek mouths; Pismo, Carpenter, Arroyo Grande and Oso Flaco. Oso Flaco Creek and the associated lagoon warrants special notation here; this creek is the only flowage onsite that reaches the ocean throughout the Project term. This constant flow is due to the irrigation of the agricultural fields to the east, making this a popular bathing and hunting location. Hunting birds were documented in areas populated by appropriate avian prey; the shoreline by gulls, terns and shorebirds, and the dunes by horned larks (*Eremophila alpestris*), Brewer's blackbirds (*Euphagus cyanocephalus*) and house finches (*Carpodacus mexicanus*). The composition and number of the shoreline prey base fluctuates throughout the season with June being the least populous month for sanderlings (*Calidris alba*) and Western sandpipers (*Calidris mauri*), the two most numerous shorebird species along the Central California Coast. Several species of locally nesting and numerous floater (nonbreeding) gulls; California (*Larus californicus*), Heermann's (*Larus heermanni*) and Western (*Larus occidentalis*), provide an adequate prey base for the larger more aggressive individuals such as '17/D'. Documented kills (observed predations, clipped wings or feather piles indicative of peregrine kills) were of the following species (2016-2019):

- Mallard (*Anas platyrhncos*)
- Green-winged teal (*Anas crecca*)
- Eared grebe (*Podiceps nigricollis*)
- Clark's grebe (*Aechmophorus clarkii*)
- Western grebe *(Aechmophorus occidentalis*)
- Western snowy plover
- Willet (*Tringa semipalmata*)
- Whimbrel (*Numenius phaeopus*)
- Long-billed curlew (*Numenius americanus*)
- Marbled godwit (*Limosa fedoa*)
- Sanderling
- Western sandpiper
- Heermann's gull
- California gull
- Sabines gull (*Xema sabini*)
- Western gull
- California least tern
- Elegant tern (*Thalasseus elegans*)
- Common tern (*Sterna hirundo*)
- Rock pigeon (*Columba livia*)
- Eurasian collared-dove (*Streptopelia decaocto*)
- Mourning dove (*Zenaida macroura*)
- Horned lark (*Eremophila alpestris*)
- Blue-gray gnatcatcher (*Polioptila caerulea*)
- Swainson's thrush (*Catharus ustulatus*)

Species Unknown

Three unidentified raptors were documented in the Project area during the 2019 season by the APS. One bird was believed to be a day roosting great-horned owl flying to cover at Pawprint revegetation island, and two small falcons went unidentified (American kestrel or Merlin).

Sharp-shinned Hawk

The Sharp-shinned hawk (*Accipiter striatus*) is a winter resident 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.

Two migrants were observed on 7 February and 15 April 2019, a sub-adult (in juvenal plumage) perched along Refinery Road and one adult perched in Worm Valley area (southeast of marker post 4). The species is not known to pose a threat to plovers and terns for the Project.

Cooper's Hawk

Over the course of the 2019 Season, Cooper's hawks (*Accipiter cooperi*) were observed on 9 occasions in the Project area by the APS, down significantly from the 29 observations for the 2018 season. The age classes comprised two sub-adults, five adults and two unknowns. This is a significant change from 2018 where most birds were sub-adults. The occurrence of this species significantly dropped after 7 May with no further sightings until 19 July. No Cooper's hawks were hazed. While observations of this species are typically rare post-migration, it probably nests on the fringes of the Project area in small numbers.

Northern Harrier

Northern harriers (*Circus hudsonius*) are a frequently observed species within the Project area. While the revegetation islands, teeming with various size rodents, lagomorphs and insects, provide good winter forage, 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 associated wetlands, in the past attracted numerous Northern harriers. Oso Flaco Creek and its associated lagoon and wetlands could support nesting Northern harriers, but no nesting attempt has been documented. There is also suitable habitat in the Dune Lakes area, which is adjacent to the east boundary of the park, where nesting was documented by the previous APS in years past.

As described above (see 'Summary of Predator Observations and Trapping Activity'), one sub-adult male Northern harrier was authorized by CDFW and USFWS for trapping and relocation. Despite the APS' concerted effort of 353.75 trap hours and 34 trapping days, the bird eluded capture. A juvenile Northern harrier, of unknown sex, was incidentally trapped on 27 July and released the next day at the Kern National Wildlife Refuge. The bird was banded with a silver USFWS band 745-36931 right.

There were 28 observations of Northern harrier during the 2019 Season with 21 of these sightings being in sensitive areas. All age classes for both male and female were documented.

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 historic nests are located very near and adjacent to the Project; one nest in a eucalyptus grove 0.8-mile east of the mouth of Oso Flaco Creek, at the western edge of the agricultural fields, a second nest located 50 yards south of the Project boundary within Guadalupe-Nipomo Dunes National Wildlife Refuge, and 0.6-mile east-southeast of the shoreline. These two nests each fledged three young in 2017 but were not inspected in 2019. There is a third nest in Long Valley, 0.6-miles east of the shore. This nest was active early in 2019 but there was no further follow-up and the fate of this nest was unknown.

There were 31 observations of red-tailed hawks during the Project term. Nine hazing events were noted, 8 by bird-whistler and one by vehicle. Red-tailed hawk's routine has been well established at the Project. The South Oso Flaco and NOF foredunes, the creek areas and Dune Preserve provide rich hunting grounds for these large buteos but little in the way of nesting habitat. By May these birds have moved east into appropriate nesting habitat, set-up territory and begun to nest, returning to sensitive areas later in the season.

Great Horned Owl and Large Owl Species Unknown

No great-horned owls were targeted for removal this season. Great horned owls are ubiquitous in the Project area 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 area. 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. The historic nests and the associated trees which held them have all collapsed in the last few years, and no new great-horned owl nests were identified this season.

Great horned owls are an important management concern at the Project due to their abundance throughout the Project area, invariably resulting in disturbance to the nesting colonies. While there has been no documented depredation of plovers or terns by great horned owls on the Project, they have been documented having done so at other tern and plover sites and are considered a substantial threat here. Owl pellets are examined when found, through the course of the 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*), California voles (*Microtus californicus*), mice *(Peromyscus spp)*, Western harvest mouse (*Reithrodontomys megalotis*), woodrat (*Neotoma spp*.), Jerusalem cricket (*Stenopelmatus intermedius*), other various insect remains and some vegetative matter. Of the many dozens of previous pellets found and analyzed on the Project only one pellet, found near the Oso Flaco gate by park personnel in 2016, contained unidentified avian remains. This season park staff found a pellet containing feathers in the SOF area; the pellet was examined and the feathers were unidentifiable, no other identifiable remains were present.

Barn owls have been theorized to 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. While no living barn owls were documented this season, four carcasses/remains were collected; two from the shoreline, one from 7 exclosure and one from South Oso Flaco.

Of the two large owl species possible at the Project, 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 slenderer and lack the obvious 'knuckles.'

Curiously, the partial remains of a juvenile long-eared owl were collected from 7 exclosure shoreline on 8 August. This represents the first documentation of this species onsite and is highly unusual.

Burrowing Owl

Burrowing owls are rare along the coast and are a designated 'Species of special concern' (SSC) by the CDFW. This season no burrowing owls were documented in the Project area, although there was a secondhand report of a bird flushed east of the Project area near Dune Lakes. This observation was made by the Wildlife Services contractor. I expect this species is present each winter in small numbers but may go undetected. This species is known to be a proficient predator of plovers and terns, but because presence is low during the majority of the nesting season and no plover or tern losses have been documented, they are less of a concern at the Project site.

Loggerhead Shrike

Loggerhead shrikes are a threat to plovers and terns at the Project, and their numbers fluctuate from year to year. Historically shrikes were a regular nester in the Project area, but in recent years there has been no documented or suspected nesting. Twenty-three observations of loggerhead shrike were documented in 2019, twenty-one of those prior to 7 March. A lone bird was observed nearly daily from 1 February until 7 March in Dunes Preserve near the Fence Corral (south end of the Preserve) and south to Pavilion Hill. A second bird was observed in Pipeline revegetation island from 6 February until 12 February, and another lone bird was observed along Refinery Road. These birds represent wintering birds, and all vacated the Project area. On 26 June a shrike was noted foraging from the interior fence in Boneyard exclosure and again on 22 July near the vehicle gate at the south end of Boneyard exclosure. It is suspected that this bird remained in the area throughout that date range but ranged widely, staying in the back dunes.

Miscellaneous Raptors

On July 18 a sub-adult bald eagle was observed flying up the shoreline at NOF This represents only the second observation of this species in the Project Area.

On 5 August a white-tailed kite was observed flying north along the east fence toward Pipeline Revegetation island, an unusual sighting.

CDFW SEABIRD MORTALITY EVENT 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#: 19-0415
Species: COMU
UCD PATH#: 19S0533
Report Status: Gross
Band: PG:GB

EVENT PROFILE

COMMON NAMES: Snowy Plover
SCIENTIFIC NAMES: *Charadrius nivosus*
DATE COLLECTED: 7/1/2019
COLLECTION AREA: Oceano Dunes SVRA
COUNTY: San Luis Obispo
STATE: California
CARCASS CONDITION: Fresh
OILED/FOULED: No
NECROPSY DATE: 7/2/2019
NECROPSY BY: Corinne Gibble
REPORT DATE: 7/9/2019
REPORT BY: Corinne Gibble
HISTOPATHOLOGY TAKEN (Y/N?): Y
REVIEWING PATHOLOGIST: Melissa Miller

EVENT HISTORY

This fledgling plover was collected fresh dead on 7/1/2019 from the 6 exclosure shoreline at the W12W marker in dry wrack just above the high tide line at Oceano Dunes State Vehicular Recreation Area (ODSVRA) by environmental scientist Amber Clark. This bird was banded from Snowy Plover nest 64, and was last seen alive at 28 days old on 6/24/2019 in the same area. Two siblings from the same nest were foraging nearby on the day it was collected. Some adult aggression was also observed in the area at that time. To investigate possible causes of death, the carcass was sent to the CDFW Marine Wildlife Veterinary Care and Research Center (MWVCRC) for examination.

GROSS FINDINGS

This bird was an emaciated juvenile male fledgling. The eyes were sunken, and the keel was prominent. No fractures were found grossly or by post-mortem radiographs. Severe, diffuse emaciation was characterized by depleted subcutaneous, internal and pericardial adipose, atrophied skeletal muscle and a concave pectoral muscle complex. The internal organs were pale. Scant insect fragments and sand were found in the ventriculus, and scant digesta was found in the intestines. Scant urates were present in the cloaca and externally at the vent. The cause of the observed emaciation is unknown, but starvation is possible. No gross evidence of pre-existing or concurrent disease was found.

TESTS/PROCEDURES

1.) Gross photographs
2.) Postmortem radiograph
3.) Gross necropsy (including morphometric measurements)
4.) Histology

SUMMARY OF GROSS FINDINGS

Findings from gross necropsy are suggestive of death due to severe emaciation. The cause of the observed emaciation is unknown, but starvation is possible. Histology is pending.

HISTOPATH SUMMARY

Pending

FINAL DIAGNOSES

1.) Emaciation, severe, characterized by:
- Severe diffuse muscle atrophy with pectoral muscle markedly below keel
- Total depletion of subcutaneous and internal adipose

PHOTOS

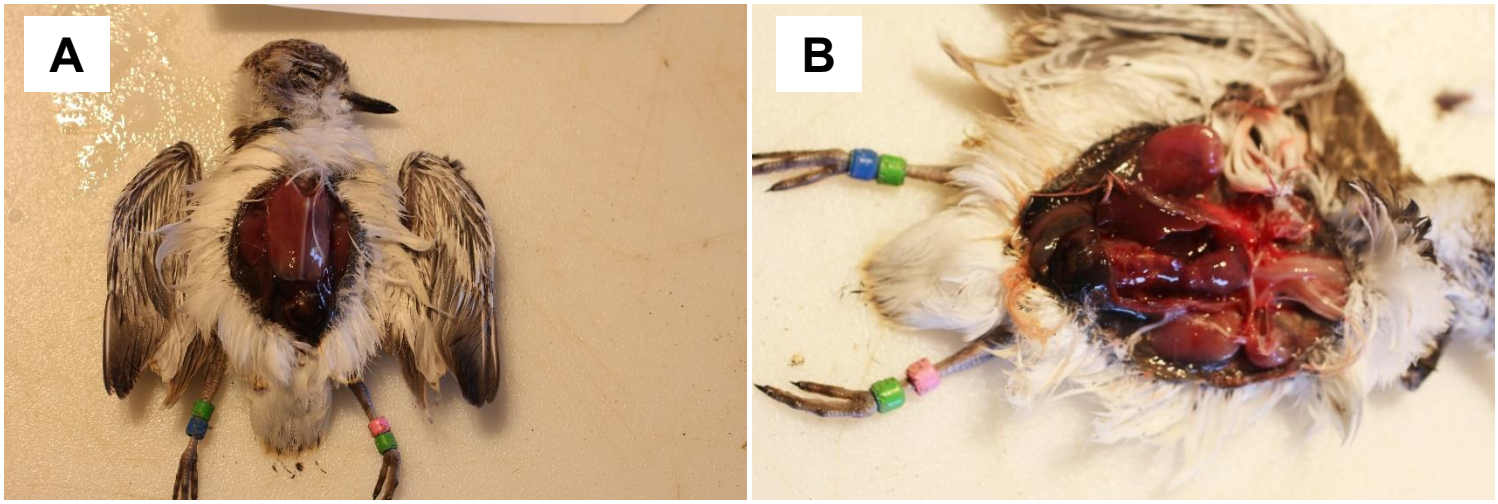

Figure 1A. View of ventral subcutis, showing keel muscle atrophy and depletion of subcutaneous adipose; Figure 1B. Ventral view with keel removed to show the coelomic cavity. There is marked depletion of subcutaneous and coelomic adipose

CDFW SEABIRD MORTALITY EVENT 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#: 19-0475
Species: LETE
UCD PATH#: 19S0566
Report Status: Gross
Band: Unbanded

EVENT PROFILE

COMMON NAMES: California Least Tern
SCIENTIFIC NAMES: *Sternula antillarum browni*
DATE COLLECTED: 7/23/2019
COLLECTION AREA: Oceano Dunes SVRA
COUNTY: San Luis Obispo
STATE: California
CARCASS CONDITION: Fresh
OILED/FOULED: No
NECROPSY DATE: 7/24/2019
NECROPSY BY: Corinne Gibble
REPORT DATE: 8/14/2019
REPORT BY: Corinne Gibble
HISTOPATHOLOGY TAKEN (Y/N?): Y
REVIEWING PATHOLOGIST: Melissa Miller

EVENT HISTORY

This bird was found on 7/23/2019 in the designated nesting exclosure approximately 220 feet east of the western fence at Oceano Dunes State Vehicular Recreation Area (ODSVRA). There was no disturbance on the sand surface around the carcass. Because it was unbanded, information regarding this bird is sparse; however, ODSVRA staff believes the bird hatched locally and was approximately 21-30 days old on 7/23/2019, based on the ages of known unbanded chicks (11 of 52 chicks were unbanded) at this location.

GROSS FINDINGS

This bird was a juvenile male fledgling. No fractures were found grossly or on postmortem radiographs. The bird was thin, with mild pectoral muscle atrophy, scant subcutaneous and pericardial adipose, and no coelomic adipose. All internal organs were within normal limits grossly. The proventriculus and ventriculus contained a single large mass of compressed fibrous material that appeared to be a large piece of blue felt fabric. Scant digesta was found in the small intestines and colon. The kidneys were mildly congested, and scant urates were present in the cloaca and externally at the vent. Two small areas of symmetrical congestion were apparent near the base of the skull; no associated skin or brain lesions, or fractures were found. No gross evidence of pre-existing or concurrent disease was found.

TESTS/PROCEDURES

1.) Gross photographs
2.) Postmortem radiograph
3.) Gross necropsy (including morphometric measurements)
4.) Histology

SUMMARY OF GROSS FINDINGS

Findings from gross necropsy are suggestive of death due to gastrointestinal impaction.

HISTOPATH SUMMARY

Pending

FINAL DIAGNOSES

1.) Suspected foreign body ingestion gastric impaction, characterized by:
- Large mass of compacted, felt like fabric material in the proventriculus and ventriculus
- Probable anorexia and gastric dysfunction
- Mild emaciation

IMAGES

Figure 1. Ventro-dorsal radiograph images, showing no visible fractures

Figure 2A. Large mass of compacted, felt fabric like material in the proventriculus and ventriculus; Figure 2B. Enlarged view of large mass

Figure 3. Areas of symmetrical congestion near the base of the skull

Necropsy Detail

Animal Type	GAN	Preferred ID	Taxonomy	Sex	Birth Date	Age
Individual	STB19-00365	2019.18	Charadrius nivosus nivosus/Snowy plover	Undetermined	+/- May 28, 2019 1 day	0Y 0M 4D

Submission

Death Date May 31, 2019 00:00
Date Submitted Jun 01, 2019
Date Discovered
Submitted By ~
Manner of Death Natural/Non-euthanasia

Carcass Weight
Measurement ~
Estimate No
Exclude from reference intervals No

Death Location
Location Type Enclosure
Enclosure S BARBARA

Recent History/Observations Note

Presented 2.5 days previously @ 2 days old as an abandoned wild born chick. Rangers reported rolling and difficulty keeping up with parent and other chick.
Was given supportive care for 2 days and appeared to become more stable and bar.
Acutely after sq treatment with 2units LRS w 2units 50% dextrose had heamorrhagic dc from nares and oral cavity and cardiac arrest. Confirm deceased.
Opened coelomic cavity and placed in 10% formalin, submitted to zoopath for histopath.

Special Request

~

Case Info

Pathology Case Number ~
Parties to get copy of final report ~
Responsible Pathologist Michael M. Garner DVM
Responsible Resident ~

Death Numbers

Death Number	Effective Date	Entered By
~	~	~

Workflow Notes and Additional Case Comments

~

Gross Necropsy

Necropsy Info

Necropsy Date ~
Carcass Condition Code ~
My Institution ~
Reference Number ~
Necropsy Prosector ~
Additional Staff ~

Report

Report Written Date ~
Necropsy Report/Description

~

Gross / Preliminary Diagnosis

Diagnoses

Diagnosis	Standardized Diagnosis
~	~

Initial Necropsy Comments & Interpretation

~

Samples & Tests

Samples

Sample Type/Anatomical Source	Preservative
~	~

Measurements

Organ Weights & Lengths

Measurement Date/Time	Type	Measurement Item	Measurement Value	Measured By
~	~	~	~	~

Histopathology

Tissue Processing

Tissue Trim Date	~
Trimmed By	~
Tissue Processing Submission Date	~
Tissue Processed Completion Date	~
External Laboratory	NW Zoopath
Reference Number	G19-2061

Histopathology Info

Histopathology Report Date	Jun 17, 2019
Histopathology Report By	Michael M. Garner DVM
Responsible Pathologist	Michael M. Garner DVM

Histopathology Report

HISTORY: This 4.5-year-old plover was a wild abandoned chick, and the rangers reported that the chick had been rolling and having difficulty keeping up with the parent and other chick. Supportive care was administered, and the bird appeared to stabilize but after a treatment administration developed a hemorrhagic discharge from the nares and oral cavity and arrested.

CLINICAL DIAGNOSIS: Open.

GROSS: Received in formalin is one chick up to 5 cm. in greatest dimension that is processed in six blocks.

MICROSCOPIC: **Lung**: The lung and air sacs are suffused with extravasated blood. **Skeletal muscle**: Skeletal muscle of the vertebral column has extensive, acute to subacute rhabdomyolysis and mineralization. The following tissues are histologically within normal limits: skeletal system, central nervous system, ears, eyes, oral and nasal cavities, thyroid, parathyroid, ultimobranchial gland, pancreas, proventriculus, ventriculus, ganglia, esophagus, trachea, heart, great vessels, intestine, umbilicus, bursa, kidney, cloaca, oviduct, adipose, yolk sac, and skin.

HISTOPATHOLOGIC DIAGNOSIS:
1. Acute pulmonary hemorrhage.
2. Subacute rhabdomyolysis with mineralization, vertebral column.

Histopathology Diagnosis

Diagnosis	Standardized Diagnosis
Acute pulmonary hemorrhage	~
Subacute rhabdomyolysis with mineralization, vertebral column	~

Finalize

Finalization Date	~
Relevant Death Info	~
Primary Body System Affected	
Responsible Pathologist	Michael M. Garner DVM
Responsible Resident	~

Significant contributors to death

Diagnosis	Standardized Diagnosis	Type

Final Summary

COMMENT: Histologic findings are consistent with acute pulmonary shock and hemorrhage, although the source of the hemorrhagic process is not apparent. Trauma seems most likely. The cause for the clinical signs noted in the history prior to the hemorrhagic syndrome is the rhabdomyolysis and mineralization of skeletal muscle throughout the vertebral column. The cause for this process is not apparent. This lesion is usually associated with stress or exertion, although hypovitaminosis E can produce a similar lesion. Generally, the latter is accompanied by necrosis of adipose tissue, which was not seen in this case. The bird was in good nutritional status and was a female. I suspect this bird had some problems pipping.

Necropsy Case Info for Husbandry Staff (Husbandry Note)

~

Addendum

Date	Note	Reported By
~	~	~

Audit Trail

~