

**NESTING OF THE CALIFORNIA LEAST TERN AND
WESTERN SNOWY PLOVER AT
OCEANO DUNES STATE VEHICULAR RECREATION AREA,
SAN LUIS OBISPO COUNTY, CALIFORNIA
2023 SEASON**



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Cover photograph from nest camera of common raven depredating the SP30 nest (circled in red) at ODSVRA on 7 exclosure shoreline 7 May 2023. Raven shown with one egg in its bill and the two other eggs were carried off by raven, one at a time, within a short time period.

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Attachments

California Wildlife Services Program, San Luis District. Oceano Dunes State Vehicular Recreation Area 2023 Predator Management Report

Wildlife Innovations. Raptor and Owl Management for the Protection of California Least Terns and Western Snowy Plovers Nesting within the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California. Annual Report - 2023

Snowy plover necropsy examination report: one adult

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 2023. This is the 22nd consecutive year of both intensive banding of snowy plover chicks and predator management that includes options for selective relocation or removal of predators. Banding of least tern chicks began in 2003.

Least tern

There were an estimated 41-42 least tern breeding pairs in 2023, slightly fewer than the 43-44 breeding pairs in 2022, and similar to the average of 40-43 pairs (range=23-60) in the 17-year period 2005-21. During the 2023 season a minimum of 15 banded birds with known origins were documented breeding at the park, with 14 banded as chicks and fledged from ODSVRA, and one banded as a chick and fledged from Vandenberg Space Force Base (VSFB).

There were 42 known nesting attempts, all from known locations within predator fencing of the Southern Exclosure. Of these, two had an unknown fate (not known if hatched or failed) and three were abandoned. The hatching rate for known location and fate nests was 92.5% (37/40), compared to the average of 85.0% during the previous 18-year period 2005-22.

Sixty-six chicks hatched and of these 38 were color-banded to individual. Thirty-five chicks (30 banded, five unbanded) are known to have fledged (seen when 21 days old or older), for a fledging rate of 53.0% and an estimated 0.83-0.85 chicks fledged per pair. This is below the average for the previous 17-year period 2006-22 (banding chicks to individual began in 2006) of 46 juveniles produced per year, a 71.2% chick fledging rate, and 1.08-1.15 chicks fledged per pair.

Snowy plover

There was a minimum of 232 breeding snowy plovers (128 males and 104 females) in 2023, an increase of 12.6% from the previous year. Eighty-nine banded birds with known origins were documented as breeding with 86.5% (77/89) banded as chicks and fledged from ODSVRA.

There were 260 known nesting attempts, including 43 identified only by detection of brood (unknown nest location). Of the 217 nests from known locations, 118 (54.4%) were in the Southern Exclosure, 18 (8.5%) in Oso Flaco, 64 (29.5%) in the Fore dune closure, eight (3.7%) in the open riding area, two (0.9%) in the closed buffer area, three (1.4%) in Eucalyptus Tree North revegetation area east of 6 exclosure, and four (1.8%) in Eucalyptus Tree revegetation area east of 7 exclosure. Of the 208 nests with known location and fate, 118 hatched for a nest hatching rate of 56.7%. This is below the average of 73.8% for the previous 21-year period 2002-22. Ninety nests failed, attributed to the following causes: abandoned pre-term (7); abandoned unknown pre- or post-term (2); vandalism (1); wind (3); overwashed by tide (5); cause unknown (3); eggs removed by staff (2); unidentified predator (7); unidentified avian predator (10); common raven (36); crow (2); harrier (10) and coyote (2).

Of the 391 hatching chicks, 167 were color-banded to brood with 62.3% (104/167) fledging, and the fate of the 224 unbanded chicks is believed known with 56.7% (127/224) fledging. A total of 231 chicks fledged (seen when 28 days old or older) for a fledging rate of 59.1% and is well above the average fledged rate of 37.7% (range=7.4-66.0%) for the 21-year period 2002-22. 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 2023, an

estimated 1.80 chicks fledged per breeding male at ODSVRA. For the previous 21-year period, average productivity was 1.43 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, visited for a variety of recreational opportunities, including driving vehicles and camping on the beach. ODSVRA allowed 1,000 off-highway vehicles per day, 1,000 street-legal vehicles per day, and 300 beach camping units during the 2023 nesting season. Approximately 1,057,900 people visited ODSVRA in 2022 and an estimated 183,900 street-legal vehicles and 73,300 off-highway vehicles were driven on the beach and dunes in the designated riding areas of the park.¹ ODSVRA was closed during the 2020 season due to COVID concerns, was open since 2021, but with limited allowable vehicle and camping use. Prior to 2020, larger portions of the park were open to vehicle use and allowable limits were higher (1,720 off-highway vehicles, 2,580 street-legal vehicles, and 1,000 campers). The 10-year estimated average from 2010-19 was higher than in 2022 with nearly 1.5 million visitors, 315,377 street-legal vehicles, and 121,786 off-highway vehicles (CDPR 2011-22).

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 2023 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 2019-21 by the National Agriculture Imagery Program (NAIP), unless otherwise noted.

State Park staff conducts monitoring activities at ODSVRA under U.S. Fish and Wildlife Service (USFWS) permit 10(a)(1)(A) ES-815214-10 and California Department of Fish and Wildlife (CDFW) Wildlife Branch Entity Scientific Collecting Permit (S-190250002-19028-001). 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) ES-807078-20, 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 2022 Annual attendance figures (source ODSVRA)

SITE DESCRIPTION

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, and is part of the larger Guadalupe-Nipomo Dunes complex that extends south to Point Sal. 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 open to vehicles extend inland approximately 0.6 to 1.3 miles. Eight numbered marker posts, located approximately 0.5 miles apart along the coastal strand, 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). ODSVRA was closed to camping in 2023 from 1-20 January, and for the early part of the nesting season 9 March - 25 April, and vehicle access was limited during these periods because of storms and periodic closure of Arroyo Grande Creek crossing. Vehicle access and use is prohibited one hour after sunset to 7 am year-round, with exceptions for emergency vehicles and visitors camping and traveling to or from their campsites and the park entrance. In the southern portion of ODSVRA is the Oso Flaco Lake area, which is closed to the public year-round on the northern end (approximately 0.5 miles of shoreline) and open to pedestrians on the southern end (approximately 1.2 miles of shoreline), 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 (Figures 1 and 2, Appendix C).

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. The Pismo Lake property was acquired in 2007 and is closed to the public.

Riding area: The area within ODSVRA open to street-legal and off-highway vehicles during the non-nesting season from 1 October to 28 February. The northern boundary for street-legal vehicles is the Grand Avenue park entrance and is marker post 2 (approximately one mile south of the Pier Avenue park entrance) for off-highway vehicles. The shoreline is open south to marker post 6, with a large area of back dunes also open to vehicles. Due to winter storms, there were many days during the non-nesting season prior to 1 March when all or portions of the riding area were closed. When the park is fully open, the riding area is approximately 900 acres on 4.2 miles of beach.

Open riding area: The area within ODSVRA open to vehicle use during the nesting season (approximately 874 acres when the park is fully open). Due to storms in the early part of the nesting season, Arroyo Grande Creek near marker post 1 was not crossable and ODSVRA did not fully open until 25 April. The installation of buffer fencing decreases the open riding area acreage. (see Closed buffer area description below). 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. The majority of the open riding area is not optimal nesting habitat, with mostly bare sand, limited areas of artificial debris patches, little to no vegetation, and regions with steep topography.

Foredune closure: Vegetation restoration area within the open riding area closed in January 2020 to improve air quality conditions. Fencing was installed approximately a quarter mile south of marker post 4 to north of marker post 6 (approximately 0.8 miles of shoreline). The closure, totaling 48 acres, is broken into three plots: Foredune North, Foredune Central, and Foredune South. The plots were given different experimental treatments using straw, native seed, and native plants. One control section was not treated. During the nesting season the treated plots had moderate amounts of plant cover, low topography, and areas

of scattered straw. The plots were not intended as a snowy plover nesting area, but in these initial years of restoration, suitable habitat is available for nesting. The fence surrounding each plot is intended to keep people and vehicles out of the restoration area, but the fence is not maintained as predator fencing and coyotes and other mammals can easily move through the area. The adjoining shoreline west of the area and the western portions of the alleyways between these three plots are closed to public use during the breeding season (1 March to 30 September) and nests found in these areas are included within the Foredune closure. The total acreage of plots, shoreline component, and alleyway area closed during the nesting season is approximately 77 acres. The eastern portions of the alleyways between these three plots were initially open for public access to restrooms and nests found here in these circumstances are considered located in the open riding area. On 18 and 27 April, the eastern portions of the two alleyways south of Foredune North and Foredune Central were closed to create buffer areas for plover nests, and nests found in these areas are considered located in a closed buffer area (see description below). The two alleyways were reopened to the public 7 and 13 September, when nests were no longer active and chicks were no longer present.

Closed buffer area: Portions of the open riding area are closed to the public to provide a buffer for tern and plover nests, chicks, and for the tern night roost. As staff finds nests or chicks outside of protected areas, management closes those areas of the open riding area to the public to provide this buffer. Additional areas of the open riding area are closed as staff finds tern nests within closed areas to provide larger buffers for these nests (see section titled Nonpredator fencing on page 17 for details on buffer sizes). The closed buffer area varies in size during the nesting season, as well as from year to year, depending on locations of nests or chicks found. On 1 June 2023, after the first tern nests were found, a large closed buffer area (53 acres) was installed east of the Southern Exclosure and Foredune closure. This closed buffer area was expanded over time to close more areas as the tern night roost and additional tern nests were established, as well as for plover chick protection (maximum of 89 acres on 24 July, see maps in in Appendix C). The fencing east of the Southern Exclosure and Foredune closure was removed on 21 August, when nests were no longer present in the area and the eastern alleyways of the Foredune closure were opened 13 September, when plover broods had fledged from the area. Because the closed buffer area can be large in size, it is often adjacent and connected to the Foredune closure, revegetation areas, or the Southern Exclosure fence using symbolic or hard fencing to keep people and vehicles out of the area, but the fence is not maintained as predator fencing and coyotes and other mammals can easily move through the area. Staff assigns the “closed buffer area” location to nests initiated and found within already existing enclosed buffer areas. Nests found outside the closed buffer area and other protected areas are assigned to the “open riding area” location.

Southern Exclosure: A single contiguous area within the southern portion of the riding area that is fenced and closed to public entry to protect nesting terns and plovers. The adjoining shoreline is also part of the Southern Exclosure. 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. 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. In 2023, the area of the Southern Exclosure (including the area above the high tide line on the closed shoreline) was approximately 298 acres and compares to an average of 294 acres (range=271-307 acres) for the 19-year period 2004 to 2022. From 2001 to 2021, the Southern exclosure and adjacent shoreline were seasonally closed to public entry during the nesting season from 1 March to 30 September, and were closed to public entry year-round beginning 9 October 2021. 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 62 acres), first incorporated into the Southern Exclosure for a full season in 2004. Habitat includes areas of bare sand, small to medium sized hummocks, limited areas of organic surface debris (shells, driftwood, dried algal wrack), and while the area was once sparsely vegetated it is more heavily vegetated in recent years.

7 enclosure: The area from marker post 7 to the south side of 7.5 revegetation area (approximately 0.4 miles of shoreline and approximately 63 acres). Habitat includes areas of bare sand, extensive areas of small to medium sized hummocks, limited areas of organic surface debris (shells, driftwood, dried algal wrack), areas of sparse to heavily vegetated dunes, and dense vegetation in the 7.5 revegetation area (4.8 acres, included in the 63 total acres) located within the 7 enclosure.

8 enclosure: 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 82 acres). Habitat includes areas of tall dunes with bare sand in the eastern portion, areas of moderate to tall foredune hummocks with mostly dense vegetation in the western portion, and limited areas of organic surface debris (shells, driftwood, and dried algal wrack).

Boneyard enclosure: The area east of the North Oso Flaco dunes. Habitat is primarily bare sand, includes tall sand dunes, especially on the eastern portion, with areas of densely vegetated moderate dunes in the western portion. This inland area does not have a shoreline component and is approximately 92 acres. A portion of the west side (approximately 16 acres) has been closed year-round since 2005 and the entire area was closed year-round in 2021 (with the rest of the Southern Enclosure). The eastern boundary of the Boneyard enclosure is not maintained with 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 enclosure during the nesting season, resulting in 44 acres in the western portion (contiguous with 6, 7, and 8 enclosures and North Oso Flaco) and 47 acres in the eastern portion in 2023.

Oso Flaco: The shoreline and dunes in ODSVRA located approximately 0.4 miles south of marker post 8. 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, with some areas partially 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.

North Oso Flaco: The area extending south of 8 enclosure to the Oso Flaco boardwalk (a pedestrian 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 is part of the Enclosure predator fence (see description in Management Actions section on page 16) and managed in a similar manner with predator fencing. Additionally, the shoreline has been closed to the public during the nesting season since 2005 and was closed year-round beginning October 2021.

South Oso Flaco: Extends from the Oso Flaco 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 enclosures. No areas are closed year-round in South Oso Flaco.

Dunes Preserve: Located south of Arroyo Grande Creek and 0.4 miles north of the Foredune closure (1.3 miles in length). The area includes tall sand dunes with densely vegetated foredunes in the western portion and primarily bare sand dunes in the eastern portion. The area was established as a preserve in 1974, vehicles and dogs are not allowed, and fencing designates the boundary adjacent to the open riding area, however there are openings in the fence for pedestrian and equestrian access. Management of the Dunes

Preserve was transferred to the Oceano Dunes District in December 2004. ODSVRA provided tern and plover monitoring for the Dunes Preserve prior to 2004 and continues to do so.

Pipeline revegetation area: Located adjacent to the east side of 8 enclosure. The area is heavily vegetated. Fencing designates the perimeter of the revegetation area adjacent to the open riding area, however this fence is not maintained as predator fencing. Since 2021, the revegetation area is closed to public entry.

Other revegetation areas mentioned in this report: Several named revegetation areas are in the open riding area near nesting areas including Bigfoot (222 feet east of the Foredune closure), Eucalyptus North (319 feet east of 6 enclosure), and Eucalyptus Tree (328 feet east of 6 and 7 enclosure). Maidenform revegetation area is located adjacent to the east side of Boneyard enclosure and the open riding area. Pavilion Hill revegetation area is 180 feet northeast of the Foredune closure between marker posts 4 and 5. The areas are mostly heavily vegetated, but some small portions of the areas more recently expanded for restoration 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. Since 2021, all these revegetation areas are closed to public entry.

Arroyo Grande Creek: Seasonally flows into the Pacific Ocean approximately 1 mile south of Pier Avenue and 1.5 miles north of the Foredune closure. 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. During the nesting season, staff installs symbolic fence in such a way to allow equestrian access to Dunes Preserve.

Carpenter Creek: Seasonally flows into the Pacific Ocean approximately 0.4 miles north of Grand Avenue and 3.5 miles north of the Foredune closure. No public vehicles are allowed in the area and the area receives a high level of pedestrian use.

Pismo Creek lagoon: Seasonally flows into the Pacific Ocean approximately 0.6 miles north of Grand Avenue and 3.7 miles north of the Foredune closure. Standing water persists all year, with low vegetated hummocks west of the lagoon; tall vegetated dunes and developed RV campground to the east. No public vehicles are allowed in the area and 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.

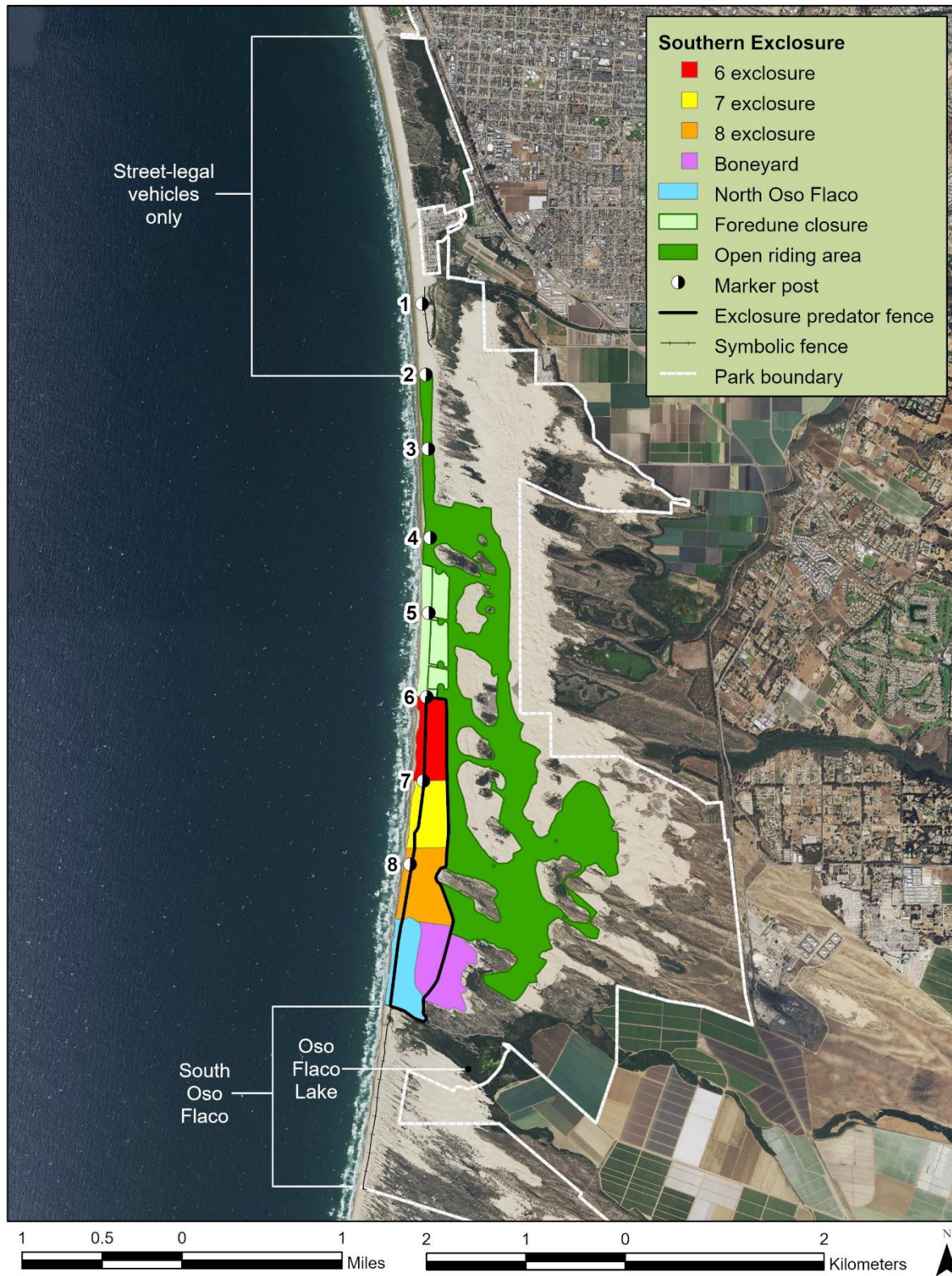


Figure 2. ODSVRA Southern Exclosure and Oso Flaco protected areas for breeding California least terns and snowy plovers in 2023.

MONITORING AND MANAGEMENT ACTIONS

MONITORING

Daily monitoring occurs from 1 March to 30 September. ODSVRA maintains four to eight or more monitors during morning and early afternoon hours. As the season progresses, monitoring increases to include the late afternoon and early evening hours, typically with two staff members. 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 at a small number of tern and plover nests may provide additional monitoring information such as adult bands, adult behavior, nest attendance, predators, nest fates, nest fate dates, and chick numbers, especially in areas otherwise difficult to access. Monitors enter data from field notes, nest cameras, and ESRI ArcGIS Online Survey123 and Field Maps into a comprehensive Microsoft Access database and ESRI ArcMap.

Open riding area

Monitoring of the open riding area by vehicle occurs daily along defined transects, as any nests or chicks located in this area require immediate protection from recreational activities and may require additional monitoring. These daily transects include portions of the revegetation areas closest to the open riding area. Staff looks for nesting bird sign, predator presence or sign, and nonpermitted visitor activity (such as off-leash dogs or kites near the enclosure). Staff also rescues sick or injured wildlife and collects deceased wildlife. Areas along transects with tern or plover activity indicating potential nesting interest (scraping or copulating) receive more thorough checks on foot and with increased frequency using binoculars or spotting scopes. Monitors pay particular attention to the boundaries of the Southern Enclosure, Fore dune closure, and revegetation areas, looking for indications of nesting close to the open riding area and for tracks or other signs of tern or plover movement into the open riding area. Close brood monitoring occurs daily, including any time staff walk within the enclosure, and is prioritized for any brood movement toward or into the open riding area (see more detail in section titled Broods in the open riding area in the Management Actions section on page 19).

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 Southern Enclosure and Fore dune closure, and from vehicles on the adjoining shoreline, 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) receiver connected by Bluetooth to a phone.

Estimating nest 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 (32 days) and backdating to nest initiation. When none of this information is available, staff cannot estimate nest initiation dates.

Nest fates

The following are categories of nest fates used in this report. Staff examines contents of nonhatching eggs post season to look for evidence of fertilization, which may help determine if eggs were abandoned pre- or post-term.

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 paragraph titled Assignment of broods to nests within this Monitoring section for more detail). When all chicks in a plover brood are known to 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 post-term: Nest abandoned after the expected hatch date; 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.

Wind: Nest buried during periods of high winds, with eggs typically found almost or completely buried.

Failed, eggs removed by staff: Nonviable eggs from nest removed by staff after incubated well past estimated hatch date. Egg removal is done in consultation with USFWS.

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 with 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 2023, least tern chicks received a size 1A numbered aluminum federal band (covered with red over aqua vinyl tape) on the left leg and a size 1A blank aluminum band on the right leg. Color tape placed on the right band creates color band combinations unique to each individual chick for the season. Weighing chicks occurs immediately prior to banding, typically at two to five days old.

Staff inconsistently banded plover chicks prior to 2001. ODSVRA aims to band as many chicks as possible, with all chicks within one plover brood given the same color band combination since 2002. ODSVRA has a limited number of designated combinations and will reuse combinations when birds with the combination are dead or after a period of at least three years with no sightings in the Pacific coast population’s range. Even with this method, reuse of combinations on birds known alive became necessary and occurred from 2010-18, resulting in indeterminate ages of some adult banded plovers. Since 2019, broods have received

a combination no longer believed in use on a living bird because ODSVRA obtained additional band combination options.

To reduce disturbance to chicks, monitors may choose to leave chicks unbanded when broods remain in areas with nearby young tern and plover broods. In addition, loss of a number of very young unbanded chicks occurs prior to any banding opportunity. Staff tracks the fates of unbanded chicks with intense brood monitoring; in many instances, the associated adult or sibling chicks may have color bands.

Assignment of broods to nests: Point Blue and park staff trained by Point Blue typically bands chicks at the nest. For unbanded broods found outside of the immediate nest area, staff evaluates brood location, age of chicks, and adult bands and assigns the brood to a nest as either: 1) a preexisting known location hatched nest or, 2) a new hatched nest with unknown location and known only from brood. Prior to 2023, staff used a third category of “unassigned nest” when unsure how to assign broods to a specific nest, in circumstances where several nearby nests hatch at the same time and unbanded broods with chicks of similar age appear on the same section of shoreline. The unassigned category was not used in 2023 and assumptions were made to determine the most likely nest source for the broods.

Chick monitoring: Staff records chick observation data during daily monitoring activities. In addition, focused searching for broods occurs multiple times each week from vehicle surveys on the Foreduene closure, Southern Exclosure, and Oso Flaco shorelines. Staff records band combinations, chick numbers, adults present, and location.

Fledging success: At ODSVRA, juvenile terns can disperse widely 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 at the Southern Exclosure and any temporary daytime roosting areas that may become established in the park or off-site. To collect additional information on banded tern juveniles dispersing off-site, staff reviews photographic records from off-site birder visits (eBird.org 2023). Staff also communicates with off-site tern managers to supplement site data and may visit nearby locations where terns fledging from ODSVRA may be present.

The fledgling least tern counting method varies 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, ODSVRA color-banded chicks to brood and since 2006 color-banded most chicks 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. Staff counts unbanded fledglings and adds the single day high count to banded fledgling numbers to obtain total fledgling numbers.

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 during chick monitoring as described above. Prior to 2001, staff monitored Oso Flaco and Pismo Dunes Natural Preserve intermittently, 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.

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). For snowy plover in 2023, the number of plover fledglings produced per eggs laid, called breeding coefficient, is also reported as an alternate assessment of productivity.

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.

Banded snowy plover adults provide the most accurate means to identify breeding population size but currently too few individually banded adults breed at ODSVRA 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; not including males with broods three weeks of age or older since 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 added 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. Staff searches for evidence (tracks, roosting scrapes, fecal matter) in the open riding area during daily morning transects and periodically within the Southern Exclosure to identify night roost locations. Monitors search for the night roost at least once per week, weather permitting, as the terns arrive at dusk or later using a thermal infrared scope (Trijicon REAP-IR) and record the location and number of individuals present. ODSVRA considers counts a minimum due to the inherent limited visibility of the night roost. Light conditions after dusk make adults and juveniles indistinguishable.

Least tern use of freshwater lakes: Freshwater lakes can provide a source of prey fish in addition to the near-shore ocean. Though not always feasible, surveying nearby small freshwater lakes documents tern use and gives a better understanding of local food resources; importantly, determining if lakes provide additional appropriately sized fish to feed chicks (chicks require fish small enough to be swallowed whole). Staff monitors the tern colony in the Southern Exclosure daily and observations of adults in flight provide information about the direction of foraging sources. Monitors conduct occasional surveys during the season at Oso Flaco Lake, located on park property approximately 1.5 miles south of the tern colony and at Monarch Dunes Golf Club ponds (4.3 miles southeast of the park) in response to non-staff reports of tern presence 2021-23.

Wind speed monitoring

Since 2011, ODSVRA monitors wind speed from a tower (S1 wind tower) located approximately 360 feet east of 6 exclosure with a recording anemometer at a height of 10 meters.

Predator activity

Monitoring predator activities: Park staff and contractors (Wildlife Innovations, U.S. Department of Agriculture [USDA] Wildlife Services, and Point Blue) collect information on predator presence at ODSVRA from March to September. From direct observation of avian and mammalian predators or their sign (e.g., tracks, scat, regurgitated pellets, prey remains, depredated nests) monitors record, when possible, species, type of sign, characteristics that may identify an individual, behavior, duration of observation, direction of travel, locations, bands found in pellet/scat contents, and any hazing or trapping details.

Measures describing predator activity

Monitors record predator presence from 1 March to 10 September (a 194-day period) under the following three categories to 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 of the 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). Monitors record predator activity in the Foredune closure using the same methods, however these recordings are not included in sighting and occurrences totals in this report to keep comparisons between years consistent. Note that the number of recorded sightings or occurrences for the first two weeks of March and the last few weeks of the season (end of August and beginning of September) may be biased lower, with less predator contractor presence in the field, and less staff time during these periods 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, and occasionally adults. Human activity and associated food resources attracts gulls, making them a subsidized predator. Staff performs general monitoring of gulls around the Foredune closure, 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 two times per week on Sunday and Monday mornings when the trash dumpsters are usually full.

Nonbreeding season monitoring of snowy plovers

Beginning in October 2009 and continuing through the 2022-23 winter, more consistent weekly surveys for snowy plovers occurred 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;
- 2) Grand Avenue to marker post 2;
- 3) marker post 2 to marker post 6;
- 4) marker post 6 to the North Oso Flaco northern boundary; and
- 5) Oso Flaco (shoreline from North Oso Flaco to ODSVRA's southern boundary).

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 fencing and posts signage to close areas to visitors. Staff may augment existing habitat with branches, woodchips, and wrack (surf-cast kelp), but distributed less of these materials in 2022-23 because the Southern Exclosure was closed to the public year-round, which allowed for materials to stay in place without disturbance. An active predator management program reduces disturbance and depredation by mammalian and avian predators. Under select circumstances, and in consultation with USFWS and CDFW, ODSVRA staff may collect abandoned but potentially viable eggs or chicks for captive-rearing and may send carcasses to an approved facility for investigative necropsy. For 2023, ODSVRA selectively took eggs to the Santa Barbara Zoo and sent carcasses appropriate for necropsy to CDFW, Office of Spill Prevention and Response, Marine Wildlife Veterinary Care and Research Center, Santa Cruz, California (MWVCRC). In addition, staff processes nonhatching eggs post season to analyze contents and takes eggshell specimens to the Santa Barbara Museum of Natural History.

Informational signage and enforcement of regulations

Staff places interpretive panels and signs at public access points, near restroom facilities, and on A-frame placards near winter plover flocks to increase public awareness of threats to terns and plovers. Staff also uses signs to identify closed areas during the breeding season. The public can access a low wattage radio station (1690 AM) with a repeated recording of park information, including information about protection of sensitive species. Least tern and snowy plover information and updates are also posted on ODSVRA websites and social media pages, such as Facebook. Park ranger staff enforces park regulations enacted to protect terns and plovers.

Closures and fencing

ODSVRA closes portions of the park to vehicle and/or pedestrian use with wire mesh or symbolic fencing. The wire fencing of the Exclosure predator fence (see details below), provides a higher level of protection compared to nonpredator fencing and symbolic fencing to keep visitors and coyotes from entering sensitive areas. When nesting occurs outside of the Exclosure predator fencing, staff may choose an alternative exclosure or other fence 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 fencing and exclosure types:

Exclosure predator fence (within Southern Exclosure and North Oso Flaco): ODSVRA enclosed with wire mesh fencing this approximately 270-acre area 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. For the purposes of this report, this type of buried wire fence is referred to as “predator fence” or “predator fencing.” 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. Beginning in 2016, for the purpose of making the fence more visible to flying least terns, orange plastic fencing overlays the top portion of the fence (in swaths approximately 16 inches wide) on the north and west fence of the Southern Exclosure from approximately marker post 6 to post 8. Heavy equipment operators assist regularly, usually weekly during high wind periods, in the maintenance of the predator fence. In 2023, staff began installing jute netting more regularly along the base of the fence to help to stabilize sand and lessen the need for heavy equipment.

Symbolic fencing

Rope fencing in several areas of the park seasonally or temporarily is used to protect nesting or shoreline brooding habitat, but varies in configuration and length of time used depending on the location and protection needs. Nests with symbolic fencing may also receive protection from a single nest wire enclosure.

Foredune closure, Southern Exclosure, and North Oso Flaco shoreline: Symbolic rope fencing, with the addition of tall posts with large stop signs extending into the intertidal area at the northern end of the Foredune closure shoreline and the southern end of North Oso Flaco to clearly designate a closed shoreline of the Foredune closure, Southern Exclosure, and North Oso Flaco to visitors for the nesting season from 1 March to 30 September. On 1 October, the symbolic fence is installed at marker post 6 extending into the intertidal zone to close the Southern Exclosure and North Oso Flaco shorelines for the winter months (the Foredune closure shoreline opens to the public 1 October).

South Oso Flaco: Symbolic rope fencing and signs close approximately 1.2 miles of nesting and brood-rearing habitat in South Oso Flaco (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 an additional buffer between nests and pedestrians.

Arroyo Grande Creek and lagoon area: Symbolic rope fencing and signs close a small area around Arroyo Grande Creek and lagoon from 1 March to the end of September for the nesting season. ODSVRA removes the symbolic fence, opening it to pedestrian use during the nonbreeding season from 1 October through 28 February, but posts and signs remain in place to restrict vehicle use year-round.

Open riding area: Nest or chick protection consists of symbolic rope fencing and signs initially when monitors discover a nest or brood in the open riding area. The symbolic fence is replaced with temporary wire fencing (nonpredator fencing) in most cases and when necessary. Staff removes fencing once nesting activity ceases or when broods are no longer present in the temporarily fenced area.

Nonpredator fencing: Wire “field” fencing has a larger mesh size and is four feet tall, unburied, not predator proof and used to identify some areas as closed to the public. Nonpredator fencing closes the western portion of the Foredune closure alleyways for the breeding season 1 March to 30 September. Staff installs nonpredator fencing to provide a closed buffer area around any least tern or snowy plover nest found in the open riding area (see Site Description for details on closed buffer area). Staff may also install the wire fencing to protect snowy plover broods in the open riding area. Tern nests receive a minimum nest buffer from the open riding area of 984 feet (300 meters). For plover nests in 2023, nest buffers were a minimum of 100 feet (30 meters). Because of the large size of the tern buffer, staff often attaches the nonpredator fencing to adjacent fenced closed areas (such as the Southern Exclosure, Foredune closure, or revegetation areas), making an irregular shape (not circular). The nonpredator fencing makes up the closed buffer area that expands or contracts in size over time, often with overlapping fencing. ODSVRA may use nonpredator fencing to create closed buffer areas of smaller sizes in cases where topography or safety conditions preclude a full-sized enclosure. Park staff vehicles are allowed in the closed buffer areas for daily monitoring tasks, fence maintenance, and to respond to emergency situations.

Circular enclosure and mini-enclosure: Staff selectively uses small enclosures (made of two-inch by four-inch wire predator fencing) around individual snowy plover nests inside or outside of predator fencing for protection from predators, including roosting gull flocks. Permitted monitors use different enclosures based on a variety of factors including, but not limited to, weather, topography, predator threats, and proximity of

young broods. Staff closely monitors nests within smaller enclosures since there may be an increase in abandonment due to predation on adult plovers attending the nests or a higher risk that sand accumulating inside the fencing during high wind events buries eggs.

Staff builds a seven-foot-diameter circular enclosure (used since 2012) with five-foot-high sides and the bottom eight inches buried when located outside of the Southern Enclosure. Plastic netting, with 1/2-inch by 1/2-inch mesh, covers the top and protects against avian and climbing mammalian predators. Staff may also selectively use a three-feet by three-feet by three-feet mini-enclosure (used since 2010), with a wire mesh top, staked into the ground, and buried four to eight inches when appropriate. The mini-enclosure takes the least amount of time and staff to install but the circular enclosure is currently preferred because the larger size may give more protection from predators, accommodates more nest movement, and may cause less sand deposition and egg burial at this very windy site.

Bumpout: A nest in the Southern Enclosure, Fore-dune enclosure, or revegetation areas and located close to the boundary of the open riding area requires temporary additional fencing extending into the open riding area to allow an adequate buffer from recreational activities. Least tern nests within 984 feet (300 meters) and snowy plover nests within 100 feet (30 meters) of the open riding area receive a bumpout. Rarely, a slight reduction in bumpout size occurs, in consultation with USFWS and CDFW, to maintain a safe vehicle corridor adjacent to the east fence. Staff creates these bumpouts using wire fence (unburied) or symbolic rope, thus they are not predator proof. Sometimes staff encloses nests on the shoreline close to the west fence with two-inch by four-inch mesh buried predator fencing extending as a bumpout from the Southern Enclosure fence.

Habitat enhancement

Staff evaluates the nesting habitat of the Southern Enclosure and the Fore-dune enclosure shoreline and places materials 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. Following the nesting seasons of 2021 and 2022, and for the five-month period October through February, the Fore-dune enclosure shoreline was open to camping and vehicles resulting in barren sand with little to no natural debris and vegetation compared to the Southern Enclosure and Oso Flaco. Beginning in February or March, and prior to nest initiation, staff may add natural materials such as driftwood, wrack, or woodchips to the Fore-dune enclosure shoreline or the Southern Enclosure, as deemed necessary to enhance habitat features. On the Southern Enclosure shoreline, staff may inoculate wrack with talitrids (commonly called beach hoppers) to help establish a breeding population, thus increasing the food resources available for plover chicks and juveniles during the breeding months.

Wrack and talitrids: Results from a five-year study conducted from 2007-11 by Drs. Jenny Dugan and Mark Page, researchers from the Marine Science Institute at the University of California Santa Barbara (UCSB), showed greatly depressed invertebrate populations on the Southern Enclosure shoreline when the area was seasonally open during five months (October through February) to recreational vehicle use. The studies also showed that invertebrates cannot effectively recover species diversity and abundance on the Southern Enclosure shoreline in the following seven-month seasonal closure (March through September). In 2012, UCSB sampled invertebrates on the ODSVRA shoreline and from 2013-23, park staff continued the surveys using the UCSB protocols. The beginning and end of season surveys are comprised of 15 transects in defined areas along the Fore-dune enclosure (3 transects, began surveying in 2021), Southern Enclosure (9 transects), and North Oso Flaco (3 transects as a control) and the samples are sent to Dr. Dugan for analysis. The Southern Enclosure has been closed year-round since October 2021, and invertebrate populations appear to be improving (talitrid survey results are pending). Since the Fore-dune enclosure shoreline is open to camping and vehicles seasonally, it is likely to have depressed numbers of invertebrate populations on the shoreline compared to the Southern Enclosure and Oso Flaco.

ODSVRA may collect wrack in the open riding area and disperses it on the Foredune closure and Southern Exclosure shorelines to improve habitat conditions. Collection and distribution occur by hand and relocation by truck and trailer. Staff may collect talitrids from outside the vehicle use area north of Grand Avenue and from South Oso Flaco, taking care not to deplete talitrid numbers from collection sites, and inoculates talitrids into the dispersed wrack on the Southern Exclosure shoreline. Wrack is dispersed mainly in the months of February to April but may be distributed later in the season. Amount of wrack and talitrids collected and dispersed, and timing of distribution, varies from year to year depending on availability of materials and amount of invertebrates found, as well as allowable staff time. Wrack and talitrids were not distributed on the closed shorelines in 2023 because of accessibility issues due to early season storm events causing beach closures, limited staff time, lack of available wrack/talitrid resources, and less bare areas present on the closed shorelines.

Wood pieces and woodchips: Staff distributes wood pieces (cut branches and driftwood) in patches from the mid-portion of 6 and 7 exclosures toward the west fence, the upper portion of the Southern Exclosure shoreline west of the fence, and the Foredune closure shoreline. Staff collects the wood pieces at the end of each season from the shoreline areas where they may be washed out and stores them for use in the following season.

From 2008-2022, staff added woodchips to the Southern Exclosure to supplement the existing assorted debris that least terns and snowy plovers often choose as nesting substrate. Crews spread woodchips in patches, usually less than a quarter-acre in size, in the Southern Exclosure in areas of barren sand and over thinning woodchip patches remaining from previous years. ODSVRA heavy equipment assists in loading woodchips to be distributed. In recent years, staff dispersed smaller amounts of woodchips and none were distributed in 2023 because less bare areas were present. Woodchips remained in place from previous years and the year-round closure of the Southern Exclosure since October 2021 protected the substrate. Moving sand dunes in other bare areas of the Southern Exclosure would cover any materials, making placement of wood pieces and woodchips impractical.

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 may haze 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 handheld launcher, the bird whistler fires a projectile up to 300 feet with 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, Wildlife Innovations performs selective live-trapping and relocation of raptors and USDA Wildlife Services conducts lethal removal of mammalian and avian predators (see section titled Predators and predator management on page 48 for additional information).

Broods in the open riding area

When staff observes tern or plover chicks within a closed protected area, but close to the boundary of the riding area, staff continues monitoring closely until the broods move a safe distance away. If broods move slightly out of the boundary without an immediate threat detected, monitors watch them closely until they return. If the brood fails to return quickly or continues to move further away from the boundary into the open riding area, monitors divert vehicle traffic and pedestrian foot traffic out of the area using fencing and/or signage if necessary. If determined necessary, monitors carefully direct the brood to a protected non-vehicle use area such as the Southern Exclosure or the Foredune closure. For nests expected to hatch outside a protected area, monitors oversee the erection of temporary fencing prior to the nest hatching to provide a safe passage until the brood reaches a protected area. Corridors may vary in size, shape, and type of

materials depending on location and other factors but are typically 100 to 200 feet in width. Additional potential protection measures allowing the brood's safe movement include flushing threats such as gulls or other predators within the travel corridor and obtaining assistance as necessary from ODSVRA patrol staff. ODSVRA consults with CDFW and USFWS before known nests located in the open riding area hatch or once a brood is found greater than 200 feet away from a protected area prior to guiding brood movement.

Selective collection and transfer of abandoned chicks and potentially viable eggs

Under select circumstances, ODSVRA staff may collect abandoned but potentially viable eggs or chicks. Monitors consider if disturbance factors from visitors or park management efforts contributed to abandonment. Some examples include: abandoned eggs or chicks from a nest in the open riding area; abandoned eggs or chicks from a nest within a single nest enclosure such as a circular enclosure, with suspected adult mortality; or abandoned eggs or chicks from a nest near the park's two-inch by four-inch enclosure fencing which can increase windblown sand deposition on the nest. For eggs, monitors first assess if any nests with active incubation but nonviable eggs (well past estimated hatch date) are available to receive the collected potentially viable eggs. Without an available nonviable active nest, and in consultation with USFWS and CDFW, staff transports the eggs to Santa Barbara Zoo, an approved facility for captive-rearing. There may be very limited circumstances where staff collects an abandoned chick, such as when a chick is observed on the closed shoreline with limited mobility and unattended by an adult for an extended period of time, as the chick would otherwise succumb to the elements. Staff places an abandoned chick in a portable brooder, warms the chick until mobile, and first attempts to reunite the chick with the associated adults on the closed shoreline; if not possible, staff transports the chick to the Santa Barbara Zoo for captive-rearing. Staff uses a portable brooder during transport to maintain an appropriate temperature for the collected eggs or chicks, as directed by the rehabilitation trained staff. When possible, chicks raised in captivity and reaching fledgling status are color-banded to individual prior to release, allowing for collection of information on movements, survival, and future reproductive success.

Investigation of least tern and snowy plover carcasses

ODSVRA, with USFWS and CDFW consultation and direction, freezes fresh carcasses of least terns and snowy plovers and sends them to MWVCRC for necropsy. Monitors may record wing length measurement of chicks or young fledglings to help determine age of individual.

RESULTS AND DISCUSSION

CALIFORNIA LEAST TERN

Number of breeding pairs

In 2023, least terns were first seen at ODSVRA on 5 May, with three flying over the exclosure, and from 9 May onward terns were seen or heard daily. The last sighting was of two juveniles over Arroyo Grande Creek on 18 August. During the previous 21 years, first sightings occurred between 8 April and 15 May (median=4 May) and last sightings occurred between 10 August and 28 September (median=29 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 2023, there was a known minimum of 41 breeding pairs and an estimated maximum of 42 pairs, with 41 nests and broods active at the same time on 20 June–22 June. This is similar to both the 43-44 pairs in 2022 and the average of 40-43 pairs (range=23-60) for the 18-year period 2005-22 (Table 1, Figure 3).

Number, clutch size, and distribution of nests

There was a total of 42 nests, with the first nest initiated approximately 27 May and the last 28 June (Appendix A). During the 21-year period 2002-22, there was an average of 47 nests per year (range=22-79) with initiation dates for first nests ranging from 16 May–8 June (median=28 May) (Table 1). Of the 42 nests (all with known complete clutch size) five had one egg, 36 had two eggs, and one had three eggs, with an average clutch size of 1.90 eggs. This compares to an average of 1.87 for 2005-22 (range=1.57-2.05) and the most recent reported statewide average of 1.68 from 2007–17 (range=1.37-1.82) (Marschalek 2008-12; Frost 2013-17; Sin 2021). Of the 42 nests, 30 (71.4%) were in 6 exclosure and 12 (28.6%) were in 7 exclosure. In 2022, 32 (71.1.3%) and 13 (28.9%) were in 6 and 7 exclosure, respectively (Figure 4).

Clutch hatching rate

Fates of the 42 nests were 37 hatch, three fail (abandonment), and two with unknown fate. The clutch hatching rate for known location and fate nests was 92.5% (37/40) (Table 2). This compares to an average hatching rate of 83.6% (range=64.7-97.8%) for known location and fate nests for the 20-year period 2003-22 (Table 1). In 2023, the hatching rate was 93.1% (27/29) in 6 exclosure and 90.9% (10/11) in 7 exclosure. Forty-nine chicks hatched from a minimum of 56 eggs in 6 exclosure and 17 chicks hatched from a minimum of 24 eggs in 7 exclosure.

Table 1. Nesting success of California least terns at ODSVRA from 1991-2023.

Percent nests hatched calculated using number of nests with known location and 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 2006-23.

Year	Estimated no. breeding pairs	No. nests (no. known location and fate)	No. hatched nests (no. known location)	Percent known location and 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 (3)	19	6	0	0	0	0
1998	33-37	40 (32)	26 (26)	81	40	60	24	0.6	0.65-0.73
1999	28-31	34 (31)	22 (22)	71	42	40	17	0.5	0.55-0.61
2000	4-5	5 (5)	4 (4)	80	8	50	4	0.8	0.80-1.00
2001	12-15	18 (18)	13 (13)	72	22	55	12	0.67	0.80-1.00
2002	20-21	22 (19)	15 (15)	79	27	37	10	0.45	0.48-0.50
2003	53-66	79 (77)	60 (60)	78	101	37	37	0.47	0.56-0.70
2004	47-55	63 (60)	44 (43)	72	69	36	25	0.4	0.45-0.53
2005	47-53	59 (59)	39 (39)	66	66	30	20	0.34	0.38-0.43
2006	31-35	38 (38)	28 (28)	74	45	80	36	0.95	1.03-1.16
2007	54-60	66 (65)	51 (50)	77	90	78	70	1.06	1.17-1.30
2008	55-56	56 (55)	50 (49)	89	99	72	71	1.27	1.27-1.29
2009	25-26	26 (26)	23 (23)	88	43	77	33	1.27	1.27-1.32
2010	23-23	23 (23)	20 (20)	87	35	83	29	1.26	1.26-1.26
2011	33-34	35 (35)	31 (31)	89	55	91	50	1.43	1.47-1.52
2012	41-44	46 (39)	32 (32)	82	51	82	42	0.91	0.95-1.02
2013	48-53	57 (52)	45 (45)	87	85	66	56	0.98	1.06-1.17
2014	47-48	49 (46)	42 (42)	91	76	76	58	1.18	1.21-1.23
2015	44-49	54 (54)	48 (48)	89	84	82	69	1.28	1.41-1.57
2016	47-48	49 (46)	46 (45)	98	78	76	59	1.2	1.23-1.26
2017	42-47	52 (34)	22 (22)	65	39	18	7	0.13	0.15-0.17
2018	30-33	35 (34)	28 (27)	79	42	83	35	1	1.06-1.17
2019	31-33	34 (33)	31 (31)	94	52	73	38	1.12	1.15-1.23
2020	35-42	48 (46)	36 (36)	78	63	60	38	0.79	0.90-1.09
2021	50-52	53 (51)	49 (48)	94	81	59	48	0.91	0.92-0.96
2022	43-44	45 (44)	42 (42)	95	69	54	37	0.82	0.84-0.86
2023	41-42	42 (40)	37 (37)	93	66	53	35	0.83	0.83-0.85

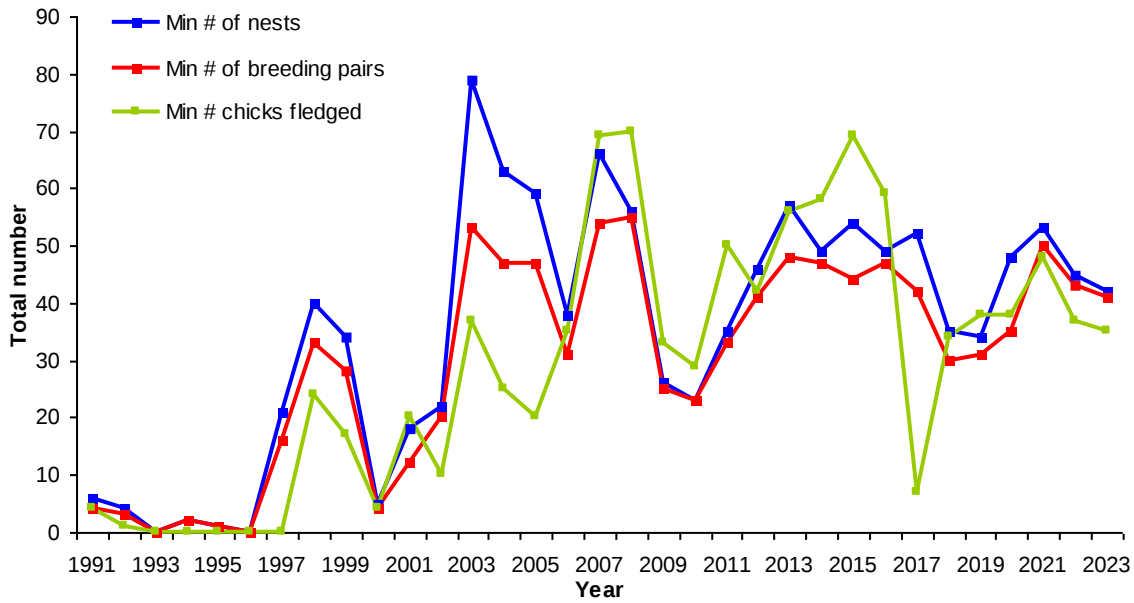


Figure 3. Number of California least tern nests, pairs, and fledglings at ODSVRA from 1991-2023.

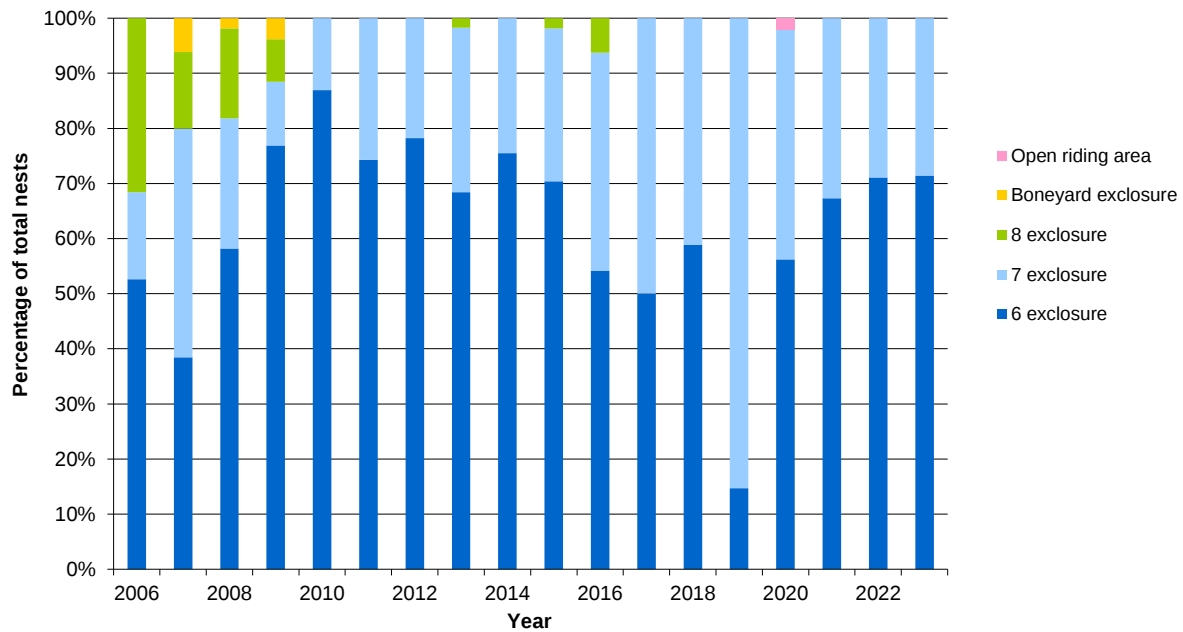


Figure 4. Distribution of known location California least tern nests as a percentage of total nests at ODSVRA from 2006-23.

Table 2. Causes of California least tern nest loss at ODSVRA from 2002-23.

Ab. = Abandoned, Unid. = Unidentified

Season	Ab. pre-term	Ab. post-term	Ab., unknown if pre- or post-term	Wind	Failed, unknown cause	Unid. Predator	Gull	Coyote	Opossum	Raccoon	Skunk	Chick dies in egg at hatch	Total no. failed nests
2002	1	1						2					4
2003	6	3			5	2		1					17
2004	9	1			3	1		2					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
2020		1	3	1	4	1							10
2021		1	2										3
2022	2												2
2023		1	2										3
Total	52	30	24	5	29	6	1	6	2	1	5	1	162
2002-23	32.1%	18.5%	14.8%	3.1%	17.9%	3.7%	0.6%	3.7%	1.2%	0.6%	3.1%	0.6%	

Chick fledging rate, juveniles produced per pair, and juvenile length of stay on-site

In 2023, 38 of 66 hatching chicks were banded with an individual color combination unique for the year. Thirty-five of the 66 chicks were seen when 21 days old or older for a fledging rate of 53.0%, the second lowest rate since 2006 when banding chicks to individual first began. The fledging rate for banded chicks was 78.9% (30/38) and 17.9% (5/28) for unbanded chicks (Appendix A). The estimated number of fledglings produced per pair ranged from 0.83-0.85 in 2023 compared to an average of 1.08-1.15 from 2006-22 (range=0.15-1.57) (Table 1). Estimated annual fledging rates for all of California are reported by CDFW as a range and averaged 0.27-0.39 fledglings per pair for the 13-year period 2005-17 (highest estimate in 2014 with range=0.37-0.68), more recent California data is not available at the time of this report writing (Marschalek 2006-12; Frost 2013-17; Sin 2021).

From 2010-15, there were six known occurrences of a least tern chick moving east of the Southern 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. For the period 2016-23, excluding 2020 when the park was closed to vehicle use and camping due to COVID for the nesting season, there were no occurrences of chicks moving into the open riding area. In 2020, due to the decrease in recreational activities with the park being closed, up to 20 terns were seen roosting in areas outside of the Southern Exclosure daily for the period of 2-24 July. Beginning in 2021, least tern nests were provided a 984-foot (300-meter) buffer closed from any public use (closed buffer area). There were three occasions of chicks seen entering the closed buffer area from the Southern Exclosure in 2021, no such occurrences in 2022, and one occasion in 2023.

Of the current or recent breeding sites in San Luis Obispo and Santa Barbara counties, banding tern chicks occurs at ODSVRA (since 2003) and VSFB (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 method¹. 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). Since 2012, ODSVRA has relied primarily on color band resighting data to derive fledging rates of tern chicks.

Color banding chicks to brood in 2005 and to individual since 2006 has also provided information on juvenile length of stay at ODSVRA. In 2023, only 10.0% (3/30) of color-banded juveniles were confirmed remaining at ODSVRA for 21 days or longer post-fledging. This compares to 3.3% (1/30) during 2022, and 27.9% (173/620) during the 15-year period 2006-20 (Table 3, Figure 5).

¹ 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.

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 18-year period 2006-23.

During this period, 721 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 observed at ODSVRA 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	3 (10%)	16 (52%)	10 (32%)	2 (6%)	0 (0%)	0 (0%)
2020	21 (60%)	12 (34%)	1 (3%)	1 (3%)	0 (0%)	0 (0%)
2021	11 (26%)	16 (38%)	14 (33%)	1 (2%)	0 (0%)	0 (0%)
2022	14 (47%)	8 (27%)	7 (23%)	1 (3%)	0 (0%)	0 (0%)
2023	6 (20%)	9 (30%)	12 (40%)	3 (10%)	0 (0%)	0 (0%)
Total 2006-23	134 (19%)	188 (26%)	221 (31%)	146 (20%)	29 (4%)	3 (0%)

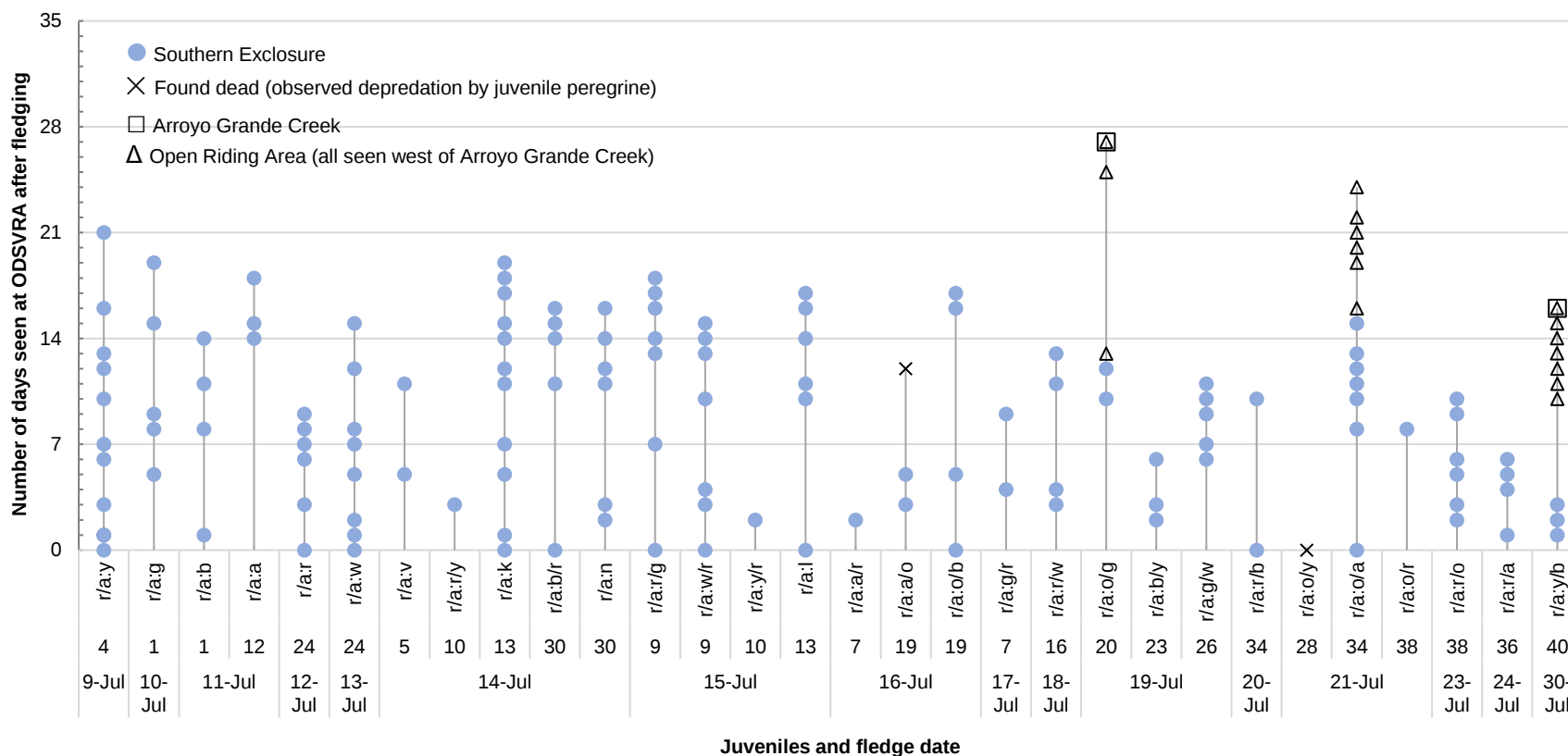


Figure 5. Number of days individually color-banded California least tern juveniles that hatched at ODSVRA in 2023 continued to be seen on-site after reaching fledge age (21 days old).

The horizontal axis provides the nest number from which each fledgling hatched and the date it fledged.

Collection and transfer of abandoned least tern chick to a nest with nonviable eggs

For the first time at ODSVRA, with approval from CDFW, an abandoned least tern chick was transferred to a nest actively being incubated but determined to have nonviable eggs (well past estimated hatch date) in 2023.

The LT36 nest was found with one egg on 12 June in 6 enclosure, the nest stayed at one egg, and incubation became inconsistent after 29 June. On 3 July at 12:15 pm, one small chick and the entire eggshell remains of a hatched egg were present at the nest that was not attended by an adult tern. At 12:54 pm, an unbanded adult snowy plover was observed brooding the tern chick and attempts to move the plover away from the chick were unsuccessful. The nest was monitored all afternoon from a distance, the plover continued to brood the tern chick near the nest, and terns were not seen in the area.

The LT2 nest was found with two eggs on 30 May in 7 enclosure and continued to be consistently incubated past the estimated hatch date of approximately 20 June with no signs of hatch observed. On 3 July, the nest was assessed as a potential surrogate for the abandoned LT36 chick, an adult was observed at the LT2 nest, one egg was at the nest with no sign of hatch, and the second egg was missing (unknown if missing pre- or post-term). After determining the adult at the LT2 nest was an acceptable option to act as a potential surrogate, the abandoned LT36 chick was transferred to the LT2 nest at 5:14 pm on 3 July. That evening, an adult was not observed returning to the LT2 nest, but an adult was at the nest brooding the chick and incubating the one egg the following morning. The adult was seen consistently brooding the chick after this date. The egg at LT2 was last seen incubated on 7 July (17 days past its estimated hatch date) and was missing post-term on 18 August. The LT36 chick continued to be attended by the LT2 adult, was banded r/a:r/a on 11 July, and subsequently fledged.

Injuries, mortality (other than eggs), and carcasses collected or observed

In 2023, there was one tern chick observed with an injury. Details of the injury are provided in Table H.1 in Appendix H. There were 5 documented least tern mortalities (other than eggs) at ODSVRA in 2023: two chicks and three juveniles. The three juvenile mortalities were the result of peregrine falcon (*Falco peregrinus*) (peregrine) predation. Documented mortality other than predation was two chicks. Both carcasses were too decomposed for necropsy. Details of the mortalities are provided in Table H.3 and H.4 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 2023 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 17 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). Since 2019, unlike many previous years, late season daytime use of Oso Flaco Lake by ODSVRA banded adult and juvenile terns has been very low. Conditions at Oso Flaco Lake appeared poor the last five years, with an increased amount of algae growth on the lake's surface, and the few adults seen fishing had poor success. 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 or from tern sighting reports by individuals other than park staff. From 2021-23, terns were observed at the ponds of Monarch Dunes Golf Club (4.3 miles southeast) by staff or reported by non-staff. Surveys were limited due to difficulty accessing ponds.

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 2023, there was a minimum of 33 banded adults with known origin documented at ODSVRA. Thirty-two of these birds were identified as banded at

ODSVRA as chicks (banding began in 2003) and one was from a bird banded as a chick in 2018 from VSFB. Breeding was documented for a minimum of 25 banded adults and this is likely an underestimate. At least 14 of the 25 breeding adults were banded as chicks at ODSVRA, one was banded as a chick from VSFB, and the complete color combinations of the other 10 breeding adults could not be confirmed (Appendix A, 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 2012-23 (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 VSFB. Ages of known year origin banded terns originating from ODSVRA and seen on-site this season ranged from two to 15 years old. In 2023, the oldest confirmed breeding adult at ODSVRA was a 15-year-old tern (g/y:g banded as a chick at ODSVRA in 2008).

Least terns banded at other sites and seen at ODSVRA

From 2011 to 2023, there have been limited observations of banded terns from other sites at ODSVRA. 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. In 2018, all VSFB chicks were banded s:b and at least one juvenile with this combination was seen 16-18 August 2018 at ODSVRA. In 2020, a two-year-old tern banded s:b was seen on 9 July, and at least one adult banded s:b was documented breeding at ODSVRA from 2021 to 2023. In 2019, all VSFB chicks were banded s:r and at least one two-year-old tern banded s:r was seen 17 July and 3 August in 2021. One adult banded s:r was documented breeding at ODSVRA in 2022, seen from 18 May to 4 June. The only documented sighting at ODSVRA of a tern banded outside of California was an adult on 16 May 2022, that was banded in 2019 in San Quintin, Baja California, Mexico, with silver on the left and a red VID band vertically labeled in white letters with “B04” on the right (Table D.1 in Appendix D).

Least terns banded at ODSVRA seen at other sites

In 2023, there were 10 least terns (seven adults and three juveniles) banded as chicks at ODSVRA, documented at sites other than ODSVRA. The majority were seen in Santa Barbara and San Luis Obispo counties at Santa Ynez River Mouth near VSFB (one juvenile), VSFB (five adults), and Coal Oil Point Reserve (one adult). Further south one adult and two juveniles were seen in San Diego County at Camp Pendleton (one adult and one juvenile) and Tijuana River Mouth (one juvenile) (Table D.2 in Appendix D).

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. From 2006-19, the night roost was only detected in 6 and 7 exclosures. A night roost was first established outside of the Southern Exclosure in 2020 when the park was closed to vehicles. In 2021, the area east of 6 and 7 exclosures was closed to visitor activity, as a closed buffer area for nests. The roost persisted outside of the Southern Exclosure within this closed buffer area during the 2021 and 2022 seasons. In 2023, surveys for a night roost were conducted on 16 days between 27 May to 16 August, and the roost was in two locations east of 6 exclosure in the closed buffer area, except on three occasions when the roost was seen within 6 exclosure (location also verified during early morning surveys by locating night roost tracks and signs) (see Figure C.2 in Appendix C). Counts at the night roost are minimums, as some or all birds would often arrive after it was too dark to count individuals. In 2023, there was a high count of 53 birds at the night roost on 10 June and 24 June. This compares to an average night roost high count of 62 (range=35-95) from 2007-22. Only adults were noted but it was typically too dark to distinguish plumage and age class (CDPR 2006-22).

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, 2020). 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, and all sites have management providing protective measures and monitoring. ODSVRA is the only site in San Luis Obispo County. RGDP, VSFB, and 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 20-year period 2004-23, ODSVRA produced a minimum of 856 juvenile terns while RGDP, VSFB, and COPR combined reported a range of 342-347 juveniles. In 2023, ODSVRA produced 35 juveniles compared to RGDP (no breeding), VSFB (17 juveniles), and COPR (no breeding) (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 Preserve (RGDP), Vandenberg Space Force Base (VSFB), and Coal Oil Point Reserve (COPR) from 2004-23.

During this period, most tern chicks were banded at ODSVRA and observation of color-banded individuals was an important means to document juvenile production. Beginning in 2018, VSFB banded tern chicks to site and year. Sources: RGDP (pers. comm. Tom Applegate), VSFB (pers. comm. Emily Rice), and COPR (pers. comm. Jessica Nielson).

Year	ODSVRA		RGDP, VSFB, and COPR combined	
	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	71	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
2020	35-42	38	60	11-16
2021	50-52	48	27	8
2022	43-44	37	43	23
2023	41-42	35	39	17
Total juveniles produced		856		342-347¹

¹In 2019, RGDP had at least 17 nests hatch a minimum of 15 chicks and the number of juveniles produced is unknown.

WESTERN SNOWY PLOVER

Minimum number of breeding adults

In 2023, the minimum number of breeding adults was the highest recorded in the 22-year period 2002-23, with a total of 232 birds (128 males and 104 females). This is an increase of 12.6% from 206 breeding adults in the previous year and compares to a range of 32-226 adults (average=154) for the 21-year period 2002-22. The average number of breeding adults for the last five years is 207, increasing slightly to 211 for the last three years (Table 5, Figure 6).

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 second half of May and first week of June. In 2023, the survey at ODSVRA counted 124 adult plovers (51 males, 56 females, and 17 of unknown sex), 53% of the minimum number documented for the entire season by known breeding activity. In 18 of the 19 years from 2005-23, the window survey count at ODSVRA was lower than the minimum number of breeding birds (53-95% of minimum number). It was higher (107%) in 2008. For the entire 19-year period the window survey count averaged 77% 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 22-year period 2002-23.

Year	Min. no. breeding adults	Min. no. breeding males	No. fledglings	No. fledglings per breeding male¹
2002	32	18	35	1.94
2003	84	52	107	2.06
2004	121	67	66	0.99
2005	116	65	82	1.26
2006	107	58	17	0.29
2007	79	47	66	1.40
2008	95	54	72	1.33
2009	114	66	81	1.23
2010	137	78	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
2020	190	110	117	1.06
2021	195	107	119	1.11
2022	206	119	179	1.50
2023	232	128	231	1.80
Average for 22-year period 2002-23	157	88	128	1.45
Average for 5-year period 2019-23	207	117	151	1.27
Average for 3-year period 2021-23	211	118	176	1.47

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

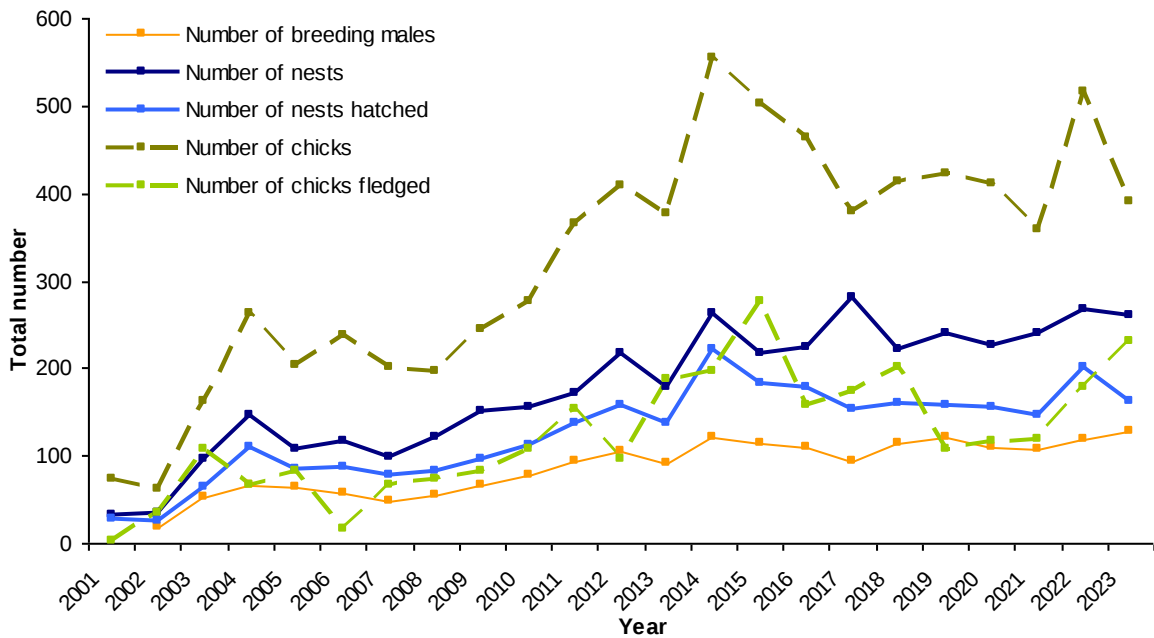


Figure 6. Number of snowy plover breeding males, nests, nests hatched, chicks, and chicks fledged at ODSVRA from 2001-23.

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 2005-23.

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%
2020	190	155	82%
2021	195	116	59%
2022	206	190	92%
2023	232	124	53%

Number and distribution of nests

In 2023, there were 260 known nesting attempts identified, including 43 with unknown nest location, initiated between 15 March to 15 July (Figure 7, Appendix B, see section titled Assignment of broods to nests in the Monitoring and Management Action section for unknown nest location description). Of the 217 nests from known locations, 118 (54.4%) were in the Southern Exclosure, six (2.8%) in North Oso Flaco, 12 (5.5%) in South Oso Flaco, 64 (29.5%) in the Foredune closure, eight (3.7%) in the open riding area, two (0.9%) in the closed buffer area, four (1.8%) in Eucalyptus Tree revegetation area east of 7 exclosure, and three (1.4%) in Eucalyptus North revegetation area east of 6 exclosure. More specifically for the Southern Exclosure, there were 52 nests in 6 exclosure, 38 in 7 exclosure, 19 in 8 exclosure, and nine in Boneyard exclosure. The Southern Exclosure and Foredune closure combined supported 83.9% of known location nests in 2023. The eight nests in the open riding area in 2023 were the most found in a single year since 2001 (excluding 2020 when the park was closed to public vehicle access most of the season). Two nests were found in the open riding area in 2022, four in 2021, and during the 19-year period 2001-19, the average was less than 1 (range=0-3). The maximum number of known location nests active at one time was 71 on 13 June, with the highest number in 6 exclosure (21 nests) (Table 7, Table 8, Figure 8, Appendix C, Table F.1 in Appendix F).

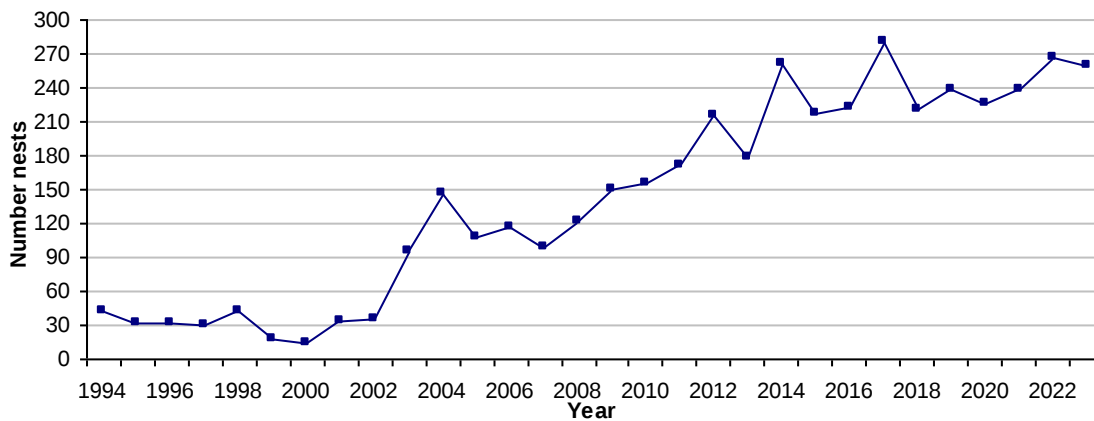


Figure 7. Number of snowy plover nesting attempts at ODSVRA from 1994-2023.
Includes nests known only from detection of broods.

Table 7. Snowy plover nest distribution and success at ODSVRA in 2023.

Excludes 43 nests known only from detection of broods.

Euc. = Eucalyptus, reveg. = revegetation

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
Southern Exclosure				
6 exclosure	52 (50)	144	35	70.0
7 exclosure	38 (34)	96	17	50.0
8 exclosure	19 (19)	50	7	36.8
Boneyard exclosure	9 (9)	24	6	66.7
TOTAL SOUTHERN EXCLOSURE	118 (112)	314	65	58.0
Oso Flaco				
North Oso Flaco	6 (6)	15	4	66.7
South Oso Flaco	12 (11)	31	6	54.5
TOTAL OSO FLACO	18 (17)	46	10	58.8
Other				
Foredune closure	64 (62)	173	36	58.1
Closed buffer area	2 (2)	5	2	100.0
Open riding area	8 (8)	22	2	25.0
Euc. North reveg. area	3 (3)	9	2	66.7
Euc. Tree reveg. area	4 (4)	11	1	25.0
TOTAL OTHER	81 (79)	220	43	54.4
GRAND TOTAL	217 (208)	580	118	56.7

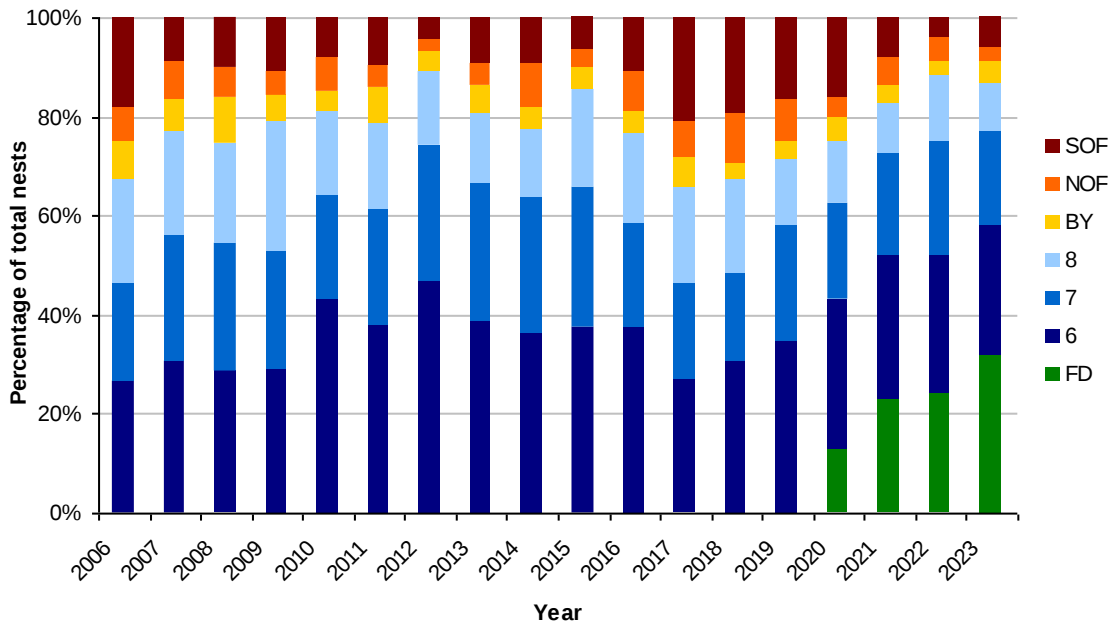


Figure 8. Distribution of snowy plover nests as a percent of total nests in the Southern Exclosure, Oso Flaco, and Foredune closure from 2006-23.

Includes all nests with known location in the Southern Exclosure, Oso Flaco, and Foredune closure (restoration area within the open riding area closed since January 2020).

6 = 6 exclosure, 7 = 7 exclosure, 8 = 8 exclosure, BY = Boneyard exclosure, FD = Foredune closure, NOF = North Oso Flaco, SOF = South Oso Flaco

Table 8. Nesting success of snowy plovers at ODSVRA from 2001-23.

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 2001-23 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. chicks fledged (percent fledged)	No. fledglings per nest	No. fledglings per egg
2001	33 (30)	na	na	27 (26)	86.7	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	244	81 (33.2)	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	405	96 (23.7)	0.44	0.16
2013	178 (167)	502	2.94 (162)	138 (130)	77.8	377	187 (49.6)	1.05	0.37
2014	262 (239)	726	2.88 (234)	222 (206)	86.2	555	196 (35.3)	0.75	0.27
2015	217 (195)	613	2.93 (188)	182 (167)	85.6	503	277 (55.1)	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	421	108 (25.7)	0.45	0.17
2020	226 (197)	627	2.92 (194)	154 (142)	72.1	410	117 (28.5)	0.52	0.19
2021	239 (219)	660	2.89 (206)	145 (129)	58.9	359	119 (33.1)	0.50	0.18
2022	266 (225)	725	2.81 (227)	200 (169)	75.1	515	179 (34.8)	0.67	0.25
2023	260 (208)	690	2.81 (195)	161 (118)	56.7	391	231 (59.1)	0.89	0.33

Average clutch size, clutch loss, and nest hatching rate

There were 260 identified nesting attempts, including 43 known only by brood, and of these 161 hatched. For 195 nests with known complete clutch size (and excluding nesting attempts known only by brood) the average number of eggs was 2.81. This compares to an average of 2.90 eggs per clutch (range=2.81-2.96) for the 19-year period 2004-22. Excluding 52 nests (nine with unknown fate and 43 detected by brood only), the nest hatching rate in 2023 was 56.7% (118/208). This is lower than the average of 73.8% (range=60.9-86.2%) from 2002-22. The hatching rate in 2023 was slightly lower in the Southern Exclosure (58.0%) than in Oso Flaco (58.8%) (Table 7, Table 8). During the 23-year period 2001-23, Oso Flaco has had a higher hatch rate than the Southern Exclosure in only two years (2023 and 2001) (Table F.1 in Appendix F). The nest hatching rate for nests found outside the Southern Exclosure and Oso Flaco was 54.4% (43/79) (Table 7). In 2023, of the 208 nests with both known location and fate, 90 failed with 74.4% (67/90) of nest loss due to predation (Table 9).

Table 9. Attributed causes of snowy plover nest loss at specific locations at ODSVRA in 2023.

A total of 90 nests failed of 208 nests with known location and fate. Excludes the closed buffer area as no nests failed in this area.

Aband. = abandoned, Euc. North reveg = Eucalyptus North revegetation area, Euc. Tree reveg = Eucalyptus Tree revegetation area, Unid. = unidentified, unk. = unknown, pred. = predator, Tide = overwashed by tide

Area	Aband. pre-term	Aband. unk. pre- or post-term	Failed eggs removed by staff	Wind	Tide	Failed, cause unk.	Unid. pred.	Unid. avian pred.	Harrier	Crow	Raven	Coyote	Vandalism	Total
Southern Enclosure														
6 enclosure	2						1	4	1		7			15
7 enclosure		1			1		3	2	2		8			17
8 enclosure	1				1		1				8	1		12
Boneyard enclosure	1										1	1		3
TOTAL SOUTHERN ENCLOSURE	4	1			2		5	6	3		24	2		47
Oso Flaco														
North Oso Flaco							1				1			2
South Oso Flaco				1	1	1					1		1	5
TOTAL OSO FLACO				1	1	1	1				2		1	7
Other														
Foredune closure	2	1	2	2	2	2	1	3	6		5			26
Open riding area	1								1	2	2			6
Euc. North reveg											1			1
Euc. Tree reveg								1			2			3
TOTAL OTHER	3	1	2	2	2	2	1	4	7	2	10			36
TOTAL ODSVRA	7	2	2	3	5	3	7	10	10	2	36	2	1	90

Snowy plover chicks in the open riding area and closed buffer areas

Between 21 and 22 July, a total of three chicks from two broods were seen in the open riding area between the Foreddune closure and Bigfoot revegetation area: one chick from the SP166 nest on 21 July (26 days old) and two chicks from the SP199 nest on 22 July (three days old). The SP166 nest hatched from inside Foreddune Central and the SP199 nest hatched from Foreddune North shoreline. On 23 July, the closed buffer area in place for least tern nests was expanded with symbolic fence to include additional area between the Foreddune closure and Bigfoot revegetation area to protect these plover broods. This was replaced with wire fencing 24 July. From 23-29 July, the SP199 brood was seen in the closed buffer area on one occasion and in Bigfoot revegetation area east of the closed buffer area on three occasions. The closed buffer fencing was removed 21 August, after all chicks in the area had fledged.

Two nests, SP18 and SP40, were found in the open riding area and nonpredator fencing was installed to provide a minimum buffer from the nest to the open riding area of 135 feet for SP18 and 132 feet for SP40. As nests neared hatch, symbolic fence corridors were installed to temporarily close public access west of the nest sites. Chick fencing, with a large open gap on the west side, was also installed around the SP40 nest to guide chicks away from the open riding area, located approximately 170 feet east of the nest. The SP18 nest, located 500 feet east of 7 enclosure, hatched two chicks on 23 May, the brood moved through a 900 foot wide closed buffer area corridor to 7 enclosure on 24 May, and both chicks were seen on the 7 enclosure shoreline by the following morning. The brood continued to be raised on the 7 enclosure shoreline, two chicks were last seen 30 May, at 7 days old, one chick was last seen 3 June, at 11 days old, and no chicks fledged. The SP40 nest, located approximately 360 feet east of 8 enclosure, hatched two chicks on 24-25 May, the brood moved through the 500 foot wide closed buffer area corridor to 8 enclosure on 25 May, and chicks were on the 8 enclosure shoreline by the following morning. The brood moved south after this date and was raised on North Oso Flaco shoreline, two chicks were last seen 12 June, at 18-19 days old, and one chick fledged.

The SP65 nest was found in the Eucalyptus North revegetation island, approximately 610 feet east of 7 enclosure and adjacent to the open riding area. Nonpredator fencing was installed to provide a minimum buffer of 130 feet from the nest to the open riding area. Prior to hatching, an approximately 1,500 feet wide symbolically fenced corridor was in place to temporarily block off public access west of the nest site. The nest hatched three chicks on 3 June and the brood moved through the closed buffer area corridor to 6 enclosure on 4 June. The brood moved south after this date and was raised on 7 enclosure shoreline, three chicks were last seen 7 June, at four days old, one chick was likely depredated by American kestrel (*Falco sparverius*) (kestrel) on 8 June, two chicks were last seen 9 June, at six days old, and one chick fledged.

Three nests (SP53, SP131, and SP137) hatched within a closed buffer area east of the Southern Enclosure or from revegetation areas adjacent to the closed buffer area and broods were monitored closely as they moved toward the protected enclosure and shoreline. Eight chicks hatched from these nests, broods all moved to the enclosure shoreline two days after hatch, and a total of four chicks fledged.

Chick fledging rate

Of the 391 snowy plover chicks hatched, 167 were banded and the fate of 224 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). There were 43 unbanded broods (110 chicks) observed on-site and believed to be from nests that were not found. Three of the 43 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 62.3% (104/167) and 56.7% (127/224) for unbanded chicks. The fledging rate for all chicks combined in 2023 was 59.1% (231/391) and is above the average fledging rate of 37.7% (range=7.4-66.0%) for the 21-year period 2002-22 (Table 8, Table F.1 in Appendix F) (CDPR 2007-22).

In 2023, the early season had a higher chick fledging rate (67.0%) compared to the late season (56.0%). In 14 of 21 years from 2003-23, the fledging rate of chicks hatching in the early season (prior to 20 June) has been higher than chicks hatching in the late season (20 June or later) (see 2012 annual report for how early and late seasons were determined.) For all years in the 21-year period 2003-23, the average early season chick fledging rate (44.4%) was 11.4 percentage points higher than the average late season chick fledging rate (33.0%) (Figure 9, Figure 10, Figure 11).

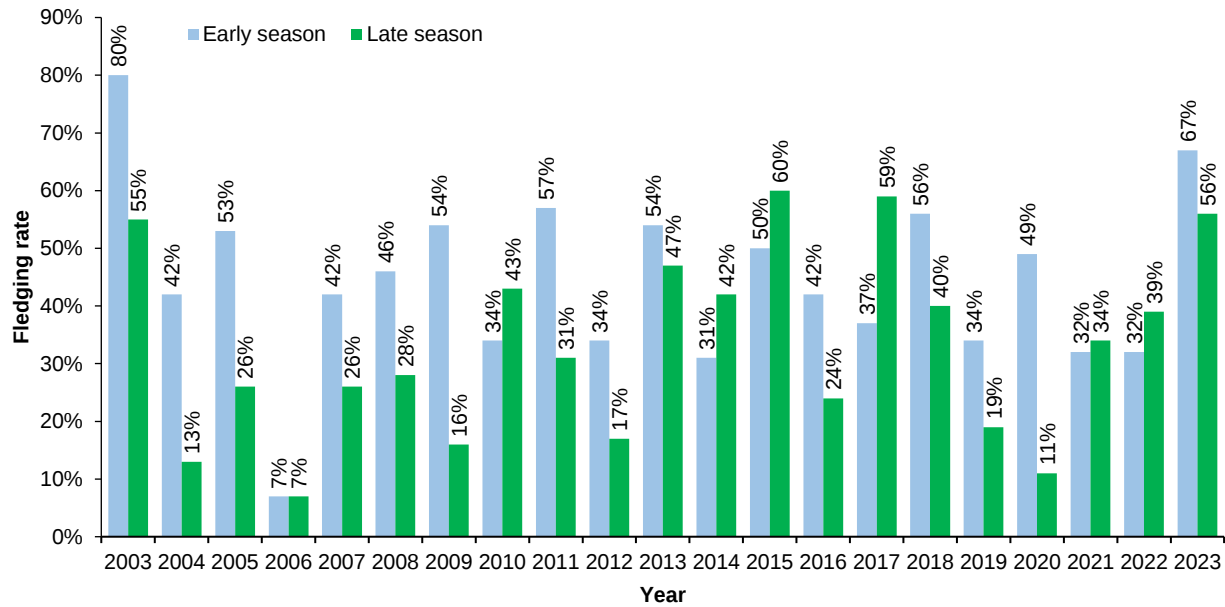


Figure 9. Fledging rate of chicks hatching in early season (prior to 20 June) and late season (20 June or later) at ODSVRA from 2003-23.

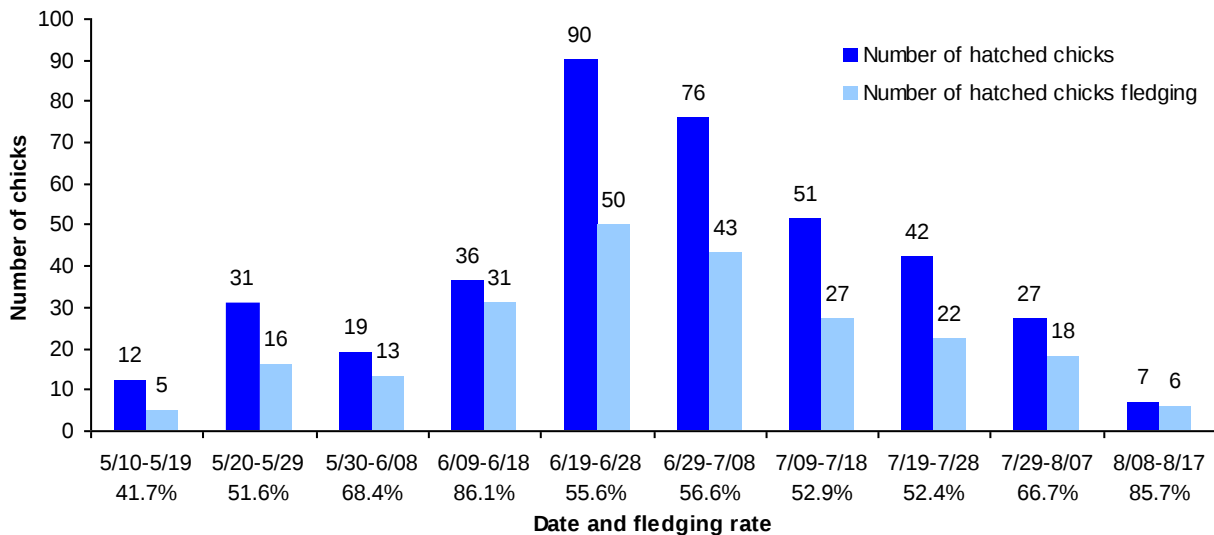


Figure 10. Number of snowy plover chicks hatching per 10-day period and number subsequently fledging at ODSVRA in 2023.

Includes all chicks with known fate (391). For broods that originated from unknown location (110 chicks from 43 broods) a hatch date was estimated within a 10-day period based on chick size.

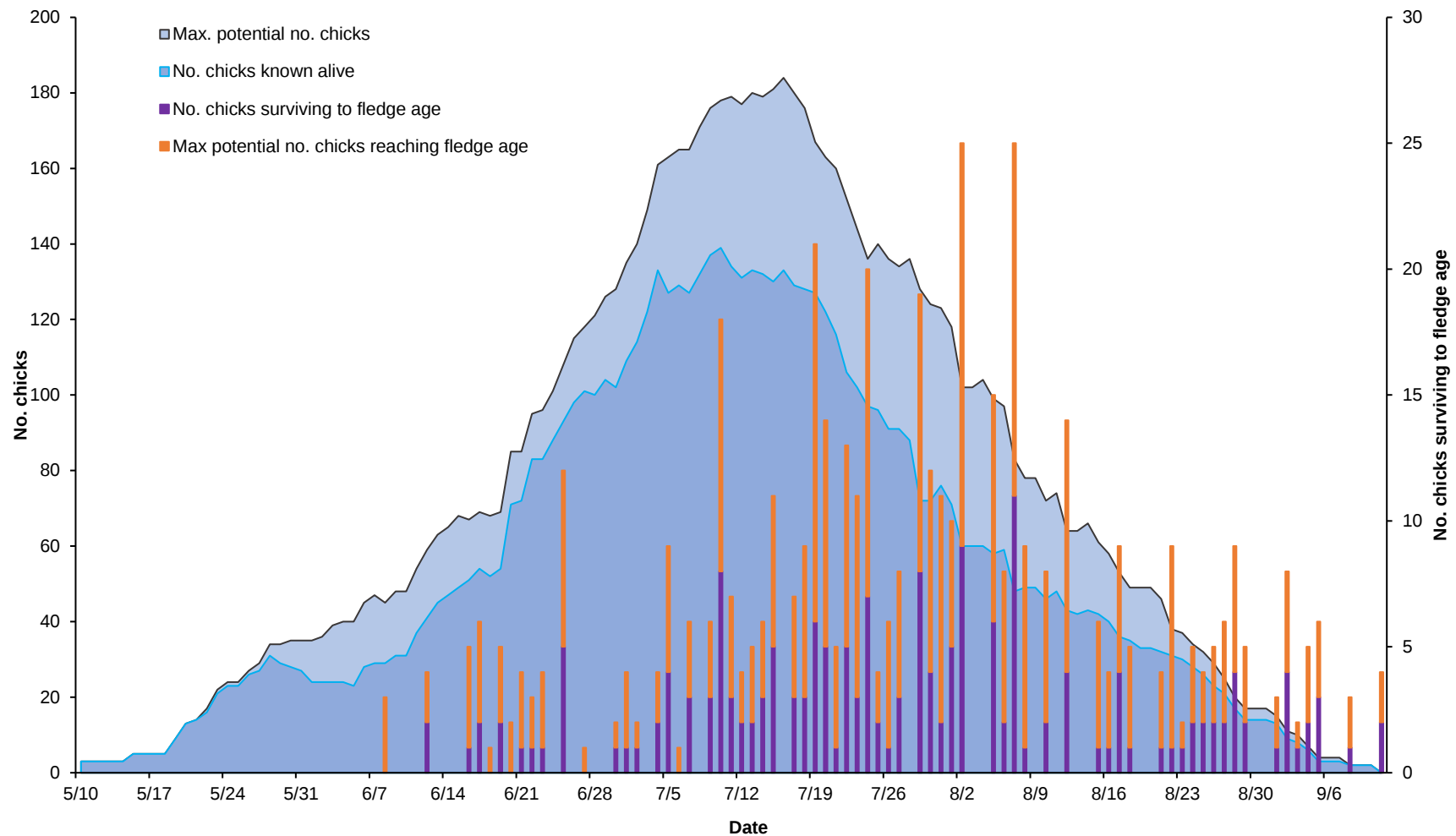


Figure 11. Chick survival and fledge rate from 10 May to 11 September at ODSVRA in 2023.

Of the total of 391 chicks hatching, 329 chicks (excludes 62 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 176 closely tracked chicks (167 banded and 9 unbanded chicks with banded siblings) from known location nests, 64 were believed lost. As has consistently been the case in previous years, chick loss measured in 5-day increments in 2023 was highest for very young chicks (0-4 days of age), accounting for 34.4% of total loss and is the lowest percent loss for this age group for the 15-year period 2009-23 (range=38-64%, average=48%) (Figure 12) (CDPR 2009-22). For 125 chicks reaching 16 days of age in 2023, the fledge rate was 84% (105/125). This is higher than the average of 79% (range=71-93%) for the previous 14-year period 2009-22 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) (CDPR 2009-22).

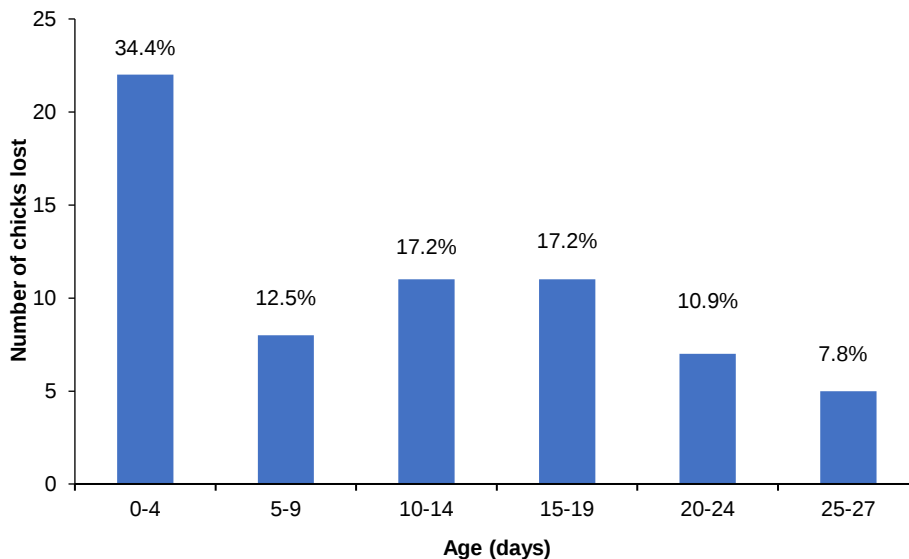


Figure 12. Loss of snowy plover chicks by age at ODSVRA in 2023.

Number and percentage of total chicks lost shown for each age group. There were 176 chicks included in the analysis (167 banded and 9 unbanded with banded siblings); 64 of these were lost. Data excludes broods that could not clearly be identified and tracked individually and broods with an estimated hatch date. If individual chick age could not be determined due to a split hatch, the earliest hatch date was used.

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 2023, the number of chicks fledging per male was 1.80, which is higher than 1.50 in 2022, and greater than the average of 1.43 during the previous 21-year period 2002-22. The number of fledglings produced per male has exceeded 1.2 in 16 of the 22 years from 2002-23 (Table 5). (Note that if the number of breeding males is underestimated, the number of chicks fledged per male is an overestimate).

Productivity measured by breeding coefficient

Breeding coefficient calculated from the number of fledglings produced per eggs laid provides a possible method to assess breeding effort (Lauten et al. 2017) (Colwell et al. 2017). A breeding coefficient below 0.15 fledglings per egg suggests productivity is low while a breeding coefficient above 0.20 indicates productivity is high for effort expended (Lauten et al. 2017-20). In 2023, the breeding coefficient was 0.33 and compares to 0.25 in 2022. For the 22-year period 2002-23, the average breeding coefficient was 0.26 fledglings per egg and the number of fledglings produced per egg has exceeded 0.20 in 15 of the 22 years (Table 8).

Injuries, mortalities (other than eggs), and carcasses collected or observed

In 2023, there were three adults, two juveniles, and one chick/juvenile observed with injuries, details of the injuries are provided in Table H.2 in Appendix H. There was a minimum of 15 documented snowy plover mortalities (other than eggs) at ODSVRA from 13 February to 12 September 2023. Eleven of the 15 mortalities were the result of predation. Predators involved were a juvenile peregrine (at least two juveniles and one chick), an adult male kestrel (one adult and at least five chicks), a kestrel of unknown sex (one chick), and a subadult western gull (*Larus occidentalis*) (one adult or juvenile). Documented mortality other than predation were three adults and one juvenile. Two adults were found in the open riding area, one adult was found on the North Oso Flaco shoreline, and one juvenile was found on 6 enclosure shoreline. No clear evidence of predation was observed at any of these carcasses. For carcasses that received a necropsy, reports are attached if available at the time of this report. Details of the individual depredations and carcasses are provided in Table H.5 and H.6 in Appendix H.

Protection of known location and fate nests

Of 208 nests with both known location and fate, the great majority (91.8%, 191/208) were initiated in areas closed for nesting with some form of protective fence and signage in place at the start of the nesting season. This fencing included Exclosure predator fencing inside the Southern Exclosure and a portion of North Oso Flaco to discourage human disturbance and coyote entry (78 nests); nonpredator fencing around the Fore dune closure to discourage human disturbance (38 nests); and symbolic fencing to discourage public entry along the shoreline of the Fore dune closure, Southern Exclosure, and North Oso Flaco (64 nests). And while the lower shoreline of South Oso Flaco is open to pedestrians during the nesting season the length of the upper beach is protected by symbolic fence (11 nests) (see section Closures and fencing in Management Actions on page 16 for additional details on types of protective fencing for nests) (Table F.3 and Table F.4 in Appendix F).

Seventeen nests were initiated in areas not closed for nesting at the start of the nesting season, including eight in the open riding area, two in the closed buffer area, and seven in the revegetation areas east of the Southern Exclosure and open riding area. The eight nests initiated in the open riding area received a nonpredator fence buffer on the date found, while nests found in the closed buffer area and the revegetation areas had nonpredator fence present at nest initiation (Table F.4 and Table F.5 in Appendix F).

All nests may also be assessed if individual nest protection, such as a circular exclosure or mini-exclosure (providing avian and mammalian predator protection), is appropriate and possible. In 2023, of the 208 nests with both known location and fate, 36 (17.3%) of the nests received either a circular exclosure or mini-exclosure and had a 94.4% hatch rate (34/36). This compares to a 48.8% hatch rate (84/172) for those nests not receiving individual nest protection. Nests may not receive individual nest protection due to a variety of concerns: adults abandoning incomplete clutches, windblown sand potentially burying eggs, topography making the eggs prone to rolling, disturbance to nearby broods, nest lost prior to chance to install circular or mini, or adult vulnerability to predators (See Table F.3, Table F.4 and Table F.5 in Appendix F for a further breakdown of nest protections and fates by location).

Banded snowy plovers breeding at ODSVRA in 2023

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 to the north, and VSFB in Santa Barbara County to the south. In 2023, the minimum number of breeding adults at ODSVRA was 232 birds, and of these 89 (38.4%) were confirmed banded and with known origins (Figure 13). For known origin banded birds, the great majority (86.5%, 77/89) represent recruitment from chicks banded and fledged from ODSVRA. Twelve breeding birds originated from sites in California (all banded as chicks) other than ODSVRA at the following locations: one from Fort Ord State Park in Monterey County; 10 from VSFB in Santa Barbara County; and one from Naval Base Coronado, San Diego County (Table D.4 in Appendix D).

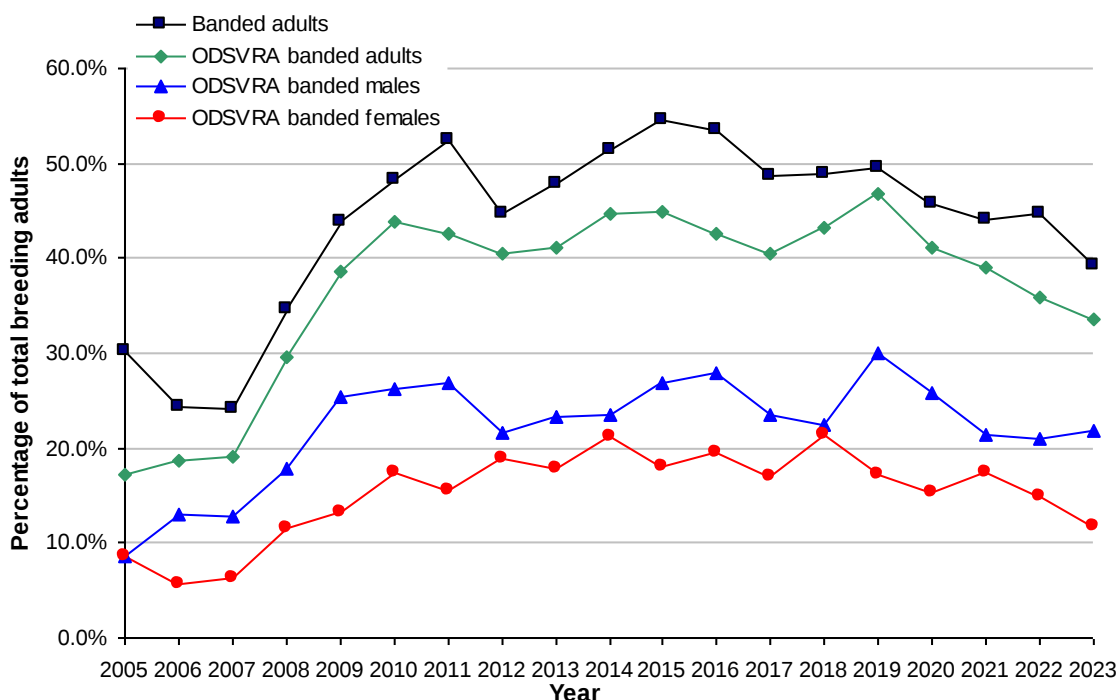


Figure 13. Percentages over the total calculated breeding population at ODSVRA of all known origin banded adults and the sum of males and females originally banded at ODSVRA breeding from 2005-23.

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

Snowy plovers banded as chicks at ODSVRA confirmed breeding elsewhere in 2023

Eleven plovers banded at ODSVRA and breeding away from the park were confirmed in two counties of California: Monterey County (one at Moss Landing State Beach, two at Salinas River State Beach, and one at Salinas River National Wildlife Refuge) and Santa Barbara County (seven at VSFB). There was a minimum of 41 additional adult plovers banded at ODSVRA observed at other sites, ranging from New River in Coos County, Oregon to North Island Naval Air Station in San Diego County, 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 four to five times a month during the five-month period October through February (see paragraph titled Nonbreeding season monitoring of snowy plovers in the Monitoring section on page 15 for survey details). Between 5 October 2022 and 22 February 2023, single day wintering plover counts at ODSVRA ranged from 43-266 birds (single day high count on 12 January 2023). The shore was divided into five beach sections and the monthly average number of plovers 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 (range=0-1) during the winter period; Grand Avenue to marker post 2 had an average of one (range=1-4); marker post 2 to marker post 6 had an average of 95 (range=67-123); marker post 6 to the northern boundary of Oso Flaco had an average of 41 (range=14-90); and Oso Flaco had an average of 24 (range=0-48) (Figure 14) (see Site Description section for details of allowed public use and access in these beach sections).

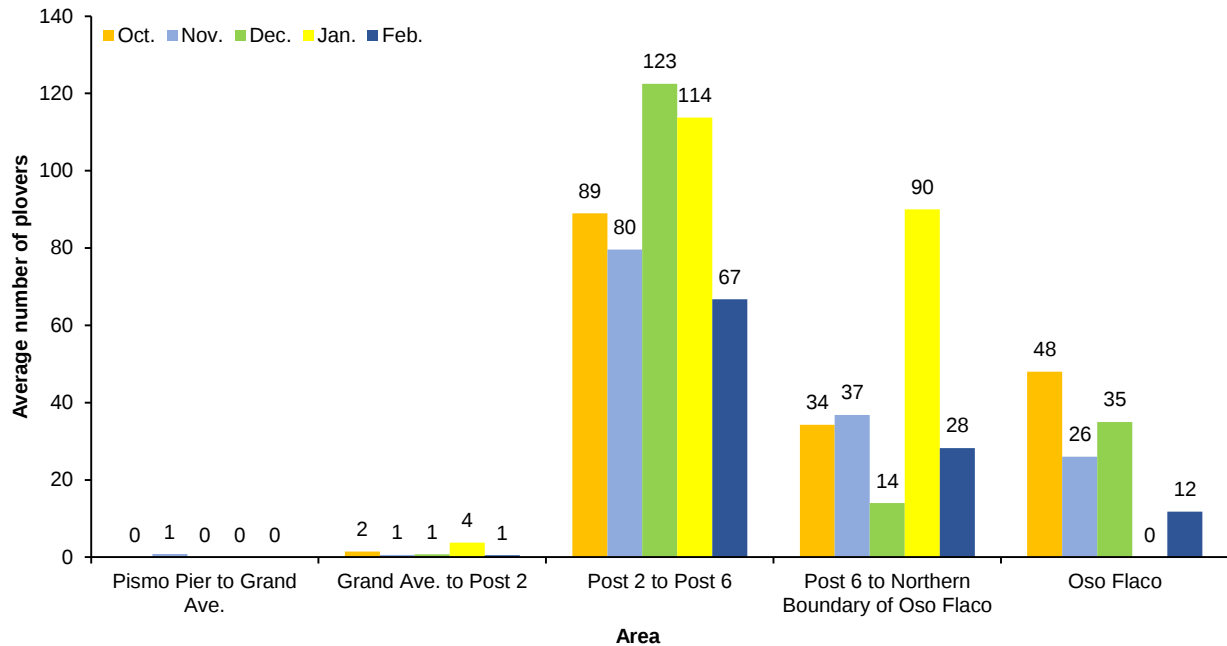


Figure 14. Monthly average number of snowy plovers observed at beach sections of ODSVRA during nonbreeding season surveys from October 2022 to February 2023.

Surveys conducted four to five times a month in 2022-23 winter.

Post = marker post.

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 2023, the survey at ODSVRA counted 163 adult plovers and compares to an average of 147 (range=134-172) during the previous 3-year period 2020-22. During the 20-year period 2003-23, the winter window survey has averaged 155 plovers (range=62-260). Beginning in 2011, ODSVRA increased full park surveys for wintering plovers with one to five surveys (includes USFWS January window survey) per month for October to February. Over the 13-year-period 2011-23, January high counts for eight years were on dates other than the USFWS winter window survey (Figure 15).

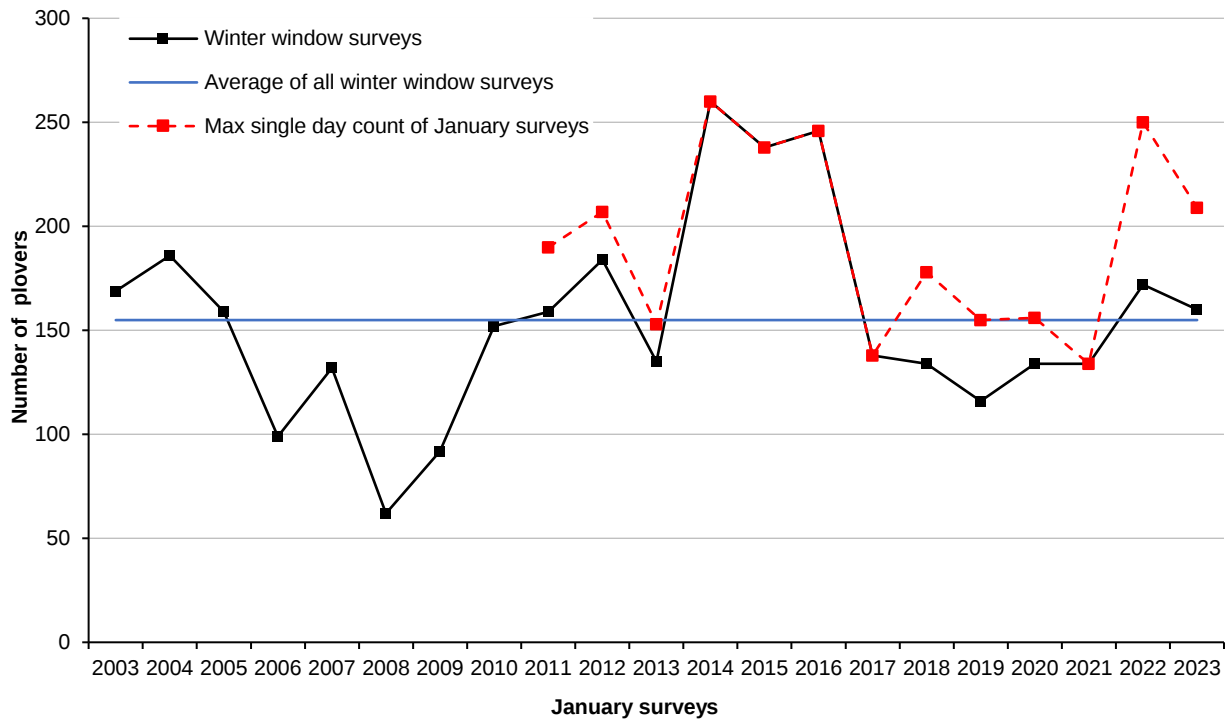


Figure 15. Number of snowy plovers counted at ODSVRA on USFWS winter window surveys 2003-23 and the maximum number of snowy plovers counted in the month of January from 2011-23.

Color band combinations of 78 banded snowy plovers were recorded during surveys from 1 October 2022 to 28 February 2023 at ODSVRA. Two were banded in Oregon at Douglas and Lane counties. All others, except one from unknown location, were banded in California at the following locations listed north to south: Point Reyes National Seashore, Marin County (1); Don Edwards National Wildlife Refuge, south San Francisco Bay (1); Eden Landing in Alameda County (1); Reservation Road, Monterey County (1); ODSVRA (60); and VSFB, Santa Barbara County (11) (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

Habitat within the Southern Enclosure is protected and closed to public entry year-round. Some areas within the Southern Enclosure have very limited scattered natural debris, such as on the shoreline, and other areas are dominated by tall and densely vegetated hummocks, such as in 8 enclosure (see more details of the Southern Enclosure in Site Description section). Areas of patchy cover can benefit plovers and terns during the nesting and chick-rearing periods. Available materials, including surf-cast kelp (wrack), branches, driftwood, and woodchips, may be placed in bare areas of the Southern Enclosure and on the Foredune closure shoreline to make more areas of patchy cover available (see section titled Habitat Enhancement in the Management Actions section). On the shoreline of 6, 7, and 8 enclosures, talitrids may be added to help restore populations of this important invertebrate prey for 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 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 disrupt incubating and brooding behavior. Presence of predators may result in eggs left unattended and subject to being overheated, chilled, or buried by windblown sand or 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.

Documented predator activity and management response in 2023

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) in the Southern Enclosure and Oso Flaco (see Monitoring and Management Actions section for more detail). Predator activity in the Foredune closure was recorded using the same methods for the Southern Enclosure and Oso Flaco but is not included in the totals for sightings or occurrences to keep comparisons between years consistent. (Predators of concern in the Foredune closure closely tracked those impacting the Southern Enclosure and Oso Flaco).

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 2023 season included peregrine, kestrel, northern harrier (*Circus hudsonius*) (harrier), common raven (*Corvus corax*) (raven), great horned owl (*Bubo virginianus*), gull, and coyote. Four coyotes, one American crow (*Corvus brachyrhynchos*) (crow), eight ravens, one western gull, and one California gull (*Larus californicus*) were lethally removed. One harrier, one Cooper's hawk (*Accipiter cooperii*), and one peregrine were live-trapped and relocated (both the trapped Cooper's hawk and peregrine were not targeted individuals) (Table G.3 in Appendix G). Avian predators perched in sensitive areas were hazed when determined appropriate.

In 2023, no tern nests were identified as lost to predator. Sixty-seven plover nests were identified lost to the following predators: coyote (2), raven (36), crow (2), harrier (10), unidentified avian (10), and unidentified predator (7). From 2002-23, 2.2% (21/975) of all tern nests with known fate were documented lost to predators (14 mammalian, one gull, and six unidentified predator). During this same 22-year period, 11.7% (428/3660) of plover nests with known location and fate were documented lost to predation (55 mammalian, 293 avian, and 80 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 (Appendices A and B) (Table F.3 in Appendix F).

In 2023, documented losses, other than eggs, to predation included three tern juveniles and at least 11 plover chicks, juveniles, and adults. Tern and plover losses were to kestrel (at least 7), peregrine (at least 6), and western gull (1) (Table H.3 and H.4 in Appendix H). The 14 tern and plover losses in 2023 compares to 14 documented losses (all plover) in 2022. During the 20-year period 2002-21, average loss was two terns (range=0-7) and nine plovers (range=0-19) (Table G.2 in Appendix G).

Mammalian predators

Opossum

Virginia opossum (*Didelphis virginiana*) (opossum) tracks were documented on five days in the Southern Exclosure in 2023, and averaged 12 days per season (range=3-25) from 2007-22 (Figure 16).

From 2002-23, known tern and plover loss to opossum was limited to two tern nests, occurring in 2010 and 2013 and two plover nests in 2021 (Figure 4, Table 2, Table F.2 in Appendix F).

Skunk

Striped skunk (*Mephitis mephitis*) (skunk) was documented in 2023 on one day in the Southern Exclosure compared to an average of 29 days per season (range=2-87) from 2007-22 (Figure 16).

There were no known tern or plover nests lost to skunk from 2020-23, compared to one in 2019, zero in 2018 and 23 (18 plover, 5 tern) in 2017. From 2002-16, nest loss to skunk was limited to six plover nests: five in Oso Flaco from 2009-11 and one in Boneyard exclosure in 2016. From 2002-23, tern and plover loss to skunk, other than eggs, is limited to two plovers in 2005, although additional loss was suspected in 2017 (Figure 4, Table 2, Table F.3 in Appendix F, and Table G.2 in Appendix G).

Raccoon

Raccoon (*Procyon lotor*) tracks were documented in 2023 on three days in the Southern Exclosure and is much lower than the average of 71 days (range=2-145) for the 16-year period 2007-22 (Figure 16).

From 2002-23, known plover and tern loss to raccoons was limited to one tern nest in 6 exclosure in 2015 and two plover nests in Oso Flaco (one in 2010 and one in 2011) (Figure 4, Table 2, Table F.2 in Appendix F).

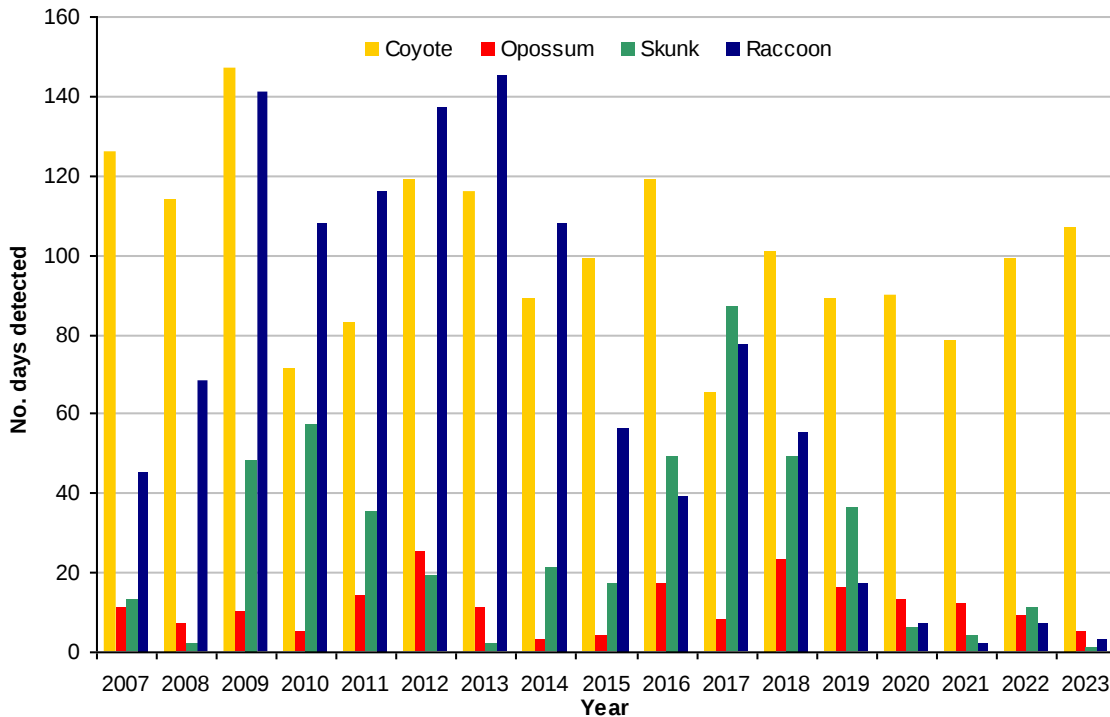


Figure 16. Number of days coyote, opossum, skunk, and raccoon were detected in the Southern Exclosure and Oso Flaco at ODSVRA from 2007-23.

Coyote

Live sightings of coyotes within the Exclosure predator fencing or along the shoreline during daytime hours are infrequent. 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. It should be noted that coyote tracks are documented opportunistically, and counts represent a minimum level of activity. In addition, shoreline accessibility for monitoring may vary between years, making direct comparison difficult.

In 2023, there were 61 occurrences inside the Exclosure predator fencing. This is higher than the average of 31 occurrences (range=5-92) for the 14-year period from 2009-22 and is likely due to prolonged periods of time when heavy equipment was not available to cover gaps under the fence created by wind scour. Documented coyote activity for the Southern Exclosure shoreline and North Oso Flaco shoreline was also above average with 124 occurrences in 2023 compared to an average of 103 for the 14-year period, 2009-22 (Table 10) (South Oso Flaco not included because coyote tracks are present daily).

Documented loss in 2023 was two plover nests, but plover chick loss was also suspected. From 2002-23, documented nest loss to coyote averaged less than one tern nest per year (range=0-2) and one plover nest per year (range=0-4) (Figure 4, Table 2, Table F.3 in Appendix F). During this same period, coyote scat was found containing a total of 38 plastic or aluminum bands, representing a minimum of 17 plovers and one tern (Table G.2 in Appendix G) (CDPR 2007-22). In 2023, four coyotes were removed in a targeted effort to reduce the threat of predation and disturbance due to coyote presence within sensitive nesting and chick-rearing habitat. This is just below the average of six removed per year from 2007-22 (range=2-12) (Table G.3 in Appendix G) (CDPR 2007-22).

Table 10. Coyote occurrence in the Southern Enclosure and Oso Flaco at ODSVRA from 2009-23.

Date range is from 1 March to 10 September (a 194-day period). Enclosure predator fencing includes all areas inside the Southern Enclosure and North Oso Flaco enclosed with predator fencing.

Year	Enclosure predator fencing	6, 7, 8 enclosures 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)
2020	27	84	30	32	173 (90)
2021	26	61	37	33	157 (78)
2022	30	84	39	70	223 (99)
2023	61	90	34	33	218 (108)

Avian predators

American kestrel

There were 49 documented sightings on 27 days of kestrels in specific areas of the Southern Enclosure and Oso Flaco in 2023 (Table 11, Table G.1 in Appendix G). This is slightly higher than the average of 23 days per season (range=6-52) for the 16-year period 2007-22 (CDPR 2007-22). Kestrels were primarily observed mid-March through early May and mid-May through mid-June perch-hunting and flying over sensitive areas. Most sightings were of an adult male kestrel frequently hunting plover chicks and documented depredating five plover chicks from 30 May to 9 June. On 9 June, what is suspected to be the same male kestrel was documented depredating a breeding female plover just outside a circular nest enclosure (Table H.4 Appendix H). Attempts to trap the male kestrel were unsuccessful and discontinued as sightings became less frequent after 9 June. In 2023, there was a minimum of three individual kestrels observed in the nesting area with three seen flying over South Oso Flaco and Boneyard at the same time on 25 March.

From 2002-23, documented tern and plover loss to kestrel was one tern in 2007, four plovers in 2021, six plovers in 2022, and seven plovers in 2023 (Table G.2 in Appendix G).

Owl

Many owl “sightings” are from detection of tracks. 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 enclosure, 7.5 revegetation area) may vary between years, making direct comparison difficult. Most owl tracks documented at ODSVRA are likely from great horned owls; barn owls (*Tyto alba*) have also been documented but to a 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 2023, owl tracks and live sightings were irregularly documented in sensitive nesting and chick-rearing habitat, with owl presence detected on 17 days with 21 separate sightings in the Southern Exclosure and Oso Flaco (Table 11, Figure 17). For these same areas from 2007-22, owl activity was documented on an average of 29 days (range=5-53). Most sightings of owls in 2023 were of a great horned owl pair perched in South Oso Flaco and of a great horned owl near a trap set for owls in the eastern portion of 8 exclosure. Trapping attempts made for great horned owl in July were unsuccessful.

From 2002-23, documented plover and tern loss to owl included one tern in 2004, three terns and one plover in 2021, and two plovers in 2022. An additional two terns in 2006 and one plover of unknown age in 2011 were depredated by an unknown avian predator, suspected to be owl (Table G.2 in Appendix G).

Red-tailed hawk

Red-tailed hawks (*Buteo jamaicensis*) were observed perching and flying in the Southern Exclosure and Oso Flaco foredunes. In 2023, there was a minimum of three individuals (three individuals seen together on 15 April) observed in the nesting area. Red-tailed hawk presence in the Southern Exclosure and Oso Flaco was documented on 32 days (80 sightings) in 2023, slightly less than the average of 38 days (range=7-74) of activity from 2007-22 (Table 11, Figure 17).

In 2017, a juvenile red-tailed hawk was observed eating a plover chick. This is the only known predation by a red-tailed hawk at ODSVRA, but they have been a documented predator of plovers and terns at other sites (CDPR 2017).

Northern harrier

Northern harrier is a documented predator of plover and/or tern nests, chicks, and juveniles at ODSVRA. During the 11-year period 2008-18, harriers averaged 86 sightings on 39 days in the Southern Exclosure and Oso Flaco. In comparison, the average from 2019-23 is 180 sightings on 65 days, an increase in sightings of 109.3% and days seen of 66.7% (Table 11, Figure 17) (CDPR 2007-22). In 2023, harrier presence was documented on 51 days (132 sightings) in the Southern Exclosure and Oso Flaco. Based on age and sex, there was a minimum of five individuals observed this season (one adult female, one adult male trapped and banded on 1 May, a second adult male observed after trapping the first, and two juveniles seen together on 30 July).

In 2023, ten plover nests were documented lost to harrier, many of which were confirmed lost to a single adult male harrier that was trapped and relocated on 1 May. Additional undocumented loss is suspected, including one plover egg found cracked and near harrier tracks in Fore dune North on 9 April. From 2002-23, total documented loss to harrier includes eight tern individuals, 34 plover nests, and 11 plover individuals (Figure 4, Table 2, Table F.3 in Appendix F, and Table G.2 in Appendix G).

Table 11. Sightings of kestrel, large owl spp., red-tailed hawk, harrier, and peregrine in specific areas of the Southern Exclosure and Oso Flaco at ODSVRA in 2023.

Date range is from 1 March to 10 September (194-day period). Note most owl “detection” based on tracks.

Location	Kestrel	Large owl spp.	Red-tailed hawk	Harrier	Peregrine	Total
6 exclosure	14	1	5	36	20	76
7 exclosure	15	3	14	26	23	81
8 exclosure	7	6	20	22	24	79
Boneyard exclosure	4	4	18	9	15	50
North Oso Flaco	1	1	20	17	24	63
South Oso Flaco	8	6	3	22	8	47
TOTAL	49	21	80	132	114	396

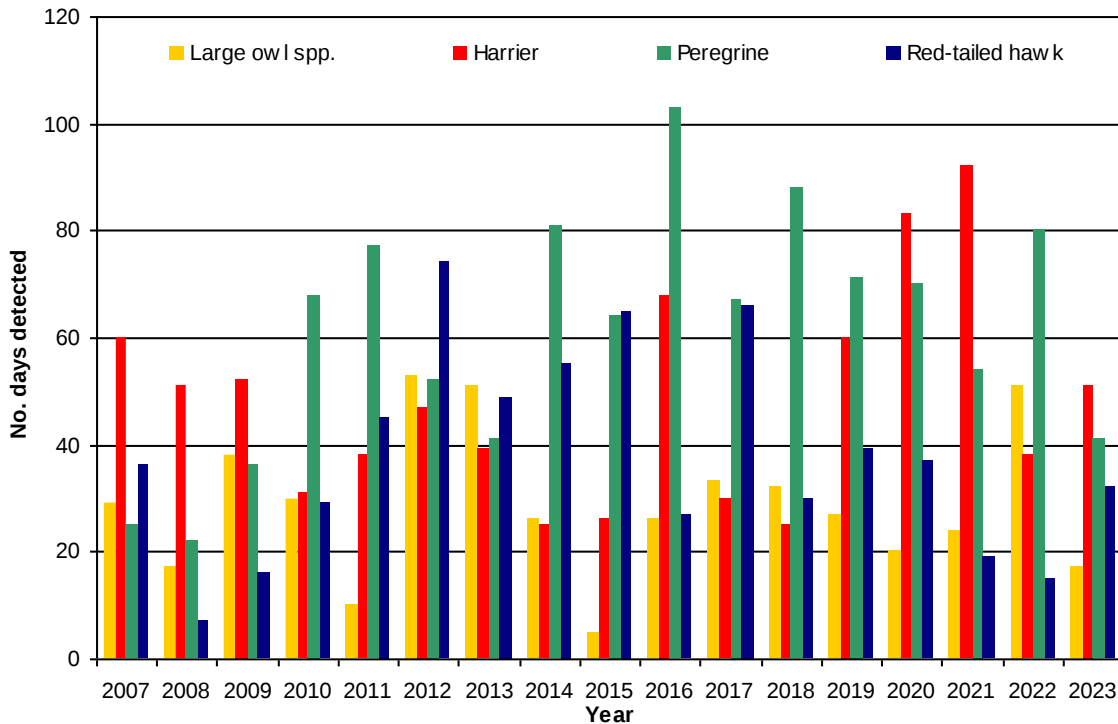


Figure 17. Number of days large owl spp., harrier, peregrine, and red-tailed hawk were detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2007-23.

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

American crow

In 2023, crows were observed perching in and flying over South Oso Flaco and 8 exclosure.

From 2002-22, documented plover nest loss to crow was limited to one nest in Pismo Creek lagoon in 2009 and two crows were lethally removed (both removed in 2019). In 2023, documented loss to crow was limited to two plover nests north of marker post 4 from 4-5 May and one crow was lethally removed from the Foredune closure shoreline.

Common raven

During the 13-year period 2008-20, ravens averaged 15 sightings on 7 days in the Southern Exclosure and Oso Flaco. In comparison, the average from the 3-year period 2021-23 is 114 sightings on 27 days, an increase in sightings of 660.0% and days seen of 285.7%. In 2023, raven presence increased to 155 sightings on 41 days in the Southern Exclosure and Oso Flaco (Table G.1 in Appendix G) (CDPR 2008-22). In 2023, eight ravens were lethally removed 4 May–12 June and compares to none being removed from 2002-12, an average of 2.4 removed from 2013-21 (range=0-5), and 7 removed in 2022 (Table F.2 in Appendix F, CDPR 2002-23). In 2023, there were a minimum of 10 individuals observed during the nesting season based on two seen flying together on 22 June and eight removed prior to this date.

During the 30-year period 1992-2022, documented nest loss to raven was limited to 56 plover nests (average=1.87 nests per year), with first documented nest loss to raven occurring in 2003. For the past 7 years in a row, from 2017-2023, plover nest loss to raven has been documented annually. In 2023, documented loss to raven included 36 plover nests, with more loss suspected. Additionally, on 17 May, raven tracks were seen around two shell-lined possible nest bowls with plover overtracking that may have

represented two undocumented plover nests depredated by raven. Additionally, on 30 April, a raven was seen landing in vegetated hummocks in the northeast portion of 6 enclosure and flying off with an egg that may have represented another undocumented plover nest.

Gulls

In 2023, documented loss to gull was limited to a single plover adult or juvenile, although more plover chick loss to gulls was suspected during the season (Table H.4 Appendix H). 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 2023, a subadult western gull was observed eating a large plover (juvenile or adult) on 7 enclosure shoreline and was lethally removed. Pink and blue tape from two plover bands was recovered from the gut contents, indicating at least one plover was depredated. Additionally, on 26 July, adult plovers from nearby nests were observed displaying at a subadult California gull walking on the 8 enclosure shoreline. This gull was lethally removed and no evidence of plover remains were found in the gut contents.

From 2002-23, documented loss to gulls is one tern nest, 32 plover nests, and 63 plover individuals (Figure 4, Table 2, Table F.3 in Appendix F, and Table G.2 in Appendix G).

Peregrine falcon

Peregrine falcons were observed from mid-April through September, actively hunting, perching, and consuming prey in the Southern Enclosure, and Oso Flaco. In 2023, there were 114 sightings on 41 days of peregrines in the Southern Enclosure and Oso Flaco, compared to the previous year (240 sightings on 80 days) and an average of 183 sightings (range=38-362) on 65 days (range=22-103) from 2008-22 (Table 12). A minimum of three individual peregrines were identified at ODSVRA this season: one juvenile, one subadult, and one adult female.

From 21 July to 12 September, there were multiple sightings of a juvenile peregrine falcon hunting areas of the Southern Enclosure and Oso Flaco. Documented loss to this likely single individual included three juvenile terns, one plover chick, and two juvenile plovers, with additional loss suspected (Table H.4 in Appendix H). Attempts to trap this juvenile peregrine were unsuccessful. On 31 July, an adult female peregrine was hunting the enclosure shoreline and was inadvertently caught in a trap placed for the juvenile peregrine. Due to the potential threat this adult female peregrine posed to terns and plovers, it was banded with a black VID band 94AK on the left leg and relocated 3 August to Shasta County, 414 miles northeast of ODSVRA.

From 2002-23, peregrines were observed depredating 11 terns and 53 plover chicks, juveniles, and adults (Table G.2 in Appendix G). Additionally, a subadult peregrine was observed eating an active plover nest in 6 enclosure in 2012, the only known nest predation by a peregrine at ODSVRA (CDPR 2002-22).

Table 12. Sightings of peregrine in specific areas of the Southern Exclosure and Oso Flaco at ODSVRA from 2008-23.

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)	No. peregrines trapped
2008	11	11	5	6	4	1	38 (22)	0
2009	13	13	13	6	9	20	74 (36)	1
2010	37	29	25	11	24	18	144 (68)	3
2011	39	45	40	32	37	12	205 (77)	0
2012	41	37	31	9	27	11	156 (52)	1
2013	28	23	19	2	14	14	100 (41)	0
2014	75	85	67	11	69	55	362 (81)	1
2015	41	31	28	15	19	29	163 (64)	1
2016	54	50	45	16	32	57	254 (103)	0
2017	31	35	40	8	37	41	192 (67)	1
2018	60	55	52	17	55	56	295 (88)	2
2019	45	36	28	15	32	33	189 (71)	2
2020	46	34	31	4	19	44	178 (70)	1
2021	40	40	36	11	21	14	162 (54)	2
2022	70	60	48	33	7	22	240 (80)	0
2023	20	23	24	15	24	8	114 (41)	1

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 the effectiveness of those actions. 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. Banding a large portion of the tern and plover chicks hatching from ODSVRA is necessary to determine the seasonal productivity and for assessing the management effectiveness. 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.

Every year, ODSVRA bands as many tern and plover chicks as possible, but there are situations when park staff will determine the banding effort is not suitable or could be detrimental to the birds. Chicks are not banded at ODSVRA when it will cause a disturbance to nearby young tern and plover broods. A variety of other factors will prohibit banding including, but not limited to, very young unbanded chicks lost prior to any banding opportunity, weather conditions (and other conditions defined in the USFWS permit) that would make banding unsafe, topography and vegetation in area of chicks making them difficult to locate, and chicks from nests with unknown locations found when too old and mobile to capture for banding. In 2023, there were the highest percentages of unbanded tern chicks (42%, 28/66) and plover chicks (57.3%, 224/391) compared to any other season since banding began. In 2022, there were 27.5% (19/69) unbanded tern chicks and 32.6% (169/515) unbanded plover chicks, and compares to 19.2% (range=9.4-35.9%) for tern and 34.5% (range=12.3-52.4%) for plover during the previous 10-year period 2012-21. The increase in unbanded chicks of both tern and plover in 2023 is likely a result of the highest number of plover nests hatching during a period that occurred simultaneously with tern nests hatching. This caused increased densities of young chicks in many areas, and banding is not possible in these dense brood situations since it would cause a high amount of detrimental disturbance to the broods. In addition, there has been an increase in density of vegetation and size of hummocks in the Southern Exclosure and Fore dune closure, making chicks more difficult to view and locate for banding.

Even though the number of unbanded chicks was high in 2023, all of the unbanded plover chicks were successfully tracked and fates for them were determined with intensive brood monitoring. Tern broods do not tend to remain in one area compared to plovers and may leave the site very quickly after fledgling, which makes unbanded tern chicks more difficult to track and determine fate.

Since 2022, Point Blue has been training ODSVRA staff to band plover chicks and it is recommended to continue to train additional staff in 2024 with the goal to apply for additional permits to band. For 2024, Point Blue will continue banding efforts at ODSVRA and have agreed to provide more than one banding contractor if needed during the busier part of the season as an option to attempt to band additional chicks if conditions allow.

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 ODSVRA colony 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.

Continue to provide bumpouts and buffer fencing to protect least tern and snowy plover nests and chicks in or close to the open riding area

Least tern and snowy plover nests inside fenced areas of the Southern Enclosure, Foredune closure, and revegetation areas, may receive temporary additional fencing if a buffer is needed to increase the nest distance from recreational activities in the open riding area. These bumpouts connect to the fence adjacent to nests and extend into the open riding area. Buffer fencing for nests and the tern night roost, when found in the open riding area, is connected to the closest adjacent closure fencing, if appropriate. The bumpout and buffer sizes, determined in consultation with USFWS and CDFW, differs for plover and tern.

It is recommended for 2024 to provide the buffer distances listed below to comply with the January 2021 Biodiversity Management Plan (BMP) using a bumpout or nonpredator fencing (CDFW 2021):

Least tern nests: Provide a tern nest buffer distance of 984 feet (300 meters).

Least tern night roost in the open riding area: Install a bumpout or nonpredator fencing to maintain a minimum of 330 feet (100 meters) from the tern night roost location.

Snowy plover nests in the Southern Enclosure and Foredune closure: Continue to install bumpouts to provide a minimum 100-foot buffer distance between the plover nest and the open riding area for plover nests found inside the Southern Enclosure or Foredune closure, and located close to the fence that borders the open riding area.

Snowy plover nests outside the Southern Enclosure and Foredune closure: Continue to experiment with various plover nest buffer sizes for nests found outside the Southern Enclosure and Foredune closure (such as the open riding area or revegetation areas), in consultation with CDFW, with buffer distances no smaller than 100 feet and no greater than 492 feet (150 meters). Hatch rates for the various buffer sizes will be compared over time. Chicks hatching from these plover nests are monitored closely as they move from nest to determine the daily location of brood for the week after hatch, survival of chicks, and ultimate fledge rates.

Nest bumpouts and buffers may be smaller in size for cases where topography will not allow the minimum size or as necessary to maintain a safe vehicle corridor adjacent to the north and east fence of any bumpout

or buffer. Additionally, to immediately protect the nest when it is first found, and because the buffer requirements are so large, a smaller size buffer consisting of symbolic rope fencing with signs or a smaller single nest wire enclosure may be installed until a larger buffer installation can be scheduled when staff time, material availability, and weather conditions permit. The bumpout and buffer material consists of nonpredator fencing. Access to enter bumpouts or closed buffer areas will not be allowed by the public, but ODSVRA staff vehicles and equipment are allowed within these areas for tasks related to daily tern and plover monitoring, periodic vegetation monitoring, and regular fence maintenance. Other vehicles and personnel will also be allowed to access these areas as necessary to respond to public emergency situations. The bumpout or buffer fencing is removed once nesting activity ceases or there are no longer broods inside the fenced area.

Nests will be monitored closely to assess the adequacy of protective fencing in reducing disturbance. If necessary, bumpouts or buffers may increase in size if disturbance to incubating birds is observed as a result of recreational activity. The buffer size may also be adjusted if tern chicks or nocturnal roosting terns are observed to remain close to the closed buffer area fence.

For plover nests in the open riding area or any area outside of the Southern Exclosure and Fore dune closure, a fence corridor that can be closed to the public may be provided as appropriate once nest is close to hatch. This may be done by extending fencing westerly to the surf line to provide a secure chick travel corridor to a protected area of shoreline for foraging habitat.

Continue to protect snowy plover broods in the open riding area

The shoreline is important as foraging habitat and for raising snowy plover chicks. After a nest hatches, broods typically move toward the closest shoreline and establish a territory. Portions of the open riding area are temporarily closed, using symbolic fence or nonpredator fencing and signs, to provide a corridor of safe passage for broods moving in the open riding area between nests and foraging areas (see section titled Snowy plover chicks in the open riding area and closed buffer areas on page 39).

In 2024, it is recommended to provide protection to plover broods in the open riding area in consultation with USFWS and CDFW, including methods to allow staff to guide broods to a protected area when necessary (see section titled Broods in the open riding area on page 19). For broods found in the open riding area that are in critical danger from recreational activities, and when it is not practical for a chick closure or travel corridor to be installed, it is recommended that chicks be captured and relocated to an approved rehabilitation facility. Examples of circumstances where chick capture would be needed include: broods that are found far away from any closed shoreline and surrounded by campers where a chick corridor or closed area is not feasible; chicks become separated or appear weak while moving on their own within the riding area to a closed area; or no adult is present and chicks are unattended in the open riding area for an extended period. If possible, USFWS and CDFW will be consulted prior to any capture of chicks, however immediate action may be taken as necessary to avoid loss of chicks due to recreational activities.

Continue to use predator proof fencing and allow staff and heavy equipment access throughout the season to maintain the effectiveness of the exclosure perimeter fence protecting terns and plovers breeding in the Southern Exclosure and North Oso Flaco

The contiguous area enclosed by predator fencing within the Southern Exclosure and North Oso Flaco is important in discouraging coyotes during the nesting season from entering nesting and chick-rearing habitat, as well as to limit vehicle and human trespass year-round. The Exclosure predator fencing was installed seasonally 2006-21 and the area has been closed to the public year-round since October 2021 based on operational needs and for consistency with other agency requirements. The fence during the nesting season is composed of two layers of wire fencing six feet above the surface, with the bottom layer of two-inch by four-inch mesh buried a minimum of eight inches to discourage coyote entry. High winds at ODSVRA can cause gaps or blowouts at the bottom of the fence, and the fence is prone to falling if not

repaired in a timely manner. Other areas may become buried by sand which creates low sections in the fence. Coyotes can take advantage of the gaps and low spots to enter the enclosure, making nests and chicks vulnerable to predation. Additionally, gaps and downed fence can cause trespass issues. In 2023, and in past years, heavy equipment was used to repair and maintain the fence for the nesting season by pushing or pulling sand away from the fence, usually once per week (or more as needed) on the eastern fence line that borders the open riding area to maintain the fence for predator control. Staff also access closed buffer areas to repair fencing by hand and add fence material to close gaps and keep the fence at an optimal height.

During the 2023-24 winter months (October to February), it is recommended to continue to repair damaged fence to prevent public trespass, but it will not be necessary to maintain the fence to the same level as during the breeding season since it will not be intended for predator protection. The western fence will be removed during the winter to avoid damage by winter storms and high surf events. Although the predator fencing is effective for the nesting season, it requires almost daily maintenance, multiple hours of staff time, and is not intended to be used as a permanent fence. Prior to the 2023 season, taller and more sturdy posts were used for approximately one mile of the fencing for Boneyard enclosure and the southern portion of 8 enclosure as an experiment and we are evaluating the durability and longevity of this new fence. For 2024, if the Southern Enclosure and North Oso Flaco is expected to remain in place year-round, it is recommended that additional fencing options be explored, with the goal of finding materials that can last more than a single season, in order to maintain the integrity of the predator enclosure fencing. Incorporating new fence materials into the management program at ODSVRA, determined in consultation with USFWS and CDFW, will depend on year-round closure plans, available materials, and staff time.

Prior to the 2024 nesting season, it is recommended to replace the western enclosure predator fencing and repair the fence using heavy equipment and hand crews, to remove any gaps or low spots that may have developed over the winter. Throughout the 2024 nesting season, it is also recommended to maintain the predator fence and continue to allow staff and heavy equipment access to the fence for repairs within closed buffer areas if necessary. The heavy equipment is necessary to cover gaps or pull sand away from heavily buried areas, usually on a weekly basis to maintain the fence. Prior to equipment use, staff would scan the area within and outside the enclosure fence line to determine if there is nesting activity near the fence and any sensitive areas would be avoided by the equipment operator.

Continue to assess habitat in the Southern Enclosure and, as necessary, distribute natural materials and increase efficiency in distributing woodchips with the help of maintenance staff and heavy equipment

Natural materials such as driftwood, woodchips, and wrack (surf-cast kelp) have been distributed since 2002 within the Southern Enclosure (including the shoreline) to enhance habitat features to benefit nests and chicks. Tern shelters have not been used since 2014 because the natural habitat enhancement material, such as driftwood, are preferred as a source of cover for chicks. In 2023, woodchips and wrack were not distributed because the enclosure had sufficient materials remaining from previous years. Driftwood was collected on the shoreline at the end of the season, since it would have otherwise washed out during winter high tide and storm events, but was left in other upland areas of the Southern Enclosure. Driftwood was redistributed in bare areas of the Southern Enclosure shoreline and, in lesser amounts on the Foredune closure shoreline, at the beginning of the 2023 nesting season. Driftwood and wrack is gathered into trucks or trailers and unloaded into the Southern Enclosure by hand. From 2008 to 2022, woodchips were loaded into dump trucks, truck beds, or trailers using ODSVRA heavy equipment operators and distributed by hand into the Southern Enclosure.

In 2024, it is recommended to assess the habitat and substrate present in the Southern Enclosure and Foredune closure shoreline prior to the nesting season and, if determined necessary, distribute driftwood, woodchips, and wrack to bare areas. It is also recommended to continue using available heavy equipment and dump trucks for woodchip dispersal. The equipment increases staff efficiency, allows larger amounts

of woodchips to be dispersed, and a broader distribution of material to provide shelter from wind and cover from predators. The use of heavy equipment needs to be balanced with other operational needs in the park.

Continue to monitor wrack levels on the Southern Exclosure shoreline and, if necessary, implement distribution of wrack and inoculate with wrack-associated invertebrates (these invertebrates are an important 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, prior to 2021, when the exclosure was seasonally closed only for the breeding season (March-September), there was not a sufficient period of time for invertebrates to effectively and naturally recover species diversity and abundance on the Southern Exclosure shoreline following five months of recreational use. In 2012-22, park staff inoculated wrack added to the Southern Exclosure shoreline with invertebrates, but this was not done in 2023 because the year-round closure allowed for sufficient natural wrack to accumulate. Staff continued the UCSB method of invertebrate surveys used since 2012 (see paragraph titled Wrack and talitrids in the Management Actions section on page 18 for more detail) and recommend continuing these surveys in 2024. The surveys would help to document trends over time and determine if the invertebrate population is recovering on the Fore dune closure and Southern Exclosure shorelines to assist management decisions for the future. Wrack addition and inoculation using UCSB methods may occur on the shoreline in 2024 if abundance of talitrids or wrack amounts appears low, depending on available materials, accessibility of beach areas, equipment, and staff time.

Experiment with vegetation and topography management in the Southern Exclosure to improve nesting habitat

Over the last several years, areas developed dense vegetation within 6, 7, and 8 exclosures, resulting in increasingly tall vegetated hummocks and severe topography. This is especially evident in 8 exclosure. Concurrently, nesting by terns and plovers in these areas shows a marked decrease. Although nests in dense vegetation are more difficult to locate, the lower nest numbers are likely due to the combination of substrate and viewshed not being appropriate for nesting, the large dune hummocks attracting avian predators as perch locations, and the amount of area closed for nest buffers or revegetation elsewhere in the park has increased over time in areas with better quality nesting habitat.

Least terns and snowy plovers typically select open habitats with low dunes and limited vegetation cover (less than 10%), to allow the birds to have a larger viewshed for earlier detection of predators (Swaigood et al. 2018) (Muir and Colwell 2010) (Page et al. 1995). Approximately 25% of the acreage in 6, 7, and 8 exclosures (roughly 40 acres mostly on the west side) has become less productive for tern and plover, with nest numbers in this area having 16.5% of the total nests during the 2016-20 period compared to only 5.8% since the year-round closure from 2021-23. There were a total of 53 tern and plover nests in an approximate 20 acre area on the west side of 8 exclosure where topography is highest from 2016-20, and only 3 nests from 2021-23 in the same area. Since 2021, possibly in response to increased vegetation and topography on the west side of the Southern Exclosure, there has been a substantial increase of nesting closer to the east fence of the exclosure, placing more nests closer to recreational activities and requiring additional buffer fencing to protect these nests (see maps showing topography and nest abundance changes in Figures C.12 to C.14 in Appendix C).

The fore dune plants that have persisted in the exclosure include mainly sea rocket (*Cakile maritima*), beach bur (*Ambrosia chamissonis*), and Coastal sand verbena (*Abronia latifolia*). It is recommended to design an experimental habitat manipulation plan in 2024 to improve nesting habitat to be distributed for review and approval by outside agencies. The plan would focus on removal during the nonbreeding season of the nonnative sea rocket and larger dune hummocks in heavily vegetated areas where nesting has reduced in

the Southern Enclosure. The intent of the vegetation removal would be to mimic the natural action of creek and river mouths, which can clear out acres of vegetation in one storm event to create “blow-out” areas within the foredune habitat, extremes for which foredune habitats are adapted. Vegetation at the very western edge of the enclosure would be avoided since these hummocks are beneficial to plover broods as a place to take cover from predators and shelter from wind. Only large hummocks would be targeted, small hummocks left in place, with a goal of creating a mosaic of plants and open sand areas attractive to snowy plovers for nesting. Prior to any habitat manipulation, trained park staff would verify sensitive listed plant species and small mammal burrows are absent. A trained monitor would also be present during mechanical removal to ensure all wildlife remains safe and any sensitive plants are avoided. Changes in tern and plover nesting numbers and nest fates in the experimental vegetation removal areas would be documented and evaluated as part of the plan.

Continue to evaluate physical features of the nesting and chick-rearing habitat in the Southern Enclosure using drone/Uncrewed Aircraft Systems (UAS) equipment during the nonbreeding season

Beginning in 2018, and each year afterward, drone equipment was used to photograph the Southern Enclosure habitat using protocols created in consultation with USFWS or CDFW. Flights were performed prior to any nests being established or after nests hatched and chicks fledged from the flight area. All areas with drone flights were continuously monitored for snowy plovers and their behavior. Snowy plovers generally showed no signs of disturbance. The information collected during flights recorded placement of enhancement materials distributed by staff and can be used to assess nesting habitat. It is recommended for 2024 to continue scheduling drone flights in February, prior to the initiation of nests, and flights at the end of September or early October, after all plover chicks have fledged and are flight-capable.

Continue to use the trash dumpster design at marker post 2 that has been used since the fall 2020

The predator management strategy at ODSVRA includes methods to discourage attracting predators to the site, including to the trash dumpsters at marker post 2. In the past, experiments with trash dumpster covers of different configurations presented logistical and operational challenges and were discontinued. ODSVRA worked with the local trash company and they provided a new trash cover design that was installed on the beach near marker post 2 beginning in the fall of 2020. Prior to this, four to six large trash dumpsters (22 feet long, eight feet wide, and four feet high with 20 cubic yards capacity and open on top) were used and attracted a large number of gulls landing on and foraging in the dumpsters. The new dumpster design has the same dimensions, but with a closed top and a side door that is left open. This design meets the park requirements and may have helped lower the number of gulls attracted to our park. Reduction in gull numbers at the park may also be partly a result of lower camper and visitor numbers since 2020 and less waste produced. The maximum number of gulls present at one time at the dumpster area during 2021-23 nesting seasons ranged from 59-170. This is much lower than the max of 297 and 445 recorded in 2019 and 2018, respectively, years when the park was at full capacity and dumpsters uncovered on the top were used. It is recommended for 2024 to continue using the newer design of covered trash dumpsters in the marker post 2 area, as it is effective in lowering the number of gulls attracted to the area. Gull surveys are not recommended to continue, as there is ample data previously collected, but the twice per week surveys may recommence using previous methods if there are changes in the dumpster design used at marker post 2 (see Monitoring and Management section for survey details).

Ongoing management actions that will continue in 2024

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).
- A thermal scope (Trijicon REAP-IR) acquired in 2019, will continue to be used for monitoring the least tern night roost and additional equipment options will continue to 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 detection cameras for nest monitoring and train and permit additional monitoring staff as needed.
- Continue to use an anemometer with data logger from a wind monitoring tower to record daily wind speeds and direction.
- Continue option to use least tern chick fencing on the east side of the enclosure if a method to maintain the tern chick fencing is found.
- Predator monitoring and management actions that have been in place since 2002 will continue.
- The Foredune closure, Southern Exclosure, and North Oso Flaco shoreline will continue to be protected during the breeding season; this includes maintaining the posts and rope at marker post 4.5 and Oso Flaco boardwalk intertidal zones to minimize trespass. The Southern Exclosure and North Oso Flaco are closed year-round (since October 2021), and the shoreline of the Foredune closure is open 1 October to 29 February.
- Continue use of 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 will continue to be closely monitored and evaluated for 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.

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APPENDICES

APPENDIX A. CALIFORNIA LEAST TERN NESTS AT ODSVRA IN 2023.

Least tern chicks were banded with red over aqua vinyl tape on a size 1A numbered aluminum federal band on the left leg and a size 1A blank aluminum band on the right. Color tape was placed on the right band to create combinations unique to individual. Chicks were weighed immediately prior to banding, typically at two to five days old. Twenty-eight chicks from nineteen hatching nests were not banded. A minimum of five unbanded young fledglings were confirmed. Evidence supports these five unbanded fledglings originated at ODSVRA. Information on adult pair is provided where known. Sex of adults is typically not known.

All nests were protected within the Southern Exclosure with Exclosure predator fencing and bumpout fencing (see Management Actions for descriptions of fencing and see maps in Appendix C).

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. If two or three colors are on a single band, the colors are separated by a slash. 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

na = estimated date not available due to insufficient information, U = unbanded, unk = unknown, ? = unconfirmed band combinations or colors

Nest	Location	Adult pair	Est. initiation date (on or prior)	Nest fate	Fate date	No. eggs	No. chicks (no. fledged)	Chick band combination and weight (grams)	Confirmed fledged	Notes
1	7	banded unk	29 May	Hatch	19 Jun	2	2 (2)	r/a:b (9.7) r/a:g (12.8)	r/a:b r/a:g	
2	7	U unk	(29 May)	Abandoned post-term	8 Jul	2	0 (0)			Nest was incubated for a minimum of 40 days from 29 May to 7 July. On 3 July, 1 egg missing, unknown if pre- or post-term, and second egg missing post-term on 18 August. On 3 July, 1 abandoned chick from the LT36 nest was placed in the LT2 nest (see section titled Collection and transfer of abandoned least tern chick to a nest with nonviable eggs on page 28 for more detail).
3	6	U unk	30 May	Hatch	23 Jun	3	3 (unk)	U U U		Three unbanded chicks last seen on 24 June at 0 and 1 day old, and 2 unbanded chicks last seen 7 July at 13 or 14 days old.
4	6	U unk	28 May	Hatch	18 Jun	2	2 (≥1)	r/a:y (11.3) U	r/a:y	Unbanded chick last seen on 5 July at 16 days old with r/a:y sibling.
5	6	U unk	1 Jun	Hatch	23 Jun	2	2 (1)	r/a:p (10.9) r/a:v (11.8)	r/a:v	Chick banded r/a:p last seen on 4 July at 11 days old.
6	6	U unk	27 May	Hatch	17 Jun	2	2 (unk)	U U (dead)		On 22 June, an unbanded chick suspected to be LB6 based on timing and location was found dead in 6 exclosure (see table H.3 in Appendix H). Both unbanded chicks last seen together on 21 June at 3 and 4 days old.
7	7	U unk	3 Jun	Hatch	25 Jun	2	2 (2)	r/a:a/r (9.3) r/a:g/r (6.9)	r/a:a/r r/a:g/r	
8	7	U U	3 Jun	Hatch	25 Jun	2	2 (unk)	r/a:o (5.8) U		Both chicks last seen on 13 July at 17 and 18 days old.
9	6	w/b:w b/w:o/y	2 Jun	Hatch	24 Jun	2	2 (2)	r/a:r/g (22.8) r/a:w/r (26.5)	r/a:r/g r/a:w/r	

Appendix A. California least tern nests at ODSVRA in 2023 (continued).

Nest	Location	Adult pair	Est. initiation date (on or prior)	Nest fate	Fate date	No. eggs	No. chicks (no. fledged)	Chick band combination and weight (grams)	Confirmed fledged	Notes
10	7	U y/g:b/w	2 Jun	Hatch	23 Jun	2	2 (2)	r/a:r/y (10.3) r/a:y/r (9.5)	r/a:r/y r/a:y/r	
11	7	U w:(b)?	3 Jun	Hatch	27 Jun	2	1 (0)	U (not banded due to existing injury)		One egg abandoned post-term. No sign of fertilization when egg contents examined post season. On 30 June, unbanded chick near nest site with wound on back (see Table H.1 in Appendix H). Chick was last seen on 1 July at 4 days old.
12	7	U b/a:g/y	30 May	Hatch	20 Jun	2	2 (1)	r/a:a (7.0) U (dead)	r/a:a	On 23 June, unbanded chick found dead at nest site (see table H.3 in Appendix H).
13	7	? :w unk	2 Jun	Hatch	23 Jun	2	2 (2)	r/a:l (10.7) r/a:k (12.3)	r/a:l r/a:k	
14	6	(b or r)? :y/g banded	5 Jun	Hatch	27 Jun	2	2 (unk)	U U		Both unbanded chicks last seen on 6 July at 9 days old, and 1 unbanded chick last seen on 16 July at 19 days old.
15	6	U unk	3 Jun	Hatch	25 Jun	2	2 (unk)	U U		Both unbanded chicks last seen on 7 July at 11 and 12 days old.
16	6	U (b or r)? :y/g	4 Jun	Hatch	26 Jun	2	2 (1)	r/a:r/w (14.0) r/a:a/w (14.3)	r/a:r/w	Chick banded r/a:a/w last seen on 2 July at 6 days old.
17	6	U banded	3 Jun	Hatch	24 Jun	2	2 (unk)	U U		Both unbanded chicks last seen on date of hatch, and 1 unbanded chick last seen on 26 June at 2 days old.
18	7	U unk	6 Jun	Hatch	30 Jun	2	1 (unk)	U		One egg with unknown fate. Unbanded chick last seen on 16 July at 16 days old.
19	6	o/w:o/y unk	4 Jun	Hatch	25 Jun	2	2 (2)	r/a:o/b (23.3) r/a:a/o (16.8)	r/a:o/b r/a:a/o	On 28 July, the 33-day-old r/a:a/o fledgling depredated by peregrine in 6 exclosure (see Table H.3 in Appendix H).
20	6	U (r/w:o/y)?	6 Jun	Hatch	28 Jun	2	2 (≥1)	r/a:o/g (21.5) U	r/a:o/g	Unbanded chick last seen 16 July at 18 days old.
21	6	U b/w:b/y	5 Jun	Hatch	29 Jun	2	1 (unk)	U		One egg with unknown fate. Unbanded chick last seen on 16 July at 17 days old.
22	6	U unk	6 Jun	Hatch	29 Jun	2	2 (unk)	U U		Both unbanded chicks last seen together on 3 July at 4 days old, and 1 unbanded chick last seen on 5 July at 6 days old.
23	6	U g/y:w/a	7 Jun	Hatch	28 Jun	2	1 (1)	r/a:b/y (21.3)	r/a:b/y	One egg abandoned post term. Egg had a late stage embryo when contents examined post season.
24	6	U unk	31 May	Hatch	21 Jun	2	2 (2)	r/a:w (10.3) r/a:r (10.9)	r/a:w r/a:r	
25	7	U y/w:y/g	7 Jun	Hatch	1 Jul	2	1 (0)	r/a:b/a (11.1)		One egg abandoned post-term. No sign of fertilization when egg contents examined post season. Chick banded r/a:b/a last seen on 16 July at 15 days old.
26	6	U g/y:g	7 Jun	Hatch	28 Jun	1	1 (1)	r/a:g/w (30.0)	r/a:g/w	

Appendix A. California least tern nests at ODSVRA in 2023 (continued).

Nest	Location	Adult pair	Est. initiation date (on or prior)	Nest fate	Fate date	No. eggs	No. chicks (no. fledged)	Chick band combination and weight (grams)	Confirmed fledged	Notes
27	6	s:b banded	6 Jun	Hatch	27 Jun	1	1 (0)	r/a:w/g (31.2)		Chick banded r/a:w/g last seen on 7 July at 10 days old.
28	7	U w/o:r	8 Jun	Hatch	30 Jun	2	2 (1)	r/a:o/y (14.3) r/a:b/o (9.6)	r/a:o/y	On 21 July, the 22-day-old r/a:o/y fledgling confirmed depredated by peregrine in 7 enclosure (see table H.3 in Appendix H).
29	7	unk unk	(7 Jun)	Unknown	na	2	0 (0)			Nest was incubated for a minimum of 19 days from 7-25 June. Two eggs with unknown fate.
30	6	U unk	2 Jun	Hatch	23 Jun	2	2 (2)	r/a:n (13.8) r/a:b/r (15.8)	r/a:n r/a:b/r	
31	6	unk unk	7 Jun	Hatch	28 Jun	2	2 (unk)	r/a:g/o (29.2) U		Both chicks last seen on 7 July at 8 and 9 days old.
32	6	unk unk	7 Jun	Hatch	28 Jun	1	1 (unk)	U		Unbanded chick last seen on 3 July at 5 days old.
33	6	g/y:y unk	9 Jun	Hatch	2 Jul	2	2 (unk)	r/a:w/a (12.0) U		Unbanded chick last seen on 12 July at 10 days old, and chick banded r/a:w/a last seen on 18 July at 15 days old.
34	6	b/o:-unk	8 Jun	Hatch	29 Jun	2	2 (2)	r/a:r/b (12.4) r/a:o/a (11.1)	r/a:r/b r/a:o/a	
35	6	o/w:w/o banded	9 Jun	Hatch	1 Jul	2	2 (unk)	U U		Both unbanded chicks last seen 21 July at 20 days old.
36	6	U unk	12 Jun	Hatch	3 Jul	1	1 (1)	r/a:r/a (27.5)	r/a:r/a	Nest was incubated for 22 days from 12 June to 3 July. On 3 July, 1 chick from LT36 was observed on date of hatch for extended period of time without attending adult. The abandoned chick was placed in LT2 nest (see section titled Collection and transfer of abandoned least tern chick to a nest with nonviable eggs on page 28 for more detail).
37	6	unk unk	4 Jun	Hatch	25 Jun	2	2 (unk)	U U		Both unbanded chicks last seen on 15 July at 20 days old.
38	6	U unk	9 Jun	Hatch	30 Jun	2	2 (2)	r/a:r/o (12.5) r/a:o/r (17.4)	r/a:r/o r/a:o/r	
39	6	unk unk	(13 Jun)	Unknown	28 Jun	2	0 (0)			Nest was incubated for a minimum of 15 days from 13-27 June. Two eggs with unknown fate.
40	6	U w/o:g/w	16 Jun	Hatch	7 Jul	2	2 (≥1)	U r/a:y/b (7.3)	r/a:y/b	Unbanded chick last seen on 16 July at 9 days old.
41	6	U U	(20 Jun)	Abandoned, unknown if pre- or post-term	5 Jul	2	0 (0)			Nest was incubated for a 15-day period from 20 June to 4 July. Both eggs had a late stage embryo when contents examined post season.
42	6	U unk	(28 Jun)	Abandoned, unknown if pre- or post-term	10 Jul	1	0 (0)			Nest was incubated for 12-day period from 28 June to 9 July. One egg had an early stage embryo when contents examined post season.

APPENDIX B. SNOWY PLOVER NESTS AT ODSVRA IN 2023.

Split hatch noted for nests when hatching of all chicks in the brood may have occurred over more than one day. Plover chicks were banded to brood. The majority of unbanded chicks were not banded to avoid disturbing nearby young snowy plover broods. Adopted chicks that fledge are counted as fledged under their nest of origin entry. See Appendix A for description of reading bands and color letter codes.

Location: 6 = 6 enclosure, 7 = 7 enclosure, 8 = 8 enclosure, BY = Boneyard enclosure, NOF = North Oso Flaco, SOF = South Oso Flaco, Foredune = Foredune closure, CBA = closed buffer area, ORA = open riding area, Reveg. area = revegetation area (specific location in notes column).

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

Nest protection type: see Management Actions for description of Exclosure predator fencing, circular, nonpredator fencing, symbolic fence, and bumpout.

Exclosure = Exclosure predator fencing

? = unconfirmed band combinations or colors, ≥ = minimum of one or two eggs in nest and unable to confirm final egg number

na = estimated date not available due to insufficient information

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	Foredune	F=ga:wy M=U	16 Mar	Depredated, northern harrier	28 Mar	3	0 (0)		Bumpout, Nonpredator fence	
2	6	F=U M=U	20 Mar	Depredated, northern harrier	7 Apr	3	0 (0)		Exclosure	
3	7	F=U M=banded	15 Mar	Depredated, raven	14 Apr	2	0 (0)		Exclosure	
4	6	F=bb:vv M=U	23 Mar	Depredated, raven	14 Apr	3	0 (0)		Exclosure	
5	Foredune	F=rr:bb M=U	3 Apr	Wind	13 Apr	3	0 (0)		Nonpredator fence	
6	ORA	F=ga:wy M=U	5 Apr	Depredated, crow	5 May	3	0 (0)		Nonpredator fence, Symbolic fence	Nest established near marker post 4.
7	8	F= M=	na	Abandoned pre-term	9 Apr	1	0 (0)		Symbolic fence	On 5 April, nest found as 1 egg in location that would unlikely have been undetected previously. Nest never observed attended but had plover tracks at nest until 8 April.
8	ORA	F=U M=U	8 Apr	Depredated, crow	4 May	3	0 (0)		Nonpredator fence, Symbolic fence	Nest established near marker post 4.
9	Foredune	F= M=	na	Abandoned pre-term	10 Apr	1	0 (0)		Bumpout, Nonpredator fence	On 10 April, 1 egg found at nest. No sign of fertilization in egg when contents examined post season.
10	Foredune	F=U M=ga:bg	8 Apr	Hatch (Split)	10 May	3	3 (0)	3 gg:ro	Nonpredator fence	On 5 June, 1 chick likely depredated by kestrel from Foredune North shoreline (see Table H.5 in Appendix H).
11	7	F= M=	3 Apr	Depredated, avian	19 Apr	2	0 (0)		Exclosure	Nest considered depredated by avian predator with raven or harrier suspected.
12	Foredune	F=U M=banded	2 Apr	Depredated, raven	17 Apr	3	0 (0)		Symbolic fence	
13	8	F= M=	2 Apr	Depredated, raven	14 Apr	3	0 (0)		Exclosure	
14	7	F= M=	na	Depredated, avian	15 Apr	≥1	0 (0)		Symbolic fence	Nest considered depredated by avian predator with raven or harrier suspected.

Appendix B. Snowy plover nests at ODSVRA in 2023 (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
15	8	F= M=	11 Apr	Depredated, raven	16 Apr	3	0 (0)		Exclosure	
16	8	F= M=	na	Depredated	17 Apr	≥1	0 (0)		Exclosure	On 15 April, nest found at 1 egg. On 17 April, no eggs at nest and eggshell fragments nearby. Lost during period of nest loss to raven and harrier.
17	ORA	F=U M=ga:ba	14 Apr	Depredated, raven	5 May	3	0 (0)		Bumpout, Symbolic fence	Nest established in Fore dune closure alleyway.
18	ORA	F=rr:pw M=pg:by	18 Apr	Hatch	23 May	3	2 (0)	2 ga:pg	Mini-exclosure, Nonpredator fence, Symbolic fence	Nest established east of 7 exclosure. On 24 May, 1 egg found 100 feet away from nest area with 2 large holes on either end, and a dead approximately 3-week-old dried embryo when contents examined. On 22 May, brood moves from nest through closed buffer area into 7 exclosure.
19	Euc Tree	F= M=	17 Apr	Depredated, raven	27 Apr	3	0 (0)		Bumpout	
20	6	F=U M=	3 Apr	Depredated, avian	24 Apr	3	0 (0)		Exclosure	Nest considered depredated by avian predator with raven or harrier suspected.
21	7	F=bb:ar M=	22 Mar	Unknown	25 Apr	3	0 (0)		Exclosure	On 21 April, 3 eggs at nest, 1 egg had faint cracks, 1 egg had faint cracks and tapping, and 1 egg had no cracks or sounds. Nest last seen incubated on 24 April. On 25 April, no eggs at nest with plover tracks present. Nest fate occurred during period of nest loss to raven and harrier.
22	Fore dune	F= M=	16 Apr	Depredated, northern harrier	29 Apr	2	0 (0)		Nonpredator fence	
23	ORA	F=U M=	22 Apr	Depredated, raven	14 May	3	0 (0)		Nonpredator fence, Symbolic fence	Nest established east of northern 8 exclosure.
24	Fore dune	F= M=gg:gg	23 Apr	Failed, unknown cause	2 May	3	0 (0)		Bumpout, Nonpredator fence	Lost during period of nest loss to raven.
25	Fore dune	F=ny:gv M=U	13 Apr	Hatch	15 May	3	2 (2)	2 ga:po	Nonpredator fence	One egg (without cracks) abandoned post-term.
26	Fore dune	F=U M=	7 Apr	Depredated, northern harrier	27 Apr	3	0 (0)		Nonpredator fence	
27	Fore dune	F=U M=	13 Apr	Depredated, northern harrier	28 Apr	3	0 (0)		Nonpredator fence	
28	ORA	F=U M=ga:vb	17 Apr	Depredated, northern harrier	28 Apr	3	0 (0)		Nonpredator fence	Nest established east of 7 exclosure.
29	8	F=U M=	23 Apr	Depredated, raven	30 Apr	3	0 (0)		Exclosure	On 29 April, camera confirms raven eating 1 egg, then returned and ate remaining 2 eggs on 30 April.

Appendix B. Snowy plover nests at ODSVRA in 2023 (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	7	F=U M=	14 Apr	Depredated, raven	7 May	3	0 (0)		Symbolic fence	
31	6	F=U M=	14 Apr	Depredated, avian	28 Apr	3	0 (0)		Symbolic fence	Nest considered depredated by avian predator with harrier suspected.
32	NOF	F=U M=	na	Depredated	2 May	≥1	0 (0)		Symbolic fence	On 30 April, 1 egg present and nest seen incubated. On 2 May, no eggs at nest. Lost during period of nest loss to raven.
33	Foredune	F=U M=U	25 Apr	Hatch (Split)	27 May	3	2 (2)	2 pg:oo	Nonpredator fence	One egg (without cracks) abandoned post-term. No sign of fertilization in egg when contents examined post season.
34	7	F=U M=	17 Apr	Depredated, northern harrier	29 Apr	3	0 (0)		Symbolic fence	
35	Foredune	F=U M=	14 Apr	Depredated	(2 May)	2	0 (0)		Nonpredator fence	On 26 April, nest found at 2 eggs and were still present until 1 May. On 4 May, no eggs at nest. Lost during period of nest loss to raven.
36	Foredune	F=U M=	12 Apr	Depredated, avian	5 May	3	0 (0)		Nonpredator fence	Nest considered depredated by avian predator with raven suspected.
37	Euc Tree	F=U M=	25 Apr	Depredated, avian	27 Apr	≥2	0 (0)		Bumpout	Nest considered depredated by avian predator with harrier suspected.
38	BY	F=U M=U	18 Apr	Hatch	20 May	3	2 (2)	2 unbanded	Exclosure	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
39	Foredune	F=bb:go M=	26 Apr	Hatch	28 May	3	3 (2)	3 gg:ry	Bumpout, Symbolic fence, Nonpredator fence	
40	ORA	F=U M=pg:by	22 Apr	Hatch (Split)	24 May	3	2 (1)	2 gg:yy	Circular, Nonpredator fence, Symbolic fence	Nest established east of northern 8 exclosure. One egg (without cracks) abandoned post-term. No sign of fertilization in egg when contents examined post season. On 25 May, brood moves from nest through closed buffer area into 8 exclosure.
41	Foredune	F=U M=	26 Apr	Depredated, raven	1 May	≥2	0 (0)		Bumpout, Nonpredator fence	
42	6	F=U M=U	19 Apr	Hatch	21 May	2	1 (0)	1 rr:ow	Symbolic fence	One egg (without cracks) abandoned post-term. No sign of fertilization in egg when contents examined post season. On 2 June, 1 chick likely depredated by kestrel from 6 shoreline (see Table H.5 in Appendix H).
43	7	F=U M=	26 Apr	Depredated, northern harrier	29 Apr	≥2	0 (0)		Symbolic fence	
44	6	F=U M=	na	Unknown	na	≥1	0 (0)		Exclosure	From 27-28 April, 1 egg present at nest. Sometime between 29 April and 3 May, 1 egg no longer present. Egg loss occurred during period of nest loss to raven and harrier.

Appendix B. Snowy plover nests at ODSVRA in 2023 (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
45	6	F= M=U	24 Apr	Depredated	2 May	3	0 (0)		Bumpout, Exclosure	On 28 April, 3 eggs present and nest last seen incubated on 1 May. On 3 May, no eggs at nest. Lost during period of nest loss to raven.
46	6	F=U M=banded	27 Apr	Depredated, avian	11 May	2	0 (0)		Exclosure	Nest considered depredated by avian predator with raven suspected.
47	7	F= M=	27 Apr	Depredated	2 May	≥2	0 (0)		Exclosure	On 29 April, 2 eggs present and nest last seen incubated on 1 May. On 2 May, no eggs at nest. Lost during period of nest loss to raven.
48	Foredune	F= M=	na	Depredated, northern harrier	29 Apr	≥2	0 (0)		Nonpredator fence	On 29 April, evidence of nest found after observation of harrier depredating nest.
49	Foredune	F= M=	na	Depredated, northern harrier	29 Apr	≥2	0 (0)		Nonpredator fence	On 29 April, evidence of nest found after observation of harrier depredating nest.
50	Euc North	F=U M=	22 Apr	Depredated, raven	19 May	3	0 (0)		Bumpout, Symbolic fence	
51	7	F= M=(pg:yr)?	22 Apr	Depredated, raven	8 May	3	0 (0)		Exclosure	
52	6	F=U M=pg:ba	28 Apr	Hatch	2 Jun	3	1 (1)	1 unbanded	Mini-exclosure, Exclosure	Sometime between 9-22 May, 1 egg missing pre-term. One egg (without cracks) abandoned post-term. No sign of fertilization in egg when contents examined post season.
53	Euc Tree	F=U M=U	1 May	Hatch (Split)	6 Jun	3	3 (2)	3 gg:ab	Bumpout, Mini-exclosure	On 7 June, brood moves from nest through closed buffer area into 7 exclosure. Brood raised on 7 exclosure shoreline. Brood last seen with 3 chicks on 8 June at 1 and 2 days old.
54	6	F= M=	25 Apr	Abandoned pre-term	10 May	3	0 (0)		Exclosure	Two eggs with no sign of fertilization and 1 egg with an approximately 1-week-old embryo when contents examined post season.
55	8	F=U M=vg:wo	30 Apr	Depredated, raven	8 May	3	0 (0)		Exclosure	
56	Euc Tree	F= M=U	30 Apr	Depredated, raven	6 May	3	0 (0)		Bumpout, Symbolic fence	
57	7	F= M=	2 May	Depredated, raven	8 May	≥2	0 (0)		Exclosure	
58	Foredune	F= M=vw:ra	26 Apr	Depredated, avian	6 May	3	0 (0)		Nonpredator fence	Nest considered depredated by avian predator with raven suspected.
59	Foredune	F=n?:y? M=l:y/g	1 May	Failed, unknown cause	11 May	3	0 (0)		Bumpout, Nonpredator fence	On 10 May, 3 eggs present and nest last seen incubated on 11 May. On 11 May, no eggs at nest. Lost during period of nest loss to raven.

Appendix B. Snowy plover nests at ODSVRA in 2023 (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
60	ORA	F= M=	4 May	Abandoned pre-term	9 May	1	0 (0)		Nonpredator fence, Symbolic fence	Nest established east of 7 enclosure. On 9 May, 1 egg becoming partially buried and never seen previously or subsequently attended by adult. Determined abandoned pre-term and taken to Santa Barbara Zoo on 11 May (see Table F.6 in Appendix F).
61	BY	F= M=	na	Abandoned pre-term	8 May	1	0 (0)		Exclosure	No sign of fertilization in egg when contents examined post season.
62	Foredune	F=ga:py M=	19 Apr	Failed, eggs removed by staff	1 Jul	3	0 (0)		Bumpout, Symbolic fence, Nonpredator fence	Nest was observed incubated for 59 days from 4 May to 1 July. On 1 July 3 eggs removed by staff, in consultation with USFWS, to give adults opportunity to renest. Two eggs with no sign of fertilization and 1 egg with an approximately 3-week-old embryo when contents examined post season.
63	6	F=rr:ao M=	28 Apr	Depredated, raven	8 May	3	0 (0)		Exclosure	
64	7	F= M=	4 May	Depredated, raven	22 May	3	0 (0)		Exclosure	
65	Euc North	F=ga:bo M=U	2 May	Hatch	3 Jun	3	3 (1)	3 gg:ga	Mini-exclosure, Symbolic fence	On 4 June, brood moves through closed buffer area from nest and into 6 enclosure. Brood raised on 7 enclosure shoreline. Brood last seen with 3 chicks on 7 June at 4 days old. On 8 June, 1 chick likely depredated by kestrel on 7 enclosure shoreline (see Table H.5 in Appendix H). Brood last seen with 2 chicks on 9 June at 6 days old.
66	7	F=U M=U	na	Depredated	9 May	≥1	0 (0)		Exclosure	On 8 May, 1 egg present. On 12 May, no eggs at nest and depredated eggshell fragments found 85 feet away. Lost during period of nest loss to raven.
67	7	F= M=	3 May	Depredated	8 May	3	0 (0)		Exclosure	On 7 May, 3 eggs present and nest last seen incubated. On 8 May, no eggs at nest. Lost during period of nest loss to raven.
68	SOF	F= M=	na	Wind	8 May	≥1	0 (0)		Symbolic fence	No sign of fertilization in egg when contents examined post season.
69	SOF	F= M=	7 May	Depredated, raven	16 May	3	0 (0)		Symbolic fence	
70	6	F=U M=	5 May	Depredated, raven	16 May	3	0 (0)		Exclosure	
71	6	F=U M=U	8 May	Depredated, raven	22 May	3	0 (0)		Exclosure	
72	6	F=U M=	na	Depredated, avian	14 May	2	0 (0)		Symbolic fence	Nest considered depredated by avian predator with raven suspected.
73	6	F=U M=U	10 May	Hatch	12 Jun	3	3 (2)	3 unbanded	Circular, Symbolic fence	
74	NOF	F=ga:ry M=	8 May	Depredated, raven	14 May	3	0 (0)		Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2023 (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
75	Foredune	F= M=U	21 Apr	Hatch (Split)	23 May	3	3 (1)	3 unbanded	Nonpredator fence	
76	BY	F=U M=U	11 May	Hatch	12 Jun	3	2 (1)	2 bb:vg	Mini-exclosure, Exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization in egg when contents examined post season.
77	Foredune	F=U M=U	17 Apr	Hatch	19 May	3	1 (0)	1 gg:ar	Nonpredator fence	Two eggs abandoned post-term. No sign of fertilization in both eggs when contents examined post season.
78	Foredune	F=ga:wy M=U	12 May	Hatch	13 Jun	3	1 (1)	1 bb:pg	Bumpout, Mini-exclosure, Symbolic fence, Nonpredator fence	Two eggs (without cracks) abandoned post-term. No sign of fertilization in both eggs when contents examined post season.
79	6	F=U M=U	28 Apr	Hatch	30 May	2	1 (0)	1 pg:og	Circular, Symbolic fence	One egg abandoned post-term. On 1 June, a 2-day-old chick was taken to the Santa Barbara Zoo for captive-rearing (see Table F.6 in Appendix F).
80	SOF	F=U M=U	10 May	Hatch	11 Jun	2	1 (1)	1 unbanded	Symbolic fence	On 14 May, symbolic fence moved west to decrease possible pedestrian disturbance. On 16 May, nest found overwashed by tide and both eggs displaced 20-30 feet from original nest bowl, 1 egg was in active bowl and 1 egg appeared unattended. On 18 May, 1 egg moved 4 inches out from under log 10 feet away from nest bowl. On 8 June, 2 eggs approximately 4 feet apart with adult alternating between both eggs to incubate, and eggs repositioned together in nest bowl. One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
81	7	F= M=r:w/y	15 May	Depredated, raven	19 May	2	0 (0)		Exclosure	
82	8	F= M=	15 May	Depredated, raven	20 May	2	0 (0)		Exclosure	
83	BY	F= M=	1 May	Depredated, coyote	24 May	3	0 (0)		Exclosure	
84	Foredune	F= M=	na	Depredated, avian	22 May	1	0 (0)		Symbolic fence	Nest considered depredated by avian predator with raven suspected.
85	Foredune	F= M=pg:br	16 May	Hatch	17 Jun	2	1 (1)	1 unbanded	Circular, Symbolic fence	On 5 June, circular exclosure found overwashed by tide and the two eggs displaced 4 and 8 feet outside of exclosure (and 4 feet apart). One of the eggs is in an active bowl. Second egg is unattended and moved to this bowl. On 7 June, circular repositioned over nest. One egg unknown fate.
86	Foredune	F= M=	9 May	Depredated, raven	23 May	3	0 (0)		Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2023 (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	Foredune	F=U M=U	3 May	Hatch	4 Jun	2	1 (1)	1 unbanded	Circular, Symbolic fence	One egg unknown fate.
88	Foredune	F=banded M=	3 May	Depredated, raven	25 May	3	0 (0)		Symbolic fence	
89	Unknown	F= M=bb:or	na	Hatch	(12 May)	3	3 (2)	3 unbanded		On 17 May, found as a brood of 3 unbanded chicks on South Oso Flaco shoreline.
90	8	F= M=	10 May	Depredated, raven	18 May	3	0 (0)		Exclosure	
91	6	F= M=	na	Unknown	na	≥1	0 (0)		Exclosure	From 17-19 May, 1 egg present at nest. On 22 May, 1 egg found buried at nest bowl, egg marked and reset. No evidence of adult attendance subsequently. No sign of fertilization in egg when contents examined post season.
92	7	F= M=	17 May	Depredated, raven	1 Jun	2	0 (0)		Exclosure	
93	8	F= M=	na	Depredated, raven	19 May	1	0 (0)		Symbolic fence	
94	Foredune	F=U M=U	7 May	Hatch	8 Jun	3	1 (0)	1 unbanded	Circular, Symbolic fence	Two eggs abandoned post-term. No sign of fertilization in both eggs when contents examined post season.
95	8	F=U M=	17 May	Depredated, raven	22 May	3	0 (0)		Exclosure	
96	Foredune	F=U M=vv:ra	12 May	Hatch	13 Jun	3	3 (2)	3 bb:av	Nonpredator fence	
97	7	F= M=	na	Depredated, raven	18 May	2	0 (0)		Symbolic fence	
98	6	F=gg:(oa?) M=rr:ga	10 May	Hatch	11 Jun	3	2 (2)	2 gg:vb	Circular, Symbolic fence	One egg unknown fate.
99	6	F=rr:ao M=bb:pg	18 May	Hatch (Split)	20 Jun	3	3 (1)	3 unbanded	Circular, Symbolic fence	On 8 June, associated female observed depredated by kestrel (see Table H.5 in Appendix H).
100	6	F= M=	na	Depredated, raven	21 May	≥2	0 (0)		Symbolic fence	
101	7	F= M=	na	Unknown	22 May	≥2	0 (0)		Exclosure	On 19 May, nest found with 2 eggs and was last seen incubated the same day. On 22 May, no eggs at nest. Nest fate occurred during period of nest loss to raven.
102	6	F=U M=U	18 May	Hatch	19 Jun	3	3 (3)	3 pv:ab	Mini-exclosure, Exclosure	On 1 June, female observed with blood on underside of body and spots of dried blood present at nest. On 28 July, juvenile found dead on 6 exclosure shoreline (see Table H.2 and H.6 in Appendix H).
103	6	F=U M=U	16 May	Hatch	17 Jun	3	3 (2)	3 rr:pg	Exclosure	
104	SOF	F=U? M=	na	Unknown	na	≥1	0 (0)		Symbolic fence	On 20 May, nest found as 1 egg in active nest bowl in location that would likely have been undetected previously. Nest never observed attended. No sign of fertilization in egg when contents examined post season.

Appendix B. Snowy plover nests at ODSVRA in 2023 (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
105	Foredune	F=U M=	12 May	Abandoned pre-term	30 May	3	0 (0)		Nonpredator fence	On 30 May, 3 eggs determined abandoned pre-term and taken to Santa Barbara Zoo on 3 June (see Table F.6 in Appendix F).
106	Foredune	F=U M=U	5 May	Hatch	6 Jun	3	2 (2)	2 bb:ay	Bumpout, Mini-exclosure, Symbolic fence, Nonpredator fence	On 29 May, 1 egg missing pre-term.
107	Foredune	F=U M=rr:ya	13 May	Hatch	14 Jun	3	1 (1)	1 bb:wy	Nonpredator fence	On 11 June, 1 egg missing pre-term. One egg (without cracks) abandoned post-term.
108	6	F=rr:oy M=ga:br	14 May	Hatch	15 Jun	3	3 (2)	2 bb:rg 1 unbanded	Mini-exclosure, Exclosure	Two banded chicks fledged.
109	CBA	F=bb:yy M=pv:gb	8 May	Hatch	9 Jun	3	3 (3)	3 ga:ya	Mini-exclosure, Nonpredator fence	Nest established in Foreddune closure alleyway. Brood raised on Foreddune closure shoreline.
110	Unknown	F=U M=nb:rr	na	Hatch	(19 May)	3	3 (1)	3 bb:wb		On 21 May, found as brood of 3 unbanded chicks on Foreddune closure shoreline. On 30 May and 3 June, 2 chicks likely depredated by kestrel (see Table H.5 in Appendix H).
111	Foredune	F=U M=	8 May	Overwash by tide	5 Jun	3	0 (0)		Symbolic fence	
112	6	F= M=	8 May	Depredated, raven	25 May	3	0 (0)		Exclosure	On 25 May, 2 eggs depredated by raven and remaining egg not seen incubated subsequently.
113	6	F= M=ga:pv	6 May	Hatch	7 Jun	3	2 (2)	2 bb:aw	Exclosure	One egg (without cracks) abandoned post-term.
114	Unknown	F= M=U	na	Hatch	(22 May)	3	3 (2)	3 unbanded		On 23 May, found as brood of 2 small, unbanded chicks in Foreddune closure. Three chicks seen with brood beginning 27 May.
115	Foredune	F=U M=	8 May	Depredated, raven	27 May	3	0 (0)		Symbolic fence	
116	6	F=U M=ga:wb	21 May	Hatch (Split)	22 Jun	3	3 (1)	3 ga:rw	Exclosure	
117	6	F= M=	na	Depredated, raven	25 May	3	0 (0)		Exclosure	
118	6	F=U M=U	22 May	Hatch (Split)	23 Jun	3	3 (3)	2 vg:va 1 unbanded	Exclosure	
119	7	F=rr:wo M=U	24 May	Hatch	25 Jun	3	3 (2)	3 unbanded	Exclosure	
120	6	F=U M=w:-s-	19 May	Hatch (Split)	20 Jun	3	3 (2)	2 vg:gw 1 unbanded	Mini-exclosure, Exclosure	On 26 May, 1 egg with faint inward dent. One banded and 1 unbanded chick fledged.
121	Foredune	F= M=	na	Unknown	na	≥1	0 (0)		Bumpout, Nonpredator fence	On 25 May, nest found as 1 egg in location that would likely have been undetected for a long enough period to hatch. Nest never observed attended. Egg missing on 1 June.
122	Foredune	F=U M=U	10 May	Hatch (Split)	11 Jun	3	3 (3)	3 gg:bv	Mini-exclosure, Nonpredator fence	
123	7	F=U M=U	25 May	Overwash by tide	2 Jun	2	0 (0)		Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2023 (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
124	7	F=rr:ry M=ga:yo	16 May	Hatch	17 Jun	3	2 (2)	2 vg:bg	Exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization in egg when contents examined post season. Female observed with left leg injury on 18 and 20 June (see Table H.2 in Appendix H).
125	6	F=U M=ga:wr	20 May	Hatch	21 Jun	3	2 (0)	2 unbanded	Mini-exclosure, Exclosure	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
126	Foredune	F=U M=	13 May	Hatch	14 Jun	3	1 (1)	1 unbanded	Circular, Symbolic fence	Two eggs unknown fate.
127	BY	F= M=	19 May	Depredated, raven	27 May	2	0 (0)		Exclosure	
128	BY	F=bb:ww M=U	15 May	Hatch	16 Jun	3	3 (3)	3 bb:gv	Mini-exclosure, Exclosure	On 12 June, Brewer's blackbird lands on the mini-exclosure, banded female flies from nest into side of mini-exclosure, then runs out of exclosure and displays. Blackbird leaves, female returns to nest and is subsequently seen without injury.
129	7	F=banded M=U	19 May	Hatch (Split)	20 Jun	3	3 (3)	3 ga:bv	Mini-exclosure, Exclosure	On 20 June, 2 eggs and 1 chick inside the mini-exclosure were only 6 inches from edge of the exclosure. All moved to center of mini-exclosure.
130	6	F= M=pg:or	24 May	Hatch	25 Jun	3	2 (1)	2 unbanded	Exclosure	One egg unknown fate.
131	CBA	F=U M=a:g/o/g	27 May	Hatch	26 Jun	2	2 (1)	2 vg:vb	Mini-exclosure, Symbolic fence, Nonpredator fence	Nest established east of 7 exclosure just inside the single next exclosure for inactive SP28 nest. Brood last seen with 2 chicks on day of hatch moving into Eucalyptus Tree revegetation area. Remaining chick raised on 8 exclosure shoreline beginning 28 June.
132	8	F=vg:ra M=	20 May	Overwash by tide	5 Jun	3	0 (0)		Circular, Symbolic fence	
133	Unknown	F= M=vg:rw	na	Hatch	(26 May)	3	3 (1)	3 unbanded		On 28 May, found as brood of 3 unbanded chicks on 8 exclosure shoreline.
134	Foredune	F=ow:wr M=U	24 May	Hatch (Split)	25 Jun	3	3 (0)	2 bb:vr 1 gg:rg	Bumpout, Nonpredator fence	On 29 June, a turkey vulture seen eating a cormorant carcass on Fore dune North shoreline and associated adult displays and leads 2 chicks away from area. Vulture flushed and 1 chick found crouched and unattended near carcass. The unattended chick was placed in brooder, warmed, banded gg:rg, and reunited with adult and 2 chicks.
135	Foredune	F= M=vg:yr	na	Failed, eggs removed by staff	18 Jul	3	0 (0)		Nonpredator fence	Nest incubated for 49 days from 30 May to 18 July. On 18 July, 3 eggs collected post-term. No sign of fertilization in all 3 eggs when contents examined post season.
136	7	F= M=pg:ow	26 May	Hatch	27 Jun	3	2 (2)	2 vv:ba	Exclosure	One egg (without cracks) abandoned post-term.

Appendix B. Snowy plover nests at ODSVRA in 2023 (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
137	Euc North	F=U M=U	19 May	Hatch	20 Jun	3	3 (1)	3 vg:ww	Mini-exclosure, Symbolic fence	On 21 June, brood moves through closed buffer area from nest into 6 exclosure. Brood raised on 6 exclosure shoreline beginning 21 June. Brood last seen with 3 chicks on 25 June at 5 days old and with 2 chicks on 26 June at 6 days old.
138	Foredune	F= M=U	na	Overwash by tide	5 Jun	2	0 (0)		Symbolic fence	
139	8	F=U M=rr:aw	27 May	Hatch	28 Jun	3	3 (1)	3 unbanded	Circular, Symbolic fence	On 21 July, a 23-day-old chick from SP139 broods with female incubating at SP206 nest.
140	SOF	F=gg:ag M=U	24 May	Overwash by tide	5 Jun	3	0 (0)		Symbolic fence	
141	7	F=U M=U	31 May	Hatch	2 Jul	3	3 (2)	3 vv:gb	Exclosure	
142	7	F=U M=banded	19 May	Hatch (Split)	20 Jun	3	3 (0)	3 unbanded	Exclosure	
143	7	F=U M=U	1 Jun	Hatch	3 Jul	3	3 (2)	3 bb:oo	Exclosure	One 2-day-old chick of the SP143 nest adopted by SP242 male beginning 5 July and it fledged.
144	NOF	F= M=gg:rb	25 May	Hatch	26 Jun	3	2 (2)	2 unbanded	Mini-exclosure, Exclosure	One egg unknown fate.
145	6	F=vv:ar M=U	22 May	Hatch	23 Jun	2	1 (0)	1 unbanded	Exclosure	One egg abandoned post-term. Approximately 3.5-week-old embryo in egg when contents examined post season.
146	NOF	F=U M=U	30 May	Hatch (Split)	1 Jul	3	2 (0)	2 unbanded	Mini-exclosure, Exclosure	One egg unknown fate.
147	Foredune	F=U M=pv:pb	29 May	Hatch (Split)	30 Jun	3	3 (2)	3 vv:bb	Nonpredator fence	
148	6	F=U M=U	30 May	Hatch	1 Jul	3	2 (1)	2 unbanded	Exclosure	On 5 June, nest found with 2 eggs at nest and 1 egg 3 feet northwest of nest with inward dent and crack from pointed end to base of egg. Cracked egg last seen near nest 1 July with the 2 hatched chicks and assumed not to have hatched.
149	Foredune	F=U M=U	2 Jun	Hatch (Split)	4 Jul	3	3 (0)	3 unbanded	Symbolic fence	
150	SOF	F=U M=pv:vb	2 Jun	Hatch	4 Jul	3	2 (2)	2 unbanded	Circular, Symbolic fence	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
151	Unknown	F= M=U	na	Hatch	(20 May)	≥2	2 (0)	2 unbanded		On 25 May, found as brood of 2 unbanded chicks on 8 exclosure shoreline. On 30 May, one chick possibly depredated by kestrel (see Table H.5 in Appendix H).
152	6	F=yp:ga M=U	2 Jun	Hatch (Split)	4 Jul	3	3 (3)	3 ga:go	Exclosure	
153	6	F=U M=bb:bw	21 May	Hatch	22 Jun	3	3 (3)	3 unbanded	Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2023 (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
154	Foredune	F=U M=	18 May	Hatch	19 Jun	3	1 (0)	1 unbanded	Nonpredator fence	Two eggs abandoned post-term, only 1 egg present on day collected. No sign of fertilization in egg when contents examined post season.
155	6	F=U M=U	1 Jun	Hatch	3 Jul	3	3 (0)	3 vg:rb	Exclosure	
156	7	F=y:a/r M=U	23 May	Hatch	24 Jun	3	3 (1)	3 unbanded	Exclosure	
157	7	F=U M=U	6 Jun	Hatch (Split)	8 Jul	3	3 (0)	3 unbanded	Exclosure	
158	6	F=U M=pg:ba	5 Jun	Hatch (Split)	7 Jul	3	3 (1)	2 gg:wg 1 unbanded	Exclosure	One banded chick fledged.
159	6	F=U M=rr:yo	3 Jun	Hatch	5 Jul	3	3 (0)	3 vg:bb	Exclosure	
160	6	F=bb:bb M=rr:ra	6 Jun	Hatch (Split)	9 Jul	3	2 (1)	2 ga:vv	Exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization in egg when contents examined post season.
161	Foredune	F=U M=pg:yr	2 Jun	Hatch (Split)	4 Jul	3	3 (3)	3 unbanded	Symbolic fence	
162	6	F=U M=	12 Jun	Hatch (Split)	24 Jul	3	2 (1)	2 pg:bw	Exclosure	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
163	6	F=vv:rv M=n:oy	8 Jun	Hatch	10 Jul	3	3 (3)	3 vg:vv	Exclosure	
164	BY	F=U M=nw:yw	8 Jun	Hatch	10 Jul	3	3 (2)	3 bb:ya	Mini-exclosure, Exclosure	
165	8	F=U M=ga:ga	7 Jun	Hatch (Split)	9 Jul	3	3 (2)	3 unbanded	Mini-exclosure, Exclosure	
166	Foredune	F=o:a/b/a M=gg:gg	24 May	Hatch (Split)	25 Jun	3	3 (2)	3 unbanded	Nonpredator fence	On 21 July, brood seen in the open riding area and Bigfoot revegetation area.
167	8	F=U M=U	2 Jun	Hatch	4 Jul	3	3 (3)	3 vv:gg	Symbolic fence	
168	6	F=U M=U	8 Jun	Hatch (Split)	10 Jul	3	3 (0)	3 unbanded	Symbolic fence	
169	Unknown	F=U M=U	na	Hatch	(27 May)	3	3 (2)	3 unbanded		On 30 May, found as brood of 3 unbanded chicks on 6 exclosure shoreline.
170	Unknown	F=U M=U	na	Hatch	(29 May)	3	3 (2)	3 unbanded		On 1 June, found as brood of 2 small unbanded chicks on 6 exclosure shoreline. Three chicks seen with brood beginning 4 June.
171	Unknown	F=bb:bb M=U	na	Hatch	(28 May)	≥2	2 (1)	2 pg:ro		On 30 May, found as brood of 2 unbanded chicks on 7 exclosure shoreline.
172	NOF	F=U M=U	11 Jun	Hatch	13 Jul	3	1 (0)	1 unbanded	Exclosure	One egg unknown fate and 1 egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
173	Unknown	F=U M=U	na	Hatch	(5 Jun)	3	3 (2)	3 unbanded		On 8 June, found as brood of 3 unbanded chicks on 7 exclosure shoreline.
174	Unknown	F=U M=ga:ob	na	Hatch	(6 Jun)	≥2	2 (2)	2 bb:pw		On 9 June, found as brood of 2 unbanded chicks on 7 exclosure shoreline.

Appendix B. Snowy plover nests at ODSVRA in 2023 (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
175	Foredune	F=U M=U	21 May	Hatch	22 Jun	3	3 (0)	3 unbanded	Nonpredator fence	
176	7	F=U M=U	7 Jun	Hatch	9 Jul	3	3 (2)	3 gg:vv	Exclosure	
177	7	F= M=(U)?	20 May	Hatch	21 Jun	3	1 (0)	1 unbanded	Exclosure	Two eggs unknown fate.
178	Foredune	F=U M=vv:ga	30 May	Hatch	1 Jul	3	3 (3)	3 unbanded	Nonpredator fence	
179	SOF	F=gg:ag M=U	7 Jun	Failed, unknown cause	21 Jun	3	0 (0)		Symbolic fence	Two eggs missing pre-term and one egg abandoned pre-term. No sign of fertilization in egg when contents examined post season.
180	Foredune	F=U M=	30 May	Wind	28 Jun	3	0 (0)		Nonpredator fence	
181	Foredune	F=U M=U	28 May	Hatch	29 Jun	2	2 (0)	2 unbanded	Nonpredator fence	
182	8	F= M=	7 Jun	Depredated, coyote	24 Jun	3	0 (0)		Exclosure	
183	8	F=vg:ra M=U	9 Jun	Hatch	11 Jul	3	2 (0)	2 unbanded	Symbolic fence	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
184	Foredune	F= M=U	30 May	Hatch	1 Jul	3	3 (2)	3 unbanded	Nonpredator fence	
185	Foredune	F=U M=U	11 Jun	Hatch	13 Jul	3	3 (0)	3 ga:gw	Symbolic fence	
186	7	F=rr:ra M=U	6 Jun	Hatch	8 Jul	3	3 (2)	3 unbanded	Symbolic fence	
187	6	F=U M=U	13 Jun	Hatch	15 Jul	3	3 (1)	3 gg:vw	Symbolic fence	
188	Foredune	F=U (dark) M=rr:yr	17 Jun	Hatch (Split)	19 Jul	3	3 (2)	3 pv:gg	Nonpredator fence	On 19 July, nest of 3 eggs repositioned 2 feet away of encroaching sand dune.
189	Foredune	F=U M=nb:rr	18 Jun	Hatch (Split)	20 Jul	3	3 (0)	2 pg:wb 1 unbanded	Symbolic fence	
190	7	F= M=banded	26 May	Hatch (Split)	27 Jun	≥2	2 (0)	2 unbanded	Exclosure	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.
191	Foredune	F=U M=U	16 Jun	Hatch	18 Jul	3	2 (0)	2 unbanded	Symbolic fence	One egg unknown fate.
192	Foredune	F= M=U	14 Jun	Hatch (Split)	16 Jul	3	3 (1)	3 unbanded	Symbolic fence	
193	6	F=bb:yy M=pg:yw	19 Jun	Hatch	21 Jul	3	1 (1)	1 unbanded	Exclosure	Two eggs (without cracks) abandoned post-term. No sign of fertilization in both eggs when contents examined post season.
194	7	F=rr:bb M=U	4 Jun	Hatch (Split)	6 Jul	3	3 (3)	3 unbanded	Symbolic fence	
195	7	F=U M=U	23 Jun	Hatch	25 Jul	3	3 (0)	3 pg:gb	Symbolic fence	
196	NOF	F=U M=gn:ya	12 Jun	Hatch (Split)	14 Jul	2	2 (2)	2 unbanded	Circular, Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2023 (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
197	SOF	F=U M=U	11 Jun	Hatch	13 Jul	3	2 (2)	2 gg:rw	Circular, Symbolic fence	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season. Associated male adopted a 16-day-old chick from SP198 brood and an approximately 14-day-old chick from SP250 beginning 27 July.
198	SOF	F=ga:bo M=bb:or	9 Jun	Hatch	11 Jul	3	3 (1)	3 gg:yg	Symbolic fence	One 16-day-old chick of the SP198 nest adopted by SP197 male beginning 27 July and not seen to fledge.
199	Foredune	F=U M=U	17 Jun	Hatch	19 Jul	3	3 (1)	3 vv:wb	Symbolic fence	On 22 July, brood seen in the open riding area and Bigfoot revegetation area. From 23-29 July, brood seen in closed buffer area (1 occasion) and in Bigfoot revegetation area east of the closed buffer area (3 occasions). From 6 August to 11 September, 1 vv:wb chick and then fledgling observed on Fore dune closure shoreline with left leg injury (see Table H.2 in Appendix H).
200	7	F=ga:av M=U	28 Jun	Hatch	30 Jul	3	2 (1)	2 vv:vb	Symbolic fence	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
201	Foredune	F=banded M=U	26 Jun	Hatch	28 Jul	2	2 (2)	2 ga:yw	Symbolic fence	
202	6	F=U M=pg:ba	29 Jun	Hatch	31 Jul	3	2 (2)	2 unbanded	Symbolic fence	One egg unknown fate.
203	6	F=gg:oa M=U	18 Jun	Hatch	20 Jul	3	2 (2)	2 unbanded	Symbolic fence	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
204	8	F=banded M=U	29 Jun	Hatch	31 Jul	3	3 (2)	3 ga:yg	Symbolic fence	
205	6	F=U M=U	24 Jun	Hatch	26 Jul	3	1 (1)	1 vv:vv	Symbolic fence	Two eggs abandoned post-term. No sign of fertilization in both eggs when contents examined post season.
206	8	F=U M=rr:aw	4 Jul	Hatch	11 Aug	3	2 (1)	2 unbanded	Symbolic fence	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season. On 21 July, a 23-day-old chick from SP139 broods with female incubating at SP206 nest.
207	8	F= M=vg:yg	28 Jun	Hatch	30 Jul	3	2 (1)	1 ga:ao 1 unbanded	Symbolic fence	On 25 July, one egg with inward dent and visible yolk. One egg unknown fate. Banded chick fledged.
208	Foredune	F=rr:ay M=ga:bg	13 Jun	Hatch	15 Jul	3	3 (0)		Symbolic fence	
209	Foredune	F=banded M=U	5 Jul	Hatch	6 Aug	3	1 (1)	1 gg:gy	Symbolic fence	Two eggs (without cracks) abandoned post-term. No sign of fertilization in both eggs when contents examined post season.
210	SOF	F=U M=U	4 Jul	Hatch	5 Aug	3	3 (3)	2 ga:pw 1 unbanded	Symbolic fence	
211	7	F=U M=U	29 Jun	Hatch (Split)	31 Jul	3	3 (2)	2 pg:ga 1 unbanded	Symbolic fence	One banded and one unbanded chick fledged.

Appendix B. Snowy plover nests at ODSVRA in 2023 (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
212	BY	F=U M=rr:wr	22 Jun	Hatch	24 Jul	3	3 (1)	3 unbanded	Exclosure	
213	BY	F=U M=gg:wo	13 Jun	Hatch	15 Jul	3	2 (1)	2 gg:br	Exclosure	On 13 July, pip portion of egg broke off during handling, exposing membrane with small tear and visible chick. Egg placed back in nest bowl. One egg unknown fate.
214	SOF	F=banded M=	20 Jun	Vandalism	19 Jul	3	0 (0)		Circular, Symbolic fence	Nest last observed incubated on 18 July. On 20 July, circular exclosure damaged and eggs missing.
215	6	F=U M=ga:ob	5 Jul	Hatch (Split)	6 Aug	3	3 (2)	3 gg:ya	Symbolic fence	On 27 August, 1 chick depredated by peregrine on 6 exclosure shoreline (see Table H.5 in Appendix H).
216	6	F=U M=ga:pv	7 Jul	Hatch	8 Aug	3	3 (3)	2 gg:ow 1 unbanded	Symbolic fence	
217	6	F=U M=ga:pr	23 Jun	Hatch	25 Jul	3	3 (0)	3 unbanded	Exclosure	
218	Foredune	F=U M=U	4 Jul	Hatch	5 Aug	3	1 (1)	1 ga:wg	Symbolic fence	Two eggs (without cracks) abandoned post-term. No sign of fertilization in both eggs when contents examined post season.
219	6	F=U M=U	15 Jul	Abandoned pre-term	4 Aug	2	0 (0)		Symbolic fence	Approximately 1.5- and 2-week-old embryos in eggs when contents examined post season.
220	SOF	F=pv:by M=gg:wo	25 Jun	Hatch	27 Jul	3	3 (2)	3 pg:aa	Symbolic fence	
221	6	F=U M=rr:pa	3 Jul	Hatch	4 Aug	2	2 (1)	2 unbanded	Exclosure	
222	Foredune	F=banded M=U	13 Jul	Hatch	14 Aug	2	2 (2)	2 gg:pw	Symbolic fence	On 12 September, 1 fledgling depredated by peregrine on 6 exclosure shoreline (see Table H.5 in Appendix H).
223	7	F=U M=	na	Abandoned, unknown if pre- or post-term	na	3	0 (0)		Symbolic fence	On 8 September, nest found as 3 eggs abandoned, unknown if pre- or post-term. No sign of fertilization in all 3 eggs when contents examined post season.
224	Foredune	F=U M=	na	Abandoned, unknown if pre- or post-term	na	3	0 (0)		Symbolic fence	On 14 September, nest found as 3 eggs abandoned, unknown if pre- or post-term. Two eggs with no sign of fertilization and 1 egg with an approximately 1-week-old embryo when contents examined post season.
225	7	F=U M=	na	Unknown	na	≥2	0 (0)		Symbolic fence	On 16 September, nest found as 2 eggs abandoned, unknown if pre- or post-term. Approximately 2-week-old embryo in both eggs when contents examined post season.
226	Unknown	F=U M=ga:ba	na	Hatch	(12 Jun)	≥2	2 (2)	2 unbanded		On 14 June, found as brood of 2 unbanded chicks on Fore dune closure shoreline.
227	Unknown	F=U M=U	na	Hatch	(18 Jun)	≥2	2 (2)	2 unbanded		On 23 June, found as brood of 2 unbanded chicks on 8 exclosure shoreline.
228	Unknown	F=banded M=U	na	Hatch	(20 Jun)	3	3 (2)	3 unbanded		On 22 June, found as brood of 3 unbanded chicks in 6 exclosure.

Appendix B. Snowy plover nests at ODSVRA in 2023 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (no. fledged)	No. chicks banded and combination	Nest protection type	Notes
229	Unknown	F=ga:ry M=U	na	Hatch	(20 Jun)	3	3 (3)	3 unbanded		On 23 June, found as brood of 3 unbanded chicks on North Oso Flaco shoreline.
230	Unknown	F= M=U	na	Hatch	(20 Jun)	3	3 (2)	3 unbanded		On 24 June, found as brood of 3 unbanded chicks on 6 enclosure shoreline.
231	Unknown	F=U M=U	na	Hatch	(22 Jun)	3	3 (2)	2 unbanded		On 22 June, found as a brood of 2 small unbanded chicks in 6 enclosure. On the same day, a third unbanded chick, believed to be from the same brood, was found immobile in 6 enclosure. The unattended chick was placed in brooder, and taken to Santa Barbara Zoo (see Table F.6 in Appendix F).
232	Unknown	F=ny:gv M=U	na	Hatch	(24 Jun)	≥2	2 (1)	2 unbanded		On 26 June, found as brood of 2 unbanded chicks on Foredune closure shoreline.
233	Unknown	F= M=vg:ob	na	Hatch	(24 Jun)	3	3 (3)	3 unbanded		On 28 June, found as brood of 3 unbanded chicks on 8 enclosure shoreline.
234	Unknown	F=U M=l:y/g	na	Hatch	(26 Jun)	3	3 (2)	3 unbanded		On 28 June, found as brood of 3 unbanded chicks on South Oso Flaco shoreline.
235	Unknown	F= M=ny:wg	na	Hatch	(25 Jun)	≥2	2 (2)	2 unbanded		On 29 June, found as brood of 2 unbanded chicks on 6 enclosure shoreline.
236	Unknown	F= M=U	na	Hatch	(25 Jun)	3	3 (0)	3 unbanded		On 26 June, found as brood of 3 unbanded chicks in 6 enclosure.
237	Unknown	F= M=ga:wo	na	Hatch	(28 Jun)	≥2	2 (2)	2 unbanded		On 1 July, found as brood of 2 unbanded chicks on 6 enclosure shoreline.
238	Unknown	F= M=U	na	Hatch	(28 Jun)	3	3 (2)	3 unbanded		On 3 July, found as brood of 3 unbanded chicks on 6 enclosure shoreline.
239	Unknown	F=pv:pv M=rr:bw	na	Hatch	(29 Jun)	3	3 (3)	3 unbanded		On 1 July, found as brood of 3 unbanded chicks on Foredune closure shoreline.
240	Unknown	F= M=U	na	Hatch	(29 Jun)	3	3 (1)	3 unbanded		On 3 July, found as brood of 3 unbanded chicks on Foredune closure shoreline.
241	Unknown	F= M=U	na	Hatch	(2 Jul)	3	3 (2)	3 unbanded		On 3 July, found as brood of 3 unbanded chicks on South Oso Flaco shoreline.
242	Unknown	F=rr:pw M=U	na	Hatch	(2 Jul)	3	3 (2)	3 unbanded		On 5 July, found as brood of 2 unbanded chicks on 8 enclosure shoreline. Three chicks seen with brood beginning 8 July. Associated male adopted a 2-day-old chick from SP143 brood beginning 5 July.
243	Unknown	F=bb:ar M=U	na	Hatch	(1 Jul)	≥2	2 (1)	2 unbanded		On 6 July, found as brood of 2 unbanded chicks on 7 enclosure shoreline.
244	Unknown	F=U M=U	na	Hatch	(3 Jul)	3	3 (0)	3 unbanded		On 5 July, found as brood of 3 unbanded chicks on 6 enclosure shoreline.
245	Unknown	F= M=vv:wr	na	Hatch	(5 Jul)	3	3 (2)	3 unbanded		On 7 July, found as brood of 3 unbanded chicks on 8 enclosure shoreline.
246	Unknown	F=U M=U	na	Hatch	(7 Jul)	≥2	2 (2)	2 unbanded		On 10 July, found as brood of 2 unbanded chicks on 7 enclosure shoreline.
247	Unknown	F=pg:gw M=U	na	Hatch	(10 Jul)	3	3 (3)	3 unbanded		On 12 July, found as brood of 3 unbanded chicks on 8 enclosure shoreline.
248	Unknown	F= M=pg:b-	na	Hatch	(11 Jul)	3	3 (3)	3 unbanded		On 17 July, found as brood of 3 unbanded chicks on 7 enclosure shoreline.

Appendix B. Snowy plover nests at ODSVRA in 2023 (continued).

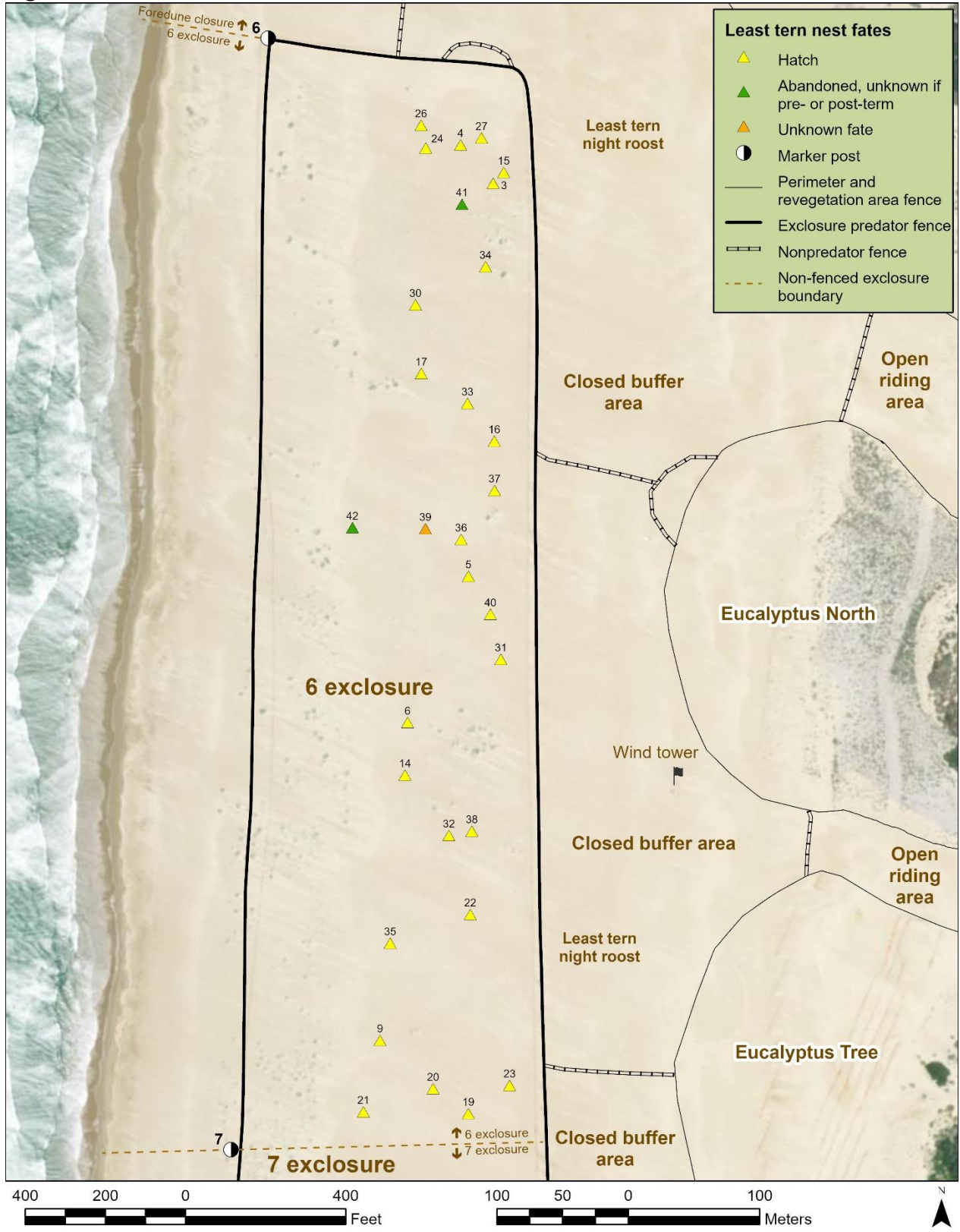
Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (no. fledged)	No. chicks banded and combination	Nest protection type	Notes
249	Unknown	F=U M=U	na	Hatch	(11 Jul)	3	3 (2)	3 unbanded		On 14 July, found as brood of 3 unbanded chicks on Fordune closure shoreline.
250	Unknown	F= M=	na	Hatch	(13 Jul)	≥1	1 (1)	1 unbanded		On 27 July, found as 1 unbanded adopted chick with SP197 male on South Oso Flaco shoreline.
251	Unknown	F=ga:wy M=	na	Hatch	(18 Jul)	≥1	1 (0)	1 unbanded		On 25 July, found as brood of 1 unbanded chick on North Oso Flaco shoreline.
252	Unknown	F= M=vq:rw	na	Hatch	(22 Jul)	3	3 (2)	3 unbanded		On 26 July, found as brood of 2 unbanded chicks on 8 enclosure shoreline. Three chicks seen with brood beginning 27 July.
253	Unknown	F= M=pg:by	na	Hatch	(21 Jul)	≥2	2 (2)	2 unbanded		On 26 July, found as brood of 1 unbanded chick on North Oso Flaco shoreline. Two chicks seen with brood beginning 26 July.
254	Unknown	F= M=U	na	Hatch	(22 Jul)	≥2	2 (2)	2 unbanded		On 2 August, found as brood of 2 unbanded chicks in South Oso Flaco.
255	Unknown	F= M=U	na	Hatch	(26 Jul)	3	3 (3)	3 unbanded		On 2 August, found as brood of 3 unbanded chicks in South Oso Flaco.
256	Unknown	F=ga:ry M=U	na	Hatch	(29 Jul)	3	3 (2)	3 unbanded		On July 31, found as brood of 3 unbanded chicks on 7 enclosure shoreline.
257	Unknown	F= M=U	na	Hatch	(7 Aug)	≥2	2 (0)	2 unbanded		On 12 August, found as brood of 2 unbanded chicks on 8 enclosure shoreline.
258	Unknown	F= M=U	na	Hatch	(5 Jul)	≥1	1 (1)	1 unbanded		On 7 July, found as brood of 1 unbanded chick on 8 enclosure shoreline.
259	Foredune	F= M=	na	Unknown	na	≥1	0 (0)		Symbolic fence	On 17 September, nest found as 1 egg abandoned, unknown if pre- or post-term. Approximately 1-week-old embryo in egg when contents examined post season.
260	7	F= M=	na	Unknown	na	≥1	0 (0)		Symbolic fence	On 8 September, nest found as 1 egg abandoned, unknown if pre- or post-term. Approximately 1-week-old embryo in egg when contents examined post season.

APPENDIX C. MAPS OF ALL CALIFORNIA LEAST TERN AND SNOWY PLOVER NEST LOCATIONS AT ODSVRA IN 2023.

Figure C.1. California least tern and snowy plover nest locations at ODSVRA in 2023.



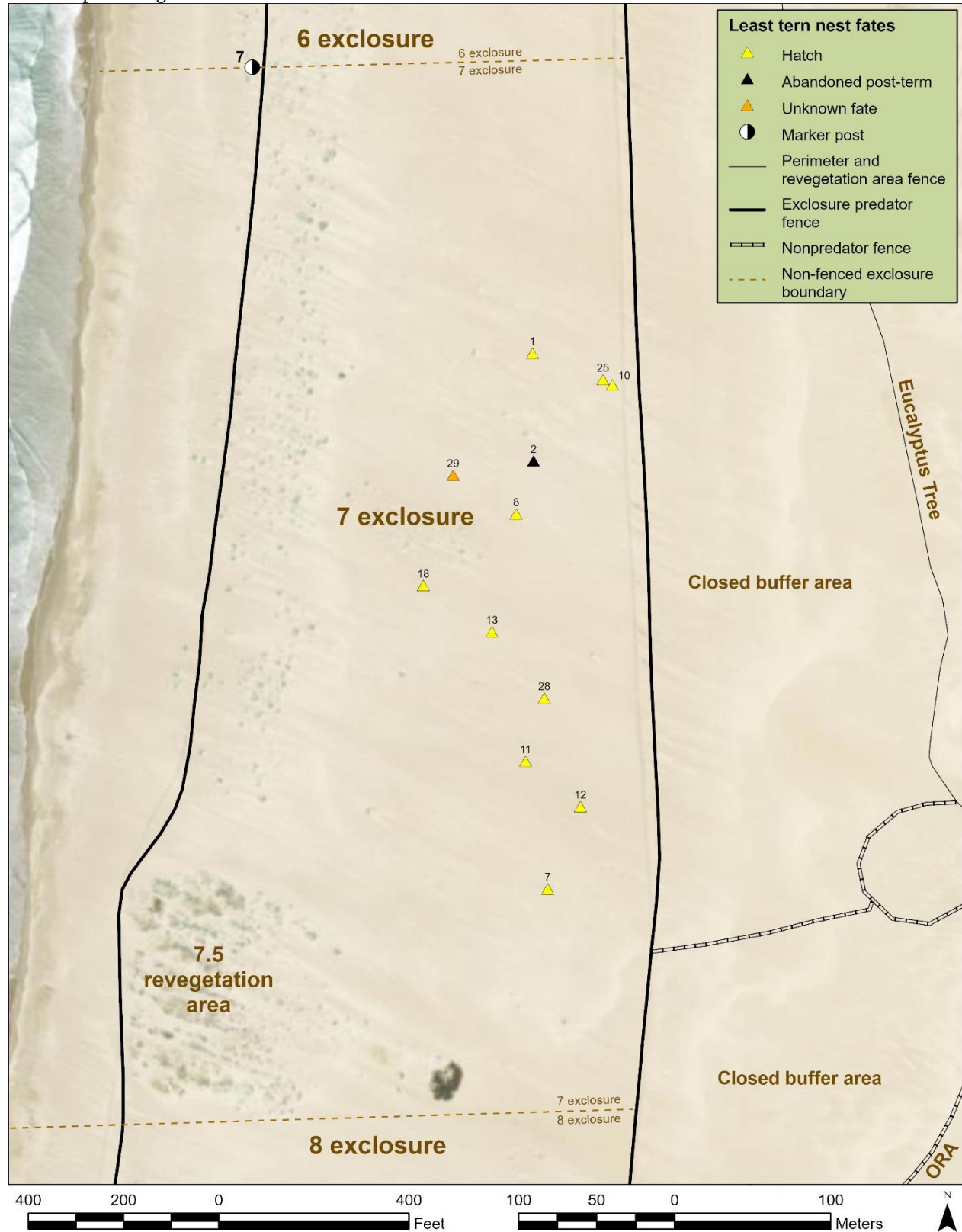
Figure C.2. California least tern nest locations at ODSVRA 6 enclosure in 2023.



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2023 (continued).

Figure C.3. California least tern nest locations at ODSVRA 7 enclosure in 2023.

ORA = open riding area



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2023 (continued).

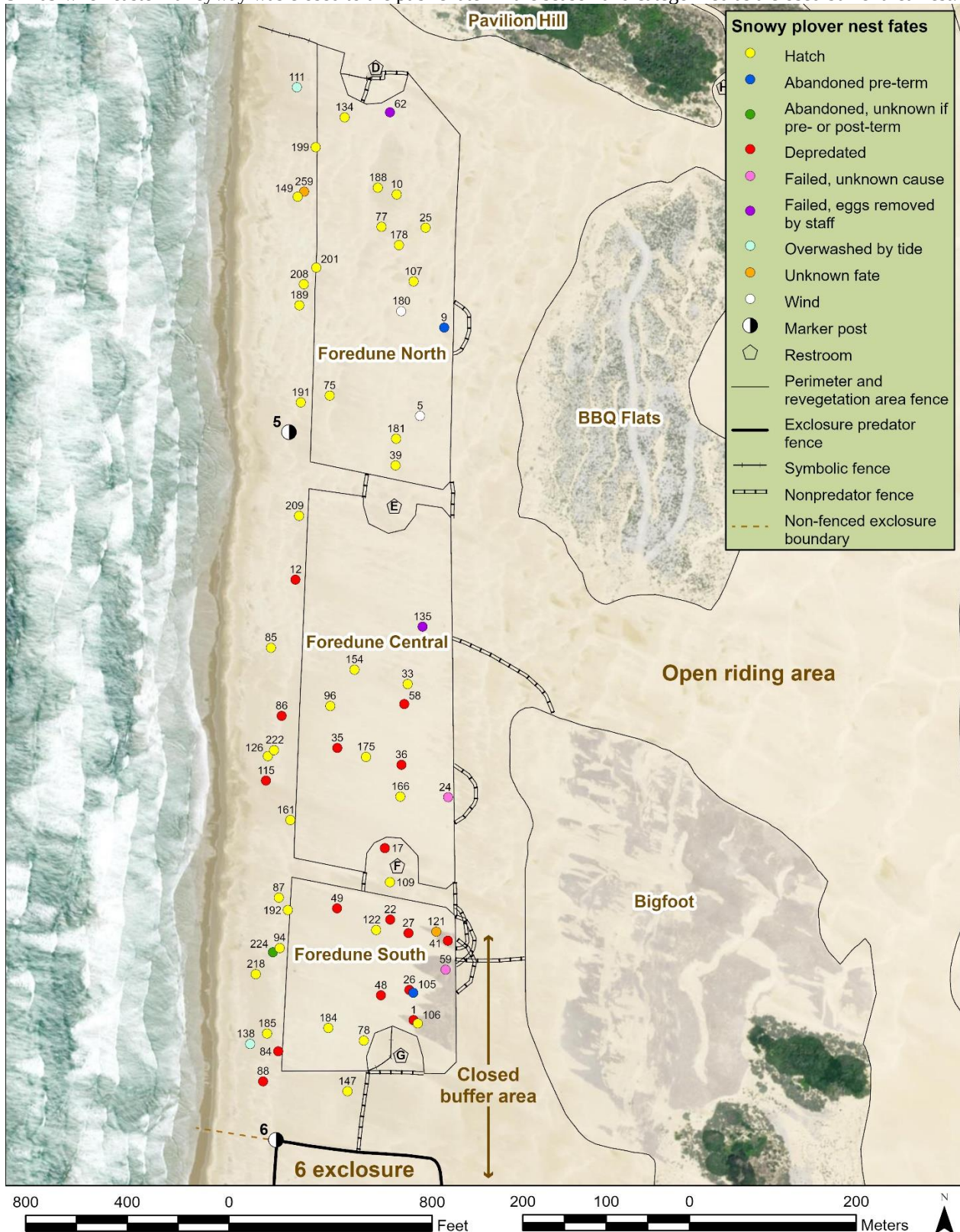
Figure C.4. Snowy plover nest locations at ODSVRA north of marker post 4 in 2023.



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2023 (continued).

Figure C.5. Snowy plover nest locations at ODSVRA Foredune closure in 2023.

Includes SP17 established when eastern alleyway open to the public and categorized as an open riding area nest and SP109 when eastern alleyway was closed to the public later in the season and categorized as a closed buffer area nest.



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2023 (continued).

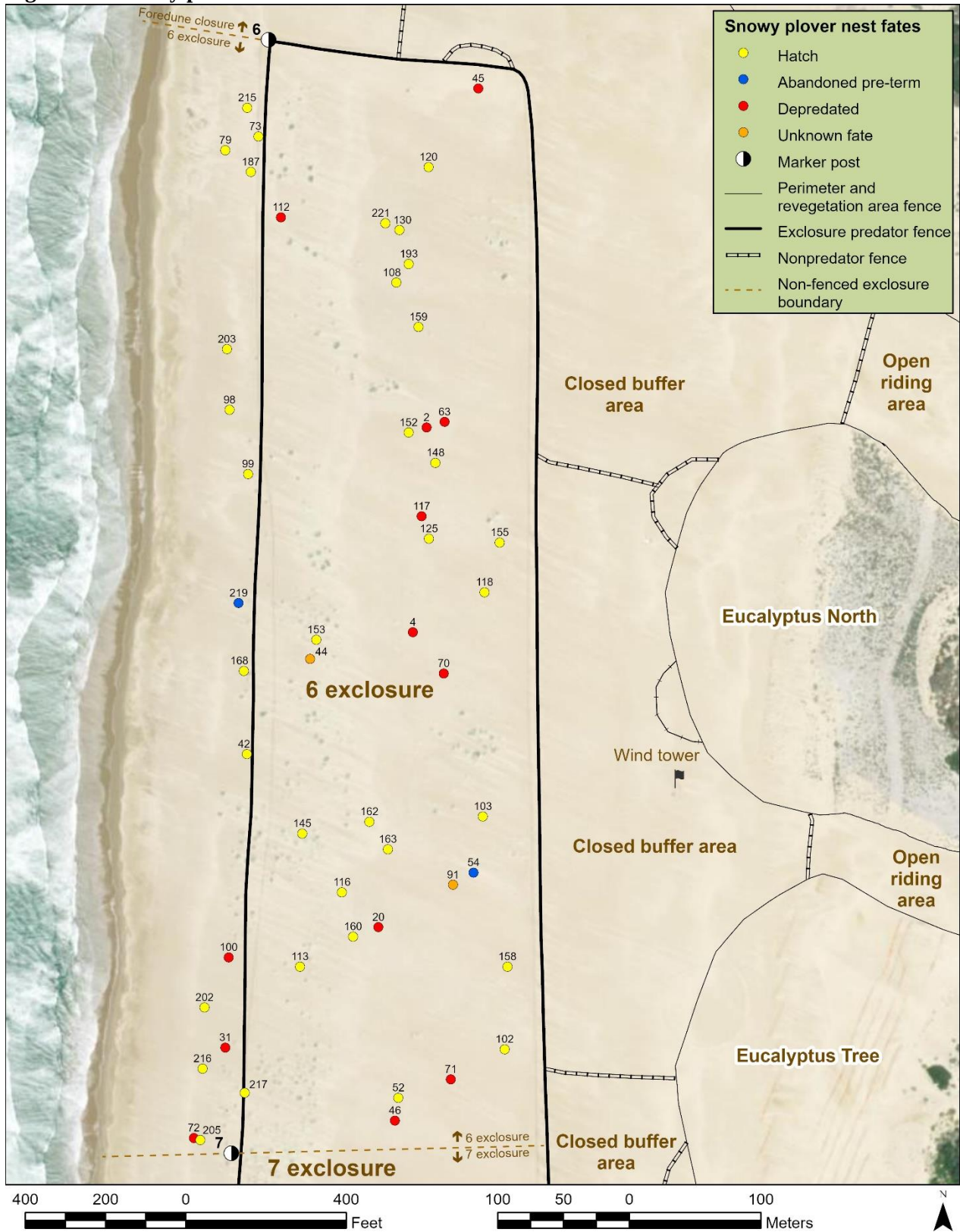
Figure C.6. Snowy plover nest locations at ODSVRA open riding area, closed buffer area, Eucalyptus North and Eucalyptus Tree revegetation areas in 2023.

Five nests in open riding area (SP18, SP23, SP28, SP40, SP60) initiated prior to installation of closed buffer area fencing. Other nests shown were initiated within the closed buffer area (SP131), Eucalyptus North revegetation area (SP50, SP65, SP137), and Eucalyptus Tree revegetation area (SP19, SP37, SP53, SP56).



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2023 (continued).

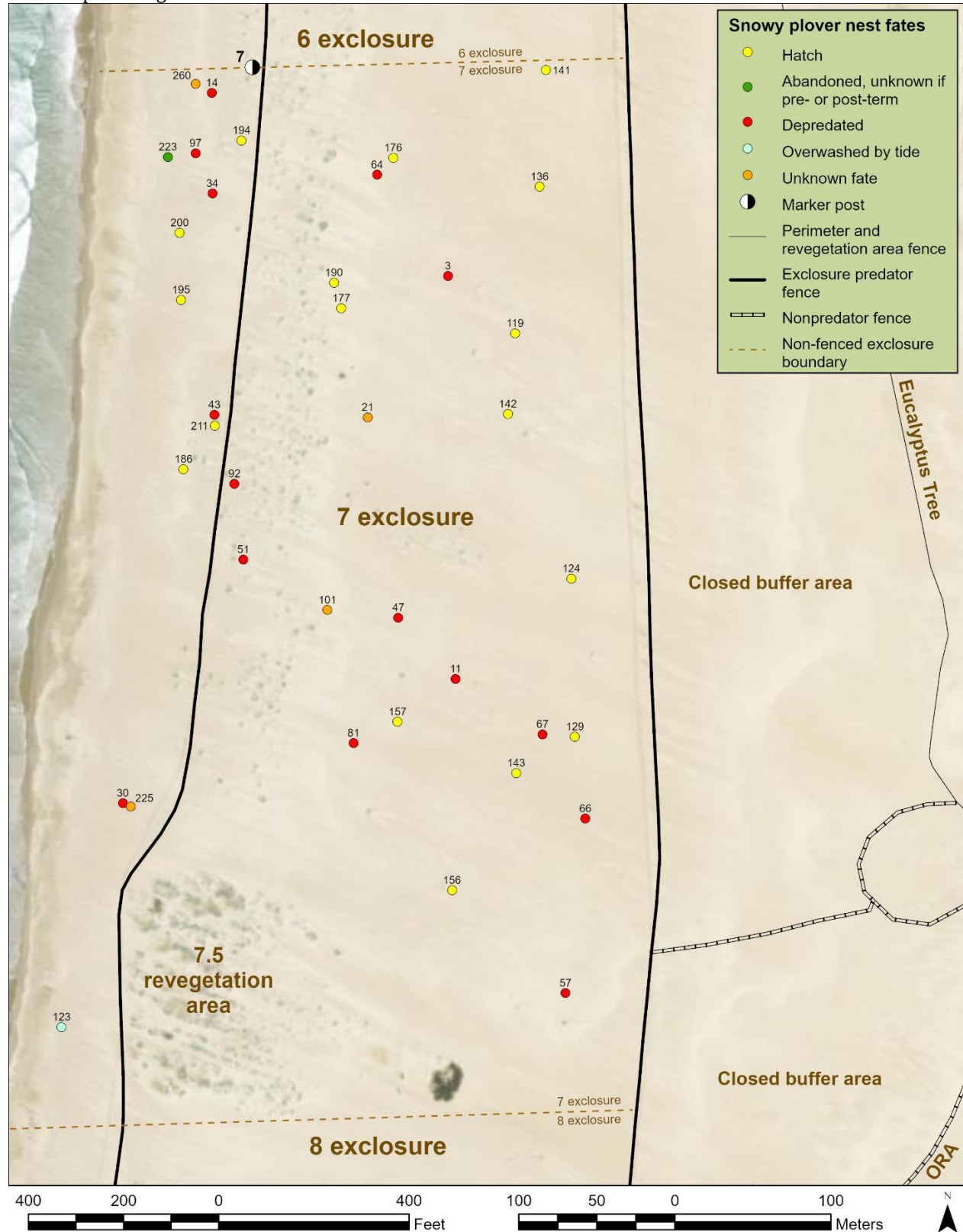
Figure C.7. Snowy plover nest locations at ODSVRA 6 enclosure in 2023.



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2023 (continued).

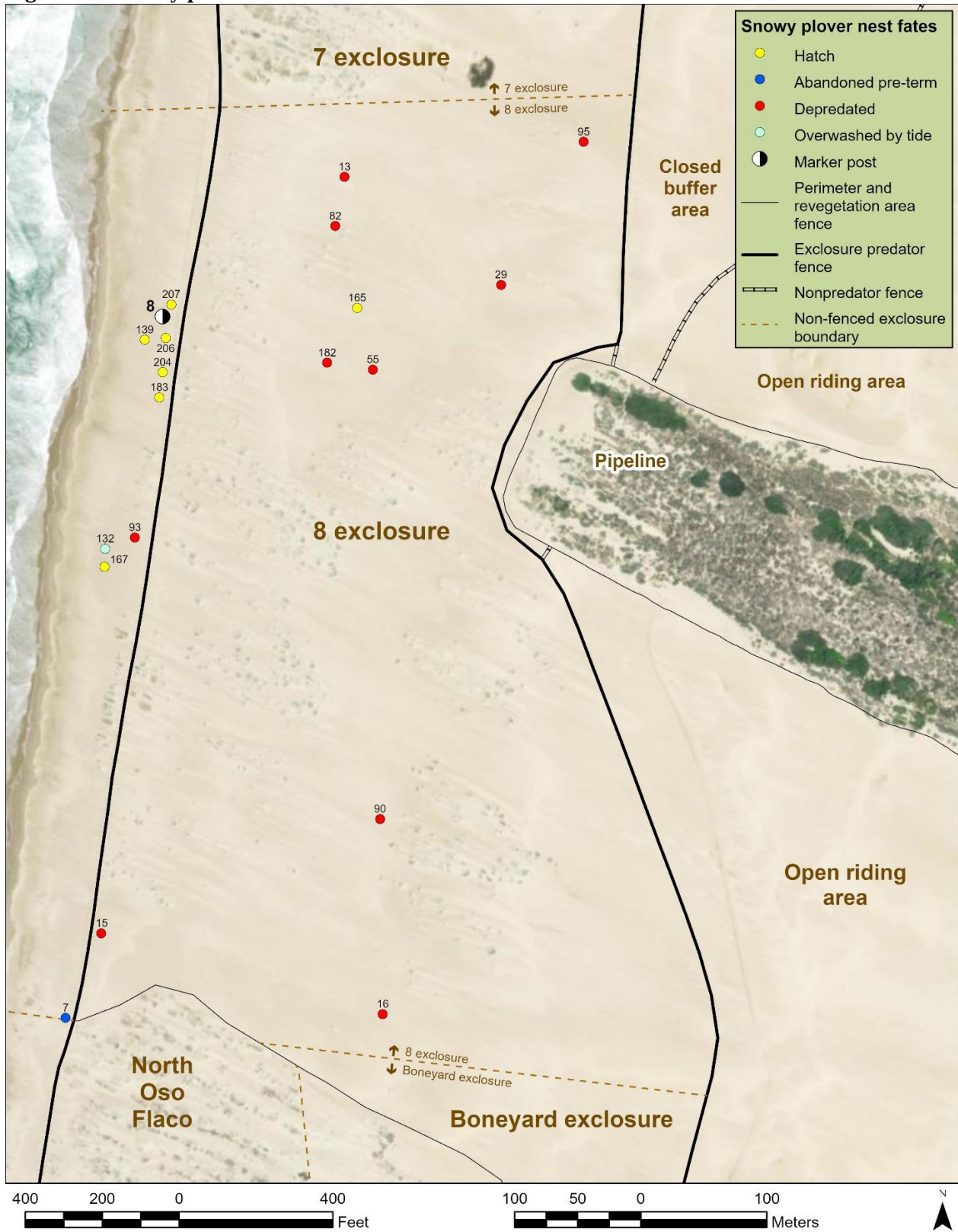
Figure C.8. Snowy plover nest locations at ODSVRA 7 enclosure in 2023.

ORA = open riding area



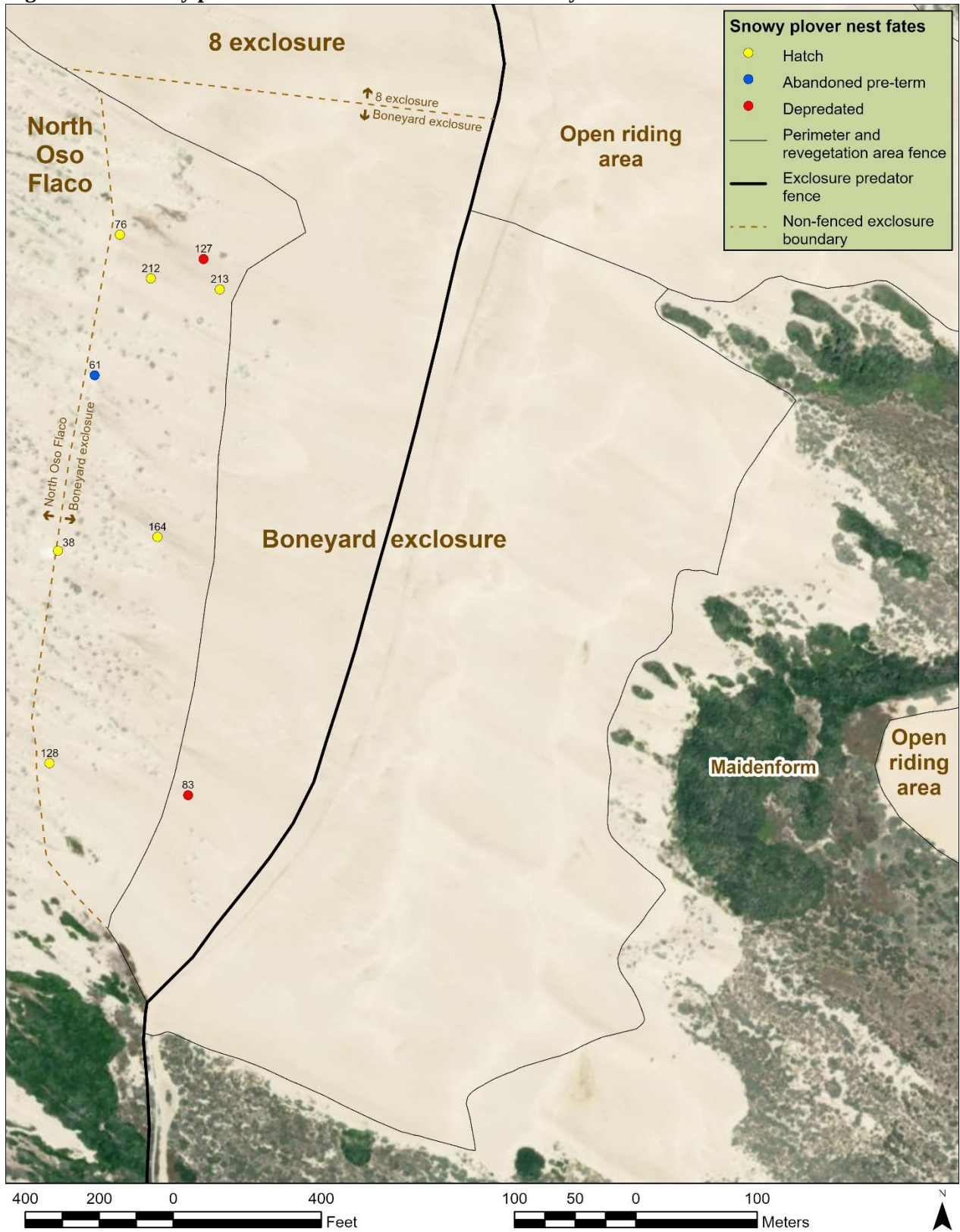
Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2023 (continued).

Figure C.9. Snowy plover nest locations at ODSVRA 8 enclosure in 2023.



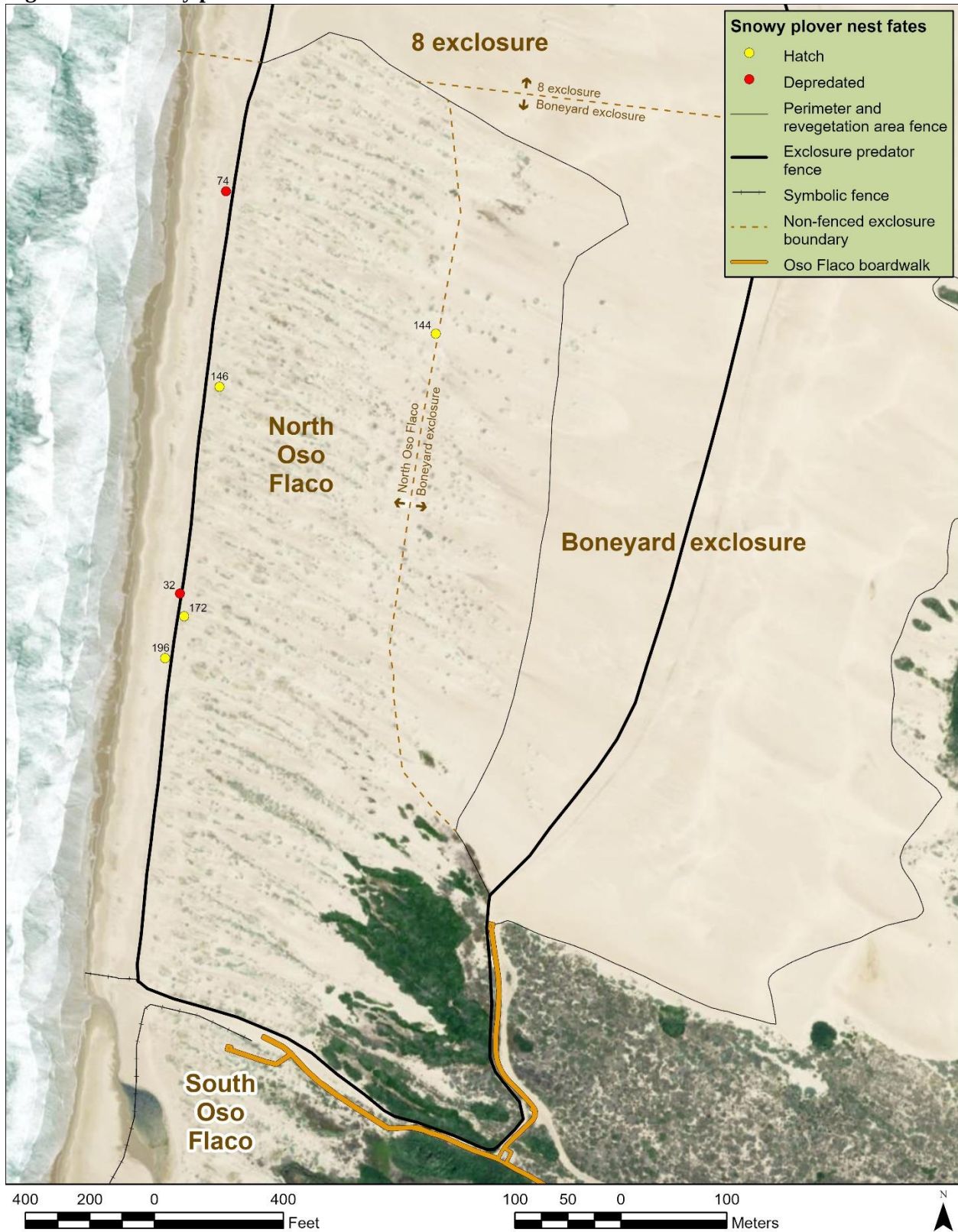
Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2023 (continued).

Figure C.10. Snowy plover nest locations at ODSVRA Boneyard enclosure in 2023.



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2023 (continued).

Figure C.11. Snowy plover nest locations at ODSVRA North Oso Flaco in 2023.



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2023 (continued).

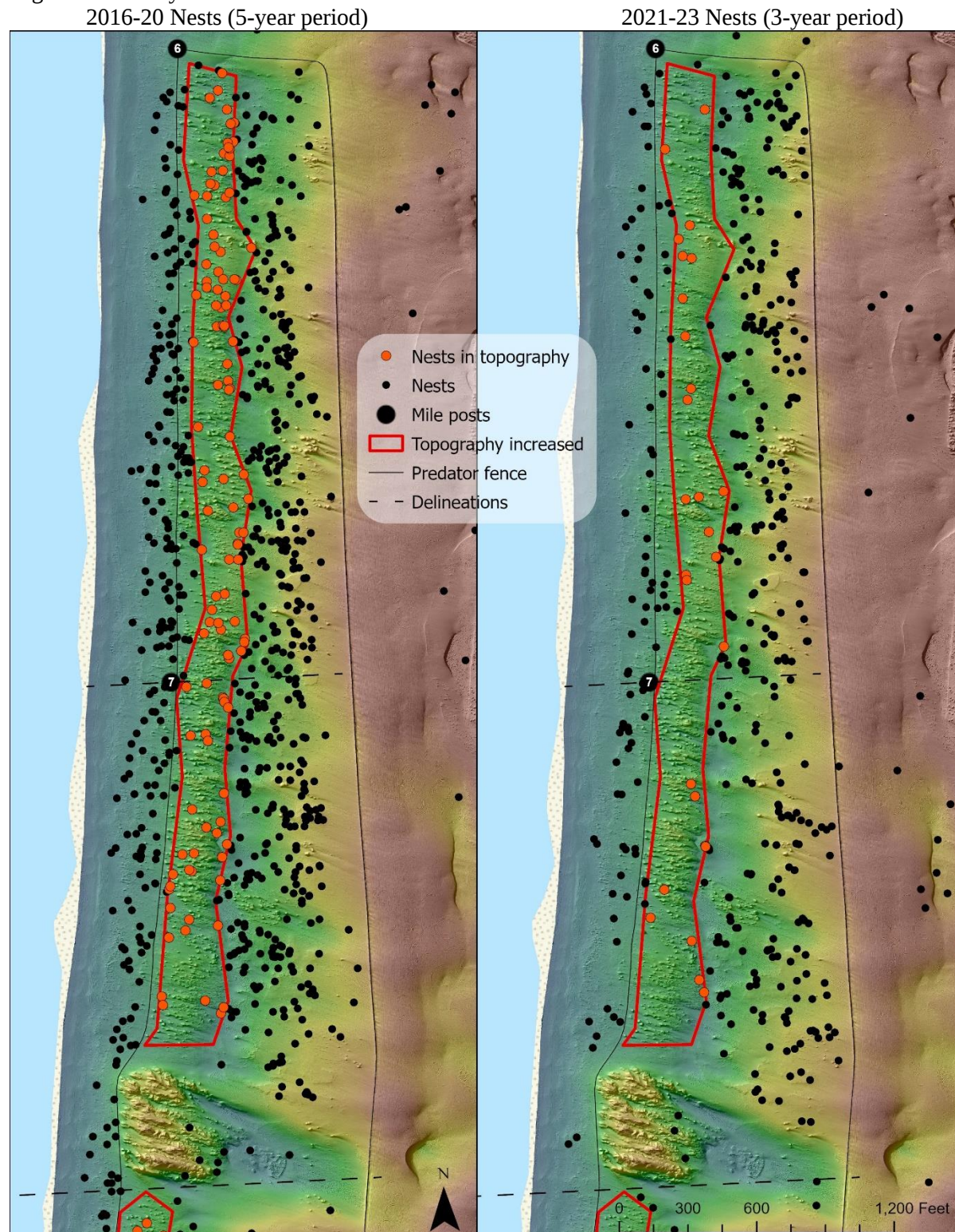
Figure C.12. Snowy plover nest locations at ODSVRA South Oso Flaco in 2023.



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2023 (continued).

Figure C.13. California least tern and snowy plover nest locations in relation to topography (hillshade and digital elevation modeling from October 2022) at ODSVRA 6 and 7 exclosures 2016-20 compared to 2021-23.

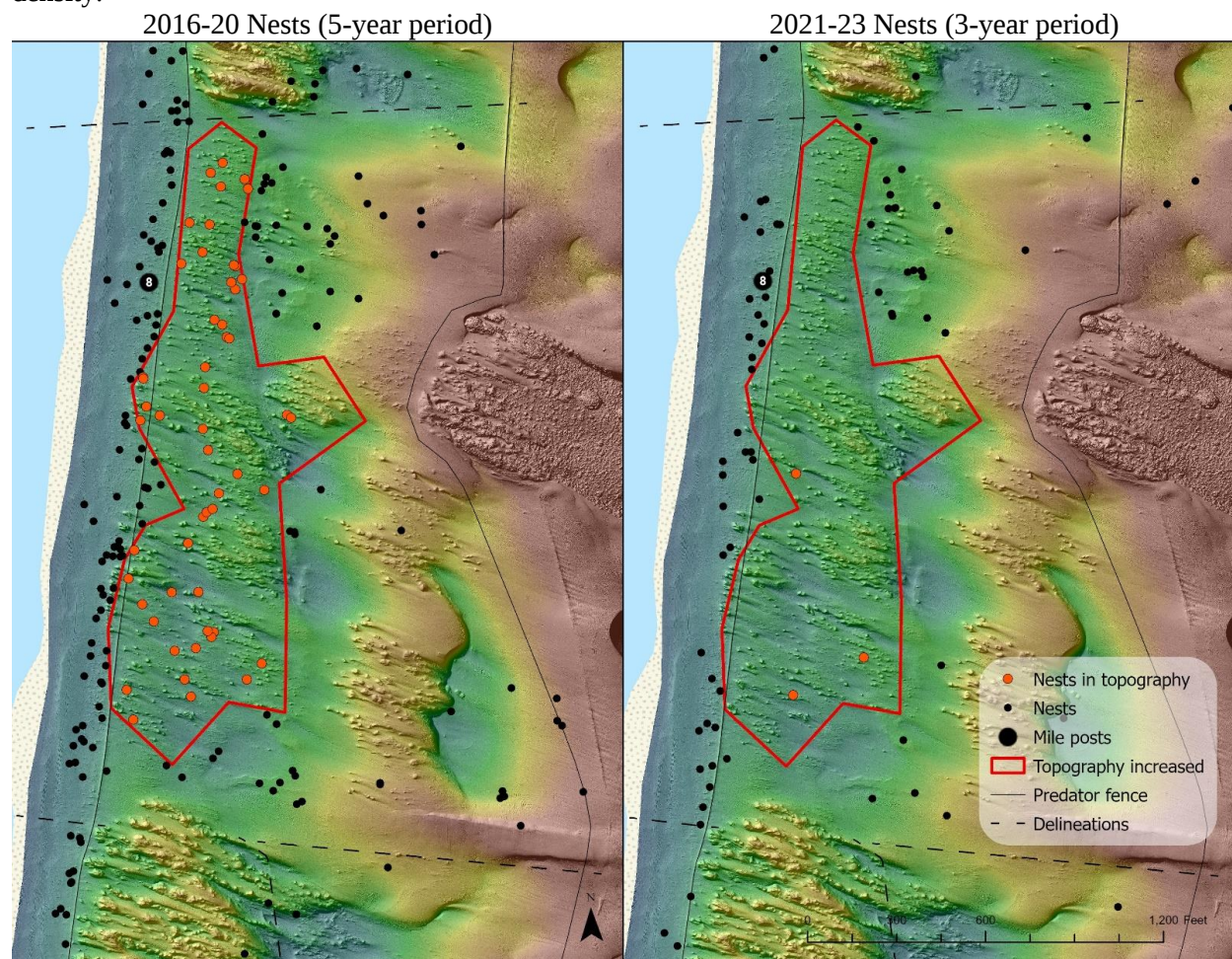
Approximately 40 acres outlined in red shows reduced nesting due to increased topography and vegetation density.



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2023 (continued).

Figure C.14. California least tern and snowy plover nest locations in relation to topography (hillshade and digital elevation modeling from October 2022) at ODSVRA 8 enclosure 2016-20 compared to 2021-23.

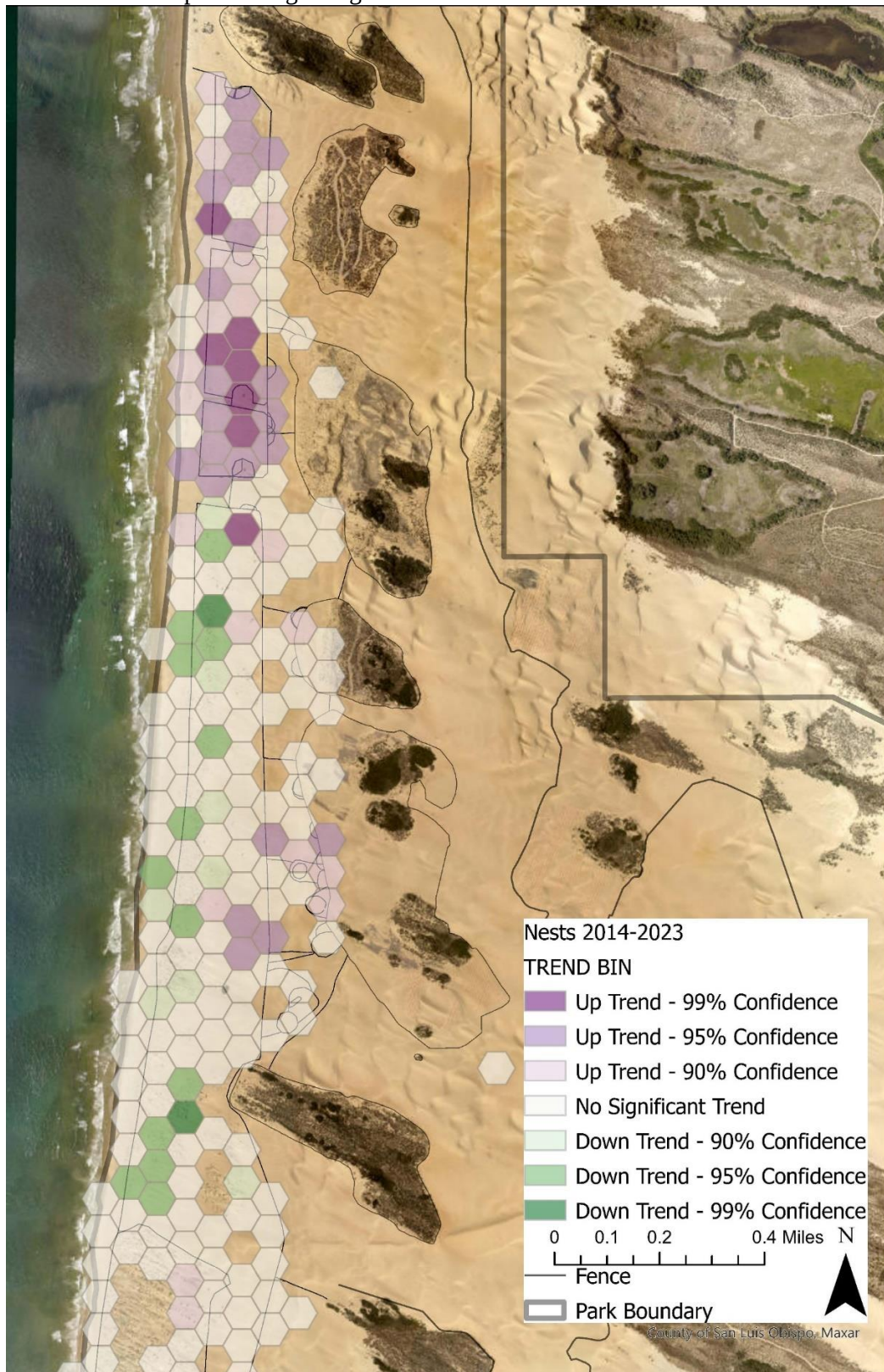
Approximately 20 acres outlined in red shows reduced nesting due to increased topography and vegetation density.



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2023 (continued).

Figure C.15. Trends of California least tern and snowy plover nest locations at ODSVRA 6, 7, and 8 exclosures, Foredune closure, and outside these areas 2014-23.

Foredune closure present beginning in 2020.



APPENDIX D. BANDED CALIFORNIA LEAST TERNS AND SNOWY PLOVERS.

Table D.1. Banded California least terns recorded at ODSVRA in 2023.

Juveniles fledged from ODSVRA in 2023 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. (For a description of color band letter codes see Appendix A.)

ODSVRA = Oceano Dunes SVRA, VSFB = Vandenberg Space Force Base

Band	Origin and Year Banded	Dates Seen	Notes
-:a/b	ODSVRA unknown	5/26	Multiple birds banded at ODSVRA with a/b on the right leg.
-:o/y	ODSVRA unknown	5/31, 6/10	Multiple birds banded at ODSVRA with o/y on right leg.
b/a:g/y	ODSVRA 2014	6/21, 6/23, 7/21, 7/28	LT12 breeding adult.
b/o:-	ODSVRA unknown	7/25, 7/29, 8/7, 8/9, 8/10, 8/11	LT34 breeding adult. Multiple birds banded at ODSVRA with b/o on the left leg.
b/w:b/y	ODSVRA 2011	7/1	LT21 breeding adult.
b/w:o/y	ODSVRA 2011	7/1	LT9 breeding adult.
g/o:y/g	ODSVRA 2015	7/1	
g/w:w/o	ODSVRA 2021	7/25	
g/w:y/g	ODSVRA 2015	6/8	
g/y:g	ODSVRA 2008	6/7	LT26 breeding adult.
g/y:k	ODSVRA 2017 or 2018	7/25	
g/y:r/y	ODSVRA 2008	7/28	
g/y:w/a	ODSVRA 2008 or 2018	6/29, 7/2, 7/3, 7/4, 7/29	LT23 breeding adult.
g/y:y	ODSVRA 2008 or 2018	7/4, 7/5, 7/6	LT33 breeding adult.
g/y:y/b	ODSVRA 2018	8/9	
g/y:y/o	ODSVRA 2008 or 2018	8/8, 8/10, 8/11	
o/r:y/g	ODSVRA 2015	8/10	
o/w:o/y	ODSVRA 2019	7/4	LT19 breeding adult.
o/w:w	ODSVRA 2019	7/28	
o/w:w/o	ODSVRA 2019 or 2021	7/4	LT35 breeding adult.
r/w:w/b	ODSVRA 2009 or 2013	7/21	
s:b	VSFB 2018	6/28, 7/25	LT27 breeding adult. In 2018 VSFB banded all chicks with s:b. Observation in past years at ODSVRA of s:b suggest bird could have lost tape on either leg. Multiple birds banded at ODSVRA with blue on right leg.
w/b:w	ODSVRA 2010	6/29, 7/1	LT9 breeding adult.
w/b:w/g	ODSVRA 2010	7/28	
w/b:w/o	ODSVRA 2010 or 2021	7/7	
w/g:w/o	ODSVRA 2021	7/26	
w/o:g/w	ODSVRA 2020	6/17, 6/18, 7/10, 7/13, 7/31	LT40 breeding adult.

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

Table D.1. Banded California least terns recorded at ODSVRA in 2023 (continued).

Band	Origin and Year Banded	Dates Seen	Notes
w/o:r	ODSVRA 2020	5/30, 7/3, 7/25	LT28 breeding adult.
w/o:r/w	ODSVRA 2020	8/1	
y/g:b/w	ODSVRA 2006, 2012, or 2016	6/3, 6/14	LT10 breeding adult.
y/g:y/a	ODSVRA 2016	7/25, 8/1, 8/2	
y/o:w/b	ODSVRA 2009	5/22, 5/24	Most of yellow tape has worn from left leg band with mostly orange tape remaining.
y/w:y/g	ODSVRA 2015	6/6, 6/7, 6/30, 7/1, 7/5, 7/8	LT25 breeding adult.

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

Table D.2. California least terns banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2023.

This is a partial list based on information received from monitors and managers.

VSFB = Vandenberg Space Force Base

Band Combination	Year Banded	Location Seen	County	Dates Seen	Notes
r/a:b	2023	Santa Ynez River Mouth	Santa Barbara	8/7	Juvenile.
g/a:y/g	2015	VSFB	Santa Barbara	5/30	VSFB breeding adult.
g/y:r/b	2008 or 2018	VSFB	Santa Barbara	6/2	VSFB breeding adult.
r/y:y/g	2015	VSFB	Santa Barbara	6/2, 6/23, 6/24, 6/25	VSFB breeding adult.
w:y/g	2005 or 2015	VSFB	Santa Barbara	7/3, 7/4, 7/5, 7/6, 7/11	VSFB breeding adult.
y/a:y/g	2005 or 2015	VSFB	Santa Barbara	6/21, 6/22, 6/25	VSFB breeding adult.
w:w/b	2009 or 2013	Coal Oil Point Reserve/Devereux Slough	Santa Barbara	8/4	
-:o/y	unknown	Camp Pendleton	San Diego	8/17	Multiple birds banded at ODSVRA with o/y on right leg.
r/a:b/y	2023	Camp Pendleton	San Diego	8/17	Juvenile.
r/a:o/b	2023	Tijuana River Mouth	San Diego	8/24	Juvenile.

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

Table D.3. Banded snowy plovers recorded at ODSVRA 1 October 2022 to 28 February 2023.

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 A.)

Eden Landing = Eden Landing Ecological Reserve, NWR = National Wildlife Refuge, ODSVRA = Oceano Dunes SVRA, SLO = San Luis Obispo, VSFB = Vandenberg Space Force Base

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
y/a:v	Siltcoos Beach 2020	Lane, OR	10/6, 10/7, 10/13, 10/14, 10/22, 10/23, 10/29, 11/5, 11/9, 11/11, 11/18, 11/24, 11/26, 11/29, 12/8, 1/18, 1/24, 2/6	
g/r:b	Tenmile Creek 2019	Douglas, OR	10/5, 10/14	
av:va	Point Reyes National Seashore 2021	Marin, CA	10/2, 10/4, 10/5, 10/8, 10/14, 10/22, 10/23, 10/29, 11/5, 11/9, 11/11, 11/18, 11/24, 11/26, 11/29, 12/1	
na:ay	Don Edwards NWR 2022	San Francisco	10/5, 10/19, 10/21, 10/23, 10/28, 11/4, 11/5, 11/30, 12/23, 12/30	
wn:pb	Eden Landing 2021	Alameda	12/1, 12/24	
yg:wl	Reservation Road 2016	Monterey	10/1, 10/2, 10/6, 10/14, 10/15, 10/22, 10/23, 10/28, 10/29, 11/10, 11/19, 11/24, 12/2, 12/3, 12/8, 12/16, 12/22, 12/24, 1/3, 2/4, 2/6	
bb:ba	ODSVRA 2019	SLO	10/1, 10/4, 10/6, 10/7	
bb:pg	ODSVRA 2022	SLO	10/5, 10/13, 11/9, 11/16, 11/19, 11/26, 12/30, 1/7, 2/1, 2/7, 2/8, 2/12	
bb:rv	ODSVRA 2021	SLO	10/6, 10/22, 10/28, 10/29, 11/4, 11/17, 11/18, 11/19, 11/24, 11/26, 12/1, 12/16, 12/17, 12/18, 12/24, 12/30, 1/7	
bb:wv	ODSVRA 2020	SLO	10/4, 10/5, 10/6, 10/13, 10/14, 11/18, 11/26, 12/9, 12/18, 12/30, 2/6, 2/7	
ga:av	ODSVRA 2020	SLO	10/14, 12/30	
ga:ba	ODSVRA 2020	SLO	10/5, 10/6, 10/14, 10/22, 10/28, 10/29, 11/2, 11/4, 11/9, 11/17, 11/22, 11/28, 12/1, 12/8, 2/1, 2/4	
ga:bg	ODSVRA 2020	SLO	10/6, 10/7, 10/14, 10/22, 10/23, 10/29, 11/19, 11/20, 11/24, 12/1, 12/2, 12/3, 12/8, 12/16, 12/18, 12/29, 1/3, 1/29, 2/6, 2/8, 2/25	
ga:bo	ODSVRA 2021	SLO	10/5, 10/14, 11/23, 11/28, 12/21, 1/18, 2/11	
ga:oa	ODSVRA 2021	SLO	10/2, 10/4, 10/6, 10/23, 10/29, 11/4, 11/11, 11/18, 11/20, 11/24, 12/8, 12/18, 12/22, 12/30, 12/31, 1/2, 1/3, 1/7, 1/29, 2/1, 2/25	
ga:pr	ODSVRA 2016 or 2017	SLO	10/5, 10/6, 10/7, 10/8, 10/14, 11/16, 11/30, 12/21, 1/8, 1/18	
ga:pv	ODSVRA 2020	SLO	10/5, 10/7, 10/23, 11/26, 11/30, 12/23, 12/30, 1/18, 2/7, 2/14	
ga:py	ODSVRA 2011	SLO	10/4, 10/5, 10/6, 10/7, 10/14, 10/21, 10/22, 10/23, 10/28, 11/11, 11/18, 11/19, 11/20, 11/24, 12/2, 12/3, 12/12, 12/17, 12/18, 12/22, 12/30, 1/21, 2/1, 2/6, 2/14	
ga:ry	ODSVRA 2017	SLO	10/5, 10/15, 10/23, 10/29, 11/5, 11/18, 12/21	
ga:wo	ODSVRA 2021	SLO	10/5, 10/14, 10/21, 10/23, 10/29, 11/4, 11/16, 11/23, 12/23, 12/30, 12/31, 1/18, 2/1, 2/6, 2/7, 2/8, 2/14	

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

Table D.3 Banded snowy plovers recorded at ODSVRA 1 October 2022 to 28 February 2023 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
ga:wy	ODSVRA 2018	SLO	10/1, 10/8, 10/13, 10/14, 10/23, 10/29, 11/4, 11/18, 11/19, 11/24, 12/22, 12/24, 2/13, 2/14, 2/15	
ga:yo	ODSVRA 2022	SLO	10/13, 10/29, 11/16, 11/24, 11/26, 12/8, 12/30, 2/7, 2/8, 2/13, 2/14	
gg:av	ODSVRA 2019	SLO	10/29, 1/29	
gg:oa	ODSVRA 2019	SLO	10/23	
gg:ob	ODSVRA 2019	SLO	10/6, 10/7, 10/14, 10/21, 10/22, 10/28, 10/29, 11/11, 11/26, 12/1	
gg:pa	ODSVRA 2022	SLO	10/1, 10/4, 10/5, 10/6, 10/7, 10/13, 10/14, 10/23, 10/29, 11/16, 11/26, 12/9	
gg:wo	ODSVRA 2022	SLO	10/14, 10/19, 10/26, 11/4, 11/17, 11/28, 12/21, 2/15, 2/21	
pg:ar	ODSVRA 2014	SLO	10/6, 10/14, 10/15, 10/20, 10/22, 11/4, 11/5, 11/14, 11/18, 11/22, 11/24, 11/29, 12/1, 12/22, 12/24, 12/29, 12/30	
pg:ay	ODSVRA 2022	SLO	11/16, 11/19, 11/20	
pg:ba	ODSVRA 2021	SLO	10/5, 10/7, 10/14, 10/19, 10/22, 10/23, 10/28, 11/4, 11/30, 12/8, 12/23, 12/24, 12/30, 1/18, 2/6, 2/11, 2/14, 2/15, 2/25	
pg:br	ODSVRA 2021	SLO	10/5, 10/13, 10/21, 10/22, 10/23, 10/28, 11/25, 11/30, 12/17, 12/23, 12/29, 2/6, 2/11, 2/13, 2/14	
pg:by	ODSVRA 2017 or 2018	SLO	10/5, 10/13, 10/14, 10/19, 2/12, 2/21	
pg:go	ODSVRA 2022	SLO	10/5, 10/6, 10/14, 11/4, 11/5, 11/11	
pg:gw	ODSVRA 2022	SLO	10/5, 10/19, 1/7, 1/18, 2/12, 2/14, 2/22	
pg:or	ODSVRA 2022	SLO	10/6, 10/15, 10/20, 10/22, 10/29, 11/4, 11/9, 11/29, 12/8, 12/24, 12/29, 1/18, 2/1, 2/7, 2/8, 2/14	
pg:ow	ODSVRA 2015 or 2016	SLO	10/5, 10/6, 10/14, 10/22, 10/26, 11/23, 2/7	
pg:ro	ODSVRA 2022	SLO	10/5, 10/19, 10/23, 10/28, 11/16, 11/26, 11/30, 12/30, 2/1, 2/6, 2/12, 2/13, 2/14, 2/21	
pg:ya	ODSVRA 2022	SLO	10/14, 10/22, 10/23, 10/29, 11/18, 11/29, 12/1, 12/2, 12/3, 12/8, 12/24, 1/1, 1/18, 2/1, 2/6	
pg:yb	ODSVRA 2015 or 2017	SLO	10/21	
pg:yr	ODSVRA 2022	SLO	10/5, 10/8, 10/13, 10/14, 10/19, 10/22, 10/23, 10/28, 11/16, 11/20, 12/2, 12/9, 12/16, 12/24, 12/30, 2/14, 2/25	
pv:aa	ODSVRA 2021	SLO	10/15, 10/21, 11/5, 11/23, 11/24	
pv:by	ODSVRA 2015	SLO	2/21	
pv:pb	ODSVRA 2022	SLO	10/1, 10/7, 10/13, 10/14, 10/22, 10/23, 11/18, 11/20, 11/24, 11/26, 12/3, 12/9, 12/16, 12/22, 12/29, 12/30, 1/21, 2/7, 2/25	
pv:pv	ODSVRA 2021	SLO	10/5, 10/14, 11/5, 11/16, 11/19, 11/28, 12/30, 1/7, 1/18, 2/15, 2/21	
pv:rb	ODSVRA 2016	SLO	10/23, 10/26, 10/29, 11/19, 11/25, 11/30, 12/22, 12/23	
pv:wy	ODSVRA 2014 or 2015	SLO	10/23, 2/11	
rr:aw	ODSVRA 2017	SLO	2/11, 2/12	

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

Table D.3 Banded snowy plovers recorded at ODSVRA 1 October 2022 to 28 February 2023 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
rr:ay	ODSVRA 2022	SLO	10/4, 10/14, 10/22, 10/23, 10/29, 11/14, 11/28, 12/1, 12/3, 12/8, 12/10, 12/16, 12/17, 12/24, 12/30, 1/2, 1/3, 2/4, 2/6	
rr:bb	ODSVRA 2016 or 2017	SLO	10/1, 10/7, 10/8, 10/19, 10/23, 11/17, 11/18, 11/19, 1/2, 2/4, 2/6, 2/14	
rr:bo	ODSVRA 2022	SLO	10/14, 10/21, 10/22, 11/16, 11/23, 11/24, 12/1, 12/8, 12/10, 12/16, 12/24, 12/29, 12/30, 12/31, 1/1, 1/2, 2/1, 2/6, 2/7	
rr:ga	ODSVRA 2022	SLO	10/5, 10/13, 10/14, 10/20, 10/21, 10/23, 10/29, 11/9, 11/24, 12/18, 2/1, 2/7, 2/8, 2/13, 2/14, 2/15, 2/21	
rr:og	ODSVRA 2022	SLO	10/2, 10/6, 10/13, 10/14, 10/22, 10/23, 10/29, 11/9, 11/20, 11/23	
rr:oy	ODSVRA 2022	SLO	10/5	
rr:pr	ODSVRA 2022	SLO	10/7	
rr:pv	ODSVRA 2022	SLO	10/22, 10/23, 10/28, 11/4	
rr:ro	ODSVRA 2022	SLO	10/5, 10/14	
rr:wr	ODSVRA 2022	SLO	10/5, 10/11, 10/14, 11/5, 11/11, 11/18, 11/30, 1/18	
rr:ya	ODSVRA 2022	SLO	10/2, 10/4, 10/13, 10/15, 10/21, 10/22, 10/28, 10/29, 11/2, 11/11, 11/18, 11/29, 12/2, 12/16, 12/18, 12/22, 1/3, 1/18, 1/29, 2/1, 2/6, 2/8, 2/11, 2/14	
rr:yr	ODSVRA 2022	SLO	10/5, 10/6, 10/8, 10/19, 10/21, 10/22, 10/23, 10/28, 11/4, 11/17, 11/18, 11/19, 11/20, 11/24, 11/26, 12/1, 12/18, 12/29, 12/30, 1/2, 1/3, 1/7, 1/18, 2/4, 2/6	
vg:aa	ODSVRA 2021	SLO	10/5, 10/23, 11/5, 11/16, 12/21, 12/29, 2/1	
vg:ab	ODSVRA 2021	SLO	10/5, 10/21, 10/29, 11/19, 11/24, 12/8, 12/18, 12/22, 12/30, 1/8, 2/7, 2/8, 2/13, 2/21	
vg:rv	ODSVRA 2020	SLO	12/30	
vg:rw	ODSVRA 2018	SLO	2/12, 2/13	
vv:ar	ODSVRA 2021	SLO	10/5, 10/28, 11/4, 11/24, 11/30, 12/23, 12/24, 1/18, 2/7, 2/13, 2/14	
vv:ra	ODSVRA 2020	SLO	10/14, 10/15, 10/19, 10/23, 1/7	
vv:rv	ODSVRA 2020	SLO	10/1, 10/7, 10/14, 10/29, 11/19, 11/22, 11/24, 11/26, 12/17, 12/22, 12/24, 1/18, 2/1, 2/8, 2/13	
a:g/o/g	VSFB 2017	Santa Barbara	10/5, 10/14, 10/19, 11/16, 11/30, 12/21	On federal service band on left leg there is exposed metal above blue tape.
l:a/v	VSFB 2022	Santa Barbara	2/6	
l:y/g	VSFB 2016	Santa Barbara	10/5, 10/6, 10/7, 10/19, 11/11, 11/28, 11/30	
nb:rr	VSFB 2020	Santa Barbara	10/2, 10/6, 10/13, 10/22, 10/23, 10/29, 11/18, 11/20, 11/22, 11/24, 11/26, 12/2, 12/3, 12/16, 12/30, 2/1, 2/6	
ns:ba	VSFB Unknown	Santa Barbara	10/5, 10/14, 10/28, 10/29, 11/16, 11/18, 11/24, 11/29, 12/2, 12/8, 12/24, 1/3, 2/6, 2/8, 2/13, 2/14	
nw:yw	VSFB 2022	Santa Barbara	10/5, 10/26, 11/16, 11/23, 1/18, 2/1, 2/15, 2/19, 2/21	

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

Table D.3 Banded snowy plovers recorded at ODSVRA 1 October 2022 to 28 February 2023 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
ny:gv	VSFB 2021	Santa Barbara	10/1, 10/7, 10/8, 10/11, 10/14, 10/22, 10/23, 10/28, 10/29, 11/5, 11/18, 11/20, 11/24, 11/25, 12/1, 12/9, 12/10, 12/16, 12/22, 1/1, 1/3	
ny:pr	VSFB 2021	Santa Barbara	10/14	
ny:wg	VSFB 2017	Santa Barbara	10/14, 10/15, 10/19, 10/21, 11/24, 11/30, 2/11	
ny:wl	VSFB 2020	Santa Barbara	10/21	
o:a/y/a	VSFB 2022	Santa Barbara	11/30, 12/8, 12/16, 1/18, 2/6, 2/7, 2/8, 2/13, 2/14, 2/15, 2/22	
w:-s-	Unknown	Unknown	1/18	

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2023.

Juveniles fledged from ODSVRA in 2023 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 A.)

ODSVRA = Oceano Dunes SVRA, SLO = San Luis Obispo, SP = State Park, NAS = Naval Air Station, NB = Naval Base, VSFB = Vandenberg Space Force Base
F = Female, M = Male

Band Combination	Sex (No.)	Origin and Year Banded	County Banded	Dates Seen	Notes
a/w:a:y		Dunes Overlook 2020	Douglas-Lane boundary, OR	7/26, 8/5, 8/11, 9/8	
wb:ry		Marina Beach 2023	Monterey, CA	8/19, 8/21, 8/22, 8/25	Juvenile.
yg:wl		Reservation Road 2016	Monterey	3/12, 7/19, 7/21, 7/22, 8/3, 8/31, 9/3, 9/15, 9/18	
ow:wr	F	Fort Ord SP 2015	Monterey	5/11, 5/12, 5/22, 5/24, 5/26, 5/29, 6/2, 6/24	ODSVRA breeding female.
ab:wb		Fort Ord SP 2022	Monterey	5/16, 7/30	
bb:ar	F	ODSVRA 2017 or 2018	SLO	4/19, 5/17, 7/12, 7/13, 7/19, 7/21, 7/22	ODSVRA breeding female.
bb:ba		ODSVRA 2019	SLO	4/27	
bb:bb	F	ODSVRA 2018	SLO	4/18, 4/27, 5/20, 5/27, 5/30, 6/3, 6/15, 7/12, 7/16	ODSVRA breeding female.
bb:bv		ODSVRA 2020	SLO	5/15	
bb:bw	M	ODSVRA 2018	SLO	4/9, 4/12, 4/26, 5/6, 6/5, 6/7, 6/12, 6/16, 6/20, 6/28, 7/2, 7/3, 7/4, 7/7, 7/8, 7/10, 7/11, 7/12, 7/13, 7/21, 7/22	ODSVRA breeding male.
bb:go	F	ODSVRA 2019	SLO	4/10, 4/13, 4/16, 4/19, 4/28, 6/3, 6/4, 6/5, 6/8, 6/15, 6/16, 6/18, 6/24, 6/25	ODSVRA breeding female.
bb:gr		ODSVRA 2012 or 2015	SLO	4/18	
bb:or	M	ODSVRA 2016 or 2017	SLO	5/17, 5/18, 5/20, 5/21, 5/22, 5/24, 5/25, 5/26, 5/27, 5/31, 6/1, 6/6, 6/7, 6/9, 8/3, 8/4, 8/5, 8/8, 8/9, 8/11	ODSVRA breeding male.
bb:pg	M	ODSVRA 2022	SLO	3/2, 3/8, 3/13, 3/17, 4/10, 4/12, 5/15, 5/19, 5/30, 6/4, 6/6, 6/7, 6/8, 6/22, 7/5, 7/6, 8/1, 8/2, 8/4, 8/9, 8/11, 8/16, 8/27, 8/31, 9/16, 9/20, 9/21	ODSVRA breeding male.
bb:wv	F	ODSVRA 2020	SLO	3/21, 4/9, 4/27, 5/23, 5/24, 6/6, 8/17, 8/29, 9/15, 9/18	ODSVRA breeding female.
bb:ww	F	ODSVRA 2020	SLO	3/6, 4/20, 4/26, 5/10, 5/18, 6/16, 7/11, 7/24, 7/28	ODSVRA breeding female.
bb:yy	F	ODSVRA 2022	SLO	5/3, 5/6, 6/9, 6/12, 6/16, 7/6, 7/22, 8/22	ODSVRA breeding female.
ga:av	F	ODSVRA 2020	SLO	5/24, 6/26, 6/27, 6/30, 8/6, 8/31	ODSVRA breeding female.
ga:ba	M	ODSVRA 2020	SLO	3/8, 3/18, 3/19, 3/23, 4/8, 4/9, 4/22, 5/12, 5/18, 5/20, 5/24, 5/27, 6/8, 6/14, 6/29, 6/30, 7/2, 7/3, 7/6, 7/11, 7/24, 8/14, 9/2, 9/15	ODSVRA breeding male.
ga:bb		ODSVRA 2017 or 2018	SLO	4/26, 4/27	
ga:bg	M	ODSVRA 2020	SLO	3/12, 3/24, 4/4, 4/5, 4/23, 5/1, 5/11, 5/14, 5/15, 5/16, 5/19, 5/20, 5/21, 5/22, 5/25, 5/26, 5/27, 5/29, 6/1, 6/2, 6/3, 6/4, 6/8, 6/14, 6/21, 6/23, 6/29, 6/30, 7/4, 7/9, 7/15, 7/21, 7/22, 7/25, 8/8, 8/15, 8/17, 8/30, 8/31, 9/1, 9/3, 9/4, 9/5	ODSVRA breeding male.

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2023 (continued).

Band Combination	Sex (No.)	Origin and Year Banded	County Banded	Dates Seen	Notes
ga:bo	F	ODSVRA 2021	SLO	5/4, 5/19, 5/22, 6/7, 6/9, 6/30, 7/6, 7/13, 7/24, 8/8, 8/9, 8/12	ODSVRA breeding female.
ga:br	M	ODSVRA 2021	SLO	4/24, 4/25, 4/28, 5/27, 5/28, 6/6, 6/8, 7/6, 7/13, 7/21	ODSVRA breeding male.
ga:ga	M	ODSVRA 2022	SLO	5/26, 5/31, 6/14, 7/4, 7/5, 7/9, 7/31, 8/2, 8/4, 8/6, 8/7, 8/9, 8/14	ODSVRA breeding male.
ga:ob	M	ODSVRA 2021	SLO	3/8, 3/19, 3/20, 3/24, 4/10, 4/22, 4/28, 5/6, 5/12, 5/16, 5/25, 5/27, 5/28, 5/31, 6/4, 6/9, 6/11, 6/13, 6/14, 6/15, 6/16, 6/18, 6/24, 7/22, 7/26, 7/28, 7/29, 7/30, 8/1, 8/3, 8/4, 8/5, 8/7, 8/8, 8/9, 8/10, 8/11, 8/13, 8/14, 8/16, 8/17, 8/18, 8/20, 8/22, 8/23, 8/24, 8/25, 8/26, 8/28, 8/29, 8/31, 9/3, 9/4, 9/5, 9/6	ODSVRA breeding male.
ga:or		ODSVRA 2016 or 2017	SLO	7/13	
ga:pr	M	ODSVRA 2016 or 2017	SLO	5/1, 5/2, 5/3, 5/7, 5/9, 6/21, 6/26, 7/29	ODSVRA breeding male.
ga:pv	M	ODSVRA 2020	SLO	3/15, 3/29, 4/29, 5/6, 5/31, 6/13, 6/24, 7/1, 7/7, 8/1, 8/7, 8/8, 8/10, 8/11, 8/12, 8/13, 8/15, 8/16, 8/17, 8/20, 8/23, 8/25, 8/26, 8/27, 8/28, 8/29, 8/31, 9/1, 9/3, 9/5	ODSVRA breeding male.
ga:py	F	ODSVRA 2011	SLO	4/26, 5/4, 5/29, 5/30, 6/15, 7/5, 7/6, 7/7, 7/8, 7/9, 7/24, 8/15, 8/30, 9/1, 9/2, 9/3, 9/4, 9/5, 9/6, 9/14, 9/15, 9/20	ODSVRA breeding female.
ga:ra		ODSVRA 2022	SLO	9/2	
ga:rb		ODSVRA 2010	SLO	7/3	
ga:rr		ODSVRA 2022	SLO	6/22	
ga:ry	F	ODSVRA 2017	SLO	4/10, 5/13, 5/24, 5/30, 6/23, 7/2, 7/3, 7/4, 8/1, 8/2, 8/15, 8/19, 8/31, 9/2, 9/14	ODSVRA breeding female.
ga:vb	M	ODSVRA 2021	SLO	4/25	ODSVRA breeding male.
ga:vw		ODSVRA 2020	SLO	3/23, 4/14, 9/21	
ga:wb	M	ODSVRA 2021	SLO	4/12, 4/17, 4/26, 4/27, 4/29, 5/12, 5/15, 5/17, 5/24, 5/28, 6/1, 6/2, 6/3, 6/4, 6/9, 6/10, 6/17, 6/18, 6/20, 6/22, 6/23, 7/1, 7/3, 7/4, 7/5, 7/6, 7/7, 7/8, 7/13, 7/15, 7/16, 7/17, 7/18, 7/21, 7/22	ODSVRA breeding male.
ga:wo	M	ODSVRA 2021	SLO	3/8, 6/8, 6/9, 7/1, 7/2, 7/6, 7/9, 7/10, 7/11, 7/12, 7/13, 7/15, 7/16, 7/17, 7/19, 7/20, 7/21, 7/25, 7/27, 8/1, 8/2	ODSVRA breeding male.
ga:wr	M	ODSVRA 2015 or 2016	SLO	4/29, 5/3, 5/4, 5/10, 5/24, 5/29, 6/2, 6/9, 6/21, 6/30, 7/7	ODSVRA breeding male.
ga:wy	F	ODSVRA 2018	SLO	3/6, 3/7, 3/13, 3/21, 3/29, 4/2, 4/6, 4/21, 5/6, 5/29, 6/4, 6/12, 7/25, 7/26, 7/27, 7/28, 7/29, 8/1, 8/2, 8/3, 8/5, 8/8, 8/15, 8/29, 9/15, 9/16	ODSVRA breeding female.
ga:yo	M	ODSVRA 2022	SLO	3/8, 5/13, 6/8, 6/17, 6/25, 6/27, 6/29, 7/11, 8/27, 8/30	ODSVRA breeding male.
ga:yr		ODSVRA 2014	SLO	4/25, 5/30, 7/12	
gg:ag	F	ODSVRA 2022	SLO	4/17, 4/18, 5/18, 6/2, 6/8, 6/16	ODSVRA breeding female.

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2023 (continued).

Band Combination	Sex (No.)	Origin and Year Banded	County Banded	Dates Seen	Notes
gg:av		ODSVRA 2019	SLO	4/25	
gg:ba		ODSVRA 2019	SLO	4/26, 5/3, 5/21	
gg:bg		ODSVRA 2021	SLO	5/20	
gg:by		ODSVRA 2021	SLO	5/24, 5/31	
gg:gg	M	ODSVRA 2021	SLO	4/5, 4/6, 4/10, 4/13, 4/14, 4/15, 4/16, 4/17, 4/18, 4/19, 4/27, 4/28, 5/3, 5/13, 5/24, 5/29, 6/2, 6/4, 6/5, 6/8, 6/17, 6/18, 6/19, 6/21, 6/30, 7/2, 7/3, 7/4, 7/5, 7/10, 7/11, 7/13, 7/15, 7/18, 7/19, 7/21, 7/22, 7/23, 7/27, 7/28, 7/29, 8/1	ODSVRA breeding male.
gg:go		ODSVRA 2019	SLO	4/16	
gg:oa	F	ODSVRA 2019	SLO	4/25, 4/26, 7/20, 7/21, 7/24, 7/28	ODSVRA breeding female.
gg:ob		ODSVRA 2019	SLO	6/15, 8/24	
gg:ol		ODSVRA 2019	SLO	4/14	
gg:rb	M	ODSVRA 2016 or 2018	SLO	5/4, 5/6, 5/16, 5/24, 6/29, 7/5, 7/6, 7/7, 7/8, 7/9, 7/11, 7/12, 7/14, 7/16, 7/18, 7/20, 7/21, 7/23, 7/24, 7/25	ODSVRA breeding male.
gg:wa		ODSVRA 2021	SLO	4/28, 4/29, 4/30, 5/23, 5/26, 6/4, 6/6, 6/9, 6/11, 6/29, 6/30	
gg:wb		ODSVRA 2011 or 2013	SLO	7/16	
gg:wo	M (2)	ODSVRA 2022	SLO	5/16, 5/27, 5/30, 6/2, 6/3, 6/9, 7/13, 7/20, 7/25, 7/28, 7/29, 8/4, 8/5, 8/23, 8/25, 9/2, 9/14	ODSVRA breeding males (2).
gg:wr		ODSVRA 2014 or 2016	SLO	5/7	
pg:b-	M	ODSVRA unknown	SLO	3/9, 5/26, 6/2, 7/17, 7/20, 7/22, 7/23, 7/25, 7/28, 8/1, 8/2, 8/3, 8/4, 8/8	ODSVRA breeding male.
pg:ba	M (2)	ODSVRA 2021	SLO	3/6, 4/13, 4/14, 4/26, 5/12, 5/15, 5/16, 5/23, 5/29, 5/30, 5/31, 6/2, 6/5, 6/6, 6/7, 6/8, 6/9, 6/10, 6/12, 6/13, 6/14, 6/15, 6/16, 6/22, 6/24, 6/25, 6/26, 6/27, 6/29, 6/30, 7/1, 7/4, 7/8, 7/11, 7/12, 7/14, 7/19, 7/25, 7/26, 7/31, 8/2, 8/3, 8/7, 8/8, 8/9, 8/10, 8/13, 8/14, 8/16, 8/17, 8/22, 8/23, 8/28, 9/2, 9/3, 9/10, 9/20	ODSVRA breeding males (2).
pg:bg		ODSVRA 2015 or 2016	SLO	8/15	
pg:br	M	ODSVRA 2021	SLO	4/10, 4/11, 4/25, 5/13, 5/14, 5/16, 5/19, 5/24, 5/29, 6/3, 6/4, 6/5, 6/6, 6/8, 6/18, 6/19, 6/20, 6/21, 6/24, 6/25, 6/26, 6/28, 6/29, 6/30, 7/2, 7/3, 7/4, 7/9, 7/10, 7/11, 7/13, 8/3, 8/15, 8/26, 9/2	ODSVRA breeding male.
pg:by	M (2)	ODSVRA 2017 or 2018	SLO	4/18, 4/21, 4/22, 4/23, 4/26, 5/16, 5/18, 5/21, 5/22, 5/24, 5/25, 5/26, 5/27, 5/29, 5/30, 5/31, 6/3, 6/6, 6/11, 6/12, 6/14, 6/15, 6/26, 7/11, 7/14, 7/25, 7/26, 7/27, 7/28, 7/29, 8/1, 8/3, 8/4, 8/6, 8/7, 8/8, 8/9, 8/10, 8/11, 8/13, 8/14, 8/16, 8/18, 8/19	ODSVRA breeding males (2).
pg:gw	F	ODSVRA 2022	SLO	4/15, 4/25, 5/17, 5/31, 7/1, 7/12, 7/13, 7/16, 8/12, 8/15, 8/20, 8/21, 8/31, 9/3	ODSVRA breeding female.

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2023 (continued).

Band Combination	Sex (No.)	Origin and Year Banded	County Banded	Dates Seen	Notes
pg:or	M	ODSVRA 2022	SLO	3/2, 3/12, 3/13, 4/17, 4/23, 4/27, 5/3, 5/18, 5/28, 6/2, 6/8, 7/1, 7/2, 7/3, 7/5, 7/6, 7/7, 7/9, 7/10, 7/11, 7/12, 7/13, 7/14, 7/16, 7/17, 7/18, 7/19, 7/20, 7/22, 7/25, 7/27, 8/6, 8/8, 8/15, 8/30, 8/31, 9/3, 9/5, 9/18	ODSVRA breeding male.
pg:ow	M	ODSVRA 2015 or 2016	SLO	5/16, 5/17, 5/27, 6/1, 6/3, 6/30, 7/6, 7/12, 7/13, 7/14, 7/26, 7/31, 8/16	ODSVRA breeding male.
pg:pb		ODSVRA 2014 or 2015	SLO	5/6, 5/10	
pg:rr		ODSVRA 2022	SLO	6/20	
pg:wy		ODSVRA 2022	SLO	5/29	
pg:ya		ODSVRA 2022	SLO	3/10, 3/12, 3/20, 3/24, 3/31, 7/19, 7/27, 8/29, 8/30, 9/4, 9/14, 9/15, 9/18	
pg:yb		ODSVRA 2015 or 2017	SLO	9/3	
pg:yr	M	ODSVRA 2022	SLO	3/20, 3/31, 4/13, 4/15, 4/16, 4/17, 4/24, 4/25, 5/2, 5/14, 5/26, 5/28, 5/30, 6/3, 6/9, 6/12, 6/13, 6/23, 7/6, 7/11, 7/13, 7/15, 7/18, 7/19, 7/20, 7/25, 7/28, 7/30, 8/2, 8/3, 8/10, 8/14, 8/15, 8/18, 8/29, 9/1, 9/3, 9/6, 9/8, 9/11	ODSVRA breeding male. On 25 April, bird banded pg:yr seen with possible right leg injury (see Table H.2 in Appendix H).
pg:yw	M	ODSVRA 2022	SLO	4/26, 4/28, 5/3, 5/14, 6/6, 6/7, 7/21, 7/22, 8/12, 8/13	ODSVRA breeding male.
pv:bb		ODSVRA 2022	SLO	5/16	
pv:by	F	ODSVRA 2015	SLO	4/7, 5/24, 7/26, 7/28, 8/8, 8/9, 8/11, 8/12, 8/13, 8/14, 8/16, 8/19, 8/20, 8/21, 8/22, 8/23, 8/25, 8/31, 9/2, 9/14	ODSVRA breeding female.
pv:gb	M	ODSVRA 2020	SLO	4/8, 5/3, 5/6, 5/22, 5/26, 5/29, 6/5, 6/7, 6/8, 6/10, 6/12, 6/13, 6/14, 6/18, 6/19, 6/28, 7/6, 7/7, 7/12, 7/13	ODSVRA breeding male.
pv:pb	M	ODSVRA 2022	SLO	3/12, 3/26, 4/19, 4/27, 5/3, 5/6, 5/12, 5/16, 5/27, 5/28, 6/2, 6/6, 6/9, 6/12, 6/13, 6/14, 6/17, 6/22, 6/23, 6/30, 7/1, 7/2, 7/3, 7/9, 7/15, 7/16, 7/19, 7/29, 7/30, 8/1, 8/2, 8/7, 8/11, 8/15, 8/16	ODSVRA breeding male.
pv:pv	F	ODSVRA 2021	SLO	3/30, 4/11, 4/26, 5/4, 6/12, 7/1, 7/2, 7/6, 7/12, 7/19, 7/23, 7/28, 8/3, 8/11, 8/30, 8/31, 9/1, 9/3	ODSVRA breeding female.
pv:vb	M	ODSVRA 2022	SLO	6/1, 6/7, 6/8, 6/14, 6/22, 7/5, 7/8, 7/9, 7/10, 7/13, 7/14, 7/22, 7/24, 7/25, 7/26, 7/29, 7/30, 8/1, 8/8	ODSVRA breeding male.
pv:wy		ODSVRA 2014 or 2015	SLO	6/8, 6/23	
rr:aa		ODSVRA 2021	SLO	6/10	
rr:ao	F	ODSVRA 2022	SLO	5/4, 5/25	ODSVRA breeding female. On 8 June, kestrel observed depredating rr:ao female from SP99 nest (Table H.4 in Appendix H).
rr:ar		ODSVRA 2022	SLO	4/19	

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2023 (continued).

Band Combination	Sex (No.)	Origin and Year Banded	County Banded	Dates Seen	Notes
rr:aw	M (2)	ODSVRA 2017	SLO	3/25, 4/10, 4/11, 4/25, 5/2, 5/3, 5/24, 5/31, 6/1, 6/3, 6/15, 6/18, 6/23, 7/3, 7/4, 7/5, 7/8, 7/12, 7/16, 7/20, 7/26, 7/28, 8/3, 8/5, 8/9, 8/11, 8/12, 8/13, 8/14, 8/15, 8/16, 8/19, 8/21, 8/25, 8/26, 8/29, 8/30, 8/31, 9/1, 9/3, 9/4, 9/5, 9/6, 9/8	ODSVRA breeding males (2).
rr:ay	F	ODSVRA 2022	SLO	3/5, 3/13, 3/29, 3/31, 4/4, 4/10, 4/14, 4/28, 5/5, 6/4, 6/8, 6/14, 7/15, 7/19, 7/20, 7/21, 8/30, 9/4, 9/5, 9/16, 9/20	ODSVRA breeding female.
rr:bb	F	ODSVRA 2016 or 2017	SLO	3/9, 3/31, 4/3, 5/23, 5/26, 6/15, 7/6, 7/7, 8/5, 8/6, 8/31, 9/1, 9/2, 9/5, 9/16	ODSVRA breeding female.
rr:bo		ODSVRA 2022	SLO	3/10, 3/12, 8/31, 9/4, 9/16	
rr:bw	M	ODSVRA 2016 or 2017	SLO	4/10, 4/26, 5/6, 5/17, 5/24, 6/6, 6/8, 6/9, 7/1, 7/2, 7/3, 7/4, 7/5, 7/6, 7/8, 7/10, 7/11, 7/15, 7/23, 7/24, 7/25, 7/27	ODSVRA breeding male.
rr:ga	M	ODSVRA 2022	SLO	3/15, 3/31, 4/26, 5/6, 5/28, 5/31, 6/4, 6/8, 6/11, 6/12, 6/13, 6/14, 6/16, 6/18, 6/19, 6/20, 6/25, 6/27, 7/3, 7/7, 7/10, 7/15, 7/16, 7/18, 7/21, 8/15, 8/16, 9/1	ODSVRA breeding male.
rr:oo		ODSVRA 2022	SLO	5/16, 5/24, 5/26, 6/8, 6/14, 6/15, 7/4, 7/8, 7/21, 9/16	
rr:oy	F	ODSVRA 2022	SLO	4/23, 5/11, 5/25, 6/12, 6/15, 6/16, 6/19, 7/6, 7/12, 7/25, 8/13	ODSVRA breeding female.
rr:pa	M	ODSVRA 2022	SLO	5/31, 6/9, 6/16, 6/18, 6/19, 6/22, 7/26, 8/1, 8/3, 8/5, 8/6, 8/7, 8/8, 8/9, 8/10, 8/13, 8/14, 8/19, 8/20, 8/24, 8/25, 8/27, 8/29	ODSVRA breeding male.
rr:pw	F	ODSVRA 2014	SLO	4/18, 4/29, 5/23, 5/24, 5/27, 5/30, 6/2, 7/8, 7/20	ODSVRA breeding female.
rr:ra	M & F	ODSVRA 2022	SLO	4/26, 5/24, 6/1, 6/18, 7/2, 7/6, 7/10, 7/11, 7/13, 7/16, 7/19, 7/20, 7/21, 8/1, 8/2, 8/3, 8/8	ODSVRA breeding male and female.
rr:ry	F	ODSVRA 2022	SLO	4/25, 5/22, 6/20, 6/22, 7/31, 8/11, 8/19, 8/25, 8/31, 9/2, 9/6	ODSVRA breeding female. On 18 June, bird banded rr:ry seen with a left leg injury (see Table H.2 in Appendix H).
rr:wo	F	ODSVRA 2022	SLO	5/24, 5/25	ODSVRA breeding female.
rr:wr	M	ODSVRA 2022	SLO	4/6, 4/25, 4/29, 5/13, 5/17, 6/12, 6/15, 6/22, 6/23, 7/2, 7/9, 7/13, 7/24, 7/25, 7/26, 7/27, 7/28, 8/1, 8/2, 8/3, 8/4, 8/6, 8/9, 8/10, 8/13, 8/14, 8/15, 8/16, 8/17, 8/18, 8/19, 8/20, 8/21, 8/22, 8/31, 9/2	ODSVRA breeding male.
rr:ya	M	ODSVRA 2022	SLO	3/23, 4/17, 4/18, 4/19, 5/23, 5/24, 5/28, 5/29, 6/5, 6/8, 6/11, 6/12, 6/14, 6/16, 6/18, 6/19, 6/21, 7/11, 7/12, 7/20, 7/22, 7/25, 7/26, 8/15, 9/15	ODSVRA breeding male.
rr:yo	M	ODSVRA 2022	SLO	4/25, 5/2, 5/4, 5/16, 6/16, 6/21, 7/3, 7/4, 7/6, 7/7, 7/8, 7/13, 7/19, 7/22, 7/28, 7/29	ODSVRA breeding male.

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2023 (continued).

Band Combination	Sex (No.)	Origin and Year Banded	County Banded	Dates Seen	Notes
rr:yr	M	ODSVRA 2022	SLO	3/11, 3/24, 3/31, 4/7, 4/13, 4/14, 4/15, 4/17, 4/18, 4/19, 4/25, 4/26, 4/27, 4/28, 5/2, 5/3, 5/4, 5/11, 5/13, 5/18, 5/22, 5/24, 5/25, 6/1, 6/2, 6/5, 6/7, 6/14, 6/16, 6/17, 6/20, 6/21, 6/22, 6/30, 7/1, 7/2, 7/4, 7/7, 7/11, 7/19, 7/20, 7/21, 8/3, 8/8, 8/14, 8/19, 8/22, 8/30, 8/31, 9/3, 9/5, 9/15	ODSVRA breeding male.
vg:ab		ODSVRA 2021	SLO	3/20	
vg:ba		ODSVRA 2019	SLO	3/31, 4/5, 4/25, 4/26, 5/26, 5/27, 6/4, 6/5, 6/8, 6/12	
vg:bw		ODSVRA 2016 or 2017	SLO	4/6	
vg:ob	M	ODSVRA 2021	SLO	5/12, 5/18, 5/29, 6/3, 6/6, 6/28, 6/30, 7/1, 7/3, 7/4, 7/5, 7/6, 7/11, 7/13, 7/14, 7/15, 7/19, 7/21, 7/22, 7/23, 7/29	ODSVRA breeding male.
vg:ra	F	ODSVRA 2022	SLO	4/25, 5/16, 5/27, 5/29, 6/1, 6/14, 6/23, 7/13, 8/9, 8/11, 8/12, 8/18, 8/20, 8/31, 9/1, 9/2, 9/5	ODSVRA breeding female.
vg:rw	M	ODSVRA 2018	SLO	4/8, 4/11, 5/24, 5/28, 5/31, 6/6, 6/8, 6/10, 6/15, 6/17, 6/18, 6/23, 6/27, 7/11, 7/14, 7/19, 7/23, 7/26, 7/27, 7/29, 7/30, 8/1, 8/2, 8/5, 8/7, 8/9, 8/11, 8/12, 8/13, 8/15, 8/16, 8/17, 8/18, 8/21	ODSVRA breeding male.
vg:wo	M	ODSVRA 2022	SLO	5/6	ODSVRA breeding male.
vg:yq	M	ODSVRA 2018	SLO	4/10, 5/16, 5/24, 5/30, 6/2, 6/3, 6/8, 6/9, 6/15, 6/19, 6/30, 7/10, 7/25, 8/1, 8/5, 8/10, 8/13, 8/14, 8/15, 8/24	ODSVRA breeding male.
vg:yr	M	ODSVRA 2022	SLO	4/18, 4/19, 4/30, 5/23, 5/24, 6/8, 6/21, 7/31, 8/11, 9/4, 9/5, 9/10, 9/16	ODSVRA breeding male.
vg:yy		ODSVRA 2016 or 2018	SLO	3/9, 4/26, 5/17	
vv:ar	F	ODSVRA 2021	SLO	3/6, 4/23, 4/26, 5/24, 6/26, 7/4, 8/15, 9/2	ODSVRA breeding female.
vv:bw		ODSVRA 2014 or 2015	SLO	3/9, 3/13, 3/26, 5/16, 5/17	
vv:ga	M	ODSVRA 2022	SLO	4/10, 4/25, 5/6, 5/19, 5/24, 5/30, 6/4, 6/8, 6/11, 6/12, 6/14, 6/17, 6/18, 6/21, 6/22, 6/28, 6/30, 7/28, 7/29, 8/6, 9/21	ODSVRA breeding male.
vv:ra	M	ODSVRA 2020	SLO	3/30, 4/10, 4/27, 5/6, 5/7, 5/13, 5/24, 5/28, 6/6, 6/13, 6/14, 6/15, 6/16, 6/21, 7/2, 7/6, 7/9, 7/12, 7/13, 7/18, 7/20, 7/21, 7/22, 7/23, 7/28, 8/26, 9/3, 9/6, 9/11, 9/15	ODSVRA breeding male.
vv:rv	F	ODSVRA 2020	SLO	7/10, 7/12, 7/13, 7/15, 7/17, 7/19, 7/21, 8/8, 8/30, 8/31, 9/2, 9/10	ODSVRA breeding female.
vv:wr	M	ODSVRA 2015 or 2016	SLO	5/16, 5/27, 6/2, 6/3, 6/6, 6/15, 7/6, 7/7, 7/8, 7/21, 7/29, 7/31, 8/3	ODSVRA breeding male.
a:g/o/g	M	VSFB 2017	Santa Barbara	6/1, 6/7, 6/19, 6/20, 7/3, 7/5, 7/8, 7/12, 7/13, 7/19, 7/22, 7/25	ODSVRA breeding male. On federal service band on left leg there is exposed metal above blue tape.
a:y/v		VSFB 2023	Santa Barbara	9/2	Juvenile.
an:ng		VSFB 2020	Santa Barbara	4/9	
an:ra		VSFB 2022	Santa Barbara	7/28	

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2023 (continued).

Band Combination	Sex (No.)	Origin and Year Banded	County Banded	Dates Seen	Notes
g:v/g		VSFB 2023	Santa Barbara	8/31, 9/2	Juvenile.
gn:ya	M	VSFB 2022	Santa Barbara	5/18, 5/27, 5/30, 6/14, 6/28, 7/12, 7/14, 7/15, 7/16, 7/18, 7/23, 7/25, 7/26, 7/27, 7/28, 7/29, 8/1, 8/2, 8/3, 8/7, 8/9, 8/12, 8/13, 8/14, 8/15, 8/17, 8/23, 8/31, 9/1, 9/2	ODSVRA breeding male.
l:a/v		VSFB 2022	Santa Barbara	3/26, 4/14, 4/19, 4/20, 4/24, 4/25, 4/26, 4/27, 5/1	
l:y/g	M	VSFB 2016	Santa Barbara	4/11, 5/5, 5/16, 5/22, 5/24, 6/3, 6/12, 7/22	ODSVRA breeding male.
n:-oy	M	VSFB Unknown	Santa Barbara	6/6, 7/10, 7/12, 7/13, 7/15, 7/16, 7/19, 7/21, 7/22, 7/26, 7/29, 8/8, 8/9	ODSVRA breeding male.
nb:al		VSFB 2020	Santa Barbara	5/17	
nb:oy		VSFB 2016	Santa Barbara	8/7	
nb:rr	M	VSFB 2020	Santa Barbara	5/12, 5/15, 5/22, 5/23, 5/25, 5/26, 5/27, 5/30, 5/31, 6/1, 6/3, 6/4, 6/5, 6/8, 6/11, 6/14, 6/16, 6/24, 7/20, 8/3, 8/5, 8/30, 9/3, 9/5, 9/11, 9/16, 9/18, 9/20	ODSVRA breeding male.
no:bo		VSFB 2023	Santa Barbara	7/28	Juvenile.
no:oo		VSFB 2023	Santa Barbara	8/30	Juvenile.
ns:ba		VSFB Unknown	Santa Barbara	7/21, 8/29, 9/5	
nw:ra		VSFB 2022	Santa Barbara	9/2	
nw:yw	M	VSFB 2022	Santa Barbara	4/10, 5/15, 5/16, 5/31, 6/6, 6/28, 7/12, 7/13, 7/14, 7/16, 7/17, 7/18, 7/23, 7/24, 7/26, 7/27	ODSVRA breeding male.
ny:bw		VSFB 2020	Santa Barbara	5/17	
ny:gv	F	VSFB 2021	Santa Barbara	5/11, 5/22, 5/23, 5/24, 7/9, 7/20, 7/21, 8/3, 8/5, 8/6, 8/8, 8/14, 8/31, 9/1, 9/2, 9/15, 9/16	ODSVRA breeding female.
ny:ow		VSFB 2023	Santa Barbara	7/15	Juvenile.
ny:wg	M	VSFB 2017	Santa Barbara	5/16, 5/31, 6/29, 7/4, 7/5, 7/7, 7/8, 7/10, 7/11, 7/12, 7/13, 7/18, 7/20, 7/22, 7/25, 8/15, 8/19	ODSVRA breeding male.
ny:yw		VSFB 2021	Santa Barbara	7/25	
o:a/b/a	F	VSFB 2021	Santa Barbara	5/6, 5/10, 5/13, 5/24, 5/27, 6/1, 6/29, 7/2, 7/3, 7/4, 7/5, 7/6, 7/9, 7/10, 7/11	ODSVRA breeding female.
w:a/r/a		VSFB 2023	Santa Barbara	8/1	Juvenile.
y:a/r	F	VSFB 2022	Santa Barbara	5/27, 6/23, 6/30, 7/5, 7/7, 7/19	ODSVRA breeding female.
y:y/b/y		VSFB 2023	Santa Barbara	8/30, 8/31, 9/2	Juvenile.
yp:ga	F	North Island NAS 2022	San Diego	4/24, 5/4, 7/5, 7/6	ODSVRA breeding female.
w:-o-		Unknown	Unknown	8/31, 9/1, 9/2	
w:-s-	M	Unknown	Unknown	6/27, 7/3, 7/4, 7/5, 7/9, 7/10, 7/11, 7/13, 8/19, 9/1, 9/3	ODSVRA breeding male.

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

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2022 to 28 February 2023.

This is a partial list based on information received from a coordinated effort throughout the range of monitors and managers to share band sightings. 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 A.)

COPR = Coal Oil Point Reserve, Guadalupe RP = Guadalupe Restoration Project, SB = State Beach, SLO = San Luis Obispo, SP = State Park, VSFB = Vandenberg Space Force Base

Band Combination	Year Banded	Location Seen	County	Dates Seen
vv:ga	2022	Manchester Beach	Mendocino, CA	10/20
pv:ag	2015 or 2016	Dillon Beach	Marin	10/12, 11/9, 12/8, 1/3, 1/19, 2/25
vg:wo	2022	Dillon Beach	Marin	10/12, 12/7, 12/8
pv:by	2015	Point Reyes National Seashore	Marin	11/14
vg:ya	2020	Point Reyes National Seashore	Marin	1/20, 2/10
vv:ga	2022	Point Reyes National Seashore	Marin	11/14, 1/20
ga:av	2020	Ano Nuevo SP	San Mateo	12/18
pg:bg	2015 or 2016	Laguna Creek Beach	Santa Cruz	11/4, 11/21, 11/22, 12/5, 12/23
vg:rw	2018	Laguna Creek Beach	Santa Cruz	11/4, 11/14, 12/19, 12/23, 1/30
gg:wb	2011 or 2013	Seabright SB	Santa Cruz	12/15
gg:by	2021	Del Monte Beach	Monterey	12/20, 1/28
pg:ay	2022	Del Monte Beach	Monterey	1/28, 1/31
pg:pb	2014 or 2015	Del Monte Beach	Monterey	11/15, 1/31
rr:br	2022	Del Monte Beach	Monterey	12/20
pg:pb	2014 or 2015	Carmel River Mouth	Monterey	12/21, 12/28
ga:yo	2022	Arroyo Laguna	SLO	10/3, 10/4, 10/5, 10/6, 10/10, 10/17, 10/24, 10/31, 11/7, 11/15, 11/21, 12/19
pg:ay	2022	Arroyo Laguna	SLO	10/3
pv:wr	2022	Arroyo Laguna	SLO	10/17, 10/24, 10/31
rr:ay	2022	Arroyo Laguna	SLO	11/21
rr:vw	2021	Arroyo Laguna	SLO	10/10, 10/17, 10/24, 10/31
vv:pa	2020	Arroyo Laguna	SLO	11/21, 12/19
ga:yo	2022	San Simeon SP	SLO	1/31
vv:pa	2020	San Simeon SP	SLO	1/31
ga:yo	2022	Santa Rosa Creek	SLO	1/28, 1/31
gg:pr	2022	Santa Rosa Creek	SLO	1/31
rr:vw	2021	Santa Rosa Creek	SLO	11/7
vv:pa	2020	Santa Rosa Creek	SLO	1/31
bb:ar	2017 or 2018	Villa Creek	SLO	10/3, 10/10, 10/19, 10/31, 11/21, 11/30, 12/5, 12/9, 12/12, 12/16, 12/19, 1/19, 1/26, 2/6, 2/13, 2/20, 2/21

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

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2022 to 28 February 2023 (continued).

Band Combination	Year Banded	Location Seen	County	Dates Seen
bb:yy	2022	Villa Creek	SLO	10/19
gg:oa	2019	Villa Creek	SLO	10/3, 10/9, 10/10, 10/19, 10/24, 10/28, 10/31, 11/4, 11/7, 11/14, 11/21, 11/26, 12/12, 12/16, 12/19, 1/26, 1/30, 2/13, 2/16
bb:yy	2022	Morro Strand SB	SLO	10/17, 10/24, 11/14, 11/18, 11/28, 12/2
ga:yo	2022	Morro Strand SB	SLO	10/10
gg:oa	2019	Morro Strand SB	SLO	11/28
gg:oo	2022	Morro Strand SB	SLO	11/28
pv:rr	2022	Morro Strand SB	SLO	10/3, 10/31, 11/14, 11/21, 12/6
rr:bo	2022	Morro Strand SB	SLO	10/17, 11/7, 11/14, 11/21, 11/28, 12/2, 12/12
rr:ob	2022	Morro Strand SB	SLO	10/24
rr:pr	2022	Morro Strand SB	SLO	10/3, 10/10, 10/17, 10/24, 10/31, 11/7, 11/21, 11/28, 12/6, 12/12
rr:rw	2022	Morro Strand SB	SLO	11/14
vg:rv	2020	Morro Strand SB	SLO	10/3, 10/10, 10/17, 10/24, 10/31, 11/7, 11/14, 11/21, 11/28
vv:ra	2020	Morro Strand SB	SLO	11/28
gg:yo	2022	Morro Bay Spit	SLO	10/24
rr:pr	2022	Morro Bay Spit	SLO	10/10
rr:rw	2022	Morro Bay Spit	SLO	10/3, 10/10, 10/17
vv:ra	2020	Morro Bay Spit	SLO	10/10, 11/14
gg:wo	2022	Guadalupe RP	SLO	2/1
gg:yr	2017 or 2018	Guadalupe RP	SLO	2/1
pv:by	2015	Guadalupe RP	SLO	2/1
gg:aw	2017 or 2018	VSFB	Santa Barbara	10/18
gg:rb	2016 or 2018	VSFB	Santa Barbara	10/18
rr:ar	2022	VSFB	Santa Barbara	10/18
pg:gw	2022	Jalama Beach	Santa Barbara	11/9
vg:yr	2022	Jalama Beach	Santa Barbara	11/10
gg:ag	2022	COPR	Santa Barbara	1/6, 2/18
gg:wo	2022	COPR	Santa Barbara	10/8, 10/22, 10/28, 11/3, 1/25, 2/4, 2/18, 2/21
pv:gy	2018	COPR	Santa Barbara	10/16
vv:ab	2017 or 2018	COPR	Santa Barbara	1/13
bb:go	2019	San Buenaventura SB	Ventura	11/22, 11/30, 12/7, 12/13, 12/19, 1/3, 2/2, 2/8, 2/15, 2/21
vg:gg	2022	San Buenaventura SB	Ventura	11/9, 12/7, 2/2, 2/15, 2/28
ga:gy	2020	Zuma Beach	Los Angeles	11/30

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

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2022 to 28 February 2023 (continued).

Band Combination	Year Banded	Location Seen	County	Dates Seen
bb:ag	2020	Santa Monica	Los Angeles	11/1
vg:ba	2019	Santa Monica	Los Angeles	1/9, 2/3, 2/19

Appendix D. Banded California 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 2023.

This is a partial list based on information received from a coordinated effort throughout the range of monitors and managers to share band sightings.

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

COPR = Coal Oil Point Reserve, Guadalupe NWR = Guadalupe-Nipomo Dunes National Wildlife Refuge, NAS = Naval Air Station,

NBVC = Naval Base Ventura County, NWR = National Wildlife Refuge, RP = Restoration Project, SB = State Beach, SLO = San Luis Obispo,

VSFB = Vandenberg Space Force Base

F = female, M = male

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
gg:ao	2022		New River	Coos, OR	6/19	
vg:pb	2022		Mackerricher SB	Mendocino, CA	5/18	
pv:ab	2023		Dillon Beach	Marin	9/19	Juvenile.
pv:ag	2015 or 2016		Dillon Beach	Marin	3/8, 3/16, 8/9, 8/22, 8/30, 9/6, 9/19	
vg:wo	2022		Dillon Beach	Marin	8/22, 9/6, 9/19, 9/26	
vg:rw	2018		Laguna Creek Beach	Santa Cruz	9/11	
bb:ay	2023		Pajaro Spit	Santa Cruz	9/6	Juvenile.
gg:yo	2022		Pajaro Spit	Santa Cruz	7/28	
pg:bg	2015 or 2016		Pajaro Spit	Santa Cruz	7/31, 8/4, 8/17, 8/25, 9/6, 9/21	
pv:ab	2023		Pajaro Spit	Santa Cruz	9/6	Juvenile.
pv:gb	2020		Pajaro Spit	Santa Cruz	8/15	
vg:bg	2023		Pajaro Spit	Santa Cruz	9/6	Juvenile.
vg:rw	2018		Pajaro Spit	Santa Cruz	8/25	
vg:ya	2020		Pajaro Spit	Santa Cruz	9/6	
pv:ag	2015 or 2016	M	Moss Landing Salt Ponds	Monterey	3/31, 4/3, 4/4, 4/12, 4/14, 4/19, 4/21, 5/1, 5/9, 5/17, 5/24, 5/31, 6/5, 6/6, 6/21, 8/2	Moss Landing Salt Ponds breeding male.
pg:bg	2015 or 2016	F	Salinas River SB	Monterey	4/5, 4/13, 4/27, 6/12, 6/22, 7/12, 7/17	Salinas River SB breeding female.
rr:ra	2022	M	Salinas River SB	Monterey	4/19, 4/25, 5/4, 5/10, 5/17, 5/24, 6/1, 6/8, 7/19	Salinas River SB breeding male.
pg:bg	2015 or 2016		Salinas North Spit	Monterey	3/17, 7/20	
pg:vo			Salinas North Spit	Monterey	8/15	
rr:ra	2022		Salinas North Spit	Monterey	7/25	
pg:bg	2015 or 2016		Salinas River NWR	Monterey	3/27, 4/10	
rr:ab	2016 or 2017		Salinas River NWR	Monterey	5/12	
rr:bo	2022		Salinas River NWR	Monterey	5/14, 5/19, 5/22, 6/8, 6/9, 6/13, 6/16, 6/20, 6/21, 6/28, 6/30, 7/3, 7/6, 7/11, 7/24, 7/26, 7/28, 7/31, 8/2, 8/4, 8/8	
vg:ya	2020	M	Salinas River NWR	Monterey	3/24, 4/3, 4/21, 4/27, 5/18, 6/2, 6/26, 6/28, 6/29, 6/30, 7/3, 7/6, 7/21, 7/31, 8/2	Salinas River NWR breeding male.
pg:ay	2022		Del Monte Beach	Monterey	3/20	

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 2023 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
pg:pb	2014 or 2015		Del Monte Beach	Monterey	3/13	
vv:gg	2023		Del Monte Beach	Monterey	9/28	Juvenile.
gg:by	2021		Marina Dunes	Monterey	3/7	
rr:bo	2022		Marina Dunes	Monterey	5/11	
bb:wb	2023		Marina SB	Monterey	8/16	Juvenile.
ga:po	2023		Marina SB	Monterey	8/30	Juvenile.
pg:gw	2022		Marina SB	Monterey	5/30, 6/5, 6/11, 6/13, 6/27, 7/5	
pg:yw	2022		Marina SB	Monterey	5/15, 5/17, 6/13, 6/16	
vg:ya	2020		Marina SB	Monterey	7/14	
rr:bo	2022		Fort Ord SP	Monterey	8/17	
ga:ya	2023		Arroyo Laguna	SLO	9/18	Juvenile.
pg:oo	2023		Arroyo Laguna	SLO	9/18	Juvenile.
bb:ar	2017 or 2018		Villa Creek	SLO	8/7, 8/11, 8/12, 8/14, 8/16, 8/18, 8/21, 8/24, 8/25, 8/28, 9/1, 9/6, 9/8, 9/11, 9/15, 9/21, 9/26	
bb:wb	2023		Villa Creek	SLO	8/28, 9/1, 9/26	Juvenile.
ga:rw	2023		Villa Creek	SLO	9/25	Juvenile.
gg:oa	2019		Villa Creek	SLO	3/27, 6/12, 7/31, 8/2, 8/4, 8/14, 8/21, 8/25, 8/28, 9/6, 9/8, 9/11, 9/18, 9/22, 9/26	
bb:aw	2023		Morro Strand SB	SLO	9/6	Juvenile.
bb:pg	2022		Morro Strand SB	SLO	9/6, 9/8	
bb:wg	2020		Morro Strand SB	SLO	8/21	
bb:wy	2023		Morro Strand SB	SLO	9/1	Juvenile.
ga:bv	2023		Morro Strand SB	SLO	9/1	Juvenile.
ga:go	2023		Morro Strand SB	SLO	9/15	Juvenile.
ga:po	2023		Morro Strand SB	SLO	8/4, 8/7, 8/14, 8/18, 8/21, 9/11	Juvenile.
ga:rw	2023		Morro Strand SB	SLO	9/6, 9/8	Juvenile.
ga:vv	2023		Morro Strand SB	SLO	9/6	Juvenile.
gg:rw	2023		Morro Strand SB	SLO	9/6	Juvenile.
gg:vb	2023		Morro Strand SB	SLO	9/6	Juvenile.
gg:wo	2022		Morro Strand SB	SLO	8/7, 8/8, 8/11, 8/16	
pg:gw	2022		Morro Strand SB	SLO	8/4, 8/9, 8/11, 8/21, 9/1	
pv:rr	2022		Morro Strand SB	SLO	3/29, 4/5, 7/14, 7/21, 7/28, 7/31, 8/4, 8/11, 8/14	
rr:bo	2022		Morro Strand SB	SLO	3/23, 3/27, 3/29, 4/3, 4/10, 4/12, 4/14, 4/24, 4/26	

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 2023 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
rr:yr	2022		Morro Strand SB	SLO	7/31	
vg:bg	2023		Morro Strand SB	SLO	9/1, 9/6	Juvenile.
vg:vv	2023		Morro Strand SB	SLO	9/8, 9/11	Juvenile.
bb:av	2023		Morro Bay Spit	SLO	9/26	Juvenile.
bb:aw	2023		Morro Bay Spit	SLO	9/15, 9/22, 9/26	Juvenile.
bb:gv	2023		Morro Bay Spit	SLO	9/18	Juvenile.
bb:wy	2023		Morro Bay Spit	SLO	9/18, 9/22, 9/26	Juvenile.
bb:ya	2023		Morro Bay Spit	SLO	9/6	Juvenile.
ga:go	2023		Morro Bay Spit	SLO	9/11, 9/18, 9/22, 9/26	Juvenile.
ga:po	2023		Morro Bay Spit	SLO	7/31, 8/2, 8/14, 8/23, 8/29, 8/30, 9/1, 9/11, 9/15, 9/18, 9/22	Juvenile.
ga:rw	2023		Morro Bay Spit	SLO	9/18, 9/22	Juvenile.
ga:vv	2023		Morro Bay Spit	SLO	9/15, 9/18, 9/22	Juvenile.
gg:wo	2022		Morro Bay Spit	SLO	8/21, 8/22, 8/28, 8/29, 9/1, 9/6, 9/11, 9/15, 9/18, 9/22, 9/25	
pv:rr	2022		Morro Bay Spit	SLO	7/19	
rr:bo	2022		Morro Bay Spit	SLO	4/19, 4/21	
vg:vv	2023		Morro Bay Spit	SLO	9/15, 9/18, 9/22, 9/26	Juvenile. Two birds observed on 22 September.
vg:ww	2023		Morro Bay Spit	SLO	8/19, 8/22	Juvenile.
vv:gg	2023		Morro Bay Spit	SLO	9/22	Juvenile.
bb:vw	2018		Guadalupe NWR	SLO	5/23	
bb:wy	2023		Guadalupe NWR	SLO	8/14	Juvenile.
ga:bb	2017 or 2018		Guadalupe NWR	SLO	7/13	
ga:vb	2021		Guadalupe NWR	SLO	5/23, 5/26	
ga:vw	2020		Guadalupe NWR	SLO	6/29, 7/18	
ga:wo	2021		Guadalupe NWR	SLO	8/14	
gg:ab	2023		Guadalupe NWR	SLO	8/14	Juvenile.
gg:ol	2019		Guadalupe NWR	SLO	5/24	
gg:wr	2014 or 2016		Guadalupe NWR	SLO	7/13	
gg:yr	2017 or 2018		Guadalupe NWR	SLO	7/25	
pg:by	2017 or 2018		Guadalupe NWR	SLO	6/29	
pv:bb	2022		Guadalupe NWR	SLO	6/29	
pv:yr	2017 or 2018		Guadalupe NWR	SLO	7/13, 7/18, 7/25	

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 2023 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
rr:pv	2022		Guadalupe NWR	SLO	8/14	
rr:wr	2022		Guadalupe NWR	SLO	7/18	
bb:av	2023		Guadalupe RP	SLO	8/8	Juvenile.
bb:gv	2023		Guadalupe RP	SLO	8/8	Juvenile.
bb:yb	2011, 2013 or 2015		Guadalupe RP	SLO	6/2	
bb:yg	2022		Guadalupe RP	SLO	5/18, 6/2, 6/9, 6/12, 7/19	
ga:ya	2023		Guadalupe RP	SLO	8/8	Juvenile.
gg:by	2021		Guadalupe RP	SLO	3/24	
gg:yr	2017 or 2018		Guadalupe RP	SLO	3/20, 4/20, 5/5, 5/18, 5/26, 8/8	
pv:bw	2022		Guadalupe RP	SLO	4/26	
pv:yr	2017 or 2018		Guadalupe RP	SLO	6/15, 6/22, 6/27, 7/10	
rr:oy	2022		Guadalupe RP	SLO	6/9, 6/15, 6/22, 6/27, 7/5	
rr:pv	2022		Guadalupe RP	SLO	4/20, 4/26, 6/2, 7/10	
vg:wo	2022		Guadalupe RP	SLO	4/15, 4/20, 4/26, 5/3, 5/5, 6/2	
bb:av	2023		VSFB	Santa Barbara	8/9, 8/17, 8/24	Juvenile.
bb:aw	2023		VSFB	Santa Barbara	8/17	Juvenile.
bb:pw	2023		VSFB	Santa Barbara	8/7, 8/31, 9/6	Juvenile.
bb:rg	2023		VSFB	Santa Barbara	8/9	Juvenile.
bb:ro	2021		VSFB	Santa Barbara	7/4	
bb:wb	2023		VSFB	Santa Barbara	9/20	Juvenile.
bb:wy	2023		VSFB	Santa Barbara	8/22, 8/24, 8/30, 9/12	Juvenile.
bb:yr	2021	M	VSFB	Santa Barbara	3/16, 3/30, 4/4, 4/6, 4/11, 4/18, 4/25, 4/27, 5/18, 5/25, 6/15, 6/21, 6/23, 6/30, 7/10, 7/11, 7/13	VSFB breeding male.
ga:av	2020		VSFB	Santa Barbara	5/9	
ga:ba	2020		VSFB	Santa Barbara	6/22	
ga:go	2023		VSFB	Santa Barbara	9/12	Juvenile.
ga:gv	2020	M	VSFB	Santa Barbara	3/2, 3/7, 3/16, 3/22, 4/11, 4/13, 4/18, 4/27, 5/2, 5/11, 5/18, 5/31, 6/2, 6/14, 6/15, 7/6, 7/13, 7/17, 7/20, 7/24, 7/25, 8/1, 8/9, 8/17, 8/30, 9/28	VSFB breeding male.
ga:ya	2023		VSFB	Santa Barbara	8/23	Juvenile.
gg:av	2019	F	VSFB	Santa Barbara	3/2, 3/7, 3/16, 3/22, 3/28, 3/30, 4/4, 4/6, 4/11, 4/13, 5/4, 5/9, 5/18, 5/25, 6/6, 6/8, 6/12, 6/13, 6/15, 7/17, 7/20, 7/27, 8/24, 9/12, 9/28	VSFB breeding female.

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 2023 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
gg:aw	2017 or 2018	F	VSFB	Santa Barbara	3/2, 3/30, 4/24, 5/18, 7/11, 7/13, 8/1, 8/9	VSFB breeding female.
gg:bv	2023		VSFB	Santa Barbara	8/17	Juvenile.
gg:ga	2023		VSFB	Santa Barbara	8/9	Juvenile.
gg:pr	2022		VSFB	Santa Barbara	4/13, 4/25, 5/4, 5/16, 5/18, 5/25, 6/6, 6/23, 7/11, 7/13, 7/17, 7/24, 7/27, 8/30, 9/1, 9/12	
gg:rb	2016 or 2018	F	VSFB	Santa Barbara	3/16, 3/22, 3/28, 4/4, 4/11, 4/25, 4/27, 5/9, 5/23, 6/8, 6/14, 6/23, 7/11, 7/13, 7/17, 7/20, 9/12, 9/28	VSFB breeding female.
gg:ry	2023		VSFB	Santa Barbara	8/9, 8/17, 8/22, 8/24	Juvenile.
gg:vw	2023		VSFB	Santa Barbara	9/12	Juvenile.
gg:wo	2022		VSFB	Santa Barbara	4/10, 4/14, 4/17, 7/6, 7/17, 8/30, 9/12	
gg:yw	2022		VSFB	Santa Barbara	7/6, 7/17, 8/30	
gg:yy	2023		VSFB	Santa Barbara	9/12	Juvenile.
pg:gw	2022		VSFB	Santa Barbara	5/22	
pv:wr	2022		VSFB	Santa Barbara	7/19, 8/10, 9/6	
rr:bo	2022	M	VSFB	Santa Barbara	5/9, 5/25, 6/6, 6/8, 6/30, 7/4, 7/6, 7/13, 7/20, 7/25, 8/1, 8/9, 8/17, 9/1, 9/12	VSFB breeding male.
rr:pg	2023		VSFB	Santa Barbara	9/6, 9/10, 9/20	Juvenile.
vv:ba	2023		VSFB	Santa Barbara	8/24, 8/28	Juvenile.
vv:bg	2022	F	VSFB	Santa Barbara	6/21, 6/23, 6/30	VSFB breeding female.
vv:gb	2023		VSFB	Santa Barbara	9/12	Juvenile.
vv:gg	2023		VSFB	Santa Barbara	8/29, 8/30, 9/6, 9/20	Juvenile.
bb:rg	2023		COPR	Santa Barbara	8/29	Juvenile.
bb:vb	2011, 2013 or 2014		COPR	Santa Barbara	8/24	
ga:go	2023		COPR	Santa Barbara	9/13	Juvenile.
ga:pb	2016 or 2017		COPR	Santa Barbara	4/22, 4/26, 5/13, 6/2, 6/5	
ga:po	2016 or 2017		COPR	Santa Barbara	8/24	
gg:ag	2022		COPR	Santa Barbara	8/7, 8/23	
gg:br	2023		COPR	Santa Barbara	9/13	Juvenile.
gg:pv	2021		COPR	Santa Barbara	6/9	
gg:wo	2022		COPR	Santa Barbara	3/8, 3/18	
vg:gg	2022		San Buenaventura SB	Ventura	3/6, 3/16, 3/20, 3/30, 4/4	
ga:pb	2016 or 2017		McGrath SB	Ventura	6/13, 7/3, 7/5	
ga:yo	2022		McGrath SB	Ventura	7/31	

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 2023 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
rr:ra	2022		McGrath SB	Ventura	7/31	
vg:gg	2022		McGrath SB	Ventura	7/31	
bb:aa	2020		NBVC Point Mugu	Ventura	6/28	
bb:ag	2020		NBVC Point Mugu	Ventura	5/11, 5/22	
rr:aa	2021		NBVC Point Mugu	Ventura	6/28	
bb:gv	2023		Hermosa Beach	Los Angeles	8/24	Juvenile.
pv:ay	2022		Huntington Beach	Orange	5/13	
vv:ba	2023		Camp Pendleton	San Diego	8/29	Juvenile.
ga:vb	2021		North Island NAS	San Diego	8/4	
ga:ya	2023		North Island NAS	San Diego	8/10	Juvenile.
gg:rw	2023		North Island NAS	San Diego	9/20	Juvenile.
pv:yr	2017 or 2018		North Island NAS	San Diego	4/21	
vg:yy	2016 or 2018		Tijuana Estuary	San Diego	8/3	

APPENDIX E. CALIFORNIA LEAST TERN REPRODUCTIVE SUCCESS REPORTED FOR CURRENT, RECENT, OR INFREQUENT BREEDING SITES IN SAN LUIS OBISPO AND SANTA BARBARA COUNTIES FROM 2004-23.

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

unk = number not available due to insufficient information

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
	RGDP	8	8	3	7	0	0.00	0.00
	VSFB 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
	RGDP	4	4	0	0	0	0.00	0.00
	VSFB	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	1.03-1.16
	RGDP	0	0	0	0	0	0.00	0.00
	VSFB 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
	RGDP	1	1	1	1	1	1.00	1.00
	VSFB	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	71	1.27	1.27-1.29
	RGDP	0	0	0	0	0	0.00	0.00
	VSFB	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
	RGDP	2-3	3	2	3	3	1.00	1.00-1.50
	VSFB	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
	RGDP	1	1	1	2	2	2.00	2.00
	VSFB	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
	RGDP	0	0	0	0	0	0.00	0.00
	VSFB	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
	RGDP	0	0	0	0	0	0.00	0.00
	VSFB	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	1.06-1.17
	RGDP	0	0	0	0	0	0.00	0.00
	VSFB	15	15	15	25	19	1.27	1.27
	COPR	0	0	0	0	0	0.00	0.00

Appendix E. California least tern reproductive success reported for current, recent, or infrequent breeding sites in San Luis Obispo and Santa Barbara counties from 2004-23 (continued).

Year	Site	No. pairs	No. nests	No. nests hatching	No. chicks	No. juveniles	No. juveniles per total no. nest	No. juveniles per pair
2014	ODSVRA	47-48	49	42	76	58	1.18	1.21-1.23
	RGDP	0	0	0	0	0	0.00	0.00
	VSFB	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
	RGDP	0	0	0	0	0	0.00	0.00
	VSFB	22	22	22	45	29	1.32	1.32
	COPR	0	0	0	0	0	0.00	0.00
2016	ODSVRA	47-48	49	46	78	59	1.20	1.23-1.26
	RGDP	0	0	0	0	0	0.00	0.00
	VSFB	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
	RGDP	0	0	0	0	0	0.00	0.00
	VSFB	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
	RGDP	10-11	11	5	10	4	0.36	0.36-0.40
	VSFB	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
	RGDP	17	17	8	15	unk	unk	unk
	VSFB	42	47	36	63	21	0.44	0.50
	COPR	0	0	0	0	0	0.00	0.00
2020	ODSVRA	35-42	48	36	63	38	0.79	0.90-1.09
	RGDP	50	56	10	18	5-10	0.09-0.18	0.10-0.20
	VSFB	10	12	7	11	6	0.50	0.60
	COPR	0	0	0	0	0	0.00	0.00
2021	ODSVRA	50-52	53	49	81	48	0.91	0.92-0.96
	RGDP	0	0	0	0	0	0.00	0.00
	VSFB	27	34	17	29	8	0.24	0.30
	COPR	0	0	0	0	0	0.00	0.00
2022	ODSVRA	43-44	45	42	69	37	0.82	0.84-0.86
	RGDP	1	1	0	0	0	0.00	0.00
	VSFB	42	45	39	78	23	0.51	0.55
	COPR	0	0	0	0	0	0.00	0.00
2023	ODSVRA	41-42	42	37	66	35	0.83	0.83-0.85
	RGDP	0	0	0	0	0	0.00	0.00
	VSFB	39	42	37	62	17	0.40	0.44
	COPR	0	0	0	0	0	0.00	0.00

^{1,2} Minimum counts of adult terns at the VSFB 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, 2001-23.

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 nest location 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 Southern Enclosure; size has remained consistent since 2004. Beginning in 2021, closed buffer area became a new nesting location. Area information is provided in the report Site Description section.

BY = Boneyard, Euc. = Eucalyptus, reveg. = revegetation

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 from known location nests fledged
2001	Southern Enclosure	25	25	22	88	57	2	4
	Oso Flaco	4	2	2	100	6	1	17
	Open riding area	1	1	0	0	0	0	0
	Arroyo Grande Enclosure ^{1, 3}	3	2	3	100	9	0	0
	Total	33	30	27	87	72	3	4
2002	Southern Enclosure	33	33	25	76	62	35	56
	Oso Flaco	2	2	0	0	0	0	0
	Total	35	35	25	71	62	35	56
2003	Southern Enclosure	74	73	53	73	136	91	67
	Oso Flaco	13	13	4	31	11	7	64
	Open riding area	1	1	1	100	3	3	100
	Dunes Preserve	1	1	1	100	3	0	0
	Pipeline reveg. area	3	3	2	67	4	2	50
	East of BY enclosure ²	2	2	1	50	3	2	67
	Total	94	93	62	67	160	105	66
2004	Southern Enclosure	113	111	87	78	208	59	28
	Oso Flaco	27	27	17	63	40	7	18
	Open riding area	1	1	0	0	0	0	0
	Pipeline reveg. area	1	1	1	100	3	0	0
	Total	142	140	105	75	251	66	26
2005	Southern Enclosure	79	79	60	76	142	57	40
	Oso Flaco	22	22	18	82	49	23	47
	East of BY enclosure ²	2	2	2	100	6	2	33
	Total	103	103	80	78	197	82	42
2006	Southern Enclosure	87	84	65	77	173	8	5
	Oso Flaco	29	29	22	76	57	9	16
	Open riding area	1	1	0	0	0	0	0
	Total	117	114	87	76	230	17	7
2007	Southern Enclosure	76	76	61	80	159	58	36
	Oso Flaco	15	15	9	60	20	4	20
	Total	91	91	70	77	179	62	35
2008	Southern Enclosure	100	100	73	73	172	64	37
	Oso Flaco	19	19	8	42	19	5	26
	Total	119	119	81	68	191	69	36
2009	Southern Enclosure	125	124	86	69	220	79	36
	Oso Flaco	23	22	8	36	22	2	9
	Pismo Lagoon	1	1	0	0	0	0	0
	Total	149	147	94	64	242	81	33

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

Table F.1. Nesting success of snowy plovers in identifiable areas at ODSVRA, 2001-23 (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 from known location nests fledged
2010	Southern Exclosure	126	123	95	77	234	86	37
	Oso Flaco	22	22	13	59	33	15	45
	Open riding area	1	1	1	100	2	2	100
	Carpenter Creek	1	1	0	0	0	0	0
	Arroyo Grande Creek	3	3	0	0	0	0	0
	Total	153	150	109	73	269	103	38
2011	Southern Exclosure	140	135	113	84	300	129	43
	Oso Flaco	23	23	16	70	40	18	45
	Open riding area	2	2	2	100	5	1	20
	Total	165	160	131	82	345	148	43
2012	Southern Exclosure	194	186	143	77	353	85	24
	Oso Flaco	14	14	9	64	21	4	19
	Open riding area	3	3	0	0	0	0	0
	Total	211	203	152	75	374	89	24
2013	Southern Exclosure	147	144	115	80	286	123	43
	Oso Flaco	23	23	15	65	38	25	66
	Total	170	167	130	78	324	148	46
2014	Southern Exclosure	201	194	173	89	428	142	33
	Oso Flaco	44	44	33	75	86	35	41
	Open riding area	1	1	0	0	0	0	0
	Total	246	239	206	86	514	177	34
2015	Southern Exclosure	182	175	153	87	401	215	54
	Oso Flaco	20	20	14	70	39	24	62
	Arroyo Grande Creek ³	1	-	1	-	2	0	0
	Total	203	195	168	86	442	239	54
2016	Southern Exclosure	169	156	136	87	326	94	29
	Oso Flaco	40	37	29	78	82	36	44
	Arroyo Grande Creek ³	1	-	1	-	2	1	50
	Total	210	193	166	85	410	131	32
2017	Southern Exclosure	195	165	107	65	252	105	42
	Oso Flaco	77	72	38	53	96	55	57
	Arroyo Grande Creek	1	1	0	0	0	0	0
	Total	273	238	145	61	348	160	46
2018	Southern Exclosure	145	139	111	80	274	131	48
	Oso Flaco	61	61	33	54	84	43	51
	Total	206	200	144	72	358	174	49
2019	Southern Exclosure	172	163	118	72	299	81	27
	Oso Flaco	57	56	30	54	75	13	17
	Euc. North reveg. area	1	1	1	100	3	1	33
	Total	230	220	149	68	377	96	25
2020	Southern Exclosure	128	117	85	73	206	56	27
	Oso Flaco	39	35	21	60	55	4	7
	Foredune closure ⁴	25	23	17	74	47	14	30
	Open riding area ^{4,5}	21	21	18	86	49	21	43
	Bigfoot reveg. area	1	1	1	100	3	0	0
	Total	214	197	142	72	360	95	27

Table F.1. Nesting success of snowy plovers in identifiable areas at ODSVRA, 2001-23 (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 from known location nests fledged
2021	Southern Enclosure	132	128	74	58	182	61	34
	Oso Flaco	29	29	11	38	23	9	39
	Foredune closure	48	48	36	75	90	29	32
	Closed buffer area	7	7	4	57	8	2	25
	Open riding area	4	4	2	50	6	2	33
	Dunes Preserve	1	1	1	100	1	0	0
	Bigfoot reveg. area	1	1	1	100	2	0	0
	Euc. Tree reveg. area	1	1	0	0	0	0	0
	Total	223	219	129	59	312	103	33
2022	Southern Enclosure	153	145	122	84	298	95	32
	Oso Flaco	20	20	4	20	8	2	25
	Foredune closure	55	53	38	72	86	39	45
	Closed buffer area	4	4	4	100	12	1	8
	Open riding area	2	2	0	0	0	0	0
	Euc. Tree reveg. area	1	1	1	100	3	3	100
	Total	235	225	169	75	407	140	35
2023	Southern Enclosure	118	112	65	58	161	92	57
	Oso Flaco	18	17	10	59	21	15	71
	Foredune closure	64	62	36	58	81	41	51
	Closed buffer area	2	2	2	100	5	4	80
	Open riding area	8	8	2	25	4	1	25
	Euc. North reveg. area	3	3	2	67	6	2	33
	Euc. Tree reveg. area	4	4	1	25	3	2	67
	Total	217	208	118	57	281	157	56

¹Arroyo Grande enclosure: A seasonal enclosure (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 and none in 2002.

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

³In 2001, 2015 and 2016, brood with approximately one- to three-day-old chicks found in Arroyo Grande Creek area, assumed to be from an unknown nest nearby, and included in this table, but excluded from the percent hatch rate.

⁴In 2020, 1 nest found on the Foreddune closure shoreline was designated as an open riding area location nest in the 2020 report and was changed to the location of Foreddune closure beginning in the 2021 report in order to conform with current location designations.

⁵In 2020, 21 nests located outside closed areas such as Southern Enclosure, Foreddune closure, Oso Flaco, and revegetation areas included in the open riding area category even though the area was closed to public vehicle and camping access (but open to other public recreation use) for most of the 2020 season (see 2020 annual report for more details).

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

Table F.2. Attributed causes of snowy plover nest loss in Southern Enclosure and Oso Flaco at ODSVRA from 2002-23.

Flooded nests include nests overwashed by tide and nests flooded by creek. The percentage of total loss for each cause is shown for the 22-year period 2002-23. Beginning with the 2020 report, all nests from 2002 onward likely lost to wind were placed in the fate category of “Wind,” to avoid use of earlier terminology such as “Abandoned, suspected due to wind.”

So. Excl. = Southern Enclosure, Aband. = Abandoned, Corvid = crow or raven

Year	Area	Aband. pre- term	Aband. post- term	Aband., unk. pre- or post- term	Wind	Failed, cause unk.	Unid. predator	Avian predator	Gull	Corvid	Raven	Harrier	Peregrine	Coyote	Raccoon	Skunk	Opossum	Flooded	Vandalism	Total
2002	So. Excl.			3	3	1								1						8
	Oso Flaco				2															2
2003	So. Excl.	5	2	3	8		3				1									22
	Oso Flaco	2		1		1	1				4									9
2004	So. Excl.	11		1		7	1				2			2						24
	Oso Flaco	4				2	3											1		10
2005	So. Excl.	9	3			7														19
	Oso Flaco	2	1				1													4
2006	So. Excl.	5	4			3	1		3					4						20
	Oso Flaco			1			1		3									2		7
2007	So. Excl.	4	1			9					1									15
	Oso Flaco	2				2					1			1						6
2008	So. Excl.	10		3		3	2	5	1			2						1		27
	Oso Flaco	3		1				4				1						2		11
2009 ¹	So. Excl.	7	1		2	1	7	14	2			1						1		36
	Oso Flaco	3			1	2	2	4								1		1		14
2010	So. Excl.	5	2		9		4	6										2		28
	Oso Flaco	1			2			2							1	2		1		9
2011	So. Excl.	6	3	1	1	2	1	5		3										22
	Oso Flaco						2			2					1	2				7
2012	So. Excl.	11	1	3	6	3	3	5		3		5	1	1				1		43
	Oso Flaco	3	1		1															5
2013	So. Excl.	5	5		15	3	1													29
	Oso Flaco	3	2		2				1											8
2014	So. Excl.	13	1	4		2												1		21
	Oso Flaco	6		1	1		1							1				1		11

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

Table F.2. Attributed causes of snowy plover nest loss in Southern Enclosure and Oso Flaco at ODSVRA from 2002-23 (continued).

Year	Area	Aband. pre- term	Aband. post- term	Aband., unk. pre- or post- term	Wind	Failed, cause unk.	Unid. predator	Avian predator	Gull	Corvid	Raven	Harrier	Peregrine	Coyote	Raccoon	Skunk	Opossum	Flooded	Vandalism	Total
2015	So. Excl.	11	1	4	1	2		2			1									22
	Oso Flaco	1				1	1				3									6
2016	So. Excl.	5	7	2	2	3										1				20
	Oso Flaco	4				1	1		1											7
2017	So. Excl.	5	3	3	1	11	9	2	2		6			1		15				58
	Oso Flaco	5		2	2	15					4			1		3		2		34
2018	So. Excl.	9	3	5		2		3			5							1		28
	Oso Flaco	2		2	3		2	10	5					4						28
2019	So. Excl.	3		2	3	3		6	10	1	12	1				1		3		45
	Oso Flaco	3		1		2	4	2	4		1			4				5		26
2020	So. Excl.	3	1		4	1	7	8			2	3		1				2		32
	Oso Flaco			2	5	3		2			1							1		14
2021	So. Excl.	9		2	4		5	16			4	11		1			2			54
	Oso Flaco	4		1	1	2	2	3			5									18
2022	So. Excl.	7	3	2	4	2	1	2			1							1		23
	Oso Flaco	2				2	5	3			1			1				2		16
2023 ¹	So. Excl.	4		1			5	6			24	3		2				2		47
	Oso Flaco				1	1	1				2							1	1	6
2002-23 Total nest loss	So. Excl.	147	41	39	63	65	50	80	18	7	59	26	1	13	0	17	2	15	0	643
	Oso Flaco	50	4	12	21	34	27	30	14	2	22	1	0	12	2	8	0	19	1	258
2002-23 Grand Total So. Excl. and Oso Flaco		197	45	51	84	99	77	110	32	9	81	27	1	25	2	25	2	34	1	901
		21.9%	5.0%	5.7%	9.3%	11.0%	8.5%	12.2%	3.6%	1.0%	9.0%	3.0%	0.1%	2.8%	0.2%	2.8%	0.2%	3.8%	0.1%	

¹In 2009 and 2023, two nests from each year had the assigned fate of failed, eggs removed by staff (eggs were nonviable and removed by staff in consultation with USFWS) and are not represented in this table.

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

Table F.3 Nest protection used in the Southern Exclosure and Oso Flaco at ODSVRA in 2023.

Included in table are 129 nests with both known location and known fate. See Closures and fencing under Management Actions in this report on page 16 for definition of fencing types. Percent in parentheses is percent nests hatched.

rav = raven; ha = harrier; cr = crow; av = avian; un = unknown predator; coy = coyote; pre = abandoned pre-term;

ukp = abandoned, unknown pre- or post-term; w = wind; fld = flooded; unk = failed, cause unknown; v = vandalism

Area	Exclosure predator fence			Shoreline symbolic fence	
	No additional fencing	Bumpout	Mini	No additional fencing	Circular
Southern Exclosure					
6 exclosure	28	1	5	12	4
Nests hatched	18 (64%)	0 (0%)	5 (100%)	8 (67%)	4 (100%)
Nests depredated	9 (6 rav, 1 ha, 2 av)	1 (1 un)		3 (1 rav, 2 av)	
Nests failed other causes	1 (1 pre)			1 (1 pre)	
7 exclosure	21		1	12	
Nests hatched	11 (52%)		1 (100%)	5 (42%)	
Nests depredated	10 (6 rav, 1 av, 3 un)			5 (2 rav, 2 ha, 1 av)	
Nests failed other causes				2 (1 ukp, 1 fld)	
8 exclosure	9		1	7	2
Nests hatched	0 (0%)		1 (100%)	5 (71%)	1 (50%)
Nests depredated	9 (7 rav, 1 un, 1 coy)			1 (1 rav)	
Nests failed other causes				1 (1 pre)	1 (1 fld)
Boneyard	6		3		
Nests hatched	3 (50%)		3 (100%)		
Nests depredated	2 (1 rav, 1 coy)				
Nests failed other causes	1 (1 pre)				
SOUTHERN EXCLOSURE TOTALS	64	1	10	31	6
Nests hatched	32 (50%)	0 (0%)	10 (100%)	18 (58%)	5 (83%)
Nests depredated	30 (20 rav, 1 ha, 3 av, 4 un, 2 coy)	1 (1 un)		9 (4 rav, 2 ha, 3 av)	
Nests failed other causes	2 (2 pre)			4 (2 pre, 1 ukp, 1 fld)	1 (1 fld)
Oso Flaco					
North Oso Flaco	1		2	2	1
Nests hatched	1 (100%)		2 (100%)	0 (0%)	1 (100%)
Nests depredated				2 (1 rav, 1 un)	
Nests failed other causes					
South Oso Flaco				8	3
Nests hatched				4 (50%)	2 (67%)
Nests depredated				1 (1 rav)	
Nests failed other causes				3 (1 w, 1 fld, 1 unk)	1 (v)
OSO FLACO TOTALS	1		2	10	4
Nests hatched	1 (100%)		2 (100%)	4 (40%)	3 (75%)
Nests depredated				3 (2 rav, 1 un)	
Nests failed other causes				3 (1 w, 1 fld, 1 unk)	1 (v)
GRAND TOTAL	65	1	12	41	10
Nests hatched	33 (51%)	0 (0%)	12 (100%)	22 (54%)	8 (80%)
Nests depredated	30 (20 rav, 1 ha, 3 av, 4 un, 2 coy)	1 (1 un)		12 (6 rav, 2 ha, 3 av, 1 un)	
Nests failed other causes	2 (2 pre)			7 (2 pre, 1 ukp, 1 w, 2 fld, 1 unk)	2 (1 fld, 1 v)

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

Table F.4 Nest protection used in the Foredune closure, Closed buffer area, and revegetation areas at ODSVRA in 2023.

Included in table are 71 nests with both known location and known fate. See Closures and fencing under Management Actions in this report on page 16 for definition of fencing types. Percent in parentheses is percent nests hatched.

rav = raven; ha = harrier; av = avian; un = unknown predator; pre = abandoned pre-term; ukp = abandoned, unknown pre- or post-term; w = wind; fld = flooded; unk = failed, cause unknown; rem = failed, eggs removed by staff.

Area	Nonpredator fencing				Shoreline symbolic fence	
	No additional fencing	Bumpout	Mini	Bumpout and Mini	No additional fencing	Circular
Foredune closure	27	8	2	1	20	4
Nests hatched	15 (56%)	2 (25%)	2 (100%)	1 (100%)	12 (60%)	4 (100%)
Nests depredated	8 (5 ha, 2 av, 1 un)	2 (1 rav, 1 ha)			5 (4 rav, 1 av)	
Nests failed other causes	4 (1 pre, 2 w, 1 rem)	4 (1 pre, 2 unk, 1 rem)			3 (1 ukp, 2 fl)	
Revegetation areas		4	1	2		
Nests hatched		0 (0%)	1 (100%)	2 (100%)		
Nests depredated		4 (3 rav, 1 av)				
Nests failed other causes						
Closed buffer area			2			
Nests hatched			2 (100%)			
Nests depredated						
Nests failed other causes						
OTHER TOTALS	27	12	5	3	20	4
Nests hatched	15 (56%)	2 (17%)	5 (100%)	3 (100%)	12 (60%)	4 (100%)
Nests depredated	8 (5 ha, 2 av, 1 un)	6 (4 rav, 1 ha, 1 av)			5 (4 rav, 1 av)	
Nests failed other causes	4 (1 pre, 2 w, 1 rem)	4 (1 pre, 2 unk, 1 rem)			3 (1 ukp, 2 fl)	

Table F.5 Nest protection used in the Open riding area at ODSVRA in 2023.

Included in table are 8 nests found in the open riding area (initiated in areas with no protective fencing) with known fate. See Closures and fencing under Management Actions in this report on page 16 for definition of fencing types. Percent in parentheses is percent nests hatched.

rav = raven; ha = harrier; cr = crow; pre = abandoned pre-term;

Area	Nonpredator fencing		
	No additional fencing	Circular	Mini
Open riding area	6	1	1
Nests hatched	0 (0%)	1 (100%)	1 (100%)
Nests depredated	5 (2 rav, 1 ha, 2 cr)		
Nests failed other causes	1 (1 pre)		

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

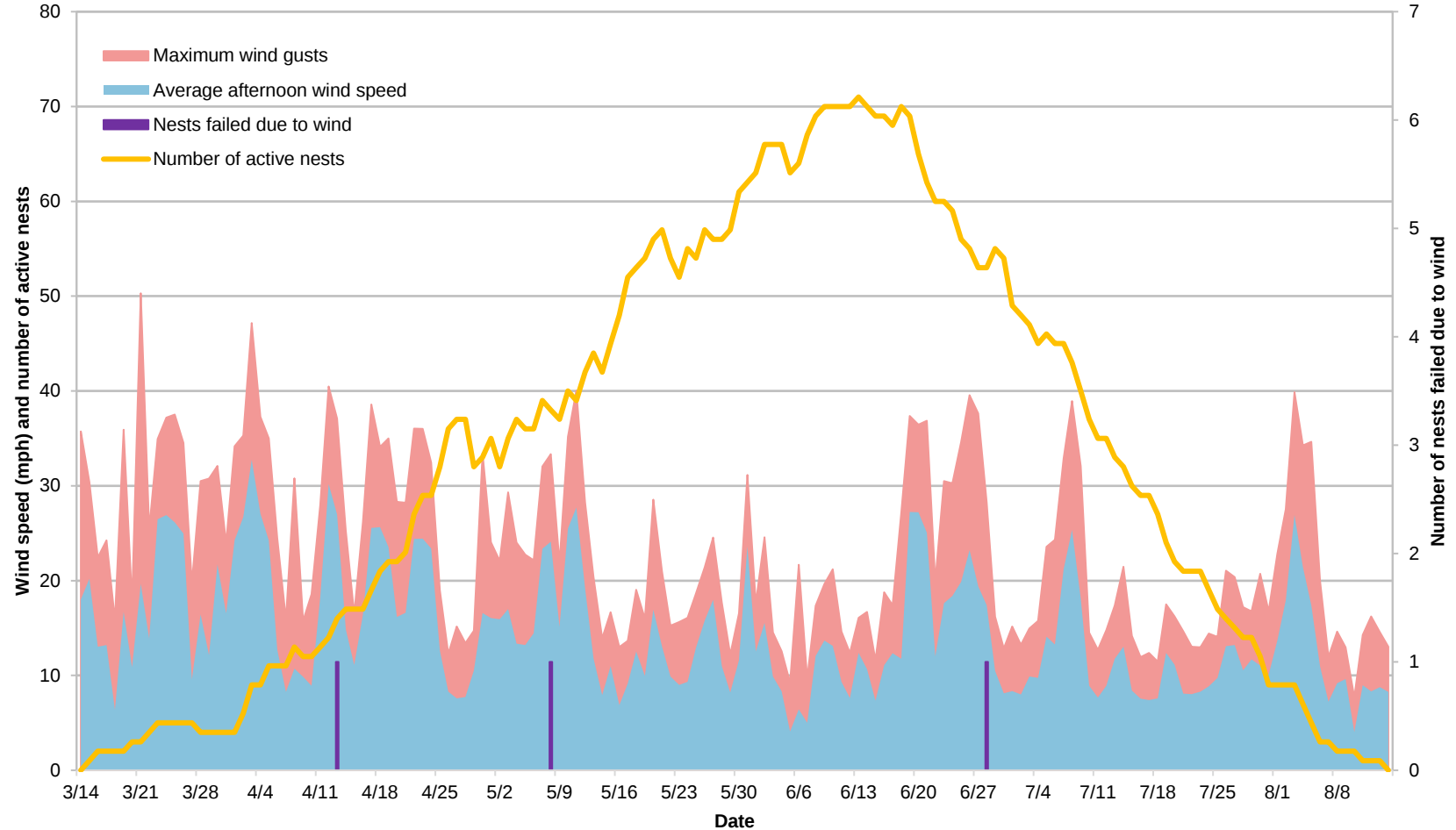


Figure F.1. Daily wind speed data (daily afternoon average and daily maximum wind gust) and snowy plover nest loss attributed to wind at ODSVRA from 14 March to 14 August 2023.

The left y-axis corresponds to wind speed in miles per hour (mph) and total number of active nests. The right y-axis corresponds to number of nests lost with fate wind (only nests with entire clutch lost, whether partial or complete, are included and not eggs lost from a nest that remained active.) Wind speed was collected at the S1 wind tower, located approximately 375 feet east of 6 enclosure since 2011, from an anemometer at 10 meters height. The daily afternoon average wind speed is calculated from the average of the hours 1:00 pm–5:00 pm. The maximum wind gust represents the maximum wind speed for the entire day. The date provided for nest loss to wind may, in several cases, be a day after the actual event.

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

Table F.6. Selective transfer of abandoned snowy plover chick and abandoned potentially viable eggs to Santa Barbara Zoo, Santa Barbara County, in 2023.

The chick and all eggs were transferred to Santa Barbara Zoo on same day collected. All resulting fledglings were unbanded and released at Coal Oil Point Reserve (COPR) in Santa Barbara County.

Nest no.	No. collected	Date collected	No. eggs hatched	No. fledglings	Release date (age)	Notes
60	1 egg	11 May	1	1	19 July (43 days)	On 4 May, nest found with 1 egg in the open riding area 340 feet east of 7 enclosure. Nest was immediately protected with symbolic fencing and nonpredator fencing installed the following day resulting in a minimum 126-foot buffer from the nest to the open riding area. Nest never observed incubated, remained with 1 egg, and was partially buried by sand on 9 May. On 10 May, a camera was installed and nest was confirmed abandoned. The egg hatched 6 June, chick fledged, and was released.
105	3 eggs	3 June	0	0	na	On 20 May, nest found with 3 eggs in the Foredune closure. Egg float data indicated nest initiated approximately 12 May. Camera installed 23 May and shows nest was inconsistently incubated 23-27 May, after which the nest was no longer in camera view and not visible from a distance. Camera was adjusted 30 May and nest was not incubated subsequently. All 3 eggs were fertile but stopped developing by 10 June in the late stages.
79	1 chick	4 June	na	0	na	On 30 May, 1 chick hatched from nest on the 6 enclosure shoreline and the other egg in this 2 egg nest did not hatch. The following morning the chick, banded pg:og, observed aggressively attacked by an adult plover from a nearby brood, and later in the morning was slightly limping on right leg and attended by 2 adults. The chick was checked daily 1-3 June and appeared to walk normally. On 4 June, the chick was found immobile and not attended by an adult on the 6 enclosure shoreline. The 5-day-old chick was collected, placed in a warmed brooder, and it quickly became more active. On arrival at the Santa Barbara Zoo, it was reported to be in stable condition. While in rehabilitation, chick developed left leg issues, with lameness noted and radiographs showing decreased bone density. Chick died 18 June and histologic findings are consistent with sepsis as the cause of death.
231	1 chick	22 June	na	1	14 August (53 days)	On 22 June, a small, unbanded chick was found immobile in northern 6 enclosure unattended by adult. The recently hatched chick (still with egg tooth present) was placed in a brooder and transferred to Santa Barbara Zoo. The chick fledged and was released. A brood of 2 small, unbanded chicks from unknown nest location, attended by 2 adults, was found earlier the same morning on 22 June in southern 6 enclosure. Origins of the immobile chick was unknown at the time it was found, but assumed after review to be associated with this 2-chick brood based on chick size and timing of sightings. The 2 chicks fledged.

APPENDIX G. PREDATOR SUMMARY TABLES AND FIGURES.

Table G.1. Summary of predators detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2023.

Observations from 1 March–10 September (a 194-day period). Contracted predator management specialists were essentially done and observer presence in field by park staff was reduced by September (very few 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. For a summary of depredated plover nests, see Table F.2 in Appendix F. Refer to Tables H.3 and H.5 in Appendix H for a summary of documented predation of terns and plovers, other than eggs.

Species	First date observed	Last date observed	No. days detected	Min. no. individ.	Notes
Mammalian					
Coyote	4 Mar	6 Sep	108	-	Most common on the Southern Exclosure and Oso Flaco shoreline. Noted inside the Exclosure predator fencing on 32 days (61 occurrences). Two plover nests documented depredated by coyote. Four coyotes were removed this season.
Opossum	13 Apr	26 Aug	5	-	Activity noted in 6, 8, and Boneyard exclosures irregularly April to August.
Raccoon	11 Mar	7 May	3	-	Activity only noted in Boneyard exclosure.
Skunk	27 July	27 Jul	1	-	One occurrence of a live skunk on 8 exclosure shoreline observed using a thermal scope for nighttime predator surveillance on 27 July.
Avian					
Crow	16 Mar	28 Jul	31	7	Primarily observed in March and April over South Oso Flaco and 8 exclosure. Seven crows seen at the same time on 22 March. Two plover nests documented depredated by crow. One crow removed this season.
Kestrel	18 Mar	15 Aug	27	3	Frequent sightings in late March and again in early June. Observed hunting in all areas of the Southern Exclosure and Oso Flaco. A male kestrel was observed hunting 6, 7, and 8 shore and taking at least 5 plover chicks over an 11-day period (one additional plover chick lost to a kestrel of unknown sex on 8 June) from 30 May to 9 June. Attempts to trap this male kestrel were unsuccessful. Minimum of 3 individuals (based on number seen simultaneously): three kestrels seen at the same time on 25 March.
Raven	4 Mar	22 Jun	41	10	Primarily observed flying over the Southern Exclosure and Oso Flaco from early April to late May. Ten plover nests were documented loss to raven. A total of 8 ravens were lethally removed, on or prior to 12 June. Sightings were reduced after 12 June through 22 June (4 sightings over 10 days). No sightings after 22 June. Minimum of 10 individuals (based on number seen simultaneously, and trapped individuals) observed during season: 8 removed prior to 13 June and two ravens seen at the same time on 22 June.
Gull spp.	Present daily throughout season				Gulls were present the length of the shoreline of the Southern Exclosure and Oso Flaco. One subadult California gull lethally removed on 26 July after plover adults seen getting off nest and displaying at gull. One subadult western gull lethally removed on 30 July after observing it catch and eat one 1 plover juvenile or adult.

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 2023 (continued).

Species	First date observed	Last date observed	No. days detected	Min. no. individ.	Notes
Harrier	5 Mar	5 Sep	51	5	Harrier sightings increased through March and peaked in April when a male harrier was observed hunting over all areas of the Southern Exclosure and Oso Flaco. Ten plover nests documented depredated by harrier. Male harrier depredating nests was trapped on 1 May and harrier sightings remained low May through September. No additional plover or tern losses were attributed to harrier. Minimum of 5 individuals (based on age and sex characteristics, number seen simultaneously, and trapped individuals) observed during the season: 2 adult males, 1 adult female, 2 juveniles seen at same time on 30 July.
Osprey	Common throughout season				Although not documented as a predator of plovers or terns, ospreys (<i>Pandion haliaetus</i>) 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 the Southern Exclosure shoreline and occasionally perched and eating fish. Hazed as appropriate.
Large owl spp.	13 Mar	15 Aug	17		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 noted in all areas of the Southern Exclosure and Oso Flaco. Most sightings were of a great horned owl pair roosting in South Oso Flaco and of a great horned owl caught on camera investigating a trap set for owls inside 8 exclosure. Attempts to trap owls were unsuccessful.
Loggerhead shrike	20 Mar	8 Apr	3	1	All observations in 7 and 8 exclosures, and South Oso Flaco.
Peregrine	12 Apr	8 Sep	41	3	Most observations between mid-June and end of July of an unbanded juvenile hunting all areas of the Southern Exclosure and Oso Flaco. A minimum of 3 tern fledglings, 1 plover chick and 2 plover juveniles were documented taken by a juvenile peregrine from July to September. Attempts to trap a juvenile peregrine were unsuccessful. One non-target adult female trapped on 31 July and banded with black VID band "94AK" on left leg and silver on right. Minimum of 3 individuals (based on bands and/or age and sex characteristics) observed during season.
Red-tailed hawk	8 Mar	5 Sep	32	3	Observed throughout the Southern Exclosure and Oso Flaco. Three individuals seen at same time on 15 April.

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

Table G.2. Documented predation of California least tern and western snowy plover, other than eggs, in Southern Enclosure and Oso Flaco at ODSVRA from 2002-23.

Documented predation of chicks, juveniles, and adults of terns and plovers at ODSVRA likely represents a small percentage of actual occurrences because most predations are not witnessed or leave little to no evidence behind, unlike eggs at a nest. Predation management that included options for selective relocation or lethal removal of avian and mammalian predators began in 2002. Documented predation represented in this table occurred from 1 March to 10 September (a 194-day period) from 2002-23. Unk pred = Unknown predator, T = California least tern, P = Western snowy plover.

Year	Coyote		Skunk		Kestrel		Merlin		Peregrine		Harrier		Red-tailed hawk		Great horned owl		Owl spp.		Western gull		California gull		Ring-billed gull		Gull spp.		Brewer's Blackbird		Shrike		Avian spp.		Unk pred		Total
	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P			
2002																																		0	
2003																														3		1		4	
2004								1			5	1					1					2								1	3			14	
2005				2				1														1							1	2			1	8	
2006 ¹								1																									2	3	
2007 ²		4			1																												2	2	9
2008 ²																				2				1									1	4	
2009										2												1												3	
2010										2										2												2		6	
2011 ³										2										2		15									1	2		22	
2012	1	3							1	3		1													3					1	3		2	18	
2013									1	2																						2		5	
2014									2	3												4											1	10	
2015							1			3										1														5	
2016									1	2												9								3				15	
2017 ⁴										2				1																				3	
2018										5										9		2									1			17	
2019										9	1									4								1						16	
2020		4								7		1								3													2	4	21
2021 ⁵						4			3	5	2	8			2		1	1													1			28	
2022						7				3						2				1														1	14
2023						7			3	3										1														14	
Total	1	11	0	2	1	18	0	4	11	53	8	11	0	1	2	2	2	1	0	25	0	34	0	1	0	3	0	1	1	8	5	12	9	12	
Total T and P	12		2		19		4		64		19		1		4		3		25		34		1		3		1		9		17		21		239

¹Two terns depredated by unknown predator suspected to be owl.

²Unknown predations in 2007 and 2008 suspected to be avian.

³One plover depredated by unknown avian species suspected to be owl.

⁴A number of recently hatching tern chicks suspected loss to skunk, but no remains found to confirm.

⁵Two additional tern carcasses were found and predation was suspected, but not confirmed.

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

Table G.3. Mammalian and avian predators removed or trapped and relocated under predator management actions for least terns and snowy plovers at ODSVRA in 2023.

Eight ravens, four coyotes, one crow, one California gull, and one western gull were lethally removed. One northern harrier, one Cooper's hawk, and one peregrine falcon were live-trapped and relocated (release date in parentheses). All animals trapped or removed were within ODSVRA boundaries. The Cooper's hawk and adult peregrine falcon were inadvertently caught in traps intended for other targeted individuals.

Date	Species	Age/Sex	Location
Lethally removed			
19 Apr	crow	adult	Foredune closure shoreline
4 May	raven	adult	Open riding area east of Eucalyptus Tree revegetation area
9 May	raven	adult	Boneyard enclosure
9 May	raven	adult	Pavilion Hill
16 May	raven	adult	7 enclosure
16 May	raven	adult	7 enclosure
26 May	raven	adult	Boneyard enclosure
5 Jun	raven	adult	Open riding area east of Pipeline revegetation area
12 Jun	raven	adult	Boneyard enclosure
30 Jun	coyote	adult	Closed buffer area east of Foredune closure
5 Jul	coyote	adult	Open riding area east of Maidenform revegetation area
12 Jul	coyote	juvenile	Bigfoot revegetation area
26 Jul	California gull	subadult	8 enclosure shoreline
28 Jul	coyote	adult	Eucalyptus Tree revegetation area
30 Jul	western gull	subadult	6 enclosure shoreline
Live-trapped and relocated			
1 May (2 May)	harrier	adult male	Foredune closure shoreline near marker post 6
24 Jul (24 Jul)	Cooper's hawk	subadult female	8 enclosure
31 Jul (3 Aug)	peregrine	adult female	6 enclosure shoreline

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

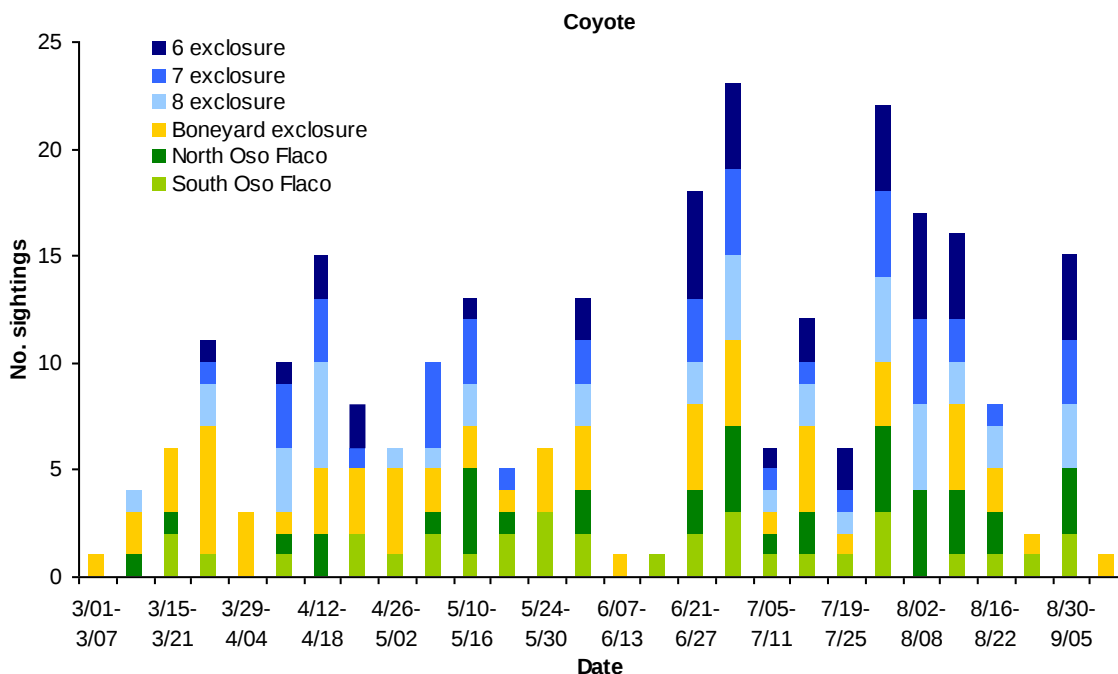


Figure G.1. Coyote occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2023.

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, and 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 intended to be excluded from the area protected by predator fencing.

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

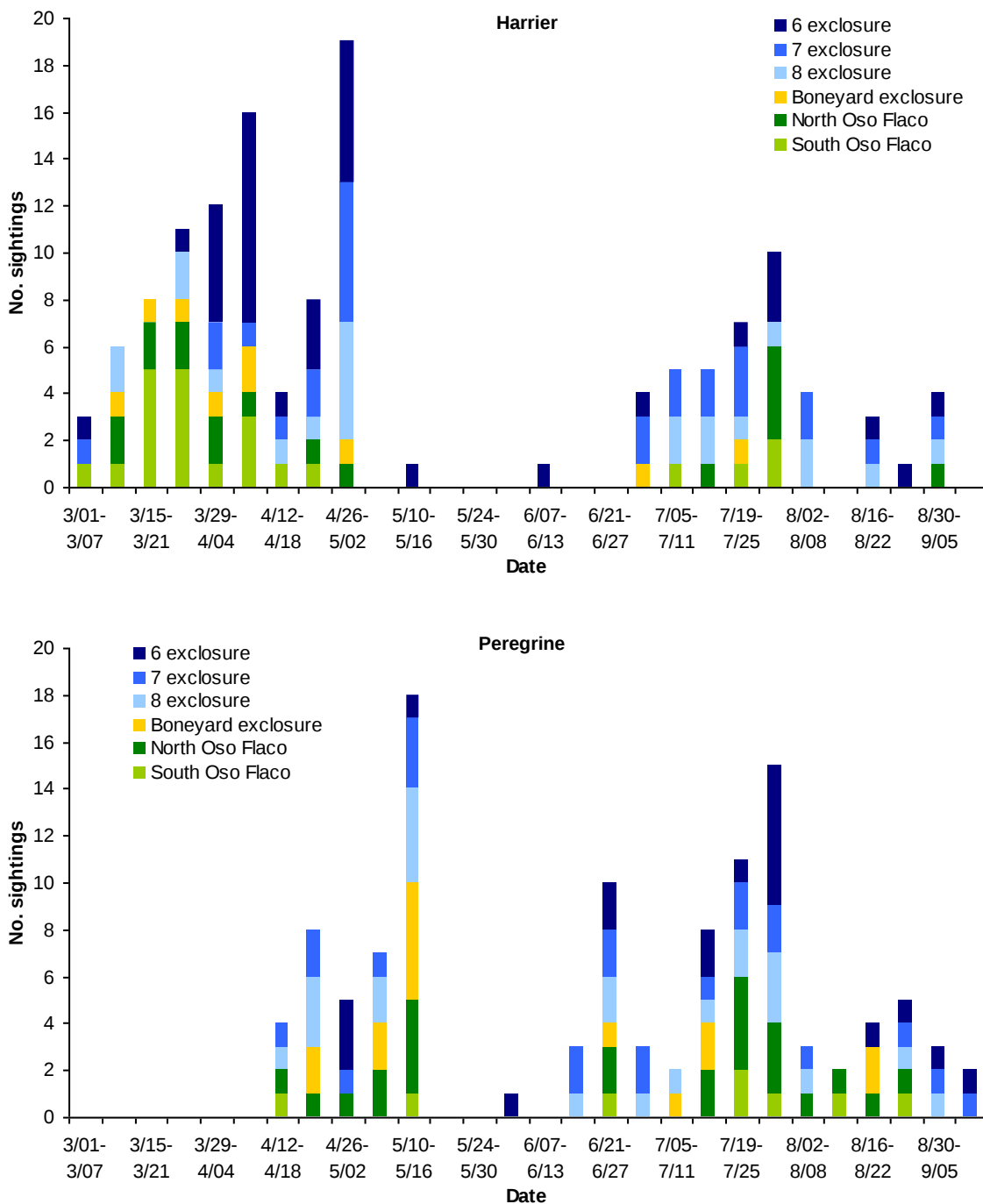


Figure G.2. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2023.

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

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

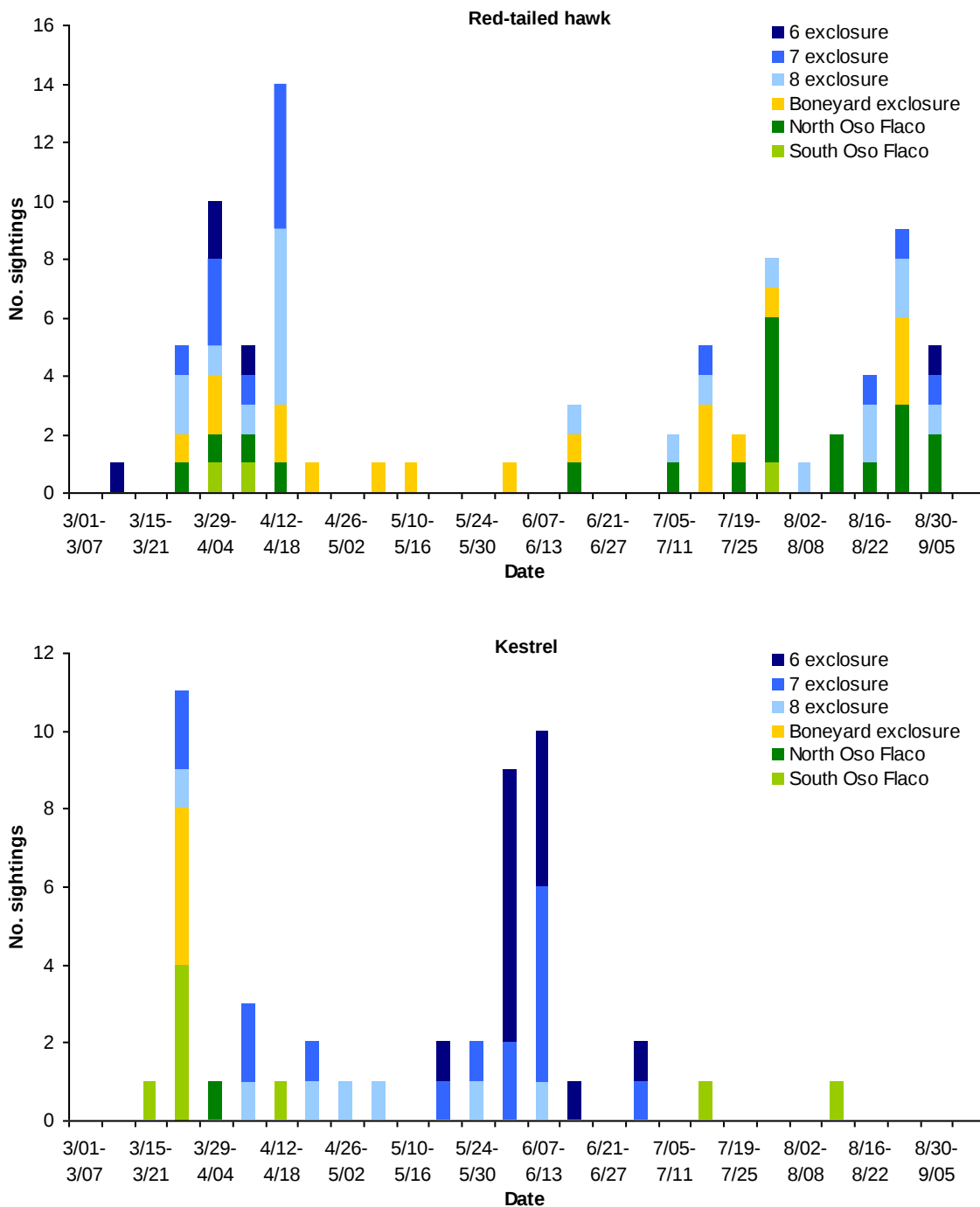


Figure G.2. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2023 (continued).

Observations from 1 March–10 September (a 194-day period). One kestrel trapped and relocated 6 August.

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

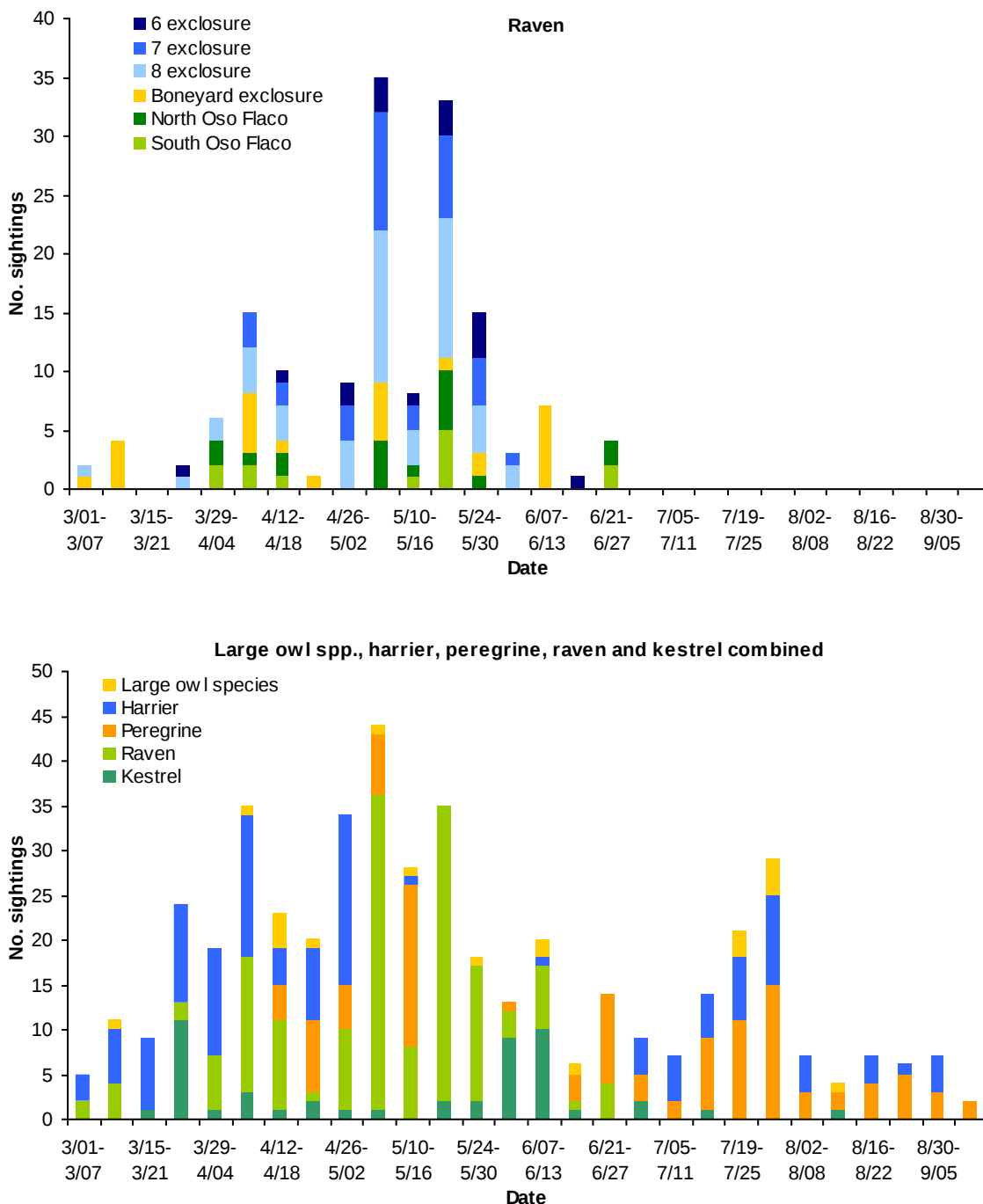


Figure G.2. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2023 (continued).

Observations from 1 March to 10 September (a 194-day period). Seven ravens lethally removed over 16-day period 29 April–14 May.

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

Table H.1. Sightings of injured least terns in 2023.

No. (age)	Location	Notes
1 (chick)	7 enclosure	On 27 June, the LT11 nest in 7 enclosure hatched 1 chick. Later that day a snowy plover adult associated with a nearby nest was seen on two occasions aggressively attacking the tern adult attending chick at the LT11 nest, the chick was not observed to be harmed, and appeared and behaved normally when inspected in hand after the incident. On 30 June, the tern chick was found near the nest with a large wound on its back and had a lower than average weight for its 3-day-old age (5.9 grams). Chick was not banded. The chick was last seen 1 July at 4 days old.

Table H.2. Sightings of injured snowy plovers from December 2022 to 11 September 2023.

No injured plovers were seen December 2022, subsequent to the 2022 annual report.

No. (age)	Location	Notes
1 (adult)	Open riding area	On 25 April, a plover adult banded pg:yr was south of marker post 3 with a possible right leg injury, putting less weight on the leg while running, and not seen subsequently. The bird was banded as a chick at ODSVRA in 2022 (2 fledged). An adult was overwintering at ODSVRA 2022-23, and a breeding male at ODSVRA was seen subsequent to 25 April 2023 without injury.
1 (adult)	6 enclosure	On 1 June, an unbanded female plover associated with the SP102 nest observed with blood on underside of body and there were spots of blood in nest bowl and on 1 of the 3 eggs. The bird was seen subsequently incubating the nest with no sign of injury. The nest hatched 19 June, the 3 chicks were seen attended by both adults, and all 3 fledged.
1 (adult)	7 enclosure, 7 enclosure shoreline	On 18 June and 20 June, a female plover banded rr:ry associated with the SP124 nest observed putting no weight on the left leg. The nest hatched 17 June, the female was not seen with the brood subsequent to 20 June, and an injured bird with the band combination was not relocated elsewhere.
1 (juvenile)	6 enclosure shoreline	From 29 July to 2 August, an approximately 35-day-old unbanded plover from unknown nest location observed mostly hopping on the left leg and putting very little weight on the right leg. A juvenile matching this description not seen subsequently.
1 (chick/juvenile)	Foredune Central shoreline	From 6 August to 11 September, one 18- to 54-day-old plover banded vv:wb from the SP199 nest observed limping on the left leg and with toes curled up. Chick/juvenile was moving and foraging well when observed almost daily 6-30 August. On 2 and 11 September, bird was less active, hopping on right leg and putting little to no weight on left leg. The juvenile was not seen subsequently.
1 (juvenile)	Foredune South shoreline	From 9 August to 2 September, an unbanded juvenile plover observed holding the left wing low and wing appeared broken. The injury did not improve or change over time.

Table H.3. Documented predation of California least terns in 2023.

No. (age)	Predator	Location	Notes
1 (juvenile)	Peregrine (juvenile)	7 enclosure	On 21 July, a peregrine observed eating prey in 7 enclosure. Prey confirmed to be the 21-day-old tern banded r/a:o/y from the LT28 nest.
1 (juvenile)	Peregrine (juvenile)	6 enclosure shoreline	On 27 July, a peregrine caught a juvenile tern over the 6 enclosure shoreline and consumed it on the shoreline. It is unknown if tern was banded.
1 (juvenile)	Peregrine (juvenile)	6 enclosure shoreline	On 28 July, a peregrine caught a juvenile tern over the 6 enclosure shoreline and consumed it on the shoreline. Prey confirmed to be the 33-day-old tern banded r/a:a/o from the LT19 nest.

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

Table H.4. Mortality, other than documented predation, of least terns in 2023.

No carcasses were found December 2022, subsequent to the 2022 annual report.

MWVCRC=CDFW, Office of Spill Prevention and Response, Marine Wildlife Veterinary Care and Research Center, Santa Cruz, CA.

HPAI=highly pathogenic avian influenza.

No. (age)	Location	Notes
1 (chick)	6 exclosure	On 22 June, a small, unbanded tern chick carcass was found near its LT6 nest in 6 exclosure. The chick was last seen 21 June at 3 days old at the nest. It was frozen, sent to MWVCRC, was determined to be negative for HPAI, but carcass was too decomposed for necropsy.
1 (chick)	7 exclosure	On 23 June, a small, unbanded tern chick carcass was found near its LT12 nest in 7 exclosure. The chick was last seen 21 June at 1 day old at the nest. It was frozen, sent to MWVCRC, was determined to be negative for HPAI, but carcass was too decomposed for necropsy.

Table H.5. Documented predation of snowy plovers from 1 March to 30 September 2023.

No. (age)	Predator	Location	Notes
≥1 (chick)	Kestrel (male)	8 exclosure shoreline, Foredune North shoreline	On 30 May, a kestrel observed potentially catching a plover chick from the 8 exclosure shoreline and flew into 8 exclosure. A little over an hour later, a kestrel caught a plover chick from the Foredune North shoreline and flew away with it to the east off-site. Based on location and brood observations, the first prey was possibly a 10-day-old chick from the SP151 nest and the second prey was likely an 11-day-old chick from the SP110 nest.
1 (chick)	Kestrel (male)	6 exclosure shoreline	On 2 June, a kestrel caught a plover chick from the 6 exclosure shoreline, perched briefly with it on the shoreline, and flew with it to the east off-site. Based on location and brood observations, the prey was likely a 12-day-old chick from the SP42 nest.
1 (chick)	Kestrel (male)	Foredune North shoreline	On 3 June, a kestrel observed flying over the Foredune closure shore and landing on the Foredune North shoreline where it ate a plover chick. Based on location and brood observations, the prey was likely a 15-day-old chick from the SP110 nest.
1 (chick)	Kestrel (male)	Foredune North shoreline	On 5 June, a kestrel caught a plover chick from the Foredune North shoreline, begins eating it on the shoreline, and flew with the remains east off-site. Based on location and brood observations, the prey was likely a 25- to 26-day-old chick from the SP10 nest.
2 (adult female and chick)	Kestrel (1 male, 1 unknown sex)	6 and 7 exclosure shorelines	On 8 June, a kestrel (sex unknown) observed on the 7 exclosure shoreline with plover chick prey and flew with it east of 7 exclosure. Based on location and brood observations, the prey was likely a 5-day-old chick from the SP65 nest. Thirty-four minutes later, possibly the same kestrel, identified as a male, landed on a circular exclosure for SP99 nest on the 6 exclosure shoreline, plover flew away from the nest exclosure, and kestrel flew after and caught the plover. The kestrel begins eating the prey on the shoreline before flying with it into 6 exclosure to finish consuming it. The prey was the female from the SP99 nest, and subsequently only a male observed attending the nest and little to no incubation observed during the daytime. Three chicks hatched from the SP99 nest 20-21 June, and 1 chick fledged.
≥1 (chick)	Kestrel (male)	Foredune Central and 7 exclosure shorelines	On 9 June, a kestrel observed hunting over the 6 exclosure and Foredune Central shorelines and later found perched on the Foredune Central west fence eating a possible plover chick. Afterwards, the kestrel caught a small plover chick from the 7 exclosure shoreline and flew with it to the east off-site. Multiple broods were present and it is unknown which nest the chick originated from.
1 (adult or juvenile)	Western gull (subadult)	7 exclosure shoreline	On 30 July, a western gull caught and consumed a large plover, juvenile or adult sized, on the 7 exclosure shoreline. Gull was lethally removed and pink and blue tape from 2 plover bands was recovered from the gut contents, indicating at least 1 plover was depredated.
1 (chick)	Peregrine (juvenile)	Foredune South shoreline	On 27 August, a peregrine observed catching a 21-day-old plover chick from the SP215 nest on the Foredune South shoreline near marker post 6. Peregrine flew with the chick to the 6 exclosure shoreline and consumed the plover.

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

Table H.5. Documented predation of snowy plovers from 1 March to 30 September 2023 (continued).

No. (age)	Predator	Location	Notes
≥2 (juvenile)	Peregrine (juvenile)	Foredune South and 6 exclosure shorelines	On 12 September, a peregrine caught a plover fledgling from the Fore dune South waterline, flew with it to the shoreline west of marker post 7, and consumed the plover. Afterwards, the peregrine flies south and circles over the 6 exclosure shoreline and is observed perched on the 7 exclosure shoreline with plover prey. The peregrine flew with prey and perched further south on 7 exclosure shoreline where it is seen dropping the prey before flying south. Peregrine continued to hunt over the shoreline and monitors hazed it south. The peregrine caught another bird from the air over the North Oso Flaco shoreline before flying southeast of South Oso Flaco. Leg bands found at the first prey location indicate it was a 29-day-old fledgling from the SP222 nest. The second plover prey item, found whole and intact, was an unbanded juvenile. The last prey item was an unknown avian species.

Table H.6. Mortality, other than documented predation, of snowy plovers in 2023.

No carcasses were found December 2022, subsequent to the 2022 annual report.

MWVCRC=CDFW, Office of Spill Prevention and Response, Marine Wildlife Veterinary Care and Research Center, Santa Cruz, CA.

HPAI=highly pathogenic avian influenza.

No. (age)	Location	Notes
2 (adult)	Riding area, east of 7 exclosure	On 13 February, an unbanded adult plover carcass was found in the riding area, 100 feet east of the exclosure fence, and halfway between marker post 7 and 8. The following day, a second unbanded adult carcass was found approximately 100 feet to the north of the first one. Both carcasses were partially buried and appeared flattened. They were frozen, sent to MWVCRC, determined to be negative for HPAI, but were too decomposed for necropsy.
1 (adult)	North Oso Flaco	On 4 May, an unbanded adult plover carcass was found 7 feet east of the west exclosure fence in North Oso Flaco, an area that is closed to all recreational activity year-round and approximately 0.3 miles from the nearest open riding area. The intact frozen carcass was sent to MWVCRC and necropsy results indicate the bird presumptively died of acute crush trauma of unknown source. The carcass had a compressed liver, displaced keel, evidence of hemorrhaging, and abrasions to multiple areas of body (see attached necropsy report).
1 (juvenile)	6 exclosure shoreline	On 28 July, a juvenile plover carcass, banded pv:ab from the SP102 nest, was found on the 6 exclosure shoreline. The carcass was intact but was too decomposed for necropsy. Three fledglings from SP102 nest, all banded pv:ab, were last seen together 25 July at 36 days old and 1 was seen 27 July.

Oceano Dunes State Vehicular Recreation Area

2023 Predator Management Report



Submitted To:

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&
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CA Wildlife Services Program

Introduction

USDA-APHIS-Wildlife Services (WS) worked on the Oceano Dunes State Vehicular Recreation Area (ODSVRA) from March 27th to September 12th for the 2023 nesting season. Wildlife Biologist Charlie Richards, District Supervisor Barry Lowry, Wildlife Specialist Donnie Simms, and Assistant District Supervisor Tom Young conducted predator management activities in and around the California Least Tern (*Sternula antillarum browni*) (CLTE) and Western Snowy Plover (*Charadrius nivosus nivosus*) (SNPL) nesting areas. Charlie Richards and Donnie Simms were responsible for the day-to-day fieldwork throughout the 2023 nesting season. WS surveyed, trapped, hazed, and removed predators threatening CLTE and SNPL.

Methods

A variety of predator management methods, including surveying, trapping, hazing, and lethal removal were utilized throughout the 2023 SNPL and CLTE nesting season.

Predator surveys were performed regularly by WS during the SNPL and CLTE nesting season. Surveys were conducted by vehicle and on foot to search for evidence of predator activity. Vortex Optics Viper HD 10x42mm binoculars and a Vortex Optics Diamondback 20-60x80 Spotting Scope were utilized during surveys to locate signs of predator activity and presence. Surveys mainly took place east of the nesting exclosures within the revegetation areas (Appendix 1), along the exclosure's shoreline, in the agricultural fields east of Oso Flaco Lake, and south to Brown Road in Santa Barbara County. Additionally, WS stayed in regular communication with State Parks staff to share information about predator sightings and activity via the communication software Zello Walkie Talkie.

Trapping was one of the primary methods of predator control used during the 2023 nesting season. The main types of traps used were the Oneida Victor #1 ½ soft catch and Soft Catch Woodstream #3, which are both padded leg hold traps. They were set primarily to capture coyotes (*Canis latrans*) and common ravens (*Corvus corax*). Padded leg-hold traps for coyotes were baited with commercially produced gland and food-based scent lures, urine, and various other food baits. Raven traps were baited by creating false SNPL nests using quail eggs.

Wildlife Services regularly assisted Thadeus Sternberg and Daniel Biteman of Wildlife Innovations with trapping and hazing of problematic raptors on the Oceano Dunes property. Wildlife Services stayed in regular communication with Thadeus or Dan about the location and habits of avian predators. Wildlife Services hazed problematic raptors by flushing the birds on foot, with a vehicle, or by firing a bird whistler.

Firearms were used to euthanize animals captured in traps. A Benelli M2 12-gauge semi-automatic shotgun with Federal Premium BlackCloud Steel 3-inch shells with #2 shot was used to euthanize common ravens, an American crow, and a California gull. Euthanasia of coyotes was conducted with a Ruger Mark IV chambered in 22 long rifle and a Ruger M77 chambered in .308 Win. Ammunition for the Ruger Mark IV was CCI® Short Range Green lead free

ammunition. The Ruger M77 chambered in .308 Win shooting 150 gr Hornady Superformance SST.

Egg platforms were used to lure in and then poison ravens during the 2023 nesting season. Chicken eggs treated with DRC-1339 were used to remove ravens. This platform was monitored by a game camera to detect the presence of ravens at the platform.

DRC-1339 has been successful in removing ravens at other SNPL nesting sites, including a neighboring property to Oceano Dunes. After the ravens visit the platforms regularly, the boiled chicken eggs are replaced with hard boiled chicken eggs dosed with two milligrams of the corvidicide DRC-1339. The active chemical in DRC-1339, 3-Chloro-p-Toluidine Hydrochloride, causes renal failure in the target bird species within 24 to 72 hours of ingestion. DRC-1339 was chosen because it is a selective avicide that is highly toxic to nest-depredating corvids but would require much larger doses to be toxic to mammals and other species of non-target birds.

Results

The 2023 SNPL and CLTE nesting season had a variety of predators: common ravens, American crows, coyotes, gulls, owls, peregrine falcons, northern harriers, and American kestrels. Wildlife Innovations focused on trapping raptor species and WS focused on mammals, common ravens, American crows, and gulls. Common ravens were believed to be responsible for the largest number of nest predations during this nesting season. Common ravens were documented to have predated 36 SNPL nests. Coyotes were responsible for predating 2 SNPL nests. American crows predated 2 SNPL nests. Northern harriers predated 10 SNPL nests. There were an additional 10 SNPL nests taken from unknown avian predators. 7 SNPL nests were taken by unidentified predators. No CLTE nests were predated during the 2023 season. 11 SNPL individuals were lost due to predation. 6 SNPL chicks and 1 SNPL adult were predated by a male American kestrel. 1 adult or juvenile SNPL was predated by a western gull. A juvenile peregrine falcon predated 1 SNPL chick and 2 SNPL juveniles. 3 CLTE individuals, all 3 juveniles, were lost due to predation from a juvenile peregrine falcon.

During the 2023 nesting season, WS removed a total of four coyotes (*Canis latrans*) from ODSVRA. On June 30th, the first coyote was dispatched in the east of the Foredune enclosure using a Ruger M77 rifle chambered in .308 win. The second coyote was dispatched east of the Maidenform revegetation area using a Ruger M77 rifle chambered in .308 win on July 5th. On July 11th traps were set for coyotes in and around vegetation islands. Four traps were placed on July 11th and were removed August 8th. The third coyote removed from the Bigfoot vegetation area was trapped on July 12th using a Soft Catch Woodstream #3 padded foot hold trap and dispatched with a Ruger Mark IV chambered in 22 long rifle. The fourth coyote removed from the Eucalyptus Tree vegetation area was trapped on July 28th using a Soft Catch Woodstream #3 padded foot hold trap and dispatched with a Ruger Mark IV chambered in 22 long rifle.

Coyotes have predated and disturbed SNPL and CLTE nests and chicks in previous years, and they continued to be a problem during the 2023 nesting season.

Corvids such as common ravens (*Corvus corax*) and American crows (*Corvus brachyrhynchos*) are a predation threat to nesting SNPL and CLTE throughout their entire range.

WS removed the first predator of the 2023 nesting season, an American crow, on April 19th with a Benelli M2 12-gauge shotgun on the Foredune closure shoreline.

WS removed eight Common Ravens from ODSVRA during the 2023 nesting season. Monitoring for ravens was conducted on site as well as in the agricultural fields to the east of Oso Flaco Lake and south to Brown road. No ravens were seen or removed from these off-site locations. Trapping efforts for ravens started on April 25th after ravens had been seen frequenting the site. The first raven was removed east of the Eucalyptus Tree vegetation island on May 4th with a Benelli M2 12-gauge shotgun. On May 9th, both the second raven in the Boneyard area, and the third raven in Pavilion Hill were removed with a Benelli M2 12-gauge shotgun. The fourth raven was trapped on May 16th with an Oneida Victor #1 ½ soft catch foothold trap surrounding a fake nest containing quail eggs east of 7.5 Revegetation. The fifth raven was removed on May 16th with a Benelli M2 12-gauge shotgun as it was flying above the fake nest east of 7.5 Revegetation. The sixth raven was trapped at a fake nest set with raven decoys surrounding the fake nest on May 26th in east Boneyard. The seventh raven was trapped with an Oneida Victor #1 ½ soft catch foothold trap on June 5th east of the Pipeline revegetation area. The last raven of the season was removed using an Oneida Victor #1 ½ soft catch foothold trap on June 12th in east Boneyard.

Gull predation was a concern throughout the latter part of the nesting season. WS staff watched groups of gulls along the shoreline to quickly respond to possible predation events. A California gull was dispatched using a Benelli M2 12 gauge on July 26th. Wildlife Services was prompted to remove this California gull after noticing SNPL adults performing broken wing displays towards the gull. The gull was dispatched, however there were no SNPL remains upon inspection of the gull's digestive tract. Additionally, a subadult western gull was removed by state park ranger staff as Wildlife Services was not on site during this predation event. This western gull was removed on July 30th. 2 SNPL bands were discovered from the contents of the digestive tract, indicating that at least 1 SNPL was depredated.

WS conducted other duties as time permitted. WS reported predator sightings to State Parks Resources Staff as they occurred and submitted reports using the Predator_Database_2023_USDA on Microsoft Access. WS also kept in communication with Thadeus Sternberg or Daniel Biteman of Wildlife Innovations to report sightings of raptors.

Future Recommendations

WS recommends that state parks continue to check the enclosure fencing regularly for changes in the sand that may cause gaps or mounded sand. This will help prevent terrestrial predators from accessing sensitive nesting areas.

WS recommends that state parks continue to remove carcasses off the beach as an effort to reduce attractants for scavenging predators.

WS recommends the continued removal of species that present a threat to the SNPL and CLTE populations at ODSVRA.

Report all common raven sightings to WS at any time of the year. Removal actions can take place year-round. Having a knowledge of raven activity prior to this date can allow removal efforts to be more productive.

WS recommends state parks continue hazing raptors from areas near SNPL and CLTE nesting areas. Caution should be used during hazing to avoid scaring SNPL and CLTE from their nests.

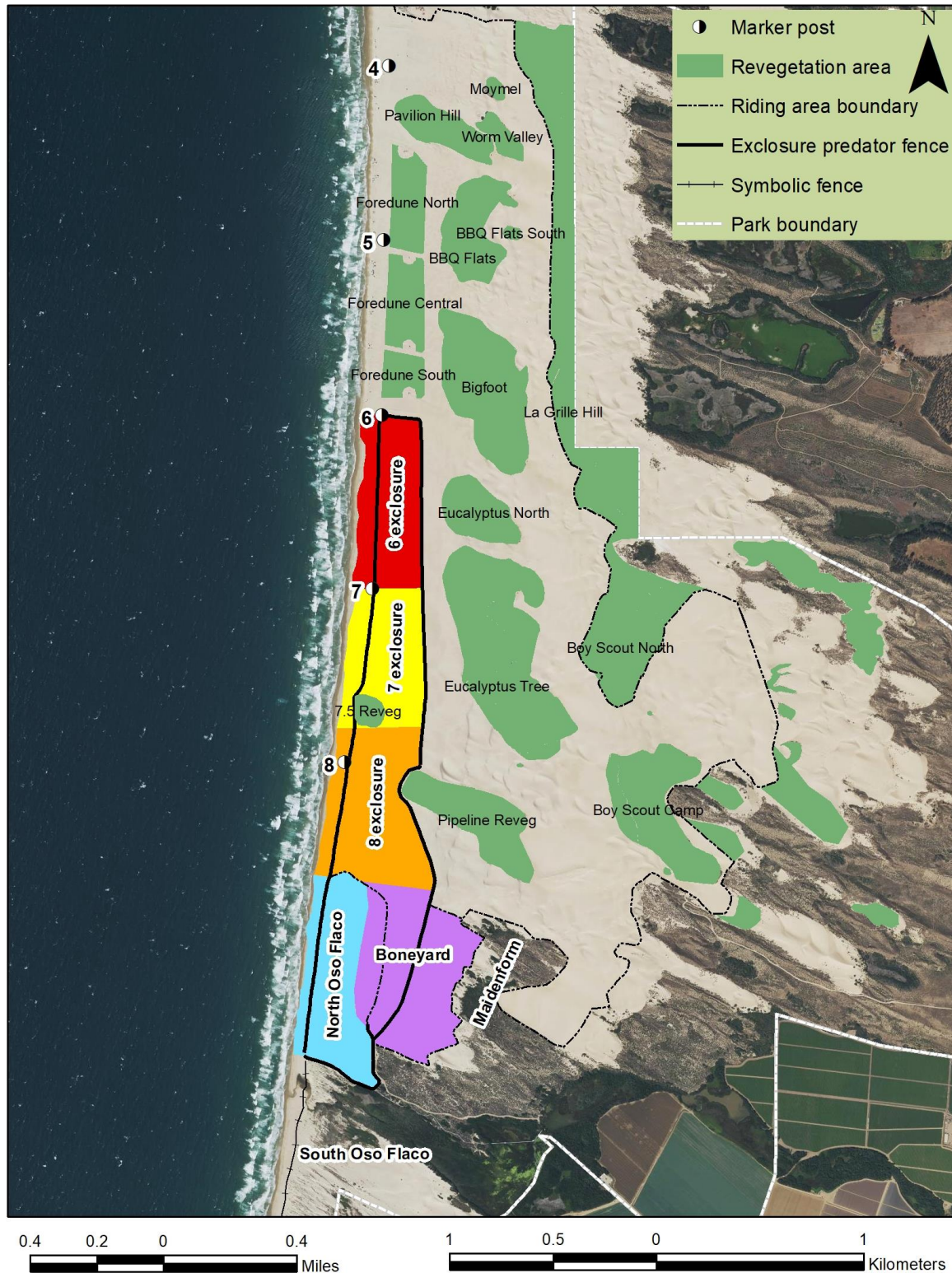
WS recommends state parks continues to consider the option to use egg platforms for future raven control efforts. The method of using egg platforms with eggs treated with the corvicide DRC-1339 has been successful in removing ravens at other SNPL nesting sites, including a neighboring property to Oceano Dunes. The active chemical in DRC-1339 3-Chloro-p-Toluidine Hydrochloride causes renal failure in the target bird species within 24 to 72 hours of ingestion. DRC-1339 was chosen because it is a selective avicide that is highly toxic to nest-depredating corvids but would require much larger doses to be toxic to mammals and other species of non-target birds (Appendices 3 and 4).

WS recommends continued monitoring for feral swine. If feral swine are located, contact WS as soon as possible so removal efforts can begin. If deceased feral swine are located with no obvious signs of death, do not approach or touch the carcass and contact WS as soon as possible at 1-866-4-USDA-WS. If it is possible and safe to do so, check the area for other signs of dead swine.

Table 1: USDA Predator Removal Summary

Date	Species	Age	Location	Method
4/19/2023	American Crow	Adult	Foredune closure shoreline	Firearm
5/4/2023	Common Raven	Adult	Open riding area east of Eucalyptus Tree Revegetation area	Firearm
5/9/2023	Common Raven	Adult	Boneyard	Firearm
5/9/2023	Common Raven	Adult	Pavilion Hill	Firearm
5/16/2023	Common Raven	Adult	East of 7.5 Revegetation area	Padded Foothold
5/16/2023	Common Raven	Adult	East of 7.5 Revegetation area	Firearm
5/26/2023	Common Raven	Adult	East Boneyard	Padded Foothold
6/5/2023	Common Raven	Adult	Open riding area east of Pipeline Revegetation area	Firearm
6/12/2023	Common Raven	Adult	East Boneyard	Padded Foothold
6/30/2023	Coyote	Adult	Closed bugger area east of Fore dune closure	Firearm
7/5/2023	Coyote	Adult	Open riding area east of Maidenform Revegetation area	Firearm
7/12/2023	Coyote	Juvenile	Bigfoot	Padded Foothold
7/26/2023	Western/California Gull	Subadult	8 enclosure shoreline	Firearm
7/28/2023	Coyote	Adult	Eucalyptus Tree vegetation area	Padded Foothold

Barry Lowry, 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.		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.	
COMPOUND DRC-1339 CONCENTRATE – LIVESTOCK, NEST & FODDER DEPREDACTIONS <i>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.</i> 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.		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.	
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.	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	
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.			

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 m²), or a maximum yearly application rate of 0.5 lb of active ingredient per acre (5.61 g active ingredient/100 m²).

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	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 ft² (93 m²) 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 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 ft² (0.1 to 0.2 m²) 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.
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.	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 Registration No. 56228-29, Page 3 of 3

Appendix 3: Safety Data Sheet for DRC-1339



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-methylbenzamine hydrochloride
CPH

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

1-208-236-8920

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

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-methylbenzamine 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

C₇H₉NC₂

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.
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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.
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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 (CO₂).

Unsuitable Extinguishing Media	Not determined.
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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.
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For Emergency Responders	Use personal protection recommended in Section 8: Exposure Controls/Personal Protection.
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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.
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Methods and Material for Containment and Cleaning Up

Methods for Containment	Prevent further leakage or spillage if safe to do so.
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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.
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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.
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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.
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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.
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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	Odor	Moth ball
Appearance	Off-white to yellow powder	Odor Threshold	No data available
Color	Off-white to yellow		
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-1339 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: <i>Oncorhynchus mykiss</i> (rainbow trout); 10.5 mg/l: <i>Lepomis macrochirus</i> (bluegill sunfish)	No data available	0.07 mg/l: <i>Daphnia magna</i> (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/NDL - 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

<u>NFPA</u>	Health Hazards	Flammability	Instability	Special Hazards
	3	0	0	None
<u>HMIS</u>	Health Hazards	Flammability	Physical Hazards	Personal Protection
	3	0	0	E

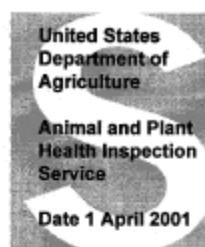
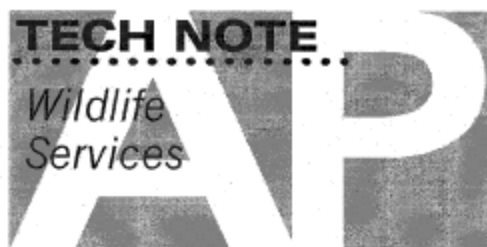
Issue Date: 2-Feb-2004
Revision Date: 21-Dec-2017
Revision Note: Information updated

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

Appendix 4: Tech Notes for the use of DRC-1339



DRC-1339 (Starlicide)

DRC-1339 (3-chloro-4-methyl benzenamine HCl, Chemical Abstract Service Reg. No. 7745-89-3) is a slow-acting avicide that is registered with the Environmental Protection Agency (EPA) for the control of several species of pest birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. Technical DRC-1339 (Starlicide Technical, EPA Reg. No. 602-134) contains 97 percent DRC-1339. Starlicide products and DRC-1339 were developed jointly by Ralston Purina, Inc., Purina Mills, Inc., and the National Wildlife Research Center (NWRC) of the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS). Registrations are maintained by PM Resources, Inc., Earth City Resources, and APHIS.

APHIS/WS currently has the following DRC-1339 products registered with EPA to resolve bird problems that cannot be solved by the use of the commercially available Starlicide Complete (EPA Reg. No. 602-136) [See table].

The use of all APHIS/WS DRC-1339 registrations is restricted to Certified Applicators and WS personnel trained in bird control (or persons under their direct, onsite supervision). All APHIS/WS DRC-1339 products are prepared from Starlicide Technical.

A number of APHIS/WS State Special Local Need (Section 24(c)) registrations also are available to solve local problems, such as blackbirds in sunflowers, blackbirds in rice, and grackles in citrus.

Acute Toxicity to Birds and Mammals

DRC-1339 was developed as an avicide because of its differential toxicity to animals. More acute avian toxicity data are available for DRC-1339 than for any other pesticide used in the world: more than 40 species have been tested. DRC-1339 is highly toxic to most sensitive bird species (LD_{50} 's range from 1 to 10 mg/kg), allowing a toxic dose to be placed on a single bait. But it is only slightly to

moderately toxic to many nonsensitive birds, most predatory birds, and most mammals (LD_{50} 's range from 100 to 1,000 mg/kg). Some species, including waterfowl and gallinaceous birds, are intermediate in sensitivity to DRC-1339 (LD_{50} 's range from 10 to 100 mg/kg). Most bird species that are sometimes pests, including starlings, pigeons, blackbirds, crows, and magpies, are sensitive to DRC-1339. Many other bird species, such as raptors and some small granivores are classified as nonsensitive. Known exceptions are owls and felines, with LD_{50} 's of about 5 mg/kg placing them in the sensitive category.

Mode of Action

The mode of action of DRC-1339 in sensitive birds is irreversible kidney and heart damage; a quiet and apparently painless death normally occurs 1-3 days following ingestion. In nonsensitive species, the mode of action is quite different, and the process requires 10-100 times more DRC-1339. In these species, the central nervous system is depressed, resulting in cardiac

Product	Registered Uses
Compound DRC-1339 Concentrate-Feedlots (EPA Reg. No. 56228-10)	For controlling blackbirds and starlings in livestock feedlots.
1339 Gull Toxicant 98% Concentrate (EPA Reg. No. 56228-17)	For controlling gulls to protect colonial nesting seabirds.
Compound DRC-1339 Concentrate-Pigeons (EPA Reg. No. 56228-28)	For controlling pigeons in and around structures
Compound DRC-1339 Concentrate-Livestock Depredations (EPA Reg. No. 56228-29)	For controlling corvids (e.g., ravens) depredating on newborn livestock, threatened or endangered species, or other species needing special protection.
Compound DRC-1339 Concentrate-Staging Areas (EPA Reg. No. 56228-30)	For controlling birds in staging areas associated with roosts.

or respiratory arrest; a quiet death usually occurs after 2-10 hours. The kidney and heart damage that occurs in sensitive birds that ingest DRC-1339 is irreversible; however, the central nervous system depression resulting from ingestion of DRC-1339 in nonsensitive mammals and raptors can be successfully treated symptomatically.

DRC-1339 is metabolized and excreted from all animals very quickly, with 90 percent or more of the compound lost within 2 hours. Most metabolites are much less toxic than DRC-1339. DRC-1339 is not accumulated in the body, thus the compound's residues generally range from 0 to less than 0.1 ppm when death occurs.

Potential Primary Hazards

Repeated exposure to DRC-1339 in feed can result in the poisoning of sensitive species. The concentration of DRC-1339 in feed that is lethal to 50 percent of treated starlings (LC_{50}) is 4.7 ppm after 30 days of exposure and 1.0 ppm after 90 days exposure. For bobwhite quail, the LC_{50} concentration in feed is 14.1 ppm, and for species of intermediate sensitivity, such as mallard ducks, the 5-day LC_{50} is 322 ppm. DRC-1339 does not appear to affect avian reproduction except at levels very close to where toxicity is expressed.

Numerous studies conducted by NWRC and WS Operations show that DRC-1339 poses a small risk of primary poisoning to most nontarget species. The primary hazards to nontarget birds are generally site specific and can be controlled by selecting a bait and bait sites that are not used by nontarget birds. The risk to nontarget birds can be further mitigated by careful prebaiting and observation prior to bait application. The risk of primary poisoning to most mammals is extremely low because of the low level of toxicity of DRC-1339 to most mammals, the baits that are used, bait dilution factors, and minimal treatment rates. Birds and mammals that may be at risk are identified in the WS Technical Notes prepared for specific DRC-1339 end-use products.

Potential Secondary Hazards

NWRC and WS Operations have been monitoring the use of all DRC-1339 products since 1968. There have been no documented secondary poisonings of mammalian or avian scavengers and predators with DRC-1339, except for a crow that may have scavenged the gut contents of a recently treated pigeon. NWRC has conducted long-term feeding studies where birds poisoned by DRC-1339 were collected and fed to raptors and scavenger mammals for 30 to more than 200 days. No symptoms of poisoning or mortalities occurred.

Special precautions may be warranted when

using DRC-1339 where owls and cats may be exposed to poisoned birds. Although it is possible that a cat or owl could ingest a lethal dose of DRC-1339 if fed birds poisoned by the compound exclusively for more than 100 days, the actual risk is normally minimal because exposure to DRC-1339-poisoned birds occurs over a few weeks or less. To reduce any potential hazard, poisoned birds should be retrieved, then burned or buried, whenever possible.

Toxicity and Stability in the Environment

DRC-1339 is generally unstable in the environment and degrades rapidly when exposed to sunlight and heat or ultraviolet radiation. DRC-1339 is highly soluble in water but does not hydrolyze. Photodegradation occurs in water with a half-life that ranges from 6.5 to 41 hours, depending upon the season (faster in summer, slower in winter). DRC-1339 is very tightly bound to soil (70-90 percent) and has low mobility. The half-life of DRC-1339 in biologically active soil is about 25 hours, and identified metabolites have low toxicity. These data indicate that DRC-1339 degrades rapidly in soils, does not persist, and will not migrate. The 96-hour LC_{50} of DRC-1339 to bluegill sunfish is 11 ppm; to rainbow trout, 9.7 ppm; and to water fleas, 0.079 ppm, indicating that DRC-1339 is only moderately toxic to fish but that some invertebrates may be very sensitive to the compound.

Sources of Information

Additional information on this product can be found in the April 1994 ADC Final Environmental Impact Statement (Appendix P), in Material Safety Data Sheets supplied by the Pocatello Supply Depot, and in the 1995 Handbook on Prevention and Control of Wildlife Damage. Specific information on this product can be obtained through the National Wildlife Research Center (NWRC) (970-266-6000) or through the NWRC web site <http://www.aphis.usda.gov/ws/nwrc>. For further information about the availability of this product, contact your WS State Director, or the Pocatello Supply Depot.

**Raptor and Owl Management for the Protection of California Least Terns
and Western Snowy Plovers Nesting at Oceano Dunes State Vehicular
Recreation Area, San Luis Obispo County, California**

Annual Report – 2023

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ABSTRACT

Predation by native and non-native predators plays a major role in the recovery efforts for both the California Least Tern (*Sternula antillarum browni*; hereafter “tern”) and Western Snowy Plover (*Charadrius nivosus nivosus*; hereafter “plover”) at Oceano Dunes State Vehicular Recreation Area (ODSVRA), and populations throughout the west coast. Predator control programs, including trapping and translocation of raptors and owls, have contributed to increased reproductive success of sensitive shorebird species. Wildlife Innovations (WI) was hired to provide raptor and owl management at ODSVRA and developed a program that focused on the targeted capture and translocation of problem individuals identified during intensive surveillance, to reduce predation pressure upon terns and plovers. During the 2023 nesting season, a total of 237 avian predators from 11 species were recorded in or near protected tern and plover nesting sites at ODSVRA. Of those, 56.5% were observed within colony nesting areas. Within colony nesting areas, more avian predators were recorded at the 8 Exclosure site (n = 31; 23.1%) than other sites, and Northern Harrier (*Circus hudsonius*; NOHA) was the most observed avian predator (n=31; 23.1%). Avian predator observations peaked in April (n=75; 31.6%) at all nesting areas. A greater proportion of American Kestrels (*Falco sparverius*; AMKE; 78.6%) and NOHA (45.2%) when observed within colony nesting areas, resulted in disturbance to terns and/or plovers than other raptors or owls. Three raptors were captured and translocated from within or near tern and plover nesting sites at ODSVRA, including one NOHA, one Cooper’s Hawk (*Accipiter cooperii*; COHA), and one Peregrine Falcon (*Falco peregrinus*; PEFA). Approximately 55.9% (n= 521.9) of all trap hours were expended targeting a single AMKE that was not able to be captured.

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INTRODUCTION

California Least Terns (*Sternula antillarum browni*; hereafter “terns”), one of three subspecies of Least Tern, and Western Snowy Plovers (*Charadrius nivosus nivosus*; hereafter “plovers”) nest along the coastline of California (USFWS 1980; 2019). Due to population declines, resulting primarily from loss of habitat (Craig 1971, Cogswell 1977), California Least Terns were federally listed as endangered in 1970 (USFWS 1973) and were listed as endangered in California by the California Department of Fish and Game in 1971 (CDFG 1976). In 1993, the Pacific coast population of Western Snowy Plovers was listed as federally threatened under the Endangered Species Act (USFWS 1993) and is considered a “species of special concern” in California by the California Department of Fish and Wildlife (CDFW). The listings under the Endangered Species Act (ESA) mandated protection of tern and plover nesting sites in California that continues to this day (USFWS 1985). Oceano Dunes State Vehicular Recreation Area (ODSVRA), a site in California, provides important habitat for nesting terns and plovers, and was estimated to account for 1.96-2.44% of the breeding population of terns in California in 2017 (Sin 2021).

California Least Terns nest along the coastlines of Western North America, from the San Francisco Bay area to Baja California, Mexico (USFWS 1980). They forage for small fish in the open ocean, along with bays, lagoons, estuaries, tidal marshes, river mouths, ponds, and lakes. California Least Terns are threatened by multiple factors, including 1) predation by native and non-native predators, 2) habitat availability, 3) decreased nesting and foraging habitat quality, 4) human disturbance at breeding sites, 5) potential degradation or loss of wintering habitat, and 6) other temporary or long-range factors such as changes in resource availability, disease, and potential effects of climate change (USFWS 2006).

The breeding range of the Pacific Coastal population of plovers extends from Midway Beach, Washington, to Bahia Magdalena, Baja California Sur, Mexico (USFWS 2019). Threats to plovers have not changed significantly since listing on the ESA, as evidence of habitat loss and degradation remains widespread. Although the degree of habitat loss and degradation varies by geographic location due to disturbance from human use of areas, urban development, introduced beachgrass, and expanding predator populations, remain the management focus in all recovery units (USFWS 2019, Riensche *et al.* 2015, USFWS 2007).

Avian and mammalian predators are significant threats to nesting terns (Burr 1988, Massey 1988, USFWS 1988). Predation can result in a direct decrease in the number of birds but can also lead to nest and colony abandonment and negatively impact site fidelity (Frost 2015, Velasco 2015). In tern breeding surveys conducted in 2014 and 2017 by CDFW, the predators primarily responsible for tern predations in California were Peregrine Falcons (*Falco peregrinus*; PEFA), rats (*Rattus* spp.), Common Ravens (*Corvus corax*; CORA), Northern Harrier (*Circus hudsonius*; NOHA), American Crows (*Corvus brachyrhynchos*; AMCR), and coyotes (*Canis latrans*; Frost 2015, 2017; Sin 2021). In 2017, coyotes accounted for 62% of tern nest predations across California, and CORA and AMCR were responsible for 30% of nest predations. During that same season, PEFA were responsible for 62% of fledgling and 39% of adult predations, and AMKE (*Falco sparverius*, AMKE) and Great Blue Herons (*Ardea herodias*; GBHE) were the primary predators of chicks (Sin 2021). Other notable predators of terns included rats, Gull-billed Terns (*Gelochelidon nilotica*; GBTE), NOHA, Great Horned Owls (*Bubo virginianus*; GHOW), Western Gulls (*Larus occidentalis*; WEGU), and Burrowing Owls (*Athene cunicularia*; BUOW). During other years the predators listed above are also prevalent causes of predation of terns and tern nests, although

additional predator species have also been documented to depredate terns.

Documented avian predators of plovers greatly overlaps with the predators of terns and include gulls, PEFA, AMKE, NOHA, COHA, RTHA, GHOW, BNOW, BUOW, Loggerhead Shrikes (*Lanius ludovicianus*; LOSH), CORA, AMCR, European Starlings (*Sturnus vulgaris*; EUST), GBHE, GBTE, and Black-crowned Night Herons (*Nycticorax nycticorax*; BCNH; CDPR 2019, 2020, USFWS 2006, Zimmerman 2008, Marschalek 2012, Jake Manley pers. comm.). Due to increasing populations of some native predators on coastal beaches, such as crows and ravens, predation pressure upon plovers may also increase and threaten the survival of the species (Neuman *et al.* 2004, USFWS 1993).

Due to the reduction in the number of nesting terns and plovers on the Pacific coast and their federal listing under the Endangered Species Act, wildlife agencies increased their monitoring and management efforts. Tern and plover monitoring at ODSVRA began in 1991 and 1992, respectively (CDPR 2017). From 2002 through 2021, the number of breeding plovers at ODSVRA ranged between 32 and 226, with an average of 151 adults and an average fledging rate of 38.3% (CDPR 2022). From 2005 through 2020, the average number of tern pairs at ODSVRA ranged from 40 to 43. Between 2006 and 2021, the average fledging rate was 72.3% (CDPR 2021). During the 2023 nesting season, fewer tern pairs (41-42) nested at ODSVRA and laid fewer nests than during 2021 (n=45, respectively). More adult plovers (minimum 229 breeding adults) laid more nests than during 2021 (n=223, respectively). Less terns (n=35) but more plovers (n=231) reached fledging age.

Wildlife Innovations (WI) entered into a three-year contract with the California Department of Parks and Recreation (CDPR) during the 2021 nesting season, to provide surveillance, behavioral evaluation, and mitigate predation of terns and plovers nesting at ODSVRA by raptors and owls. All other avian and mammalian predators are managed by USDA/APHIS/Wildlife Services (WS) under a separate contract with CDPR. Wildlife Innovations initiated raptor and owl management efforts for the 2023 nesting season on 15 March. When predations were identified by ODSVRA staff, WI investigated all predations, when possible, to attempt to determine the species responsible. The results of these predation investigations, along with direct predator surveillance and behavior evaluation data, enabled WI to utilize an adaptive and highly targeted approach to manage predator species. This methodology helps to ensure that only high-threat predators are targeted for management, thereby reducing potential for negative impacts to the native predator community, while also mitigating predation pressure on terns and plovers to support increased nesting success.

STUDY AREA

Oceano Dunes State Vehicular Recreation Area is a park managed by the CDPR in southern coastal San Luis Obispo County, California. It is part of the 18-mile-long Guadalupe-Nipomo Dunes complex that extends from Pismo Beach to Point Sal. The southern end of the park directly abuts Guadalupe-Nipomo Dunes National Wildlife Refuge. Inside the park, both street-legal and off-highway vehicles are allowed throughout designated open riding areas (ORA). These areas extend approximately 0.5 to 1.5 miles from the coast. Eight numbered marker posts, approximately one-half mile apart, are positioned along the coastal strand to orient park visitors and staff (CDPR 2022). From the shoreline to the western edge of the ORA, beginning at the northern edge of the Foredune Closures, are regions both seasonally and permanently closed to public access, collectively referred to as colony nesting areas. These exclosures have been established to protect

nesting terns and plovers, of which terns are only present during the breeding season (April–September) whereas some plovers are onsite year-round (CDPR 2020).

The following terminology and associated descriptions are used within this report (taken from CDPR 2023).

ODSVRA—All areas administered by the Oceano Dunes District are part of the ODSVRA. The CDPR manages 4,900 acres, 9.1 of which are ocean shorelines (CDPR 2020). During 2022, an estimated 183,900 street-legal vehicles and 73,000 off-highway vehicles visited ODSVRA (CDPR 2023).

Open Riding Area (ORA)—The area within the ODSVRA open to vehicle use during the nesting season. This area was approximately 874 acres at the beginning of the 2023 nesting season, but installation of nest buffers, expansion of the Foredune Closure shoreline fencing in response to plover nesting activity, and establishment of closed buffer areas decreased the overall area of the ORA throughout the nesting season. The majority of the ORA consists of bare sand, limited sections of artificial debris patches, little or no vegetation, and regions of steep topography, all of which contribute to suboptimal nesting habitat (CDPR 2023).

Closed buffer area—Portions of the ORA closed to the public to provide a buffer for tern or plover nests, in areas of high chick activity, or at tern night roosts. As OD staff locate nests, management closes areas to the public to provide this buffer area. The closed buffer area frequently varied in size during the nesting season. Additionally, each year the closed buffer will also vary, in accordance with locations of nests found.

Foredune Closure—Restoration area within the ORA, established in 2020 to improve air quality conditions. The closure's colony fencing is 48 acres in total, extending from approximately a quarter mile south of marker post 4 to north of post 6, approximately covering 0.8 miles of shoreline. The closure is divided into three plots and referenced as: Foredune North, Foredune Central, and Foredune South. The fence surrounding each plot is intended to keep people and vehicles out of the restoration area, but it is not maintained as predator fencing and coyotes and other mammals can easily move through the area. The shoreline is closed during the nesting season.

Southern Exclosure—A single contiguous area within the central and southern portion of the riding area that is closed to entry year-round and is a large part of the nesting colony (Fig. 1). The colony fencing of the exclosure is maintained predator fencing, unlike the fences of the Foredune Closure and vegetation islands. Although contiguous, for the purpose of data collection and accurate reporting there are individually identified areas referred to as the following:

6 Exclosure—The area extending from marker post 6 to marker post 7, approximately 0.5 miles of shoreline and 62 acres.

7 Exclosure—The area extending from marker post 7 to the southern edge of 7.5 Revegetation Area, approximately 0.4 miles of shoreline and 63 acres.

8 Exclosure—The area extending from the southern edge of 7.5 Revegetation Area to the North Oso Flaco fencing south of marker post 8, approximately 0.5 miles of shoreline and 82 acres.

Boneyard—The area east of the North Oso Flaco dunes. Primarily bare sand, although has more

densely vegetated hummocks in the western portion. The area is bisected by a predator fence during the nesting season, establishing the western portion as West Boneyard (WBY) and the eastern portion as East Boneyard.

Oso Flaco—The shoreline and dunes in ODSVRA south of the ORA. Consists of approximately 1.7 miles of shoreline and divided into two areas referred to as the following:

North Oso Flaco—The area extending south of 8 Exclosure to the Oso Flaco boardwalk access trail, approximately 0.5 miles of shoreline and 68 acres. The shoreline portion is closed to pedestrians with symbolic fencing during the nesting season. The area east of the shoreline is surrounded by predator fencing and, along with the Southern Exclosure, is referred to as the Exclosures.

South Oso Flaco—The area from the Oso Flaco boardwalk (South of North Oso Flaco and not visible on Fig.1) and extending to the ODSVRA southern boundary, approximately 1.2 miles of shoreline.

Exclosure—The contiguous area enclosed by the predator fencing surrounding the Southern Exclosure and North Oso Flaco. The area within the fencing is approximately 260 acres (does not include the closed shoreline areas) and was established to exclude coyotes, humans, and vehicles for the protection of nesting terns and plovers (Tamar Carmona pers. comm.).

Dunes Preserve—An area of tall sand dunes with densely vegetated foredunes in its western portion, 0.4 miles north of the Foredune Closure.

Vegetation Islands—Revegetated areas fenced to prevent access by vehicles and referred to as the following: Pipeline (PLR), Maidenform, Eucalyptus North, Eucalyptus Tree, Bigfoot, Boy Scout Camp, Pavilion Hill, and BBQ Flats (Fig. 1).

Arroyo Grande Creek—Seasonally flowing creek that feeds into the Pacific Ocean approximately 0.4 miles north of the Foredune closure. A large amount of precipitation during the prior winter caused increased flow of the Arroyo Grande (AG) creek and subsequent closure of ODSVRA to visitors for part of the 2023 nesting season.

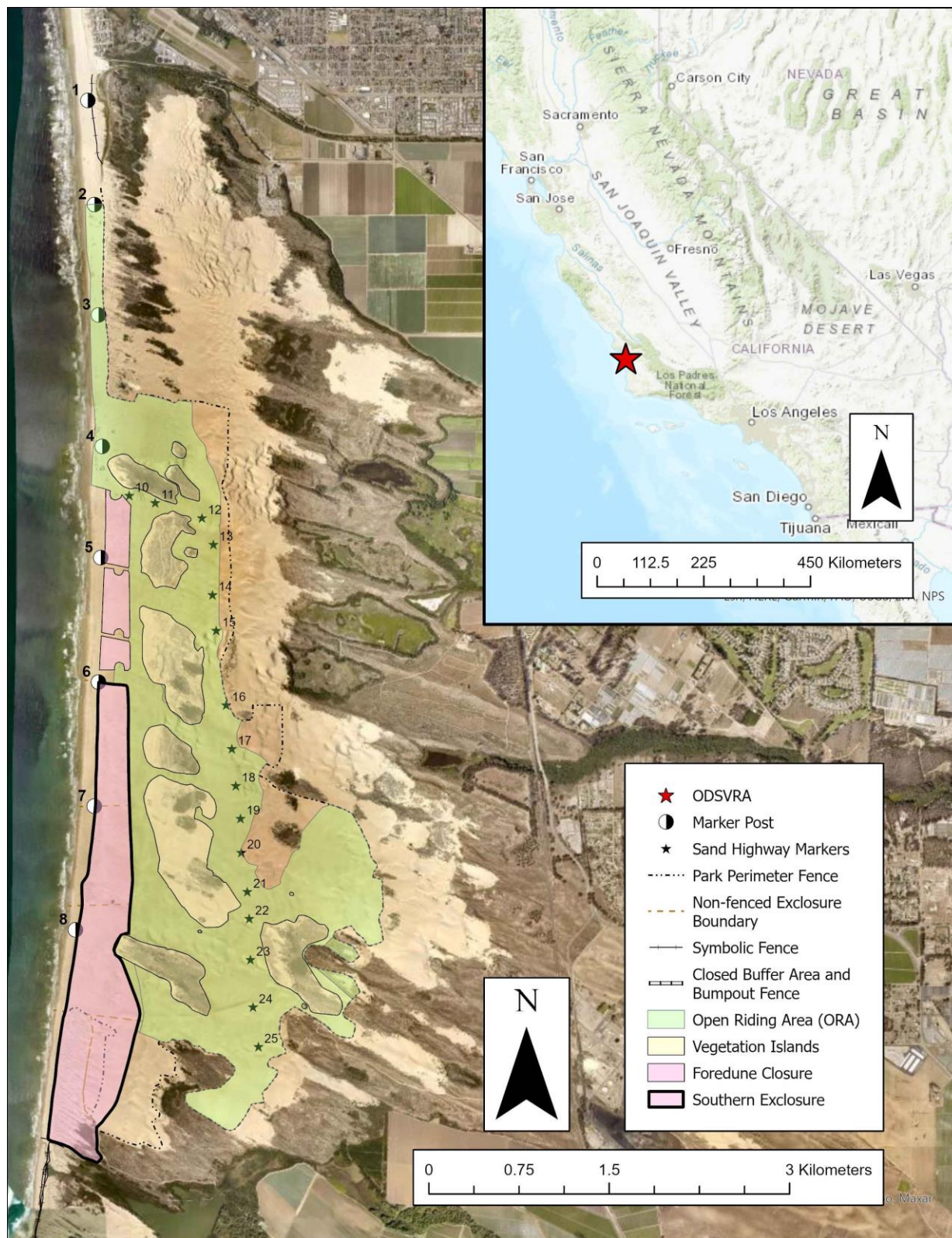


Figure 1. Map of ODSVRA, including colony fencing, ORA, and other points of interest, where raptor and owl management was conducted for terns and plovers during the 2023 nesting season.

METHODS

Raptor and owl management efforts during the 2023 tern and plover nesting season were conducted in and near previously identified beach nesting areas at ODSVRA between 15 March and 24 August 2023. Those efforts included conducting predator surveillance, behavioral evaluation and threat assessment of individual predators, investigation of tern and plover predations to determine species or individual responsible, and targeted trapping for raptors or owls documented depredating or threatening terns or plovers or their nests. Surveillance data and predation investigations reported herein are data collected by WI, and do not include observations made by ODSVRA staff or other cooperative entities. However, all observations and information reported to WI were used to inform adaptive management efforts and may be referenced during species specific narrative summaries as that information contributed to management decisions.

All WI vehicles and personnel conducting management work on ODSVRA were fitted with identifiable markings, such as reflective truck decals and shirts and/or hats displaying the WI logo, allowing park rangers, game wardens, and other park staff to easily identify them in areas closed for tern or plover nesting.

Predator Surveillance

The amount of time spent surveilling each nesting site area varied throughout the season. More patrols and fixed-position surveillance were conducted in areas where more avian predator observations or predator sign occurred, and in areas where documented or suspected predations of terns or plovers occurred. Additionally, when WI personnel were not required to remain in one location (e.g., while monitoring active traps), more time was spent monitoring high-density tern and plover nesting sites. Fixed-position surveillance was also utilized frequently during the 2023 nesting season to attempt to pattern individual raptors or to collect specific information on activities of high-threat species such as NOHA, PEFA, or CORA.

Predator observations were recorded during both daytime and nighttime hours while conducting routine patrols of enclosure fence lines and shoreline areas, during surveillance from fixed and topographically advantageous positions, while trapping for targeted individuals, and while performing predation investigations within nesting areas. Predator observations were recorded and mapped where the predator(s) were first detected unless the individual(s) focused its activity or conducted a noteworthy behavior (e.g., depredated or attempted to depredate a tern or plover) in a specific location during the observation. During the latter portion of the 2023 nesting season, a shift in data collection procedure was made to accommodate a request made by ODSVRA Staff. This shift included recording all relevant nesting enclosures or otherwise identified areas in order of visitation, following the initial observation location. Multiple observations of a nondescript individual belonging to the same species within 10 minutes of the first observation, were assumed to be the same individual and only recorded once, unless physical characteristics allowed for confident differentiation and identification as multiple individuals of the same species, in which case multiple individuals were recorded.

In addition to observations of predators, disturbance to terns and plovers caused by predators was recorded. If the presence or activity of a predator elicited a behavioral response from a tern or plover (e.g., crouching, alarm calling, displaying, mobbing), it was recorded as a disturbance. When avian predators were observed within areas expected to be occupied by terns or plovers, but disturbance could not be confirmed, it was recorded as “disturbance unknown.” If the avian predator was observed flying over terns or plovers visible to the observer and no disturbance to

terns or plovers was observed, “no disturbance” was recorded. Not all disturbance may have been detected due to factors such as topography, distance, and weather induced reductions in visibility.

Not every raptor observation was recorded to better utilize personnel time while conducting field work. For example, Osprey (*Pandion haliaetus*, OSPR) were not recorded as their diet is nearly entirely comprised of live fish, and they were rarely observed. In addition, while RTHA were commonly observed in and near vegetation islands, they rarely threatened nesting terns and plovers. As a result, only those RTHA observed inside tern and plover nesting exclosures were recorded. Also, while many gull species are documented predators of terns and plovers, because there are so many present at ODSVRA, only individuals observed threatening or depredating terns or plovers were recorded. Due to these factors, “avian predators” will include all raptors, owls, and corvids observed, but may not include gulls, RTHA, or OSPR observed.

Wildlife Innovations developed a standard weekly surveillance intended to sample all time periods within the course of each week, in an effort to prevent avian predators from going undetected. The standard schedule was adapted based on expected or detected predator presence. The standard surveillance schedule consisted of at least two mornings, two evenings, and one overnight period. The surveillance schedule designed and worked by WI was also adapted as needed or requested, to fill gaps between work schedules of other entities within the ODSVRA tern and plover program, and as a result provide valuable and complimentary information.

Wildlife Innovations conducted nighttime surveillance using thermal imaging optics to gather additional and valuable information regarding activity by nocturnal predators. Nighttime surveillance was conducted by determining the most appropriate observation location based on knowledge of predator presence and reports provided by ODSVRA staff detailing locations of tern and plover nests, chicks, and fledglings. WI personnel arrived at surveillance locations prior to sunset to become familiar with terrain during daylight, which helped to improve understanding and evaluation of habitat and predator behaviors observed through the thermal optic at night. Beginning nighttime surveillance shifts prior to sunset also enabled WI to assist ODSVRA staff in documenting tern roosting locations and to count the number of roosting individuals. Nighttime surveillance was primarily performed from a fixed point to both limit driving near identified tern roosting areas and the possibility of altering nocturnal predators’ behavior.

Time spent performing nighttime surveillance and trapping for owls reduced personnel hours available for monitoring of diurnal raptors. WI senior and field staff utilized ODSVRA staff reports of avian predator observations made during daytime hours, combined with data collected by WI during nighttime surveys, to continuously reevaluate, prioritize, and shift between nighttime and daytime surveillance schedules to best meet the needs of the program.

Avian Predator Trapping

Trapping and translocation of raptors and owls is a complicated process, requiring sufficient justification of the impacts or potential for impacts to listed species to satisfy requirements of state and federal regulatory agencies, translocation site approval, and completed banding and reporting paperwork, to remain in compliance. Before trapping was initiated, focused surveillance was conducted to gather ample justification, planning for translocation was conducted, and notification of state and federal regulatory agency representatives was completed when required and appropriate. Justification to begin trapping followed guidelines developed by CDFW and the U.S. Fish and Wildlife Service (USFWS) for the translocation of raptors associated with Threatened and Endangered species protection programs (Migratory Bird Permit Office 2013). Capture and justification forms were completed and delivered to both regulatory entities, as requested.

Raptors or owls documented depredating terns or plovers, observed exhibiting threatening predatory behavior (including activities that elicited alarm calls from terns or plovers), or repeatedly hunting within sensitive tern or plover nesting habitat, whether observed by ODSVRA monitoring staff or by WI personnel, were targeted for removal via capture with traps and translocation. Wildlife Innovations tailored the type of trap and method of deployment to be most effective for the species and the behavior of the targeted individuals. Wildlife Innovations additionally considered any characteristics or constraints posed by the trap site. A variety of standard trap types as described by Hull and Bloom (2001), were used to target and capture these avian predators. Most traps were anchored by attaching them to two-to-five-pound weights via a bungee cord which acted as a shock-absorber to reduce potential injury to captured individuals and served to maintain tension for snare-based traps. All captured raptors were banded, translocated, and released during the 2023 season.

All captured avian predators were banded with an aluminum USGS service band and, depending on species, an auxiliary band from Acraft Sign and Name Plate Co. Ltd. that contained an alpha-numeric code (black code on silver band) intended to be readable from a distance using optics. Peregrine Falcon captured during the 2023 season were instead banded with a black V.I.D. (Silver code on black band) instead of an auxiliary band. Captured individuals were released at CDFW- and USFWS-approved locations by WI, CDFW, or Natural Resources Volunteer Program (NRVP) personnel.

Predation Investigations

Wildlife Innovations investigated all reported tern and plover predations when personnel were in the field and transited to the field to investigate any depredation sites suspected to be raptor based on information provided by ODSVRA staff. If predator species was able to be determined based on ODSVRA data and photos, WI recorded the predation for trapping justification but otherwise did not include it within summary statistics. If a species could not be confirmed through evidence provided by ODSVRA and the predation was suspected to be from a non-raptor or owl species, WI investigated the predation the next time WI personnel were onsite. When WI performed the depredation investigations, a WI biologist experienced and permitted to operate within tern and plover nesting colonies and trained in identifying predator tracks/sign walked to the nest site, frequently accompanied by ODSVRA staff. During investigations, depredations were assigned to the species-level when possible and assigned a level of confidence regarding the determination.

Predation investigations presented in this report represent only those directly investigated by WI and not all investigations or depredations observed or investigated by other entities at ODSVRA. Since WI did not survey within nesting areas regularly, WI relied on ODSVRA staff reports to

detect predations. Detections most often involved an initial record of a plover or tern being off the nest during at least one regularly scheduled ODSVRA staff “nest-check”. Following that observation, or opportunistically if ODSVRA staff were already within a nesting area and discovered a depredated nest, the site was checked for signs of predation. In instances that WI was not onsite, or ODSVRA staff had otherwise located a depredation site while walking within the enclosure, the site was initially investigated by ODSVRA staff. Frequent high winds at ODSVRA often damaged or removed evidence at depredation sites if not investigated promptly. To prevent loss of evidence and promote accurate identification of the cause of each predation, if WI was not available, ODSVRA staff performed the depredation investigation. Due to the above-listed challenges, many discovered predations were not able to be identified to species and as a result were recorded as “unknown” or “unknown avian.” For a comprehensive summary of all predations for the 2023 nesting season, please see the ODSVRA monitoring report (CDPR 2023).

Data Management and Analysis

Smart phones and tablets, containing the ESRI Field Maps or Collector for ArcGIS Applications (ESRI, Redlands CA), were used to record all predator management data collected in the field. These applications were customized by WI for collection of all relevant information for effective predator management. Some examples of data collected include the following: name of personnel, date and time of observation or work being conducted, name of nesting area where work was conducted (e.g., Boneyard), type of predator control work (e.g., trapping), specific equipment used (e.g., Bal-chatri trap), activity (i.e. trap-set, trap-check, trap-pulled), specific bait used (e.g., mouse), species captured (e.g., PEFA), and final species disposition. These data were later summarized, analyzed, and mapped using ESRI ArcGIS Pro and Microsoft Excel (Microsoft Office Excel 2016, Microsoft Corp., Redmond, WA). Observation data were summed by time period, geographic area (e. g., Site or Enclosure), and species, and were reported as the number of individuals observed or as a percentage of those observed, which was calculated by dividing the number of observations within a given category by the total number of observations made. Observations recorded within vegetation areas were summed across all areas rather than by reporting individually. Predator observations recorded within occupied plover or tern areas, such as the nesting enclosures or on the shoreline, were summarized by site to better describe predator activity and predation threat within each site and across all sites. Survey data displayed within maps is of observational events, and each icon within those maps may represent more than one individual observed. Many raptors and owls are solitary, so most icons in maps only represent a single individual. Observational data within tables includes summary of the total number of individuals observed, rather than of observation events.

RESULTS

Predator Surveillance

Between 15 March and 24 August 2023, 237 avian predators of 11 species were recorded within and near tern and plover nesting areas at ODSVRA (Table 1). Over half of the avian predator observations were recorded within colony nesting areas (n=134; 56.5%). The colony nesting area with the greatest number of avian predator observations was 8 Enclosure (n=31; 23.1%). However, combining enclosures and their corresponding shorelines (i.e., 8 Enclosure and 8 Shoreline), the combined area with the greatest number of avian predator observations was 6 Enclosure and Shoreline (n=35; 26.1%). Within all areas of ODSVRA, more observations of NOHA (n=58; 24.5%) were recorded than of other species of avian predator, 46.6% of which were observed outside of colony nesting areas (Table 1, Fig. 3). Within colony nesting areas, more observations

of NOHA (n=31; 23.1%) and PEFA (n=20; 14.9%) were recorded than of other species of avian predator (Table 1, Fig. 3, Fig. 6). More avian predators were observed in all areas during April (n=75; 31.6%) than during other months (Fig. 8). The lowest number of predator observations within all areas were recorded during August (n=9; 3.8%; Fig. 8). AMCR were most prevalent during March and April, whereas CORA were most prevalent during May (Fig. 8). A greater proportion of observations of AMKE (n=11; 78.6%) and NOHA (n=14; 45.2%) within nesting colony areas resulted in disturbance to terns and/or plovers than from observations of other avian predator species (Fig. 9).

Table 1. Avian predator observations recorded, by site and species, during the 2023 tern and plover nesting season at ODSVRA.

Site	AMCR	AMKE	BNOW	CAGU	CORA	COHA	GHOW	NOHA	PEFA	RTHA	WEGU	Unidentified Corvid	Unidentified Gull	Unidentified Raptor	Total
Colony Area	15	14	0	2	12	2	4	31	20	16	5	6	7	0	134
Foredune Closure	2	0	0	1	0	0	0	9	0	0	0	0	0	0	12
Foredune Closure Shoreline	0	2	0	0	0	0	0	1	1	0	0	0	1	0	5
6 Exclosure	2	3	0	0	2	0	0	5	2	0	1	0	1	0	16
6 Shoreline	0	5	0	0	0	0	0	6	5	0	0	0	3	0	19
7 Exclosure	1	3	0	0	3	0	0	1	2	1	0	0	2	0	13
7.5 Revegetation Area	0	0	0	0	1	0	0	0	1	2	0	0	0	0	4
7 Shoreline	0	0	0	0	1	0	0	0	1	0	1	0	0	0	3
8 Exclosure	6	1	0	0	5	1	4	2	2	4	0	6	0	0	31
8 Shoreline	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
North Oso Flaco	1	0	0	0	0	1	0	6	2	9	0	0	0	0	19
North Oso Flaco Shoreline	0	0	0	0	0	0	0	0	1	0	3	0	0	0	4
South Oso Flaco	3	0	0	0	0	0	0	1	0	0	0	0	0	0	4
Boneyard (West of IBY)	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3
Other Areas	40	8	2	0	7	3	5	27	2	5	0	3	0	1	103
Location Unconfirmed ^b	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
ORA: Open Riding Area	4	0	0	0	1	0	0	1	0	0	0	0	0	0	6
East Boneyard (East of IBY)	1	0	0	0	0	0	0	0	0	1	0	0	0	0	2
Vegetation Areas ^a	35	8	0	0	6	3	5	26	2	4	0	3	0	1	93
Total	55	22	2	2	19	5	9	58	22	21	5	9	7	1	237

^a Vegetation Areas include: BBQ Flats, Bigfoot, Dune Preserve, Eucalyptus Tree, Eucalyptus North, Oso Flaco Boardwalk/Flats/Lake, Pavilion Hill, Pipeline, Maidenform and Tabletop.

^b Location unconfirmed due to auditory detection in dense fog.

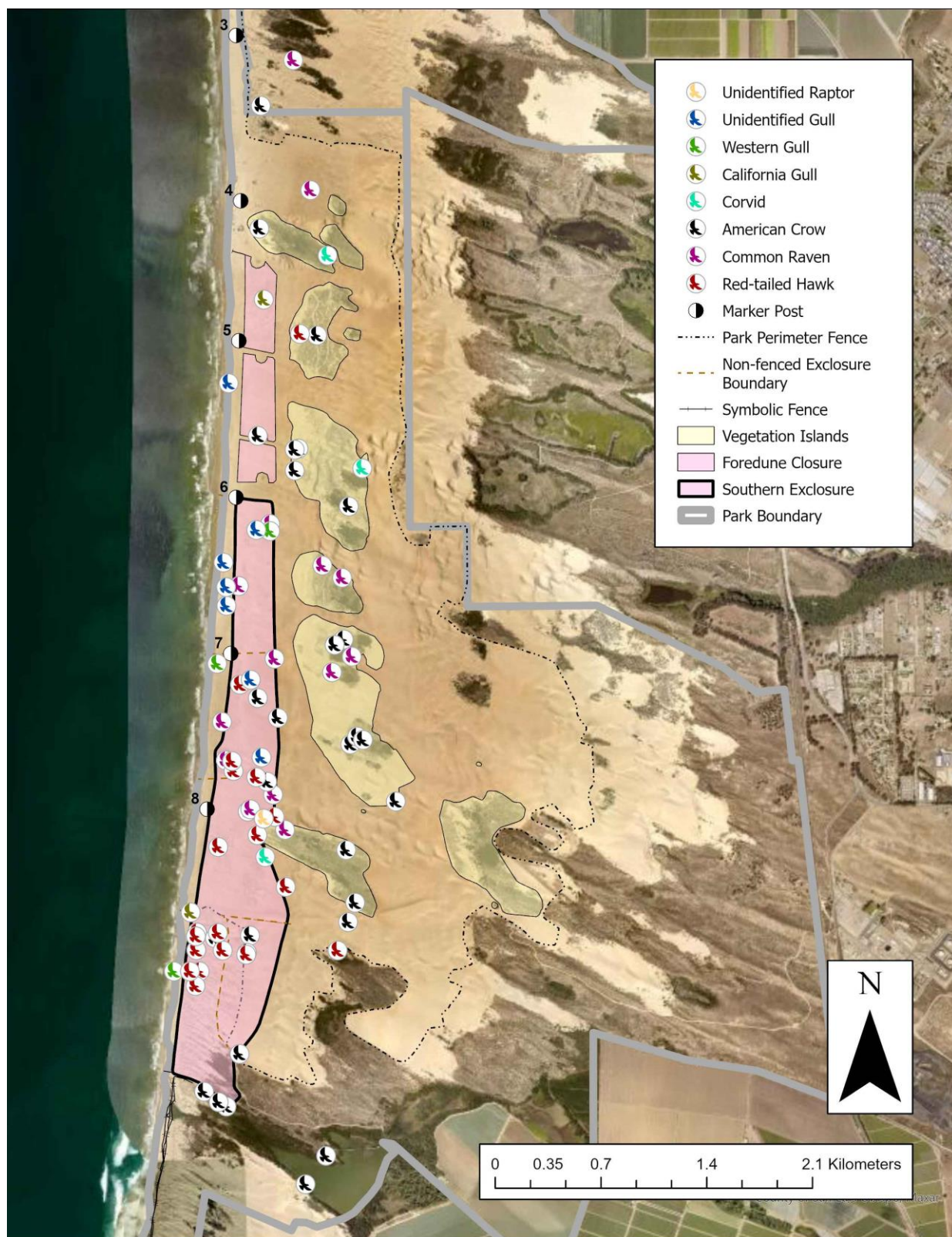


Figure 2. Locations of avian predators observed by WI within and near tern and plover nesting sites at ODSVRA, excluding the species captured or targeted for capture, during the 2023 nesting season.

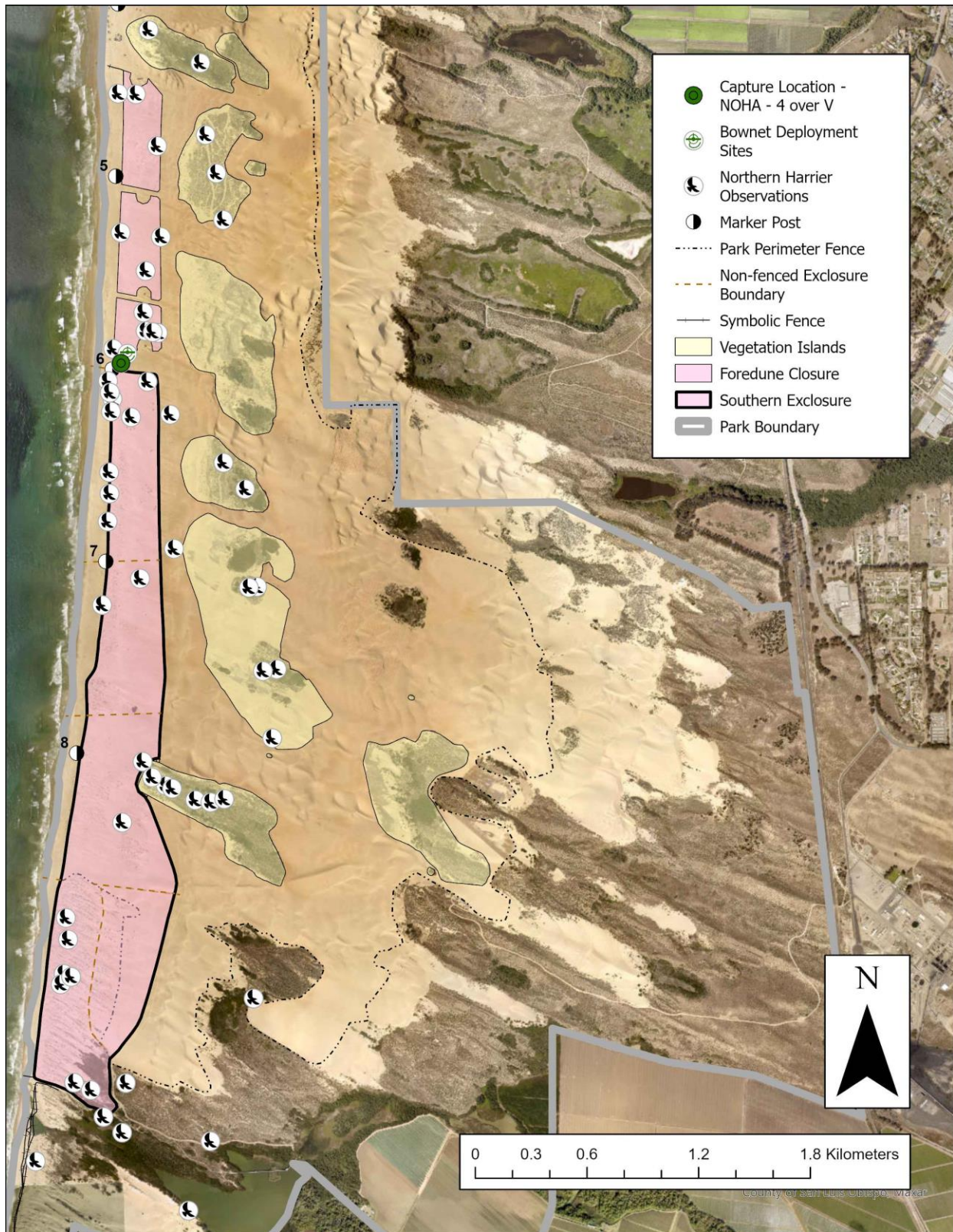


Figure 3. Locations of NOHA observations made by WI, traps placed for them by trap type and the capture location, within or near tern and plover nesting sites at ODSVRA during the 2023 nesting season.

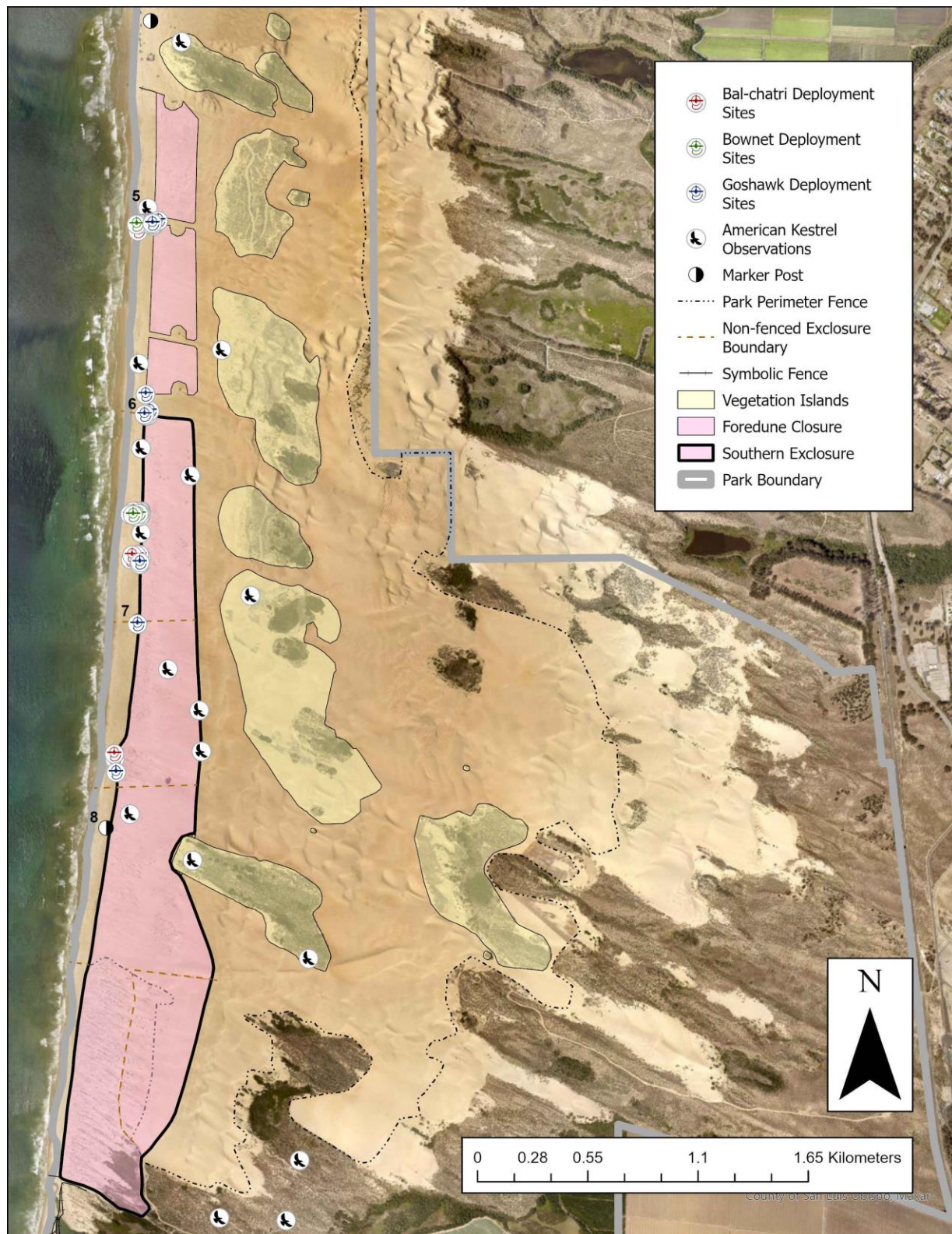


Figure 4. Locations of AMKE observations made by WI and traps placed by trap type, within or near tern and plover nesting sites at ODSVRA during the 2023 nesting season.

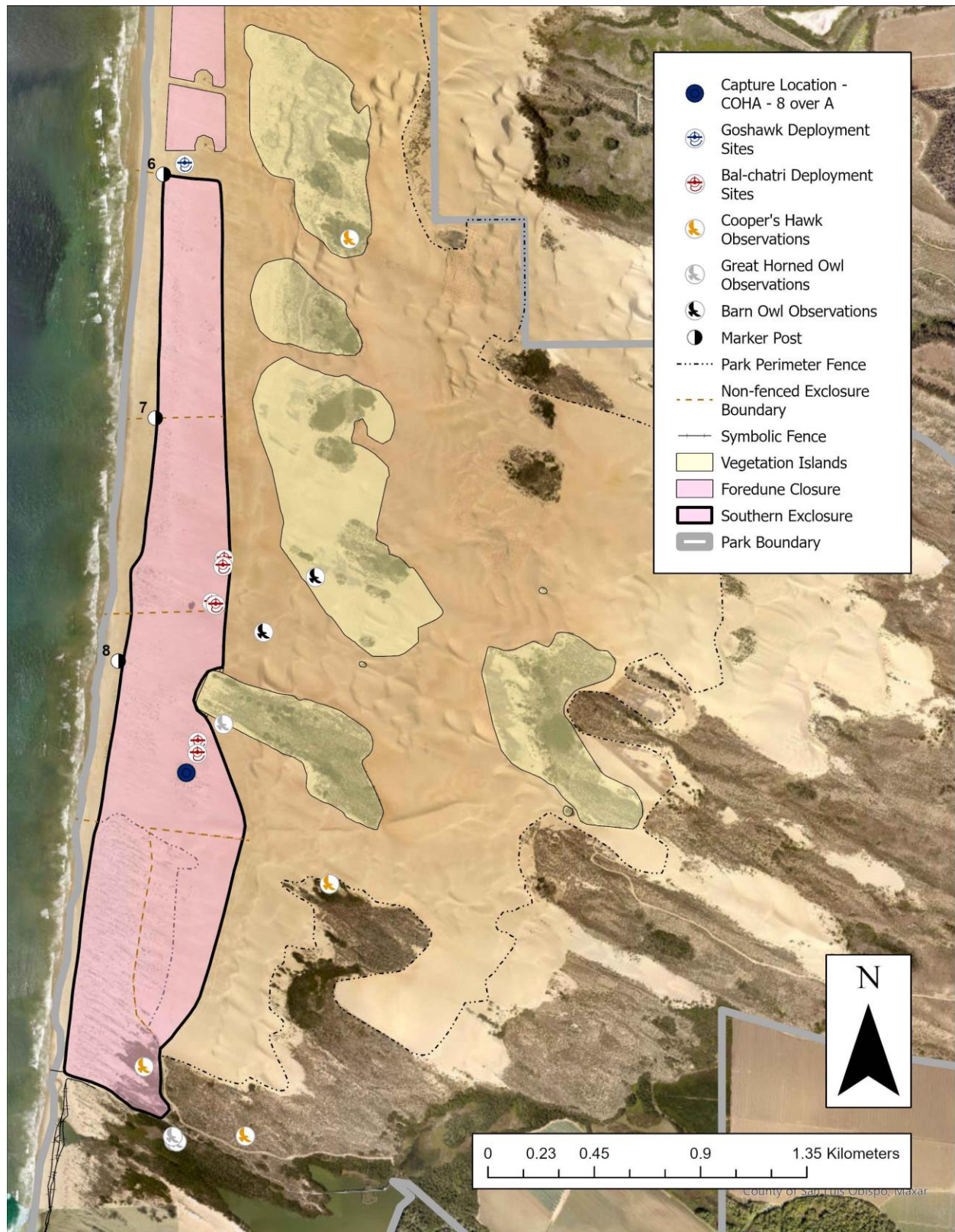


Figure 5. Locations of owl and COHA observations made by WI, traps placed for owls by trap type, and the COHA capture location, within or near tern and plover nesting sites at ODSVRA during the 2023 nesting season.

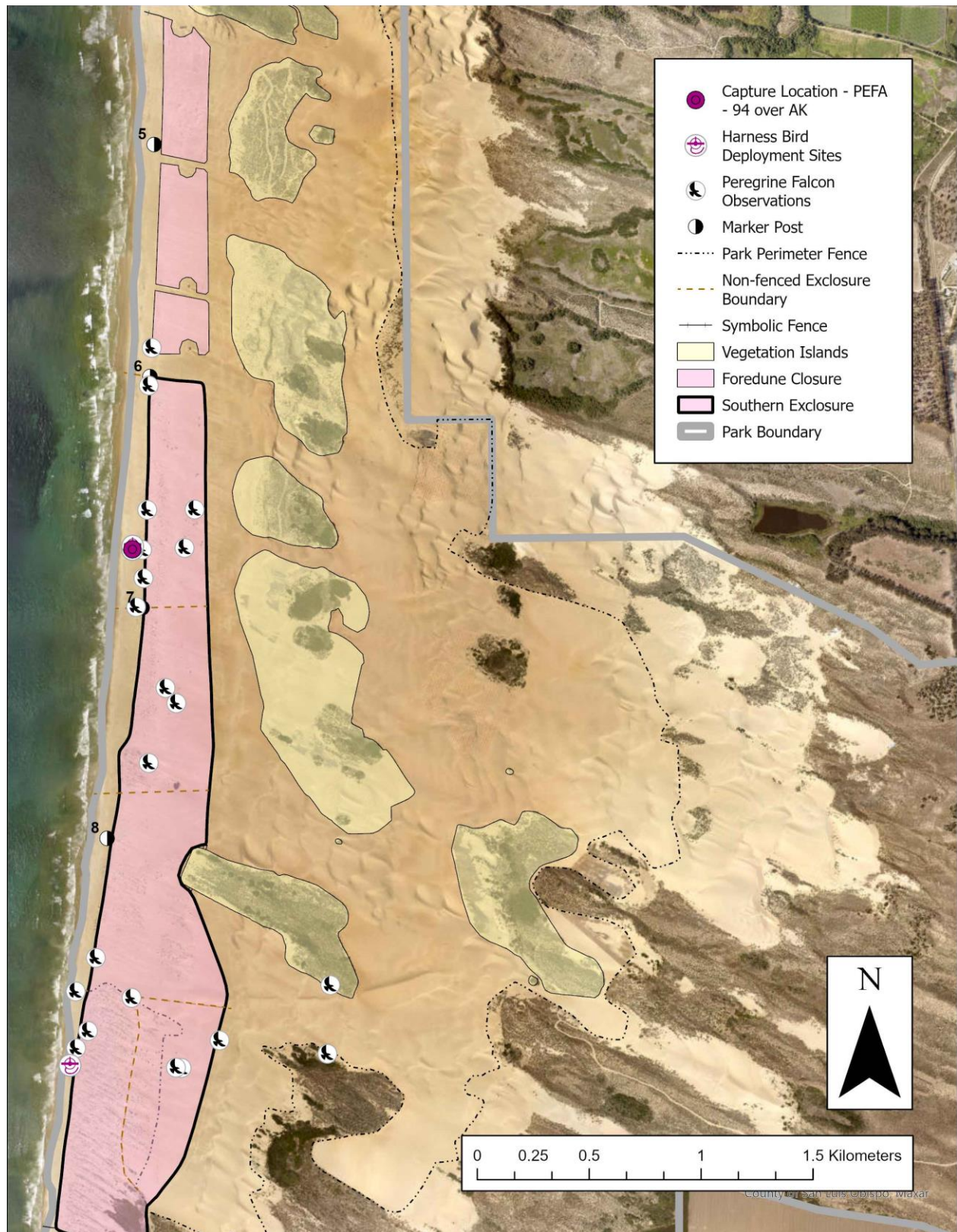


Figure 6. Locations of PEFA observations made by WI, traps placed by trap type, and the capture location within or near tern and plover nesting sites at ODSVRA during the 2023 nesting season

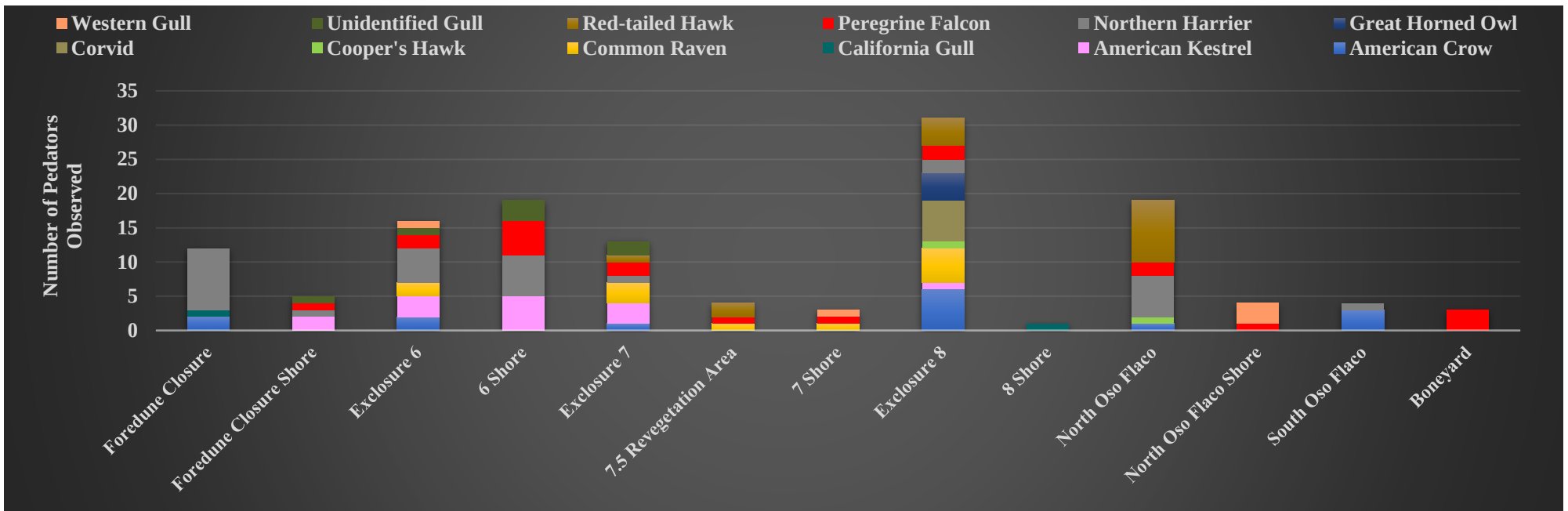


Figure 7. Number of avian predators observed by species, excluding all vegetation areas at ODSVRA during the 2023 tern and plover nesting season.

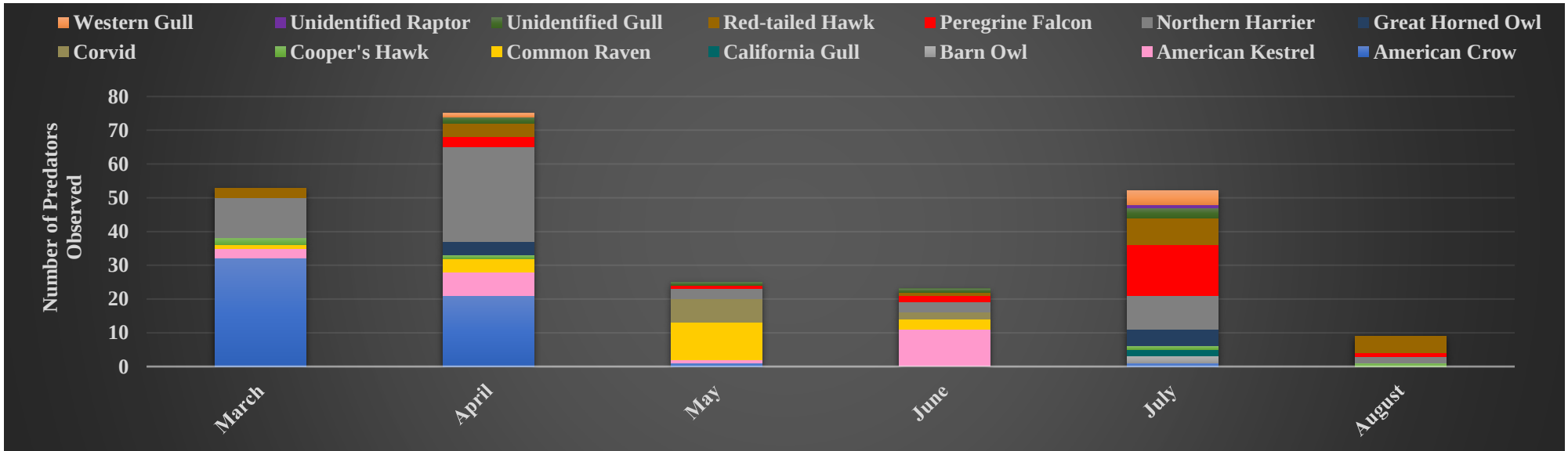


Figure 8. Number of avian predators observed by month and species at ODSVRA during the 2023 tern and plover nesting season.

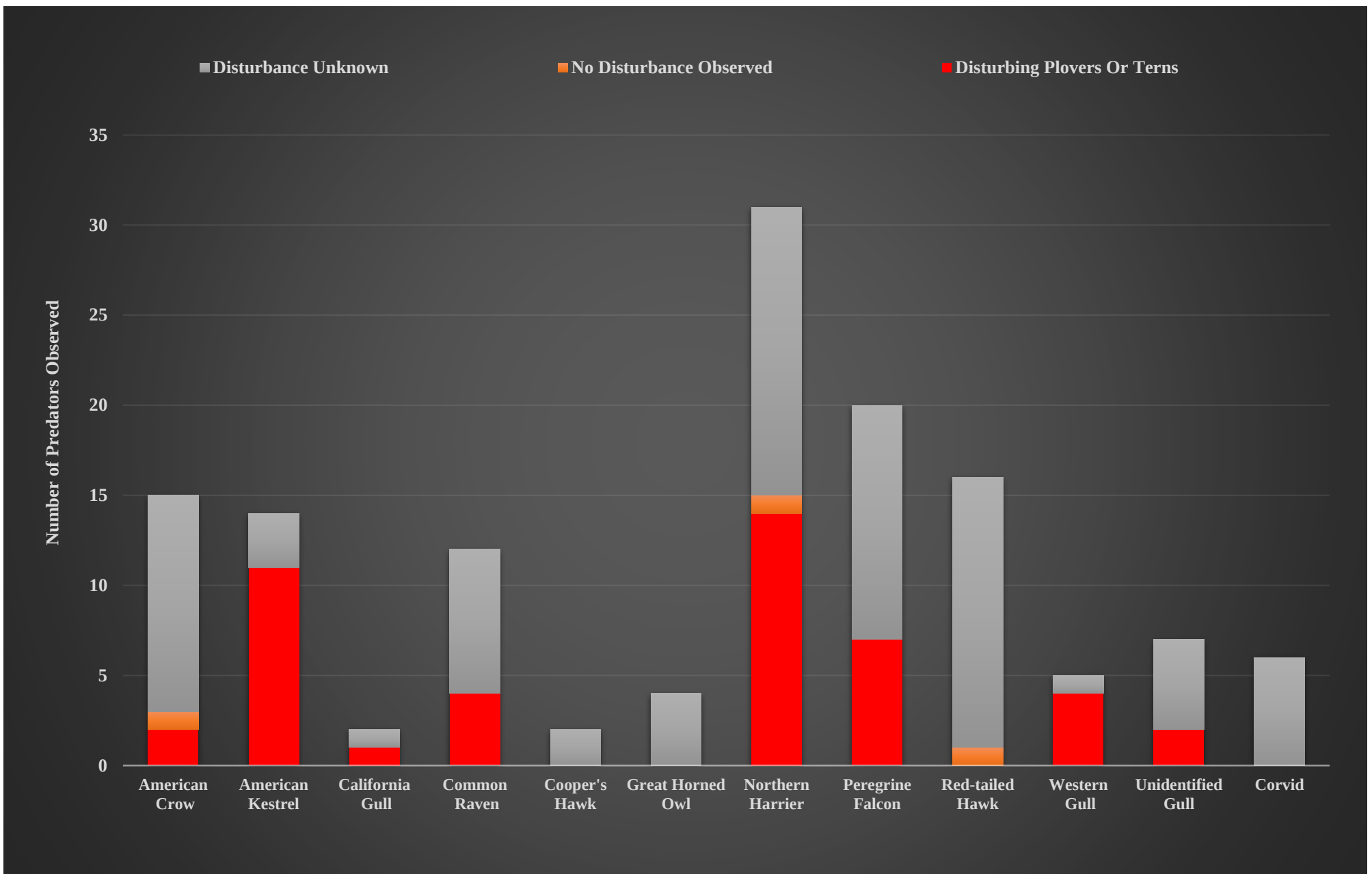


Figure 9. Number of avian predators observed by species, and whether disturbance of terns and plovers occurred during those observations, within colony nesting areas in ODSVRA, during the 2023 tern and plover nesting season.

Avian Predator Removal

During the 2023 nesting season, four avian predators were targeted for capture within or near tern and plover nesting sites on ODSVRA, resulting in the removal of three individuals belonging to three species (Table 2, Table 3). Four different trap types were deployed, for a total of 934.39 trap hours. Over half of all trap hours were spent attempting to capture an adult male AMKE (55.9%; Table 3). A large percentage of the remaining trap hours (34.8%) were spent targeting GHOW.

The adult male NOHA captured early in the season was released by CDFW in Butte County, CA (Table 4). The AHY female PEFA was transferred to Redding NRVP and transported to the Pit 3 Powerhouse for release (Table 4). The SY female COHA was released by WI at the Blue Oak Ranch Preserve in Santa Clara County (Table 4).

Table 2. Avian predators removed by species and trap type, during the 2023 tern and plover nesting season at ODSVRA.

Species	Modified Goshawk Trap	Bownet	Harnessed Pigeon	Captures
Northern Harrier	0	1	0	1
Cooper's Hawk	1	0	0	1
Peregrine Falcon	0	0	1	1
Total	1	1	1	3

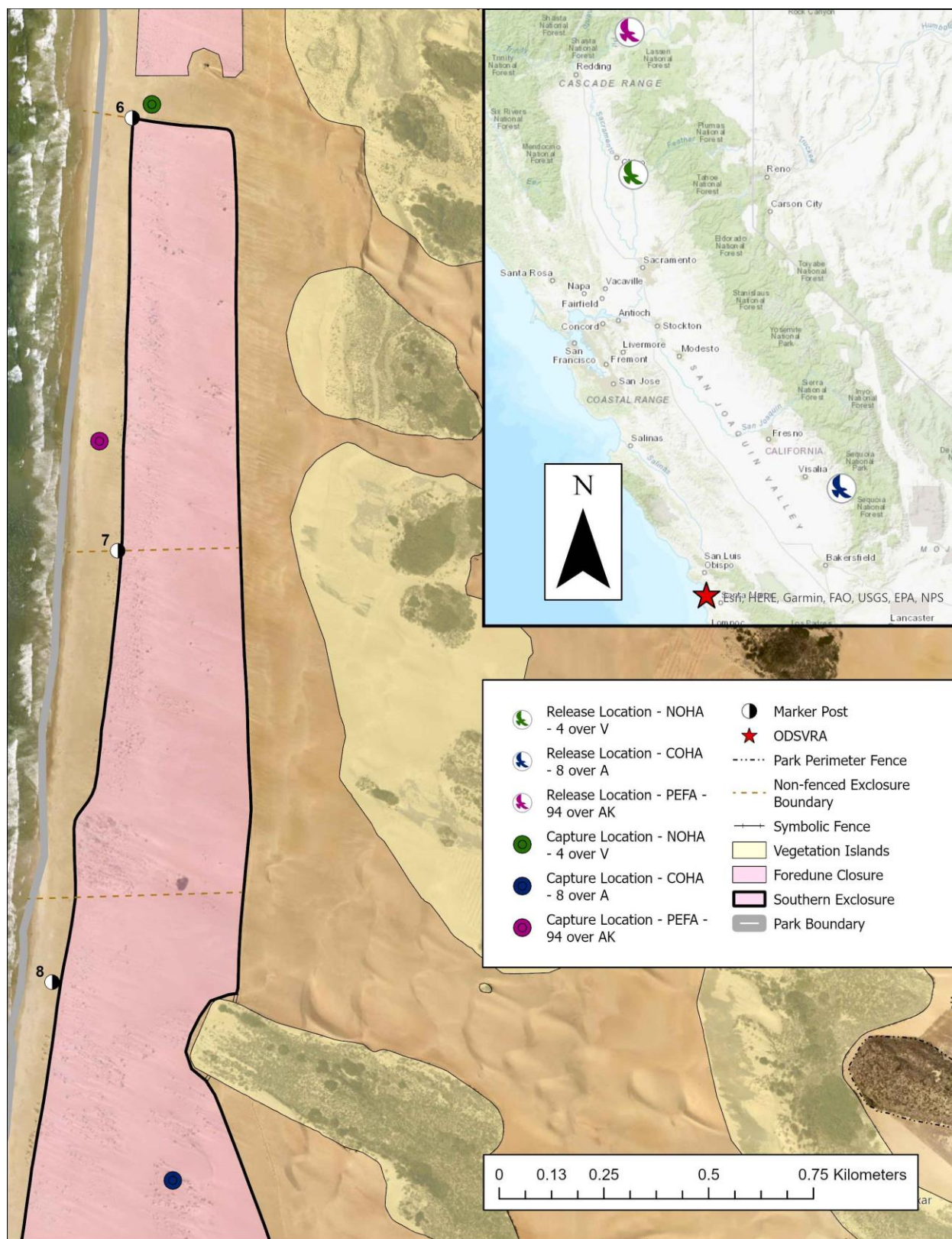


Figure 10. Capture and release locations of raptors removed from within and near tern and plover nesting areas at ODSVRA during the 2023 nesting season. Release locations are depicted within the bounds of the inset map.

Table 3. Avian predators targeted for removal, and trapping information for efforts conducted during the 2023 tern and plover nesting season at ODSVRA.

Targeted Individual	Age	Sex	Areas Trapped	Trap Types Used	# Of Days Trapping	# Of Trap Hours	Total Trap Hours	Targeted Individual Captured	Date Captured
NOHA	Adult	Male	Post 6 Alleyway	Bownet	2	24.5	24.5	YES	5/1/2023
AMKE	Adult	Male	Foredune Shore, Post 6 Alleyway, 6 Shore, 7 Shore, 8 Shore	Bal-chatri, Modified Goshawk, Bownet	11	362.77	521.94	No	N/A
GHOW	UNK	UNK	6 Alleyway, 7 Exclosure, 8 Exclosure	Bal-chatri, Modified Goshawk	14	302.6	325.37	No	N/A
PEFA	Juvenile	PEFA	6 Shore, NOF Shore	Harnessed Bird	4	62.58	62.58	N/A	N/A
TOTAL					31	752.45	934.39		

Table 4. Raptors captured and translocated from within ODSVRA, during the 2023 tern and plover nesting season.

Capture Date	Capture Site	Species	Age	Sex	Service Band # (Right Leg)	Secondary Band Type	Secondary Band (Color; Left Leg)	Capture Method	Bait Used	Translocation Site	Translocation Distance	Release Date	Released By
5/01/2022	Post 6 Alleyway	NOHA	AHY	Male	1134-00922	ACRAFT	Black on Silver; 4 over V	Bownet	Quail Egg	Butte County	506.1 km	5/2/2023	CDFW
7/24/2023	8 Exclosure	COHA	SY	Female	1266-00896	ACRAFT	Black on Silver; 8 over A	Modified Goshawk	Collared Doves & Starlings	Blue Oak Ranch Preserve, Santa Clara County	210.2 km	7/24/2023	Wildlife Innovations
7/31/2023	6 Shore	PEFA	AHY	Female	2187-22101	VID	Silver on Black; 94 over AK	Harnessed Bid	Pigeon	Pit 3 Powerhouse, Shasta County	666.7 km	8/3/2023	NRVP

DISCUSSION

This was the third year of a 3-year agreement between ODSVRA and WI, to provide raptor and owl management to benefit nesting terns and plovers. Avian predator surveillance was primarily conducted by one returning and experienced biologist during 2023, with supplemental surveillance, behavioral assessment, trapping, and project management support provided by senior level staff.

Ahead of and during each season working as a part of cooperative conservation programs, WI expends great effort to continuously review and scrutinize strategies and methods employed, to look for ways to improve the efficiency and effectiveness of each program in every aspect possible to best assist in achieving program goals. With another year of experience working on ODSVRA as a part of the tern and plover program, WI again gained more knowledge of site dynamics, predator use of the site, and developed, tested, and implemented new strategies to improve raptor and owl management during the 2023 nesting season.

Predator Surveillance

Wildlife Innovations has standardized survey efforts to support comparisons between sites and time periods, by establishing and conducting protocol-level point-count and transect surveys for the duration of the nesting season at other project sites. However, at ODSVRA during the 2023 nesting season point-count or transect surveys were not conducted for the following reasons: 1) the amount of time necessary to transit between areas at ODSVRA was extensive, 2) access to some locations may be restricted due to presence of terns or plovers, and 3) the site is large and predator diversity and abundance is high for only one full-time biologist to cover. Variation in surveillance time and effort across each site at ODSVRA made it difficult to quantify avian predator activity or make comparisons between sites and time periods using only observational data collected while conducting field work.

The standard surveillance schedule employed this season seemed to be effective. Flexibility to shift as needed to cover time periods and areas where predators were active, and to surveil areas where high densities of tern and plover nesting were likely to attract predators, was an important facet and contributed to program success during the season. As possible with funded staff hours during future seasons, a similar strategy should be utilized to best meet the needs of the tern and plover program at ODSVRA.

Avian Predator Trapping

Four Modified Goshawk Traps (MGT) were added to the variety of traps employed at ODSVRA during the 2023 nesting season. This trap-type can be operated without direct in-person monitoring, unlike Bal-chatri traps (BC), Bownets, or Verbaile traps, which have to be monitored constantly, and personnel must be nearby to remove captured individuals nearly immediately after capture. The MGT is more passive and less selective, as any bird may enter and trigger the trap, compared to a Bownet, that requires personnel to remotely trigger the trap. Adding MGTs to the set of tools used at ODSVRA allowed WI to operate more traps in more areas simultaneously. MGTs were monitored with cellular cameras when placed within areas with cellular coverage to reduce personnel time investment, and as an added measure to allow captured individuals to be removed from traps as soon after capture as possible. MGTs operated to target owls were opened just before sunset and closed before or at sunrise to avoid capture of nontarget individuals. MGTs are a cage-like structure in appearance, and some species and individuals may not enter the trap as a result of that appearance. Due to that MGTs are best used as one tool within a diverse set of tools

employed within a well-rounded trapping program.

Raptor and owl traps were placed outside of tern and plover nesting areas when possible to do so and also effectively capture targeted raptors or owls. This was done to avoid all potential for disturbance to nesting terns and plovers associated with placing and operating traps. When necessary to trap within nesting exclosures or on shoreline areas densely occupied by plover or tern chicks, trap placement and operation permissions required detailed coordination, approval, and often an escort from ODSVRA staff. Placing traps and parked vehicles used as blinds while monitoring traps at distances from tern and plover broods required to comply with ODSVRA site procedures, reduced the number of suitable trapping locations in or near high-density nesting areas, where raptors often preferred to hunt. As a result, traps sometimes had to be placed in areas not used by raptors for hunting, meaning that capture success was reliant on trap sets to attract and capture raptors as they transited to or from higher density nesting areas to hunt. These factors reduced efficiency of some trapping efforts, delaying capture of targeted individuals while more predation occurred, and may have ultimately prevented capture of some targeted individuals.

With each nest, chick, fledgling or adult that a predator depredates and consumes, the predator may become more fixated on that food source, which can make it more difficult to attract a targeted individual to pursue a lure animal offered from within a trapset as an alternative prey item. Once raptors or owls become fixated on depredating terns or plovers, capture of those individuals becomes more difficult, as it is not possible to use tern or plover chicks as lures due to permitting constraints (and WI wouldn't recommend doing that even if possible). For species such as NOHA that may be innately neophobic to unfamiliar prey sources or presentations, once they also become fixated on a food source that cannot be matched (e.g., terns or plovers) within a trapset, that may further reduce potential for successful capture. For species such as AMKE that cover lots of ground while hunting, it can be difficult to predict and then place traps where they will encounter them. If a trap cannot be placed very close to the area where the raptor or owl last successfully captured prey, and placed quickly after the raptor was last observed hunting there, capture may be delayed or ultimately unsuccessful. For these reasons, it is important to target problem individuals as soon after they begin depredating terns and/or plovers as possible, and to place traps as close to the location where predators were last hunting, to promote successful capture and mitigate predation loss of terns and/or plovers.

Deploying some traps during daylight hours increases potential for targeted birds to observe trap-deployment. The level of risk associated with this varies slightly by trap type and species targeted. If targeted birds observe personnel or vehicles interacting with trap sets, they may negatively associate the trap or lure presentation with the vehicles and humans observed. This may result in targeted individuals avoiding traps thereby inhibiting or preventing capture. If raptors or owls documented to depredate terns or plovers cannot be nonlethally captured and translocated, lethal removal may be the only option to prevent predation impacts to nesting terns and plovers from those predators.

Site access request and approval procedures necessary to place and operate traps for raptor and owl management within the ODSVRA tern and plover program are time consuming and have prevented placement of traps within optimal areas and at optimal times to capture targeted predators. This has delayed or prevented capture of some predators, and caused additional depredation loss of terns and plovers that may have been prevented with more streamlined and less restrictive trapping access procedures. The potential for additional predation loss due to an active predator should be carefully weighed against the potential for temporary disturbance to nesting

terns and plovers that may occur due to placement and operation of traps. Identification of these challenges within the program are provided here to support recommendations later within this document and are provided with the best intentions for the program and terns and plovers nesting on ODSVRA. Where and when site access restrictions for trapping are necessary and cannot be adapted due to unwritten programmatic or public pressures, WI has and will continue to work to develop innovative ideas to maximize efficiency and effectiveness of capturing problem raptors and owls within the guidelines of the program.

Predation Investigations

At ODSVRA, WS manages all non-raptor and non-owl avian species. As such, surveillance and associated data collected by WI focused on raptor and owl observations and predations and did not include the same level of collection efforts for corvid species. For a comprehensive summary of all plover and tern predations documented at ODSVRA, please refer to the CDPR 2023 monitoring report.

To detect tern or plover predations from owls, WI relied on direct observations during nighttime surveillance and ODSVRA staff reports of owl depredation sign or other activity within or near colony nesting areas. Typical sign included plover or tern feather piles near owl tracks, or owl pellets containing plover or tern remains and/or bands. No owl predations of terns or plovers were detected or directly observed during the 2023 nesting season. It is possible that predation occurred that was not detected, and owl predations may be more difficult to detect than predation by diurnal predators for various factors. At ODSVRA, monitors do not walk the entirety of tern and plover nesting areas to avoid unnecessary disturbance. As a result, most predations are detected using binoculars or spotting scopes from a distance or discovered while traveling on foot to and from a limited number of scheduled in-person nest checks. Given the dynamic topography at ODSVRA, it is likely that not all nests, predator sign, or predations were detected. This is compounded by frequent high wind events that move sand and blow away sign or other remains from predations. These site-specific challenges emphasize the need for extensive personnel time expended to attempt to visually cover as much of the nesting area as frequently as possible from a distance, and during all time periods to attempt to not miss predator activity and predation that may otherwise go undetected.

The following data summary is a compilation of depredations discovered and investigated or directly observed by both ODSVRA staff and WI personnel. A more comprehensive summary of nesting efforts and results can be found within Appendix B and H of CDPR 2023. During 2023, terns laid a total of 42 nests, 40 with known location and fate, 37 (92.5%) of which hatched, and three tern juveniles were depredated by PEFA. Plovers laid 260 nests, 251 with known location and fate, 67 (26.7%) of which were determined to have been predated. Of those predated, 58 (86.6%) are strongly suspected to have been by avian predators, with CORA (n=36, 62.1%), NOHA (n=10, 17.2%), and unidentified avian (n=10, 17.2%) were the most prominent identified avian predators of plover nests. Additional plover nests with failed, unknown cause or abandoned pre-term fates, were likely the cause of predation (CDPR 2023). In addition to nest predation, a total of 11 plovers were determined to have been predated. Of the plovers predated, 63.6% (n=7) were chicks, one was either a juvenile or adult, two were juveniles, and one was an adult. Of the predated individuals for which the predator was able to be determined, 9.1% (n=1) were Western Gull, 27.3% (n=3) were PEFA, and 63.6% (n=7) were AMKE.

Raptors as Predators of Terns and Plovers by Species

Northern Harriers

Northern Harriers are cryptic marsh hawks, and males are sometimes described as “gray ghosts” by birdwatchers due to their cryptic nature. Northern Harriers specialize in hunting birds and small rodents and are well known to depredate eggs, nestlings, and chicks of listed species at many California nesting sites, including terns and plovers at ODSVRA (CDPR 2019, 2020; Wooten *et al.* 2017, 2018, 2019). Northern Harrier’s have been documented to depredate large numbers of nests with eggs, and also chicks, at other CA plover and tern nesting sites and at ODSVRA (CDPR 2021; Wooten *et al.* 2019, 2021). Since the NOHA is a Species of Special Concern in California, more justification is required before attempting to capture NOHA on state regulated properties. In addition to that state protection, long-term raptor researchers believe that the coastal NOHA population in California is not doing well, which has prompted regulatory agency representatives to scrutinize justification for trap and translocation more.

Depredation of plover nests with eggs by NOHA was again documented on ODSVRA during the 2023 nesting season and the lighter-toned adult male was captured and translocated as a result. Some research supports that during their nesting season, NOHA within some regions primarily target voles as a food source (Hamerstrom *et al.*). The majority of NOHA observed on ODSVRA during 2023 were observed targeting, carrying, or consuming rodents. Maintaining presence of low-threat resident adult NOHA documented to focus on food sources other than terns and plovers would benefit tern and plover management efforts, as those individuals should hold territories that may otherwise be filled by NOHA that may target terns or plovers. Additionally, those low-threat individuals that produce juvenile NOHA may teach their offspring to also target rodents, thereby reducing potential for future conflict with nesting terns and plovers. Due to the wide range of NOHA behavior observed during this season, future monitoring should continue to prioritize threat assessment and determining high-threat individuals to target for capture and translocation to effectively mitigate the predation threat to terns and plovers.

Capture of NOHA can be time intensive and some NOHA are difficult or impossible to capture. NOHA seem to be neophobic to unfamiliar prey and unfamiliar presentations, and as a result lure presentation and an unobtrusive trap-type are necessary to promote success. Female NOHA are often targeted via trapping at their nests, as the nest provides both a predictable location and strong lure for the targeted birds to return to. Males are more difficult to capture since they are wary, and it is harder to predict where and when they will be to place a trap ahead of their arrival. There are few unobtrusive trap types available to support successful capture of wary NOHA. If an individual captured within one of those trap-types and translocated returns to the site and is again a threat to nesting terns and plovers, it is even less likely to be recaptured, leaving lethal removal as the only remaining management option to mitigate depredation of terns and plovers. Due to these factors, it is imperative to correctly assess and identify problem NOHA to the individual level and to only target, capture, and translocate those problem individuals. In addition, it is also imperative that all controllable factors are mitigated to ensure that traps are not observed being placed by trappers, and that trap placement, function, and operation are completed perfectly. These factors make the capture and translocation process for NOHA more time-intensive and challenging, than for many other species of raptor or owl

A minimum of seven NOHA were observed at ODSVRA during the 2023 tern and plover nesting season, based on assessment of physical characteristics (i.e. plumage development and unique characteristics), their use of different areas, and timing of presence. Since some observations didn’t

allow for identification to the individual level, more NOHA may have been present. As this is a relatively large number of NOHA, ODSVRA and the surrounding properties likely provide ample and important habitat for NOHA.

During the early part of the plover nesting season (March and April), the greatest number of NOHA observations occurred within the Foredune Closure. These observations were likely of a single adult male NOHA, that later in the season began targeting WSPL nests within that area. Due to the documented behaviors and high-density of terns and plovers in that area, that individual was captured on 01 May and translocated. The majority of NOHA observations for the remainder of the nesting season were of individuals hunting within the vegetation islands, which were more sparsely occupied by nesting plovers than other nesting areas. Additionally, NOHA within the vegetation islands were most often observed targeting and depredating small mammal species, which is typical NOHA behavior (Hamerstrom *et al.* 1985). The combination of those factors supported that those NOHA were a low threat to nesting terns and plovers and therefore no management actions were taken.

The seven distinct NOHA are discussed in detail below.

Two Adult Female NOHA—A single adult female NOHA was first recorded by WI personnel on 30 March hunting the southern portion of the NOF foredunes. Throughout the remainder of the 2023 nesting season female NOHA were rarely observed, which is likely because they were tending to their own nests, and no predations or predation attempts were documented from adult female NOHA. Observations of female NOHA were separated into two geographically distinct areas of the site, supporting that they were of two different individuals, with one foraging in each of those geographic areas. The first individual primarily hunted the southern section of ODSVRA, typically within the NOF foredunes and the vegetation adjacent to the Oso Flaco maintenance road. Observations of this individual were very infrequent, and as the individual was not documented disturbing or targeting plovers or terns, management was not warranted. This individual was likely the mother of the two juvenile NOHA observed hunting the same areas of the site later in the season. The second adult female NOHA was only observed flying through the Foredune Closure once, and during other observations exclusively hunted within vegetation islands (i.e. BBQ Flats, Bigfoot, and Eucalyptus Tree), therefore it was assessed as a low threat to terns and plovers and capture and translocation were not warranted.

Two Adult Male NOHA March/Early April—The first sighting of an adult male NOHA by WI personnel occurred on 18 March. This individual hunted over the vegetation islands and did not display threatening behavior at the time. An adult male NOHA was next observed on 23 March, when it hunted within vegetation islands and briefly in 8 Exclosure. On 28 March, a plover nest (SP1) was found depredated within the Foredune Closure, by ODSVRA staff. ODSVRA staff investigated the predation and took photos of avian predator tracks and remains of the nest. WI personnel were not able to investigate the predation until later that afternoon, and all tracks or other evidence from the predation had been destroyed from wind by then. Photos documented overlapping and atypical tracks, which could have been from NOHA, but did not allow for confident identification of the predator responsible to the species level. During the same day an adult male NOHA was observed by ODSVRA staff hunting low over both the Foredune Closure and 6 Exclosure. During that observation, the male NOHA appeared to

observe the location of depredated SP1, slowed its speed of flight, and circled the location before continuing south. No plover adults flushed from the nest during that observation, indicating that the nest was most likely already depredated. These observations may indicate that adult male NOHA was continuing to hunt the area after depredating SP1, or instead observed the predated nest for the first time if it was not the predator responsible.

Following the reported predation on 28 March, WI adjusted surveillance efforts to gather more information on adult male NOHA activity to identify hunting patterns and better evaluate the potential threat to nesting terns and plovers. Follow-up surveillance efforts were focused around the Fore-dune Closure, 6 Exclosure, and 7 Exclosure, although time was also spent surveilling the east side of the vegetation islands. Prior to 29 March, the adult male was the only NOHA observed on the site north of PLR. On 29 March however, a sub-adult NOHA was observed hunting within the Eucalyptus Tree vegetation island, indicating a territory overlap between the sub-adult and the adult. On 30 March, two adult male NOHA were identified hunting in different colony nesting areas simultaneously. These collective observations indicated that there were at least two adult males and one sub-adult NOHA active within or near colony nesting areas at ODSVRA at that point in the season. Since multiple NOHA were present, additional observations were needed to ensure that the correct NOHA was targeted for capture and translocation to mitigate additional nest predations.

No adult male NOHA were observed again until 2 April, when an adult male was briefly observed hunting within 6 Exclosure and on 6 Shoreline by ODSVRA staff. This individual was described as lighter in plumage color, matching the NOHA that was observed hunting over the SP1 plover nest on the same day it was predated. A variety of environmental factors can influence how plumage coloration is perceived including lighting, angle of wings, and specific activity during observation (i.e. in-flight or perched). As such, identification of male NOHA based solely on plumage coloration assessment without support from more definitive features may result in incorrect classification. Therefore, more assessment was needed to identify the individual responsible for the predations and to target via trapping.

Following 2 April, observations of adult male NOHA were infrequent but often included an individual characterized as having lighter coloration (hereafter “lighter coloration” and “light-tone” are used interchangeably). At that time, only two plover nests had been discovered and were known to be present within ODSVRA and only SP2 was still active. Therefore, the threat from an egg-eating NOHA was low. On 7 April, a camera set at the SP2 plover nest documented an adult male NOHA depredating the eggs within the nest and the NOHA appeared to have lighter-colored plumage. Photos of NOHA observations recorded by both ODSVRA staff and by WI were carefully reviewed, and two distinctly different NOHA were identified from photos. One of those was light-toned gray with a clear white breast and belly, and the other was generally darker in tone, with dark spotting on the belly, dark upper breast feathers, and generally darker feathers on its back and tops of wings. Additional photos comparisons indicated that all observations of adult male NOHA hunting and depredating nests within exclosures between 30 March and 7 April were determined to be of the lighter-toned male. Northern Harriers are territorial and should be more territorial during nesting season. As these observations occurred during the period that NOHA should be nesting, it is likely that the lighter-toned male displaced the darker-toned male observed earlier in the season.

With the lighter-toned male NOHA identified as the predator of two plover nests with eggs, WI focused on patterning the location and timing of its behaviors (i.e. transiting and hunting), to

inform targeted capture efforts if additional nest predations were found. The lighter-toned adult male NOHA was observed within nesting areas daily between 7 and 10 April, although the time of the day and the areas hunted varied. Initial observations consisted of hunting (i.e., slower flight, making loops/circling, returning to hunt over previously predated nests), along the western fence of the exclosures or closer to the shoreline. On 10 April, the lighter-toned male NOHA shifted to transiting more quickly through nesting exclosures instead of slowly hunting those areas. This change in behavior could have been the result of it targeting different prey sources in other areas, and it was observed transiting through tern and plover nesting areas enroute to those alternate areas. Additionally, lack of hunting success within nesting areas at ODSVRA due to low density of plover nests at that time may have caused the male NOHA to transit through without expending hunting effort for little or no reward. Without a strong pattern of hunting behavior within tern and plover nesting areas, trapping was not warranted nor would have been effective at this time, so NOHA-focused surveillance was continued.

The lighter-toned adult male NOHA was next observed on 20 April. During this observation it was hunting within the southern section of the Foredune Closure (same location that SP2 had been depredated). It was flying within one foot of the ground, flushing shorebirds and disturbing plovers as it hunted. Between 21 April and 27 April, the adult male NOHA was observed by both WI and ODSVRA staff hunting near daily within different sections of the tern and plover nesting Exclosure. On 28 April two nests, SP26 and SP27, were found depredated in the southern portion of the Foredune Closure. During investigation of SP27, definitive tracks and one egg remained with puncture marks consistent with NOHA predation were documented. No tracks nor definitive evidence remained at SP26, but a nest camera documented the lighter-toned NOHA consuming plover eggs. Also on 28 April, the adult male NOHA was observed by ODSVRA staff depredating nest SP28.

On 29 April, ODSVRA staff observed the adult male NOHA depredating two plover nests, predation of SP35 was investigated and identified to have been from NOHA, and WI observed the lighter-toned male NOHA depredate SP22 during the late evening hours. This series of events indicated a drastic shift to targeting and depredating plover nests over just two days. The extreme behavioral shift, and because more plover nests were being laid and were available to depredate, sufficient threat to nesting plovers existed to warrant capture and translocation of the NOHA. Wildlife Innovations recommended beginning to trap for the NOHA and ODSVRA approved.

Most observations of the male NOHA were of it flying at a low height through terrain. Due to that, the NOHA may not see traps if not deployed directly below its flight path. A Bownet was selected for use to target the NOHA that trap type can be concealed and is the least conspicuous trap type available for NOHA. ODSVRA Staff suggested that trapping be conducted at one of the recently depredated nests in the southern portion of the Foredune Closure. However, that area is composed of vegetated and tall hummocks, which would have reduced visibility of traps, and also visibility of NOHA when interacting with the trap. Visibility of the NOHA and the trap are essential to both evaluating interactions with the trap and also for triggering the trap.

To minimize disturbance to nesting plovers, and to target where the lighter-toned adult male had been observed crossing between Post 6 and the center of the southern Foredune Closure, WI requested to place traps within the Post 6 alleyway and that request was approved by ODSVRA Staff. Before sunrise on 30 April, two WI biologists deployed two Bownet traps separated by about 40m, each baited with different lures. Ten hours of trapping were conducted

that day, however the adult male NOHA did not enter the site. Traps were redeployed the following morning (1 May), and the adult male NOHA was captured in one of the Bownet traps at 08:15. The targeted individual was banded, and transported to Sacramento CA, where it was transferred to the USFWS. The USFWS then transferred the NOHA to CDFW who transported it to Butte County, CA, and released it on 2 May. A total of 10 plover nests were determined to be depredated by NOHA during the 2023 nesting season, all of which were suspected to have been by this individual. Following successful capture of the targeted NOHA, no other plover predations attributed to NOHA occurred and observations of male NOHA decreased significantly.

Adult Male NOHA Late Season—On 25 May, an adult male NOHA was observed hunting within PLR and successfully capturing and consuming a rodent. Following that observation, adult male NOHA were seen intermittently at ODSVRA, most often hunting within vegetation islands or transiting when observed within exclosures. On multiple occasions, adult male NOHA were observed capturing rodents and consuming them or otherwise carrying them offsite. In instances where they were hunting within vegetation islands close to the exclosures, or were otherwise transiting over exclosures, terns were often disturbed and mobbed them until they departed the area. Based on multiple observations, one of the adult male NOHA was missing primary feathers, making it uniquely identifiable, and differentiating it from the two adult male NOHA documented earlier in the season, resulting in a minimum of three adult male NOHA active at the site during the 2023 nesting season.

Sub-Adult NOHA—The first sub-adult NOHA was observed at ODSVRA on 22 March hunting over the Oso Flaco Maintenance Road near Oso Flaco Lake. This individual was rarely seen further north, but the next observation was of it arriving from the south and hunting over Tabletop, Eucalyptus Tree, and Eucalyptus North. On 2 April it was observed hunting low over the vegetation within North Oso Flaco. On 26 April, a sub-adult NOHA was observed twice, once hunting over tabletop and again an hour later flying out of 7 Exclosure into the vegetation islands where it hunted. No other observations of sub-adult NOHA were made during the season, and no threatening predatory behavior was observed to warrant trapping for sub-adult NOHA.

Juvenile NOHA Late Season—Juvenile NOHA were first documented at ODSVRA by WI personnel on 18 July. Following the initial observation, juvenile NOHA were only observed on three other days and all observations occurred between 18 and 30 July. On 30 July, two juvenile NOHA were observed hunting together in the NOF foredunes. No aggressive behaviors were documented between the individuals. As most raptors exhibit territorial behavior, they might have been siblings. Their area usage overlapped with the adult female NOHA observed in that area earlier in the season and discussed above within this report section. This supports that she may have had a nest offsite to the south of ODSVRA, and the juveniles may have been her offspring. Since the juvenile NOHA were only briefly present on-site, they either altered their hunting patterns to target off-site areas or they may have dispersed away from the site.

American Kestrel

American Kestrels are aggressive predators of insects, small rodents, and birds (Toland 1987) and have been documented as a high threat to nesting terns and plovers on other coastal sites. AMKE have been documented depredating chicks more often than other age classes of terns or plovers, although they have also been observed taking adults. On another site during a previous breeding season a single AMKE was observed taking up to six plover chicks in less than two hours (J.

Manley, Wildlife Innovations, personal communication). Given their capacity to quickly depredate large numbers of tern or plover chicks in a single depredation event, especially when feeding their own chicks and mate, AMKE can be a significant threat to chick survival within tern and plover colonies.

American Kestrels were observed at ODSVRA during the 2023 tern and plover nesting season. Most AMKE were observed transiting over the ORA, hunting in vegetation islands, and primarily targeted insects, without approaching tern and plover nesting sites. Most AMKE observations were males (86.4%, n=19), and nearly all observations of male AMKE were believed to be of one individual. During early May, few plover chicks were present within nesting areas due to CORA predation of nests with eggs, and AMKE observations occurred in vegetation islands. By the middle of May, a marked change in behavior of one male AMKE occurred, and it began focusing hunting within shoreline nesting areas occupied by plovers and taking plover chicks. Due to the threat to nesting plovers, that male AMKE was targeted for capture.

The AMKE's arrival and use of areas was highly erratic and difficult to pattern for trapping. During a 11-day period, WI deployed and operated three trap types, operating multiple types in multiple locations simultaneously on nearly all days, with up to two biologists trapping within different areas simultaneously on some days, to attempt to increase potential of exposing the AMKE to traps and capture it. Trapping was conducted within 6, 7 and 8 shorelines, and within the Foredune Shoreline. The male AMKE was briefly hung up on a BC trap, but it pulled free. This negative interaction with that trap type may have educated the AMKE, resulting in subsequent avoidance of that trap type, even when traps were placed in different locations and baited with different lure animals. The male AMKE landed on the door of a MGT once, but the lure animals were hiding under food and water containers, rather than actively moving around their enclosure. Additional observations indicated that male AMKE may have observed other traps but did not interact with them.

Wildlife Innovations requested to place traps in areas where the AMKE was last observed actively hunting. Many of the requested trapping locations were not approved by ODSVRA staff due to perceived potential for temporary disturbance to plovers associated with placement and removal of traps, and for perceived potential to attract the AMKE to an area where plover chicks were located thereby increasing potential for predation of plover chicks. Placement and operation of traps within less advantageous areas inhibited and may have prevented capture of the AMKE and resulted in additional predations of plovers. On multiple occasions, the male AMKE arrived and began hunting within location that WI had previously requested to place traps and depredated additional chicks without being exposed to traps that were not approved to be placed there. The process of requesting to place traps within optimal areas and having those requests denied, delayed capture of the AMKE.

In total, the male AMKE depredated a minimum of five plover chicks, and one adult plover. It was not able to be captured, and the last time it was observed was 11 June. The shift away from hunting within ODSVRA was likely due to a change in the status and foraging needs associated with the development of the AMKE nest it was likely feeding.

Begin narrative of AMKE observations, depredation, and summary of trapping efforts:

18 May—A male AMKE was observed hunting multiple shorelines while perching on post markers before returning to the vegetation islands. These observations marked a shift in hunting behavior and may have indicated an interest in shorebirds as prey.

30 May—Adult male AMKE hunted the shoreline and depredated one plover chick and likely a second chick within a two-hour period. During the first predation, it carried one of the chicks offsite which may indicate that he was delivering prey to a nest of his own.

1 June—WI shifted surveillance efforts to focus on the male AMKE and observed it hunt along the west fence of the Exclosures and depredate a Horned Lark (*Eremophila alpestris*; HOLA). Successful predation of plover chicks, and documented return to resume hunting the shoreline in an area occupied by more plover chicks, indicated a high enough threat to justify capture and translocation.

2 June—WI deployed a MGT customized for AMKE within the Post 6 Alleyway. The adult male AMKE was observed hunting shorelines on two additional occasions during that day, predating one plover chick from near the high tide line, and again carrying the plover chick off site, further supporting that the AMKE was delivering prey to a nest. The AMKE did not observe the MGT deployed within the Post 6 Alleyway during either visit to the shoreline. When the AMKE arrived, it landed on Post 6 facing to the southwest. To target this behavior, WI recommended that the MGT be moved to the southwest of the Post 6, but ODSVRA lead staff did not approve the location due to proximity to plover broods.

3 June—WI deployed a second MGT west of Post 7 and three BC traps baited with different combinations of lure animals in an east-west line stretching from near the fence to near the tide line. The male AMKE arrived and perched on the west fence of 6 exclosure near the traps. The AMKE quickly approached the trap and began attacking it to get at the mice within it. This continued for several minutes before the AMKE fell with wings splayed, a typical sign of successful capture. To prevent the AMKE from escaping, WI began approaching the trap. During approach, the AMKE fell backwards off the trap again with wings splayed and flapping, indicating it was still caught, but after a brief struggle on the ground, it broke free and flew to the fence line. After resting on the fence line, the AMKE resumed hunting the shoreline and depredated another plover chick. Upon examining the BC trap the AMKE had interacted with, multiple nooses were chewed where they attached to the cage structure of the trap, indicating chewing damage from rodent lure animals, and other nooses were cleanly snapped by the AMKE. Both factors contributed to the AMKE breaking free from the trap.

4 June—Traps were deployed again, using a different bait selection to change the visual appearance of traps. That afternoon, the AMKE hunted large sections of the shoreline and was most active on the foredune shoreline, specifically perching on Post 5 while scanning the surrounding habitat for prey. Due to this new hunting behavior, WI recommended moving the MGT from Post 7 to the previous 6 Shoreline trapping location and deploying BC traps at Post 5 would have the greatest likelihood of trap exposure to the AMKE. Wildlife Innovations additionally identified MGT placement at Post 5 as an effective approach if BC traps were identified as causing too much disturbance in that area. Following this request, WI was permitted to deploy traps at the 6 Shoreline location, as well as at Post 6, but trap deployment authorization for the Foredune Shoreline near Post 5 was deferred while ODSVRA staff came to a decision.

5 June—WI deployed and opened MGTs on 6 Shoreline and Post 6, and deployed BC traps on 6 Shoreline while waiting for an authorization decision to place traps within the Foredune Shoreline. The AMKE hunted along the Foredune Shoreline and perched on Post 5, then predated a fourth plover chick. Following the plover chick predation ODSVRA lead staff

authorized WI to deploy BC traps on the Foredune Shoreline, 100-150 feet farther south of Post 5 than the requested location. After authorization was received, WI removed BC traps from 6 Shoreline and deployed them on the Foredune Shoreline in the authorized location. Following deployment of the traps, the AMKE returned and crossed centrally over the Foredune Closure and landed on Post 5, causing it to not observe BC traps deployed to the southwest in the shoreline habitat. Once perched on Post 5, the AMKE scanned the shoreline to the north. Since the northern shoreline was densely occupied by plover chicks and WI was not authorized to place traps there, ODSVRA staff requested to haze the AMKE and WI concurred, as hazing was the only option at that point. After being hazed with pyrotechnics, the AMKE flew east to the vegetation islands. The AMKE was observed for the third time that day hunting along 6 Shoreline and perching on Post 6. While perched on Post 6, the AMKE visibly noticed the MGT and perched on the door of the trap while looking down at the lure animals. After sitting on the door of the trap for some time, the AMKE continued north into the Foredune Shoreline, flying very low to the ground, passing the deployed BC traps and perched on Post 5. It was not clear whether the AMKE observed the BC traps when transiting or while perching on Post 5. The AMKE was unsuccessful hunting on the Foredune Shoreline, and returned to the south, and again interacted with the MGT, showing signs of interest in lure animals but did not enter the trap, then departed the site to the east. The lure animals may have been hiding under the food and water dishes provided within the trap or were otherwise less active than desired to lure the AMKE into the trap.

6, and 7 June—Traps were again deployed. The 6 Shoreline MGT was moved to east of the Foredune Shoreline in the alleyway separating the northern and central sections of the Foredune Closure to target the AMKE as it flew west to the shoreline. Traps were deployed in these locations for two consecutive days but the AMKE was not observed.

8 June—On the third day, traps were again deployed. The AMKE returned to the site and was observed hunting at 6 and 7 Shoreline. During an initial observation, a AMKE that was not confirmed to be male consumed a plover chick on the ground before flying off-site, possibly carrying the prey item. During a second observation a half hour later, the male AMKE preyed on an adult plover. The AMKE had perched on top of a circular mini-exclosure, constructed to prevent CORA nest depredations, and flushed the adult plover from the nest and subsequently preyed on it. The circular mini-exclosure may have contributed to the predation event. Following this observation on 8 June, the AMKE was not seen for the rest of the day.

9 June—WI began trapping using two biologists, allowing more sections of the shoreline to be covered. BC's and MGT's were deployed at two locations on 6 Shoreline, on the shoreline west of 7.5 Revegetation Area, and southwest of 7.5 Revegetation Area to increase the likelihood of trap exposure to the AMKE. That day the AMKE was observed hunting most of the shorelines on two occasions and preyed on a plover chick. There was no indication that the AMKE observed deployed traps.

10 June—WI deployed two Bownet traps, one on the Foredune Shoreline and one on 6 Shoreline, in addition to BC and MGTs. This combination of traps was time intensive to set but covered the greatest amount of ground given the large hunting area utilized by the male AMKE. That day, the AMKE was observed twice, first transiting over 8 Shoreline and later perched on the western fence of 6 Shoreline. During the second observation, the AMKE flew north over the Foredune Shoreline and passed by multiple trap sets, including a Bownet, without observing them. After flying past the traps and landing on Post 5, the AMKE flew down to the high tide

line and hunted from on foot, appearing to be searching for plover chicks but was ultimately unsuccessful. The AMKE briefly returned to Post 5, then flew high to the east over the vegetation islands while hunting. After a short time hunting vegetation islands, it flew briefly over 7 Exclosure before departing the site.

11 June— Since the AMKE did not observe any of the traps, WI continued trap deployment in the same areas but the AMKE was not observed within tern and plover nesting areas.

12 June—Trapping was continued for the AMKE, but it was not observed. Following two consecutive days of AMKE not being seen at ODSVRA, trapping efforts were discontinued to attempt to pattern the changing behavior. The next observation of a male AMKE occurred on 17 June within the eastern section of PLR, away from the tern and plover nesting areas. No additional confirmed observations of the targeted male AMKE were reported for the remainder of the 2023 nesting season and no additional depredation loss to AMKE was identified.

Peregrine Falcon

Peregrine Falcons are prominent predators of tern and plover chicks, fledglings, and adults and have been documented doing so at numerous sites along the California coast, including ODSVRA (CDPR 2019, 2020, 2023; Biteman and Manley 2021; Wooten *et al.* 2016, 2017, 2018, 2019; Marschalek 2009). Peregrine Falcons are commonly observed using the central coastline of California for nesting, hunting, and perching, and as a result were a focus of raptor monitoring efforts again during the 2023 tern and plover nesting season. Wildlife Innovations anticipated the return of a previously captured, banded, and translocated adult female PEFA (W49), following regular presence on-site during the 2021 and 2022 seasons, however, no banded PEFA were observed during 2023 nesting season.

PEFA were frequently observed transiting north or south along the shoreline at ODSVRA. Capture and translocation of PEFA can be time intensive, and likelihood of return to ODSVRA may be more likely than for some sites in California for several reasons. Following a successful capture, it is crucial that PEFA are translocated as far as possible to prevent return to the site of conflict with terns or plovers, as some individuals have returned from long distances (e.g., >800 miles). Adult PEFA with established territories are more likely to return to the area of capture than younger birds, due to more established site fidelity. Previously trapped PEFA are typically difficult, and some individuals may be impossible to recapture. Additionally, since ODSVRA is located within the central portion of California, and legal permissions will not allow translocation of captured raptors beyond California borders, distances available for translocation of PEFA captured at ODSVRA are limited to less than 500 miles if taken to the north and less than 400 miles if taken to the south. Due to these factors, it is important to only attempt to capture and translocate individuals that are well-documented and have begun to preferentially target terns or plovers and are likely to continue to do so. To accomplish this, WI focused on identifying problem individuals documented to target terns or plovers on multiple occasions, through intensive adaptive surveillance.

Peregrine Falcons were observed by WI and by ODSVRA staff, transiting through or otherwise using every nesting area at ODSVRA during the 2023 season. A minimum of six individuals were identified, based on plumage characteristics, habitat use, and timing of presence. Since non-resident, migrating, or dispersing PEFA may be present at ODSVRA during different periods of the season, and individuals may quickly transit through the site, it can be difficult to accurately estimate the number of individuals that used ODSVRA during the course of a 6-month tern and

plover nesting season. Therefore, the number of individuals identified herein is a minimum, and it is possible that more were active at ODSVRA during the 2023 nesting season.

Observed hunting behavior, predations observed, and kill-sites investigated by WI indicated that most PEFA hunting activity targeted HOLA, Brewer's Blackbirds (*Euphagus cyanocephalus*), or gulls. What was believed to be one juvenile PEFA was documented depredating at least three tern fledglings, and trapping was conducted to target that individual. In addition, a juvenile PEFA depredated one plover chick, one plover fledgling, and one juvenile plover, late in the season after WI had exhausted all fieldwork hours available with the annual budget for the project, so no trapping was conducted for that PEFA.

Observations of both the juvenile PEFA that was targeted for capture, and of an adult female PEFA that was captured and translocated are discussed below.

27 June—A juvenile PEFA was first observed on 27 June, transiting through 7 Exclosure and disturbing terns. That individual was characterized by a thick rounded malar, dense vertical streaking throughout the belly to upper breast feathers, blue cere, and yellow legs.

4 July— A juvenile PEFA with the same description was observed by ODSVRA lead staff chasing terns over 7 Exclosure but did not successfully capture any terns. That individual was not observed again until 19 July.

19 July— A juvenile PEFA with the same description was observed by ODSVRA staff within the NOF foredunes. During this observation, the PEFA flushed from its perch, presumably due to vehicle proximity. Young PEFA are not typically shy of vehicles, and this trait complicated capture efforts for this individual. If shy of vehicles, mobile trapping may not be possible, and large buffers between traps and trapping personnel, and other monitoring personnel may be necessary.

20 July—ODSVRA staff observed a juvenile PEFA with similar plumage diving on a non-plover or tern avian species within SOF.

21 July—The juvenile PEFA was observed depredating a banded tern fledge within 7 Exclosure. During the observation, the PEFA was hazed repeatedly by ODSVRA staff using both pyrotechnic devices and by staff walking on foot. WI shifted to daily surveillance focused on PEFA following this observation.

25 July—The juvenile PEFA was observed perching and hunting on the NOF Shoreline, swooping and chasing small white shorebirds and gulls.

27 July—The juvenile PEFA hunted on 6 Shoreline and depredated a tern fledge. The PEFA was initially hazed by ODSVRA staff using a pyrotechnic whistler while the PEFA was hunting the tern. Following this predation, WI recommended allowing the PEFA to finish consuming the prey before hazing again to prevent the PEFA from killing additional terns if hazed from its catch before finishing, and to allow the PEFA to establish a hunting pattern that could be targeted via trapping. After the PEFA finished consuming the prey it was hazed and flew east landing east of 6 Exclosure. Following this instance, WI recommended that subsequent hazing efforts be conducted on foot to avoid conditioning the PEFA to fear vehicles, which could prevent effective trapping when using a vehicle as a blind. Photos taken during that incident were compared to photos taken on 27 June, and comparisons indicated that the same individual may have caused both incidents. WI recommended attempting to capture the PEFA and ODSVRA approved. To prevent the PEFA from observing traps being placed by personnel,

which may complicate or prevent successful capture leading to more predation loss of terns or plovers, WI requested to access the shoreline before sunrise to place traps. That request was denied, to avoid potential impacts to plovers from entering the shoreline during the dark.

28 July—When ODSVRA lead staff and WI personnel were able to access the shoreline after sunrise, the juvenile PEFA was perched on the western fence of 6 Shoreline near the planned first trap deployment site. Traps were not deployed to prevent the PEFA from seeing WI personnel placing traps. The PEFA flew south and perched in the mid-habitat of 6 Shoreline near Post 7. The PEFA then left its perch, depredated a banded tern juvenile, and landed directly at the location planned for trap deployment and began consuming the tern. While one WI biologist monitored the PEFA, a second WI biologist transited south and deployed a trap on the NOF Shoreline in case the PEFA left in that direction. After the PEFA finished consuming the tern it left to the east, and WI deployed a second trap at the 6 Shoreline location. The PEFA did not return to the shoreline that day.

29 July—WI again requested to access the shoreline before sunrise to place traps for the PEFA before it arrived onsite, and ODSVRA lead staff approved that request. WI deployed traps at 6 Shore before sunrise and waited at that location until after sunrise to transit farther south to place a second set of traps, per ODSVRA staff request. The juvenile PEFA was not observed on 29 July.

30 July—An additional trap was added to the 6 Shoreline location and placed before sunrise, and trapping was again conducted within NOF simultaneously. The juvenile PEFA was not observed on 30 July.

31 July—Traps were again deployed prior to sunrise, but only at 6 shore and no traps were placed in NOF. A juvenile PEFA was observed perching on the western fence of 6 Shoreline at sunrise, but quickly flew north out of sight into the fog without observing the trap. The PEFA returned but was north of the area where traps were deployed. ODSVRA Staff tried to bump it from that area on foot to prevent it from depredating tern fledges and to try to push it towards deployed traps. The PEFA left but headed to the east and away from traps. It was observed several more times during the day, and again ODSVRA staff attempted to bump it from areas occupied by terns or plovers and towards where traps were located, without success.

While WI was preparing to remove traps from the field an adult PEFA flew over 6 Shoreline, swooping and hunting, and engaged one of the traps deployed for the juvenile PEFA. Since the adult PEFA was hunting within occupied tern and plover habitat and due to the potential problems associated with recapturing an individual if released onsite, it was banded, transported to Sacramento CA, and transferred to CDFW for translocation.

27 August—After WI exhausted all hours budgeted for field work, ODSVRA staff observed what may have been the same juvenile PEFA depredate a plover chick. After consuming the plover, the individual was repeatedly hazed.

1 September— ODSVRA staff reported a juvenile PEFA was observed hunting multiple shorelines, with no sign of any prey item. On this occasion, the juvenile was also hazed.

11 September— ODSVRA staff reported a juvenile PEFA was repeatedly observed hunting along the shoreline and was hazed using a vehicle. No predations were documented.

12 September—ODSVRA staff reported a juvenile PEFA depredated two plover juveniles. Following the second predation, ODSVRA staff hazed the individual multiple times with

vehicles.

Wildlife Innovations reviewed all photos provided by ODSVRA of observations and compared them to photos of the juvenile PEFA targeted for trapping during July. Plumage characteristics were very similar, and based on hunting behavior it may have been the same individual that was targeted for capture, but that cannot be confirmed.

Cooper's Hawk

Cooper's Hawks are typically found in woodland habitats and have been documented as a significant threat to nesting terns and plovers, especially their chicks, on other sites (Frost 2015, Velasco 2015). Cooper's Hawks are known to be very quick when in flight and can retain juvenile brown flight feathers through their second year, making identification of younger birds difficult. Cooper's Hawks were observed five times throughout the 2023 nesting season by WI personnel, with the majority of observations within vegetation islands.

On the morning of 24 July, a second-year COHA was captured within an MGT operated within 8 Exclosure to target owls. The trap was not set until after sunset, and a camera monitoring the trap indicated that the COHA entered the trap after dark. Since COHA are tenacious predators, and well documented to depredate terns and plovers, and this individual was well outside of typical COHA habitat and within occupied tern and plover habitat, it was translocated to protect nesting terns and plovers.

COHA likely enter ODSVRA from the southern woodland habitat near Oso Flaco Lake, North Oso Flaco, and Maidenform Revegetation Area, where they are typically observed and were again during the 2023 nesting season. The COHA captured after sunset, and other COHA observations around sunrise suggest that COHA within ODSVRA may be more active during pre-dawn and post-sunset hours. During future nesting seasons, southern exclosure areas should be surveyed for COHA activity during these crepuscular time periods.

Red-tailed Hawk

Red-tailed Hawks have been documented to depredate nesting terns and plovers (Carillo 2004, Caffrey 1998) and have been observed killing multiple chicks in a short period of time on other nesting sites in California (Biteman and Manley 2021, 2022). During the 2023 tern and plover nesting season, RTHA were observed nearly every day, with activity occurring throughout the daylight hours (morning, noon, afternoon hours). Individuals observed were most often within or near the vegetation islands, and no threatening behavior was observed. This was also the case during the 2021 and 2022 nesting seasons. During 2023, RTHA were occasionally observed within nesting site exclosures during the latter part of the season, and less often during the early part of the season. The individuals observed in exclosures were not consistently present and did not show interest in terns or plovers.

Maintaining close surveillance of RTHA when chicks are on the ground (typically July–September) will continue to be an important part of depredation mitigation efforts, as that is the time of the season when RTHA have been most problematic on other tern and plover sites. Early detection of individual RTHA that have shifted to begin targeting terns or plovers can allow for expedited mitigation efforts and prevent unnecessary loss of chicks to RTHA predation.

Owls as Predators of Terns and Plovers by Species

Great Horned Owl

Great Horned Owls are common within many ecosystems, occupying a variety of habitats, and are

well known to depredate adult, fledgling, and chick terns and plovers (Lau *et al.* 2017). Since they are typically uniformly distributed across the landscape, the removal of an individual that is not targeting terns or plovers has the potential to open niche space for individuals that may be more problematic as predators of terns and plovers. During the 2023 nesting season, WI again balanced surveillance and management of diurnal predators with nights conducting surveillance for and behavioral assessment of GHOW activity within and near tern and plover nesting areas at ODSVRA. For the majority of the season, WI incorporated at least one nighttime surveillance shift each week. Surveillance was conducted by positioning in a topographically advantageous position that provided visibility of sections of the colony with the highest density of tern or plover nests, chicks, or fledglings. In addition to direct observations of individuals during nighttime surveillance, tracks and pellets found during daytime surveillance and other evidence of activity or predation by GHOW were used to indicate presence and activity by GHOW. When reports were received, or evidence of activity was discovered by WI biologists, WI altered the surveillance schedule to include nighttime surveillance of the locations where sign of GHOW activity was most recently detected.

During portions of the 2023 nesting season, threatening diurnal raptor activity necessitated WI shift personnel efforts from nighttime surveillance to diurnal surveillance or trapping. In those instances, nighttime surveillance was resumed as soon as the threat from diurnal raptors decreased. When those shifts were necessary, nighttime surveillance was most often resumed by conducting consecutive nights within multiple areas, to prevent a high-threat GHOW from going undetected.

Following observations of owl sign within exclosures occupied by nesting terns and plovers, and during a period when WI personnel were busy with diurnal raptor activity and were not able to do nighttime surveillance, two MGTs were operated for owls. The MGTs were placed in two locations, one inside of 8 Exclosure and the other within the Post 6 Alleyway. Those traps were operated during two periods, the first between 20- 28 July, and the second between 3- 12 August. Due to lack of additional evidence of owl activity, trapping was discontinued after 12 August.

Wildlife Innovations spent four distinct periods conducting surveillance for GHOW, and a minimum of three GHOW were identified based on territory use and behavior. Observations made during nighttime surveillance are divided by time period and location and summarized below.

Oso Flaco Lake/Maintenance Road GHOW Pair—On 26 March, the first GHOW of the 2023 nesting season was observed perching east of the Oso Flaco parking lot. Following this observation, GHOW were not observed during nighttime surveillance until 13 April. Between 13 and 19 April, at least one GHOW was observed consistently perching in the vegetation adjacent to the Oso Flake Maintenance Road and Oso Flaco Lakes. During one of these observations, two GHOW were observed perching within the vegetation in close proximity. Behavior and time of year indicated they were likely a mated pair. All observations of this pair took place outside of the tern and plover nesting exclosures, and no observations indicated a threat to plovers or their nests, so no management actions were necessary. In addition, the presence of the mated pair outside of the southern exclosure had potential to prevent other higher-threat individuals from occupying that area. On 15 May, two GHOW were observed in the southern portion of ODSVRA, one perched on the Oso Flaco Boardwalk fence line and the other within Maidenform. These two individuals were assumed to be the mated pair. Due to previous observations of their use of territory, they were again assessed as a low threat and not targeted for mitigation.

Early May 7.5 Reveg/6 Shore GHOW Surveillance—On 9 and 10 May, possible GHOW tracks were located in 7.5 Reveg and on 6 Shore, respectively, by ODSVRA staff. Following these reports, WI shifted the surveillance schedule to focus solely on nighttime surveillance, and focused efforts in those areas. Over four consecutive days WI spent 40 hours conducting surveillance of 7.5 Revegetation Area, 7 Exclosure, and 6 Exclosure, detecting no nocturnal avian predators within or near the colony nesting areas. During that same period, no additional owl tracks were observed by ODSVRA or other contracted staff. Surveillance results indicated the threat level did not warrant further actions and therefore nighttime surveillance was discontinued. On 15 May, ODSVRA staff discovered possible GHOW tracks within the east side of Eucalyptus Tree Vegetation Island. Since GHOW presence within the vegetation islands did not threaten nesting terns or plovers, no additional actions were warranted.

Late May 6 Exclosure GHOW/CORA Surveillance—On 25 May, ODSVRA staff located fresh GHOW tracks within the northern end of 6 Exclosure, and as a result WI shifted to nighttime surveillance to assess the threat posed by GHOW. ODSVRA lead staff requested WI work a hybrid schedule to help survey for CORA activity during the evening hours, since CORA had depredated a large number of nests during the weeks prior. Beginning on 25 May, WI filled gaps in surveillance coverage when WS personnel were off during evening hours and on weekends. To help cover these time periods, less nighttime surveillance for owls was possible. On 26 May, GHOW tracks were discovered in the ORA within the protective fencing constructed around plover nest, SP40. This nest had already hatched, and the plovers chicks had already moved to the shoreline. Since WI conducted surveillance that night, and near that area, but did not see the GHOW, it is likely that the GHOW was active after WI left for the evening. Split evening and overnight surveillance continued for five consecutive days, resulting in multiple detections of CORA actively hunting within the colony nesting areas, but no other sign or observations of threatening owl activity. On 30 May, ODSVRA staff observed the male AMKE depredating two plover chicks, and WI transitioned off of nighttime surveillance for owls to focus on AMKE.

June WBY GHOW Surveillance—While WI was conducting AMKE focused trapping and surveillance, additional evidence of GHOW activity was found by ODSVRA staff. Most of the GHOW sign was located in the southern portion of ODSVRA, in sections with lower tern and plover presence. Sign of GHOW presence was found along the IBY fence line and within Boneyard multiple times between 12 June and 19 June. Multiple pellets were located, which upon examination, contained only small mammal remains. One non-plover or tern species feather pile with accompanying GHOW tracks was found within 8 Exclosure on 12 June. Since those locations were far from areas densely occupied by terns or plovers, surveillance and trapping for the male AMKE were prioritized over additional GHOW surveillance. Following the last observation of the male AMKE on 11 June, WI switched back to performing nighttime surveillance. During four days of consecutive overnight surveillance from 22 June to 25 June, WI did not observe any nocturnal avian predators within or near the colony nesting areas and therefore switched back to the general schedule.

8 Exclosure E Fence GHOW Trapping—WI began conducting consecutive overnight surveillance shifts on 15 July with the intention of assessing nocturnal avian predator presence and activity within the nesting exclosures. Two overnight surveillance shifts were completed, however dense fog significantly obstructed visibility and no predators were observed. Since weather predictions indicated that fog conditions would persist for at least a week, to avoid

wasting surveillance hours, WI transitioned back to diurnal surveillance. On 19 July, ODSVRA staff located broken fragments of a pellet inside of Boneyard near the WBY fence. On examination, small mammal remains without any bands or other indications of avian prey were identified. Since fog prevented nighttime surveillance and operation of BC traps, and tern and plover nesting efforts were peaking, two MGTs were placed, one to the south and one to the north of where high-density chicks were located to attempt to capture owls that may enter that area. Trap locations were chosen to target areas where owls have been observed transiting and hunting during previous seasons, and to avoid disturbance to terns and plovers from necessary trap operations. MGTs were opened before sunset and closed at sunrise daily from 20 July to 27 July. On 23 July, ODSVRA staff found GHOW tracks inside of PLR along the fence boundary separating the vegetation island from 8 Exclosure. A second WI biologist began nighttime surveillance and deployed BC traps within the eastern fence of 7 exclosure. That evening, the fog conditions lifted and no GHOW were detected. On 25 July, WI operated BC traps slightly further south, just within the east fence of 8 Exclosure on the north side of PLR but no owls were observed. When exiting the field in the morning and closing the MGT for the day, WI found GHOW tracks at the 8 Exclosure trap. On review of the camera footage, WI confirmed a single GHOW landing on door of the MGT at 23:05. This observation implied that the GHOW was interested in the bait type presented, however, did not land on the perch trigger to result in a capture. In response, WI altered the perch trigger to provide a more appealing target. On 26 July WI again deployed BC traps southeast of PLR within 8 Exclosure, in a position determined to be visible from the MGT location, so that if the GHOW did not enter the MGT, it may see the BC trap sets improving likelihood for capture. No owls were observed within or near the colony nesting areas that night.

On 27 July, WI opened both MGTs without performing nighttime surveillance. During trap setting at sunset, a GHOW was observed on the southwest corner of PLR, near the 8 Exclosure fence line within view of the trap. This individual may have been the same one leaving tracks along the eastern fence of 8 Exclosure and previously recorded interacting with the MGT on camera. Overnight, a GHOW suspected to be the same individual landed next to the MGT twice based on camera surveillance. During both observations, the GHOW investigated the lure birds through the side of the trap, clearly showing interest but did not enter through the top of the trap to land on the perch trigger. The following day (28 July), WI discontinued owl trapping to focus on the juvenile PEFA reported depredating tern fledges. Both MGT lure bird cages were removed from the field and traps were closed to prevent exposure to the owl without a means of capture. On that evening, camera footage recorded the GHOW walking on the ground next to the closed MGT top chamber. As there was no bait present at the time, this behavior strongly supported that it was the same individual that investigated the trap previously and remembered the location. Noting this, WI planned to resume trapping at that location as soon as the threat from the juvenile PEFA subsided. During PEFA trapping efforts, GHOW tracks were discovered by ODSVRA staff on 30 July at the IBY gate within east Boneyard.

Following the capture of an adult female PEFA hunting 6 Shoreline and disappearance of the targeted juvenile PEFA from the site, WI shifted efforts back to owl trapping on the night of 3 August. Since remaining field work hours within the available budget were low, WI worked a modified schedule which included fewer field hours to extend field work as late into August as possible. During that period, MGTs were operated for four consecutive nights weekly from 3 August through 11 August, and surveillance was conducted around closing of the traps in the morning and opening of the traps in the evenings. During trapping efforts, sets of GHOW tracks

were found at a distance greater than 10 feet from the 8 Exclosure trap on both 9 and 10 August. This indicated GHOW presence within colony nesting areas was intermittent and that the GHOW may have no longer been interested in the MGT. Since the nesting season was almost over, and few tern fledges and plover broods remained, and few field hours remained within the available budget, WI discussed with ODSVRA lead staff and jointly decided that BC trapping was not necessary. Following the decision, no additional direct observations or signs of owls were detected at ODSVRA, and MGTs were removed from the field.

During the 2023 nesting season, WI spent more time conducting surveys for and trapping diurnal raptors. This left less time for nighttime surveillance of GHOW activity and resulted in fewer nocturnal predator observations recorded by WI. Since GHOW have been prevalent during previous seasons at ODSVRA, nighttime surveillance should be continued with some frequency during subsequent seasons. Overnight fog conditions have occurred frequently at ODSVRA. Periods of fog have lasted between days and weeks, inhibiting nighttime surveillance using thermal optics during those periods. If project funding and associated personnel time can support this level of effort, WI recommends weekly nighttime surveys to attempt to detect all owls using the site. Since beginning nighttime surveillance in 2021, valuable information has been gathered regarding nocturnal predator behavior (including owls, coyote, skunks, and location and size of the tern night roost) that would not have been otherwise detected or learned.

Barn Owls

Barn Owls are well documented to depredate adult and juvenile terns and plovers on other sites in California. During the 2023 nesting season, no tern or plover predations detected at ODSVRA were attributed to BNOW. Evidence of BNOW activity within or near the nesting areas was only detected once by ODSVRA staff (NOF shoreline), and WI heard vocalizations by BNOW twice during nighttime surveillance. Although the exact locations where the vocalizations came from were not able to be determined due to dense fog, one BNOW was heard near the vegetation islands east of 7 Exclosure, and the second was within 7 Exclosure or within the ORA on the east side of 7 Exclosure. The number of BNOW detections during 2023 was much lower than in 2022. BNOW typically only land on the ground when making attempts to capture prey, making detection of their presence and activity within tern and plover nesting areas difficult when relying solely on discovery of tracks, impact marks, or predations. During 2022 WI spent more time doing nighttime surveillance due to higher owl activity, fewer issues with diurnal avian predators that required daytime shifts, and this may be why more BNOW were detected. Nighttime surveillance may be especially important to detect BNOW activity because of their behavior. Nighttime surveillance to detect BNOW activity may be most important around high-density tern and/or plover nesting or roosting areas, and during the periods of the season when density is highest. A more complete understanding of BNOW activity and presence at ODSVRA during future nesting seasons would benefit from more frequent nighttime surveillance, if threat posed by diurnal raptors is lower or personnel time is greater.

Non-Raptor or Owl Predators

American Crows—AMCR are a prominent and problematic predator of nesting terns and plovers at other nesting sites in southern California, such as Naval Base Coronado, Marine Corps Base Camp Pendleton, Venice Beach, and Huntington Beach (Biteman and Manley 2021; Manley and Johnson 2019; Brinkman and Garcelon 2016; Liebezeit and George 2002). American Crows are synanthropic predators that thrive around human development (Johnston 2001, Marzluff *et al.*

2001) and whose populations in urban areas of California may be growing. Monitoring of AMCR continued throughout the 2023 breeding season in an effort to best assist the tern and plover program at ODSVRA. During 2023, AMCR were almost exclusively observed during March and April, and were most frequently observed within 8 Exclosure. This may indicate that AMCR primarily accessed the site from the south or east, rather than the north. Despite the observed presence of AMCR within developed areas to the north and northeast of ODSVRA, they were seldom observed entering nesting sites or shorelines from those directions. However, two depredated plover nests located north of primary and protected nesting areas, bordering areas historically and actively utilized by ODSVRA campers, were investigated by WI personnel, and determined to be depredated by AMCR. Nesting in this area might have taken place in this non-typical area during the 2023 season due to a large amount of precipitation during the prior winter, which caused increased water flow within AG creek and a resulting safety closure of ODSVRA to visitors. Without vehicle access, much of the traditionally camper-occupied sections of beach remained unoccupied by humans, making it more available for plover nesting. Once camping and vehicle access to ODSVRA was allowed to resume during the 2023 season, AMCR may have been drawn to the area and subsequently located the plover nests. Observations made by WS indicate that AMCR activity may have increased between the 2021 and 2022 nesting seasons. If that trend is valid and continues, AMCR may become a more prominent threat to nesting terns and plovers at ODSVRA during future seasons. Monitoring of AMCR should be continued and the threat to nesting terns and plovers reevaluated continuously. An important facet of AMCR management will be to identify anthropogenic food sources and other attractants within and near ODSVRA. Anthropogenic food subsidies are a primary source of corvid population growth around developed areas. Removing those attractants or excluding AMCR from accessing them would be an important step in a comprehensive management program.

Common Ravens—CORA are extremely intelligent, can have large territories, and have been documented to have significant negative impacts on listed species across the western US (Wooten *et al.* 2016, 2017, 2018, 2019, Frost 2015 Liebezeit and George 2002, Burrell and Colwell 2012, Smith and Murphy 1973, Craighead and Craighead 1956). In California alone, CORA are known to be predators of the eggs and young of threatened and endangered species, including California Least Terns, Western Snowy Plovers, California Condors, San Clemente Island Loggerhead Shrikes, Greater Sandhill Cranes, Marbled Murrelets, and desert tortoises (Liebezeit and George 2002). Common Raven populations in the United States have increased an estimated 2.87% annually for the last 50 years and by 3.46% annually within the last ten years (Sauer *et al.* 2017). Additionally, CORA populations within California deserts have increased by more than 1000% during a recent 25-year period (Boarman and Berry 1995). As it is probable that CORA populations within and near ODSVRA will also follow these growth trends, the threat of predation to terns and plovers by CORA will also likely increase in subsequent years.

During the 2023 tern and plover nesting season, CORA were observed within sensitive nesting site exclosures by WI and documented to have depredated at least 36 nests by ODSVRA staff (CDPR 2023). Common Ravens were most often observed in pairs, foraging and hunting from the wing while transiting through the site. As with AMCR, when directly observed or after being alerted by ODSVRA staff, WI supported WS personnel by helping visually track CORA to support removal. All CORA observations made by WI took place between March and June, with the highest number of CORA observed during May. Common Ravens were most frequently observed

by WI within vegetation islands, or 8 Exclosure.

During a period of high plover nest depredation during May, ODSVRA lead staff requested WI alter surveillance periods to include evening and weekend hours. To benefit the overall program, WI modified the intended work schedule from full overnight owl surveillance and began evening and early nighttime surveys on 25 May. During the first two consecutive evenings of surveillance, WI observed two CORA, presumed to be a mated pair, hunting within the plover colony. Common Ravens have been documented to recognize and remember human faces and may alter their behavior following a negative experience or observation of another CORA experiencing a negative interaction with predator control personnel or equipment. Once educated and wary, the likelihood of removing those individuals decreases substantially. Based on occurrences both reported by ODSVRA staff and directly observed by WI, CORA may have altered their activity periods to avoid the site during weekdays before 17:00, when WS was typically present.

Careful management of CORA is important to effective predation mitigation for terns and plovers. To support effective management of CORA, it is important to prevent targeted individuals from witnessing and surviving the use of management methods. CORA that observe personnel or management methods employed may be difficult or impossible to remove, and predation from educated CORA may be prolonged, as they can live as long as 15 years (Lutmerding and Love 2020). Due to those factors, a single mistake when managing CORA may result in recurring depredation events both within and across seasons. Attempting to mitigate recurring depredation from an educated CORA can be extremely costly of personnel time and reduce the amount of time available for other essential predator management tasks within a tern and plover program. To prevent educating CORA, great care should be taken to only attempt to remove CORA with a firearm when all individuals in proximity or view can be removed simultaneously, and great care should be taken to ensure that all trap sets are optimized at all times.

Coyotes—Coyotes have been documented to negatively impact nesting terns and plovers at multiple colony sites across southern and central California and are responsible for depredating the largest number of terns alongside CORA, AMCR, and PEFA (Wooten *et al.* 2016, 2017, 2018, 2019; Frost 2015). Coyotes can have large home ranges that include both urban and rural areas (Gehrt 2007) and have been documented to consume many nests during a single predation event, making them particularly detrimental to ground nesting species such as terns and plovers. As an olfactory dominant predator, coyotes are capable of navigating to prey without visual cues or daylight, making them particularly threatening to tern and plover nests and/or chicks. Regular presence of coyote within nesting areas and repeated depredation may affect site fidelity. Further, depredation events may be under detected within ODSVRA, as site-specific protocols do not include regular walking of nesting sites by monitoring personnel and predator control personnel. Additionally, depredation of chicks by coyotes would likely not be detected as chicks are likely to be consumed whole.

During the 2023 tern and plover nesting season, coyote tracks were observed by WI, ODSVRA staff, and WS personnel almost daily, along the shoreline and/or adjacent to or within nesting site exclosures, or other sensitive habitats occupied by terns and plovers, their nests, chicks, and fledglings. Coyotes are a proliferate generalist predator species abundant within and surrounding ODSVRA. Coyote tracks between vegetation islands are not unexpected, and coyote activity in those areas may not be a threat to nesting terns and plovers. However, tracks were found entering the Fore dune Closures, where brood concentration was high for most of the 2023 nesting season, in Boneyard, and within the Exclosures. Due to tidal movements, the shoreline sand was wiped clean daily, providing an irrefutable indicator of the timing of coyote presence. Tracks not only indicated regular presence, but foraging behavior by

coyote, as tracks were observed moving from the hard packed sand up into dune habitat occupied by nesting terns and plovers on numerous occasions.

While performing nighttime surveillance and trapping for owls, WI documented coyotes foraging on the shoreline and within nesting exclosures through thermal optics, although locations and techniques utilized were tailored towards detecting and monitoring owls. Nighttime fog often obscured thermal surveillance of the shoreline. When exclosures remained clear of fog and allowed surveillance of those areas for owl activity to continue but may not have detected coyote activity farther west. Frequency and number of coyote tracks observed, combined with thermal surveillance that also detected coyote activity, indicate that regular coyote foraging occurred frequently within tern and plover nesting areas during the 2023 season. The frequency and abundance of coyote foraging within nesting areas may have impacted reproductive success of both species at ODSVRA, and efforts should be made to continue to improve effectiveness of coyote exclusion, deterrence, and removal to support recovery efforts for terns and plovers.

MANAGEMENT RECOMMENDATIONS

- 1) ODSVRA staff should continue to notify predator control personnel as soon as significant changes in the number of active nesting terns or plovers within an area or exclosure are realized. During the 2023 season, WI utilized the summarized data produced by ODSVRA lead staff which detailed location of brood concentrations and fledge rates by shoreline, as often as it was available. That information was used to help identify and classify threats and respond accordingly. Frequent data summaries help to ensure that WI has the most current and complete information, to use when assessing and prioritizing management efforts, thereby promoting maximum efficiency and effectiveness.
- 2) Due to the size of ODSVRA, the diversity and abundance of the predator suite present, and because predator control and monitoring personnel resources are finite, WI recommends that raptor and owl management for terns and plovers continue to be conducted with population level implications in mind, rather than attempting to protect smaller outlier groups or individuals equal to higher density nesting areas. Raptor species or individuals determined to be a low-threat, and operating within low-density tern and plover nesting areas (i.e. the veg islands), should be allowed to remain within those areas free from hazing.
- 3) ODSVRA staff should continue to haze predators using pyrotechnics sparingly, and should only target individuals perceived to be an immediate threat for terns and/or plovers, when located within areas that contain higher densities of active nests or broods (i.e. exclosures and on shorelines). Overuse of any hazing method can reduce its effectiveness by desensitizing target individuals to the method being used. Hazing of avian predators should be conducted from on foot first, and only from a vehicle when hazing from on foot is not possible. Some predators hazed with vehicles (i.e. horn or driving directly towards them) may begin to associate vehicles with the negative experience. If raptors that need to be targeted with traps become wary of vehicles, they may be more difficult to trap as a vehicle may not be able to be used as a blind when trapping.

- 4) ODSVRA staff should reconsider the potential for disturbance caused by predator management personnel entering active tern and plover nesting areas before sunrise to place and operate traps for individual predators documented to be taking tern or plover individuals or nests. Based on a minimum of ten years and more than 15,000 hours of senior personnel conducting trapping, direct firearm removal, and predation investigations within occupied tern and plover nesting areas, potential for negative effects, and especially for take, are extremely low (no incidents of take documented during all that time). Additionally, the positive ramifications of quickly removing a high-threat predator documented actively hunting within high-density nesting areas and depredating nests or individuals likely outweighs the potential for temporary disturbance.
- 5) ODSVRA staff should continue to be cognizant and prevent disturbance from ODSVRA monitoring staff and vehicles in areas where raptor traps are active. It is recommended that ODSVRA staff and vehicles maintain a minimum distance of 400m from active traps when possible unless transiting through to another location. Strong coordination between WI field staff and ODSVRA staff should be maintained during trapping efforts if monitoring must occur in the same area as trapping is being conducted.
- 6) ODSVRA staff should request that contractor's responsible non-raptor and owl predator control adjust work schedules as needed to best target time periods when predators are active, as WI has done, to better support success within the tern and plover program.

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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

Seabird Mortality Event Necropsy Report

NECROPSY NUMBER: 23-0252

OTHER IDENTIFICATION: N/A

COMMON NAME: Snowy Plover

SCIENTIFIC NAME: *Charadrius nivosus*

DATE FOUND: 5/4/2023

COUNTY: San Luis Obispo

STATE: CA

NECROPSY DATE: 11/2/23

REPORT DATE: 11/8/23

NECROPSY BY: Corinne Gibble

Event Background

On May 4th 2023, Oceano Dunes State Vehicular Recreation Area (ODSVRA) staff found an adult snowy plover carcass within the large fenced nesting enclosure in the North Oso Flaco area. This area is completely closed to public activity and the carcass was found approximately seven feet from enclosure fencing. The bird was stored frozen and submitted to MWVCRC for gross necropsy.

Necropsy Summary

Due to the ongoing outbreak, this bird was tested for Highly Pathogenic Avian Influenza (HPAI) at the California Animal Health and Food Safety Laboratory in Davis, CA (CAHFS) prior to gross necropsy. Test results confirmed that the bird was negative for HPAI.

Postmortem radiographs revealed slight lateral displacement of the keel. During external examinations, this bird was found to be in fair condition with no scavenging. There was blood surrounding the left eye. Two abrasion wounds were found at the upper left portion of the back, and abrasion wounds were found at the left side of the neck, at the keel, and at the juncture between left femur and tibiotarsus (knee). There was blood and sand found at the bill and the left eye was proptosed (pushed out of the socket). The right eye was deeply sunken.

Internal examination confirmed lateral displacement of the keel, and acute subcutaneous and intramuscular hemorrhage of the pectoral muscle. There was also a hairline fracture at the lower right caudal border of the keel. The liver was mildly dorsoventrally compressed, with small hepatic ruptures

throughout. The trachea and lungs were filled with blood. The bird was in good nutritional condition with subcutis, and pericardial adipose present, and the pectoral muscle complex projected slightly above the keel, with no discernable pectoral muscle atrophy. The ventriculus was full of semi-digested insect shells and the gastrointestinal tract was full of digesta signifying the bird had recently eaten. The skull was grossly intact, however there was hemorrhage throughout the brain, with a large area of hemorrhage at the back of the head in the occipital region and behind the eyes.

The presumptive cause of death is acute crush trauma. No gross evidence of pre-existing disease or postmortem scavenging was found.

Completed Tests and Procedures

1. Gross photographs
2. Radiographs
3. Gross Necropsy

Gross Findings

Acute severe crush trauma, characterized by:

- Abrasion to left upper back, neck, keel, left knee (juncture between femur and tibiotarsus)
- Keel displacement
- Multifocal acute hemorrhage and bruising
- Dorsoventral compression of liver
- Occipital hemorrhage, eye proptosis

Final Diagnoses

Presumptive cause of death: acute crush injury

Samples Saved

Carcass, pectoral muscle, liver, spleen

Images

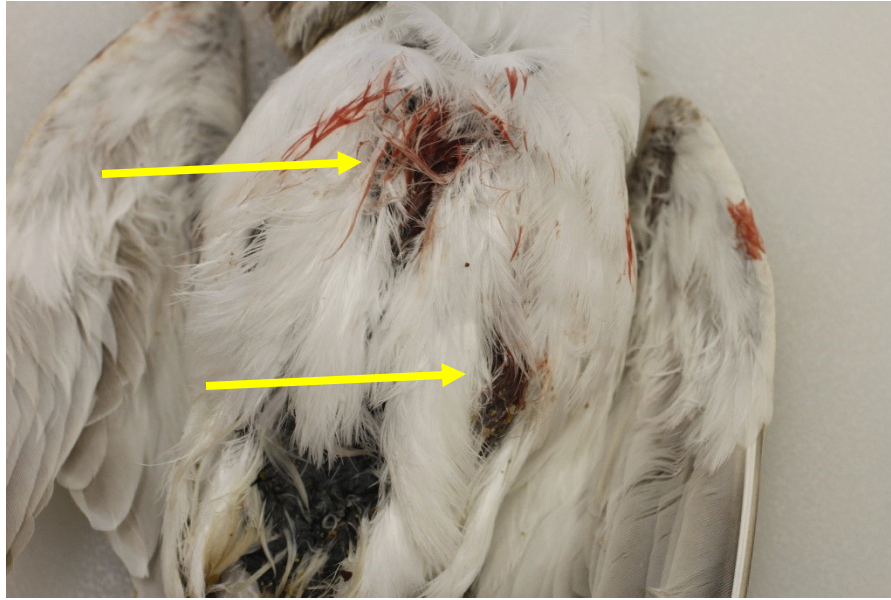


Figure 1. Abrasion to keel, left knee (juncture between femur and tibiotarsus)



Figure 2. Hemorrhage behind the eyes and at the occipital region