NESTING OF THE CALIFORNIA LEAST TERN AND WESTERN SNOWY PLOVER AT OCEANO DUNES STATE VEHICULAR RECREATION AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA 2021 SEASON

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

Published by
California Department of Parks and Recreation
Oceano Dunes District

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December 2021

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Cover photo of snowy plover brood (22-day-old chick and associated male from the SP212 nest) at ODSVRA Bigfoot revegetation area, taken by Nicole Durtschi, Oceano Dunes District tern and plover monitor, on 14 August 2021.

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California least tern necropsy examination report: two chicks

Snowy plover necropsy examination report: one chick

Snowy plover medical examination report: one juvenile, two chicks

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 2021. This is the 20th 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 50-52 least tern breeding pairs in 2021, higher than the 35-42 breeding pairs in 2020, and above the average of 40-43 pairs (range=23-60) in the 15-year period 2005-19. Breeding pairs at ODSVRA decreased after a near complete breeding failure in 2017, with only seven juveniles produced, due to high egg and chick predation by skunks. Subsequently, a number of ODSVRA banded terns expected to nest at the park relocated to nearby sites in Santa Barbara County in 2018-19 for breeding, resulting in a drop in numbers at the park. In 2021, breeding numbers increased to similar numbers seen prior to the breeding failure in 2017. During the 2021 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, name changed from Vandenberg Air Force Base in 2021).

There were 53 known nesting attempts in 2021, 52 from the Southern Exclosure and one from an unknown location, known by detection of brood. The hatching rate for known location and fate nests was 94.1% (48/51), which is above the average of 83.3% during the previous 16-year period 2005-20. Of the remaining 4 nests with known location, one had an unknown fate (not known if hatched or failed) and three were abandoned.

Eighty-one chicks hatched and of these 57 were color-banded, with the majority to individual. Forty-eight chicks (43 banded, five unbanded) are known to have fledged (seen when 21 days old or older), for a fledging rate of 59.3% and an estimated 0.92-0.96 chicks fledged per pair. This compares with an average for the previous 15-year period 2006-20 (banding chicks to individual began in 2006) of 46 juveniles produced per year, a 73.1% chick fledging rate, and 1.11-1.18 chicks fledged per pair.

Snowy plover
There was a minimum of 195 breeding snowy plovers (107 males and 88 females) in 2021, compared to 190 in 2020, an increase of 2.6%. Eighty-six banded birds with known origins were documented as breeding with 88.4% (76/86) banded as chicks and fledged from ODSVRA.

There were 239 known nesting attempts in 2021, including 16 identified only by detection of brood (unknown nest location). Of the 223 nests from known locations, 132 (59.2%) were in the Southern Exclosure, 29 (13.0%) in Oso Flaco, 48 (21.5%) in the Foredune closure, 4 (1.8%) in the open riding area, 7 (3.1%) in the closed buffer area, one (0.4%) in Dunes Preserve approximately 2,300 feet north of Foredune North, one (0.4%) in Eucalyptus Tree revegetation area approximately 650 feet east of 6 exclosure, and one (0.4%) in Bigfoot revegetation area approximately 400 feet east of Foredune Central. Of the 219 nests with known location and fate, 129 hatched for a nest hatching rate of 58.9%. This compares to an average of 74.5% for the previous 19-year period 2002-20. Ninety nests failed, attributed to the following causes: abandoned pre-term (16); abandoned post-term (3); abandoned unknown pre- or post-term (4); wind (10); overwashed by tide (1); cause unknown (2); unidentified predator (7); unidentified avian predator (23); common raven (10); northern harrier (11); coyote (1); and opossum (2). For all documented nest loss to predation, avian predators accounted for 81.5% (44/54).

Of the 359 hatching chicks, 237 were color-banded to brood with 38.4% (91/237) fledging, and the fate of the 122 unbanded chicks is believed known with 23.0% (28/122) fledging. A total of 119 chicks fledged (seen when 28 days old or older) for a fledging rate of 33.1%. The fledgling rates of the last three years, 2021 (33.1%), 2020 (28.5%), and 2019 (27.1%), have been low compared to an average rate of 39.9% for the 17-year period 2002-18. One chick fledged per breeding male is the estimated number needed to prevent the population of snowy plovers from declining and productivity of 1.2 chicks fledged per male should provide for moderate population growth (assuming approximately 75% annual adult survival and 50% juvenile survival) (U.S. Fish and Wildlife Service 2007). In 2021, an estimated 1.11 chicks fledged per breeding male at ODSVRA. For the 19-year period 2002-20, average productivity was 1.45 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. Beginning in the 2020 season, and continuing into 2021, the park has responded to concerns with the COVID-19 pandemic and efforts to limit its impacts. For a portion of 2020, including the majority of the least tern and snowy plover breeding season, ODSVRA closed the beach to all recreational vehicle traffic, as well as the two campgrounds adjacent to the beach, and the Oso Flaco Lake parking lot. Public access to the beach for day use remained open for other allowable non-vehicle activities including picnicking, walking, biking, and horseback riding. ODSVRA reopened to vehicle activities in phases, beginning with allowing a maximum of 1,000 street-legal day use vehicles per day on 30 October 2020 (Phase 1), increasing recreation use to allow 1,000 off-highway day use vehicles per day and 100 beach campers on 19 February 2021 (Phase 2), and increasing the use to 150 beach camping units on 15 June 2021 (Phase 3). ODSVRA stayed in the Phase 3 recreation level for the remainder of the 2021 breeding season, resulting in notably less activity than was typical prior to 2020, when allowable use was up to 1,000 campers, 2,580 street-legal vehicles per day, and 1,720 off-highway vehicles per day, including night riding. Approximately 410,137 people visited ODSVRA in 2020 and an estimated 93,867 street-legal vehicles and 6,372 off-highway vehicles were driven on the beach and dunes in the designated riding areas of the park.[1] This is much lower than the nearly 1.4 million visitors, and an estimated 315,022 street-legal vehicles and 63,988 off-highway vehicles in 2019, when the park was fully open for the entire year.[2] Visitor data is not available for 2021 as of the writing of this report.

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 2021 nesting season for least terns and snowy plovers at ODSVRA. A limited amount of data from previous years' reports has been updated in this report to reflect information that is more accurate and conforms to current analysis practices. Maps in figures and appendices use aerial imagery taken in 2020 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) TE-815214-9 and California Department of Fish and Wildlife (CDFW) Scientific Collecting Permits. Predator removal activities are conducted under USFWS Depredation Permit MB25976A-0. Point Blue conducts monitoring and banding activities under USFWS permit 10(a)(1)(A) ES-807078-19, 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 2020 AnnualAttendance figures (source ODSVRA)
[2] ODSVRA 2019 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 that are open to vehicles extend inland approximately 0.6 to 1.3 miles. Eight numbered marker posts, located approximately 0.5 miles apart, are positioned along the coastal strand to orient park visitors and staff. Street-legal vehicles are allowed throughout the riding area. Off-highway vehicles, as well as overnight camping, are allowed along the beach and dunes south of marker post 2 (approximately 1.0 mile south of Pier Avenue). In the southern portion of ODSVRA is the Oso Flaco Lake area with an ocean shoreline of approximately 1.7 miles. Pedestrians are allowed at Oso Flaco Lake area, but it is closed to camping, equestrian, dog, and vehicle use. The beach at Oso Flaco west of the foredunes is narrower than in the riding area.

The following are descriptions of sites and terms as used in this report (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. Management of the Dunes Preserve and Pismo State Beach was transferred to the Oceano Dunes District in December 2004. The Pismo Lake property was acquired from the CDFW in 2007 and is currently closed to the public. ODSVRA provided tern and plover monitoring for the Dunes Preserve prior to 2004 and continues to do so.

Riding area: The area within ODSVRA that is open to street-legal and off-highway vehicles. Prior to the nesting season beginning on 1 March, approximately 5.3 miles of beach was designated for street-legal vehicles from the Grand Avenue park entrance south to the southern boundary of the riding area (approximately 0.4 miles south of marker post 8, approximately 1,290 acres) and off-highway vehicles were only allowed south of marker post 2 (approximately 1,200 acres). Located in the southern portion of the riding area, the seasonal Southern Exclosure (see description on following page) is closed to all vehicles during the breeding season.

Open riding area: The area within ODSVRA open to vehicle use during the nesting season (approximately 984 acres at the beginning of the nesting season, but installation of nest buffer and Foredune closure shoreline fencing will decrease this area). 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.

Closed buffer area: Portions of the open riding area are closed to the public to provide a buffer for tern or plover nests and chicks. As staff find nests, management closes areas to the public to provide this buffer (see section titled Seasonal closure and fencing on page 16 for more detail). The closed buffer area will vary in size during the nesting season, as well as from year to year, depending on locations of nests found. In 2021, a closed buffer area (55.6 acres) was first installed on 29 April, increased in size (124.6 acres) by 22 July, and was removed on 2 September when nests and broods were no longer present in the area (see maps in Figure C.5 and C.6 in Appendix C). Because of the large size, the closed buffer area is adjacent and connected to the Foredune closure, revegetation areas, and/or the Seasonal Exclosure 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 assign the "closed buffer area" location to nests found within already existing enclosed buffer areas and nests found outside of the closed buffer area or other protected areas are assigned to the "open riding area" location.

Foredune closure: 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 (Figure 1 and C.5 in Appendix C). 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 a minimal to moderate amount of plant cover, low topography, and areas of scattered to dense straw. The plots were not managed for snowy plovers, 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 is open initially to public use and alleyways between these three plots are open for public access to the restrooms and the open riding area east of the plots. On 8 April 2021, the shoreline and alleyways were closed after the first nest was located in the Foredune closure, and these areas were reopened to the public 8 September 2021, when all nests had hatched and chicks were no longer present. Staff assign the "Foredune closure" location to nests found within the three plots, as well as nests found on the adjoining closed shoreline and alleyways (including the alleyways from marker post 5 to just north of marker post 6).

Southern Exclosure: A single contiguous area within the southern portion of the riding area that is fenced and closed to entry during the breeding season to protect nesting terns and plovers. The adjoining shoreline is also part of the Southern Exclosure and is closed to public entry during the nesting season. From 2001 to 2004, the amount of seasonally protected nesting habitat in the riding area periodically increased in size. Subsequent to 2004 there has been no increase in size of this protected area. The area of the Southern Exclosure (including the area above the high tide line on the closed shoreline) for 2021 was approximately 306 acres, compared to a range of 271-307 acres (and an average of 293 acres) between 2004 and 2020. Although the basic configuration of the Southern Exclosure has remained consistent since 2004, changes in dune topography and public safety issues affect the placement of the east fence, resulting in small variations in acreage from year to year. Individually identified areas within the Southern Exclosure include the following:

> *6 exclosure*: The area from marker post 6 to marker post 7, (approximately 0.5 miles of shoreline and approximately 61.3 acres), first incorporated into the Southern Exclosure for a full season in 2004. Habitat includes areas of bare sand, small 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 exclosure*: The area from marker post 7 to the south side of 7.5 revegetation area (approximately 0.4 miles of shoreline and approximately 62.0 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 61.4 total acres) located within the 7 exclosure.
>
> *8 exclosure*: The area from the south side of the 7.5 revegetation area to the North Oso Flaco fencing south of marker post 8 (approximately 0.5 miles of shoreline and approximately 86.9 acres). Habitat includes areas of bare sand, areas of tall dunes with bare sand in the eastern portion, areas of moderate to tall foredune hummocks with mostly dense vegetation, and limited areas of organic surface debris (shells, driftwood, and dried algal wrack).

Boneyard exclosure: 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 other areas, mostly in the western portion. This inland area does not have a shoreline component and is approximately 92.0 acres. A portion of the west side (approximately 15.5 acres) has been closed year-round since 2005. Straw bales were placed within the area in 2004 and have been mostly covered by sand. Portions of this area have also developed small to large vegetated hummocks. The eastern boundary of the Boneyard exclosure 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 exclosure during the nesting season, resulting in 48.0 acres in the western portion (contiguous with 6, 7, and 8 exclosures and North Oso Flaco) and 44.0 acres in the eastern portion.

Oso Flaco: The shoreline and dunes in ODSVRA located south of the riding area. The approximately 1.7 miles of shoreline is narrow in width, and the dunes are typically heavily vegetated, relative to the riding area. The area is part of the Oso Flaco Lake area, open to pedestrian use but closed to vehicles. For purposes of discussion in this report, Oso Flaco is divided into North Oso Flaco and South Oso Flaco (Figure 2).

North Oso Flaco: The area extending south of 8 exclosure to the pedestrian boardwalk access trail to the Oso Flaco shoreline (approximately 0.5 miles of shoreline and approximately 68 acres). Beginning in 2002, the upper beach and dunes were closed to pedestrians during the nesting season with symbolic fencing. Since 2005, the North Oso Flaco area east of the shoreline has been part of the Seasonal Exclosure (see description below) and managed in a similar manner with symbolic fencing replaced by predator fencing. Additionally, the shoreline has been closed to the public during the nesting season.

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

Seasonal Exclosure: The contiguous area enclosed by the predator fencing of Southern Exclosure and North Oso Flaco (does not include the shoreline or the eastern Boneyard area). ODSVRA fences this approximately 270-acre area during the nesting season to exclude coyotes, vehicles, and human trespass from the protected nesting habitat (see section titled Seasonal closure and fencing on page 16, Figure C.1 in Appendix C). A portion of the North Oso Flaco fence along the boardwalk is left in place year-round, however it is only maintained for predators during the nesting season (labeled as Permanent predator fence in Figure C.10 in Appendix C).

Dunes Preserve: Located approximately 0.4 to 1.5 miles north of the Foredune closure between marker post 1 and marker post 4. The area includes tall sand dunes with densely vegetated foredunes in the western portion and primarily bare sand dunes in the eastern portion. 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.

Pipeline revegetation area: Located adjacent to the east side of 8 exclosure. 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.

Other revegetation areas mentioned in this report: Maidenform revegetation area is located adjacent to the east side of Boneyard exclosure and the open riding area. Several named revegetation areas are in the open riding area adjacent to nesting areas including BBQ Flats (251 feet east of the Foredune closure), Bigfoot (previously named Pawprint, 222 feet east of the Foredune closure), Eucalyptus North (334 feet east of 6 exclosure), Eucalyptus Tree (341 feet east of 6 and 7 exclosure), Tabletop revegetation area is 660 feet east of 7 exclosure, and Boy Scout Camp is 0.6 miles east of 8 exclosure. Moymel, Worm Valley, and Pavilion Hill revegetation areas are 180 feet to 0.3 miles northeast of the Foredune closure between marker posts 4 and 5. The areas are mostly heavily vegetated, but some small portions of the areas were expanded within the last two years for restoration and are lightly scattered with dry straw and widely scattered small plants. Fencing designates the perimeter of revegetation areas in the open riding area; however this fence is not maintained as predator fencing. Some portions of these revegetation areas are closed for restoration and in other portions pedestrian public entry is allowed within the revegetation areas, but all areas are closed to vehicles and camping.

Arroyo Grande Creek: Seasonally flows into the Pacific Ocean approximately 1.4 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.

Carpenter Creek: Seasonally flows into the Pacific Ocean approximately 3.7 miles north of the Foredune closure. No visitor vehicles are allowed in the area as it is approximately 0.4 miles north of the riding area. The area receives a high level of pedestrian use.

Pismo Creek lagoon: Seasonally flows into the Pacific Ocean approximately 4.0 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 visitor vehicles are allowed in the area as it is approximately 0.75 miles north of the riding area. The area receives a high level of pedestrian use. Only a small portion of the lagoon is part of state park property.

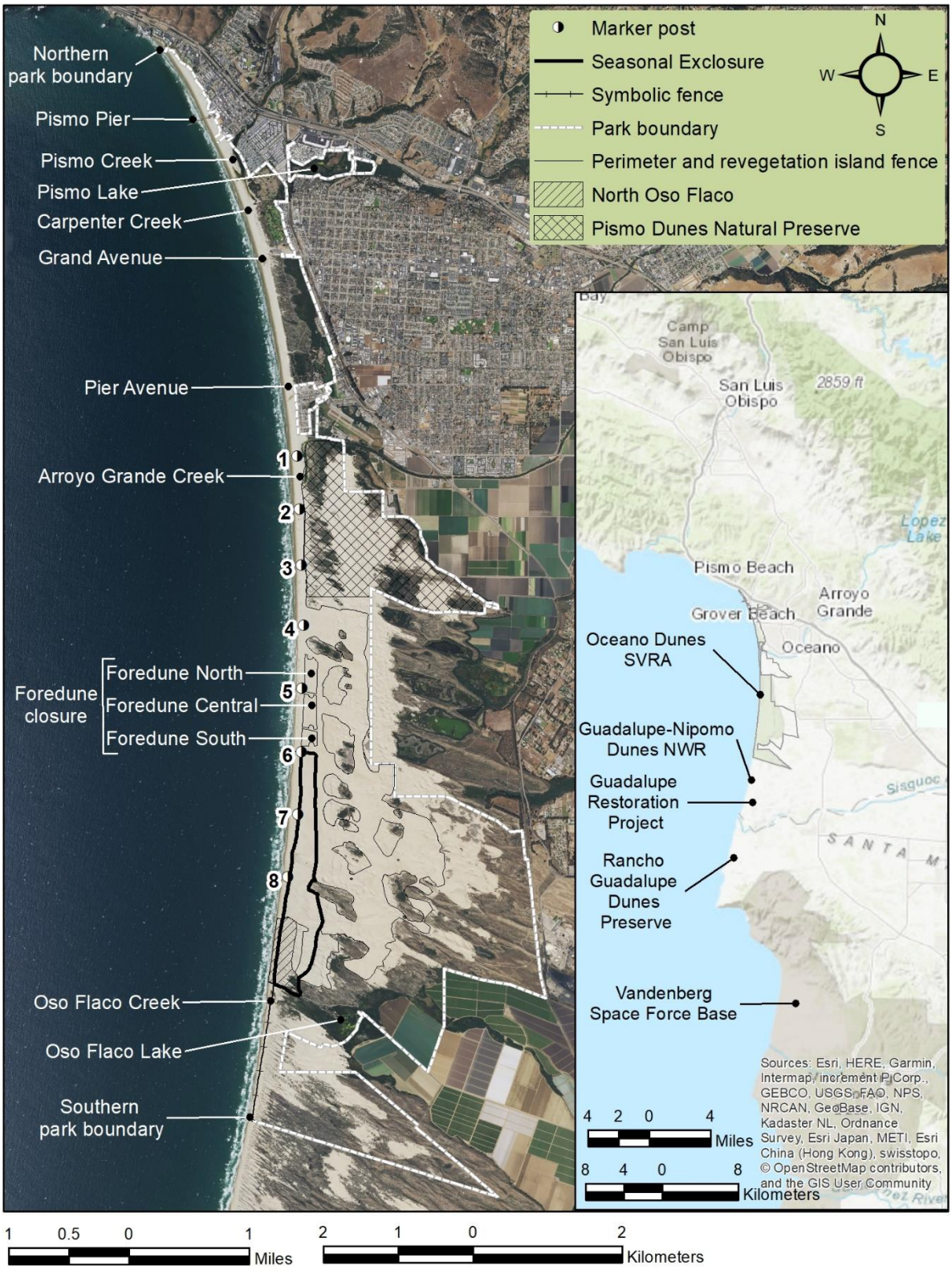

Figure 1. ODSVRA site map.

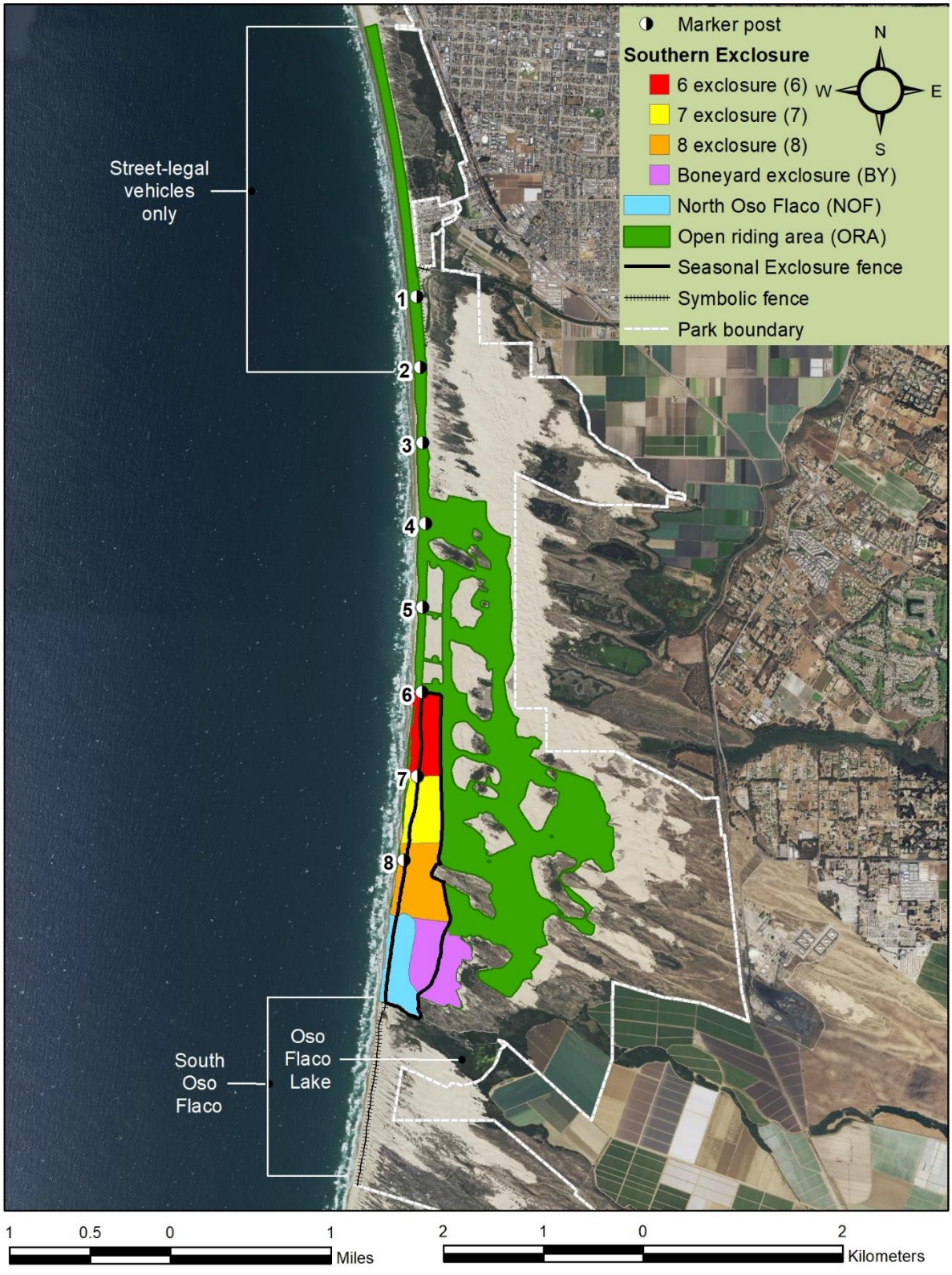

Figure 2. ODSVRA Southern Exclosure and Oso Flaco seasonally protected areas for breeding California least terns and snowy plovers in 2021.

MONITORING AND MANAGEMENT ACTIONS

MONITORING

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

Monitors collect and record data such as: nest status; brood location and count of chicks; fledgling identification; band combinations of chicks, juveniles, and adults; tern night roost location and number of birds; injuries or mortalities; predator sightings or tracks; and visitor infractions. Nest cameras placed on a small number of tern or plover nests provide additional monitoring information such as adult bands, adult behavior, nest attendance, predators, nest fates, nest fate dates, and chick numbers in areas otherwise difficult to access. When returning from the field, monitors enter data from field notes and from nest cameras into a comprehensive database system that includes a Microsoft Access database, ESRI ArcMap, ESRI ArcGIS Online's Survey123 and Collector, Microsoft Excel sheets, and paper charts.

Open riding area

Monitoring of the open riding area by vehicle occurs daily along defined transects, as any nests initiated in this area require immediate protection from recreational activities and chicks in this area may require additional monitoring. These daily transects include portions of the revegetation areas closest to the open riding area. Staff looks for nesting bird signs, predator presence or signs, nonpermitted visitor activities (such as off-leash dogs or kites near the exclosure), rescues sick or injured wildlife, and collects deceased wildlife. Areas along transects with 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 scope. Monitors pay particular attention to the boundaries of the Southern Exclosure, Foredune closure, and revegetation areas, looking for signs of nesting close to the open riding area and for tracks or other sign of tern or plover movement into the open riding area.

Close brood monitoring occurs daily and any time staff walk within the exclosure, prioritizing tracking brood movement toward or into the open riding area. When staff observe 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. ODSVRA consults with USFWS and CDFW on the appropriate actions to take for broods found in the open riding area. If approved, and determined necessary, monitors closely track plover broods and 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 signs and/or temporary fencing prior to the nest hatching to provide a safe passage until the brood reaches a protected area. 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.

Breeding least terns and snowy plovers

Finding and monitoring nests: The least tern and snowy plover management program documents size of breeding populations and attempts to find, monitor, and determine all tern and plover nest and chick fates. Staff checks most nests daily and conducts regular nest searches using binoculars and spotting scopes from parked vehicles outside of the seasonal fencing to minimize disturbance to nesting birds and broods.

Additional nest searches conducted on foot confirm egg number and document activity at the nest bowl. Staff maps nest locations using a Global Positioning System (GPS) receiver blue-toothed to a phone.

Estimated initiation date: Initiation date estimates arise from multiple methods that include: timing of egg-laying sequence; floating eggs for plover nests; or when hatch date is known, using average length of time for nests to hatch and backdating to nest initiation. When none of this information is available, staff cannot estimate nest initiation dates.

Nest fates

The following are categories of nest fates used in this report. Staff examine 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 section 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.

From 2010 to 2019, staff used the category of "abandoned, suspected due to wind" as a nest fate instead of "wind." Prior to this, nests lost where wind may have been the cause were included in the broader category of "abandoned pre-term." Starting in 2020, nests in the "abandoned, suspected due to wind" converted to the category of "wind."

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 2021, least tern chicks received a size 1A blank aluminum band on the left leg and a single size 1A numbered aluminum federal band (covered with white over orange vinyl tape) on the right leg. Color tape placed on the left band creates color band combinations unique to each individual chick for the season. Weighing chicks occurs immediately prior to banding, typically at one to three days old.

Staff inconsistently banded plover chicks prior to 2001. ODSVRA aims to band as many chicks as possible, with all chicks within one brood given the same color band combination since 2002. With a limited number of combinations designated for ODSVRA, reuse of combinations on birds known alive became necessary and occurred from 2010-18, resulting in indeterminate ages of some adult banded plovers. ODSVRA obtained additional band combination options in 2019 and from 2019-21 broods have received a combination no longer believed in use on a living bird. ODSVRA will continue this protocol as long as sufficient combinations are available. As has been the case since at least 2002, ODSVRA 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.

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 typically bands chicks at the nest. Unbanded broods found outside of the immediate nest area receive assignment to one of three categories: 1) a hatched preexisting known location nest, 2) a hatched new nest with unknown location and known only from brood, or 3) a hatched unassigned nest (listed as UNA1-UNA5 in Appendix B). Staff assigns unbanded broods to either a preexisting known location nest or a new nest with unknown location based on parent bands; or based on the brood location and age of chicks (estimated based on chick size) when adults lack bands. However, staff cannot assign broods to a specific nest in circumstances where several nearby nests hatch at the same time (hatching chicks confirmed from a distance with a spotting scope), banding at the nest is not possible, and unbanded broods with chicks of similar age appear on the same section of shoreline. Such broods fall within a category of hatched unassigned (UNA) nests.

Chick monitoring: Monitors record chick observation data during daily monitoring activities. In addition, focused searching for broods occurs multiple times each week from vehicle surveys on the Southern Exclosure, Oso Flaco, and Foredune closure shorelines. Staff records band combinations, chick numbers, adults present, location and direction of movement, and any interaction or aggression with nearby broods.

Fledging success: At ODSVRA, juvenile terns can 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 in the park at the Southern Exclosure, at Oso Flaco Lake, and any temporary daytime roosting areas that may become established. To collect additional information on banded tern juveniles dispersing off-site, staff reviews photographic records from off-site birder visits (eBird.org 2021). Staff also communicate 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 varied among years as follows: single day high counts for 1991-97 and 2000-01; a single day high count at Oso Flaco Lake for 1998; count method for 1999 unknown; and three-week interval day counts conducted from 2002-04 (chicks banded to site 2003-04). In 2005, 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.

ODSVRA considers plover chicks surviving to 28 days or older from the time of hatch as fledged (28 days after the hatch date, which counts as day zero). Staff identifies and records fledglings in the course of chick monitoring as described above. Prior to 2001, 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 (includes chicks fledged from unknown location nests).
>
> *Number of chicks fledging per nest*: Total number of chicks fledging divided by total number of nests.
>
> *Productivity*: Number of least tern fledglings per breeding pair (consistent with the annual statewide California least tern report produced by CDFW). Number of snowy plover fledglings per breeding male (consistent with USFWS Pacific coast western snowy plover recovery plan).

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

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

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

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

Individually banded snowy plover adults provide the most accurate means to identify breeding population size but currently too few 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 if they could be associated with a new nest) and number of nests initiated the day after the high count. From 2009 to 2017, staff compiled numbers of color-banded adults confirmed breeding; staff adds any number of this group not accounted for on the same day high count, including nests or broods with unknown adults, to the same day high count for the

appropriate sex. Beginning in 2018, using a database query, staff created a more accurate method to determine high counts of unbanded males and females actively associated with a nest on any given day and a total number of uniquely banded males and females associated with a nest at any point in the season.

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

Least tern night roost: During the breeding season, terns may assemble in a night roost. Monitors record the night roost location and total numbers of individuals present as the terns arrive at dusk using a thermal infrared scope (Trijicon REAP-IR). On occasions monitors cannot see terns due to darkness after dusk, but terns are heard vocalizing as they arrive to roost. ODSVRA considers counts a minimum due to the inherent limited visibility of the night roost. It is typically too dark to distinguish between adults and juveniles.

Least tern use of freshwater lakes: Freshwater lakes can provide a source of prey fish in addition to the near-shore ocean. Surveying nearby small freshwater lakes documents tern use and gives a better understanding of local food resources; importantly, determining if lakes provide additional appropriately sized fish to feed chicks (chicks require fish small enough to be swallowed whole). Monitors conduct periodic surveys at Oso Flaco Lake (located on park property approximately 1.5 miles south of the middle of tern colony) during the season, do not monitor Dune Lakes (approximately 1.5 miles to northeast) on private property with no access, and no longer monitor Cypress Ridge Lake (approximately 3.2 miles to northeast) because of terns' absence since 2013. However, staff monitors the tern colony in the Southern Exclosure daily and observations of adults in flight provide information about the direction of foraging sources and, occasionally, fish size.

Wind speed monitoring

Since 2011, ODSVRA monitors wind speed from a tower (S1 wind tower) located approximately 360 feet east of 6 exclosure with a recording anemometer at a height of 10 meters. When gaps exist in data available from the S1 wind tower, staff access information from a nearby National Oceanic and Atmospheric Administration (NOAA) marine buoy weather station, but this was not necessary for 2021.

Predator activity

Monitoring predator activities: Park staff and contractors (Wildlife Innovations, California Wildlife Services, and Point Blue) collect information on predator presence at ODSVRA from February 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, as possible, species, type of sign, behavior, duration of observation, direction of travel, and characteristics that may identify an individual.

Measures describing predator activity

Monitors record predator presence from 1 March to 10 September (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). 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. Human activity, with its associated food resources, attracts gulls, making them a subsidized predator. Staff perform general monitoring of gulls around the Southern Exclosure and Oso Flaco to identify potential problem individuals. In addition, monitors count gull numbers at the trash dumpster area near marker post 2 two times per week in the morning on a Sunday and Monday when the trash dumpsters are usually full.

Nonbreeding season monitoring of snowy plovers

Beginning in 2009 and continuing through the 2020-21 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 southern shoreline riding area boundary; and
5) Oso Flaco (southern shoreline riding area boundary 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 fence around areas seasonally closed to visitors and posts signage. Staff may augment existing habitat with branches, woodchips, and wrack (surf-cast kelp). An active predator management program reduces disturbance and depredation by mammalian and avian predators. Under select circumstances, 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 2021, ODSVRA took selective eggs to the Santa Barbara Zoo, took nonhatching eggs to the Santa Barbara Museum of Natural History, 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).

Informational signage and enforcement of regulations
Staff places interpretive panels and signs at public access points, at bathrooms, on A-frame placards near winter plover flocks, and to identify closed areas during the breeding season, which serve to increase public awareness of threats to nesting terns and plovers. The public can access a low wattage radio station (1620 AM) with a repeated recording of park information, including information about protection of sensitive species. Park ranger staff enforce park regulations enacted to protect terns and plovers.

Seasonal closure and fencing
Every year from 1 March through 30 September, ODSVRA closes portions of the park to vehicle and/or pedestrian use with wire mesh or symbolic fencing. The wire fencing of the Seasonal Exclosure (see Site Description section and details below), provides a higher level of protection when compared to nonpredator fencing (unburied, larger mesh size, and lower in height) and symbolic fencing (composed of rope with signs) to keep visitors and coyotes from entering sensitive areas. When nesting occurs outside of the Seasonal Exclosure, staff may choose an alternative wire exclosure type with consideration for the species, topography, proximity to recreational activities, predator threats, and duration of disturbance to the area during exclosure construction.

ODSVRA uses the following fencing and exclosure types:

Seasonal Exclosure protected area (within Southern Exclosure and North Oso Flaco): ODSVRA encloses with wire mesh fencing this approximately 270-acre area during the nesting season to limit vehicle and human trespass into protected nesting and brood-rearing habitat. Wire fencing five feet high (bottom eight inches buried) with two-inch by four-inch mesh discourages coyote entry. For the purposes of this report, this type of buried wire fence is referred to as "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.

The Seasonal Exclosure fencing, as described above, was installed 1 March 2021 and removed 1 October at the end of the nesting season. One layer of nonpredator fencing, unburied, was then installed on 9 October in the same general footprint of the 2021 Seasonal Exclosure outer boundary. The nonpredator fencing is effective to keep the public out, but does not exclude coyotes from entering, and therefore is not used as a viable option to protect plovers and terns during the nesting season. The western shoreline portion of the fence was not installed because it would most likely be damaged during winter storms and high surf. The shoreline at marker post 6 and at the south end of North Oso Flaco was identified as the boundary of a closed area using symbolic rope fencing and tall posts as described below.

Symbolic fencing

Rope fencing used in several areas of the park temporarily or seasonally protects 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 exclosure.

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 marker post 6 and the south end of North Oso Flaco, clearly designate a closed shoreline to visitors for the nesting season from March to October.

Foredune closure shoreline and alleyways:
On 8 April 2021, ODSVRA closed the shoreline west of the Foredune closure to the public to protect snowy plover broods during the breeding season. Rope fencing with posts and signs extended into the intertidal area to designate a closed shoreline and wire fencing closed off the alleyways on the east side (not maintained as predator fencing) (see Figure C.5 in Appendix C). On 8 September, the shoreline area opened to the public due to the absence of broods and long after all nests had hatched.

South Oso Flaco:
Symbolically fencing approximately 1.2 miles of nesting and brood-rearing habitat in South Oso Flaco identifies the closure area (lower shore remains open to public). 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, posts and signs close a small area around Arroyo Grande Creek and lagoon from 1 March to 30 September for the nesting season. ODSVRA removes the symbolic fence on 1 October, opening it to pedestrian use during the non-nesting season from October through 28 February, but posts and signs remain in place to restrict vehicle use year-round.

Open riding area:
Nest protection in the open riding area in 2021 consist of symbolic rope fencing and signs initially when monitors discover a nest, followed by a single nest wire exclosure (nonpredator fencing). Staff removes fencing once nesting activity ceases or the brood moves outside the fencing.

Nonpredator fencing: Staff installs a large wire exclosure (unburied and not predator proof) to provide a closed buffer area around any least tern or snowy plover nest found in the open riding area. Dependent on species, nests receive a minimum nest buffer from the open riding area of 984 feet (300 meters) for tern nests and 492 feet (150 meters) for plover nests. (From 2016-20, single nest exclosures, with predator fencing, were used to provide a minimum radius of 328 feet [100 meters] for tern nests and 100 feet for plover nests; prior to 2016, a tern single nest exclosure had a minimum radius of 100 feet.) Because of the large size, staff often attaches the nonpredator fencing to adjacent fenced closed areas (such as the Seasonal 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 exclosure. Park staff vehicles are allowed in the closed buffer areas for daily monitoring tasks, fence maintenance, and to respond to emergency situations.

10-foot by 10-foot exclosure, circular exclosure, and mini-exclosure: Staff selectively uses a small circular or one of two small square nest exclosures (made of two-inch by four-inch wire predator fencing) around individual snowy plover nests inside or outside of seasonal fencing for protection from predators, including roosting gull flocks. Permitted monitors use different exclosures based on a variety of factors including, but not limited to, weather, topography, predator threats, and proximity of young broods. Staff closely monitor nests within smaller exclosures since there may be an increase in abandonment due to predation on adult plovers attending the nests or a higher risk that sand accumulating inside the fencing during high wind events buries eggs.

Staff builds the 10-foot by 10-foot exclosure (available for use since 2003) and seven-foot-diameter circular exclosure (used since 2012) with five-foot-high sides with the bottom eight inches buried when located outside of the Seasonal Exclosure. As an experiment, permitted staff employed a small number of five-foot-diameter circular exclosures with four-foot-high sides, unburied, for nests in the Seasonal Exclosure or Foredune closure for the early season of 2021, but discontinued use. Plastic netting, with 1/2-inch by 1/2-inch mesh, covers the top and protects against avian and climbing mammalian predators. Since 2014, ODSVRA prefers using the seven-foot-diameter circular exclosures around nests.

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

Bumpout: A nest in the Southern Exclosure, Foredune closure, or vegetation 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) of the open riding area receive a bumpout, regardless of the protected area found. (From 2016-20, tern nest minimum buffers equaled 328 feet [100 meters] and prior to 2016, tern nest minimum buffers equaled 100 feet.) Snowy plover nests in the Southern Exclosure and Foredune closure receive a bumpout when within 100 feet of the open riding area. Plover nests in revegetation areas receive a bumpout when within 492 feet (150 meters) of the open riding area (prior to 2021, plover minimum bumpouts equaled 100 feet). 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 create these bumpouts using wire fence (unburied) or symbolic rope, thus they are not predator proof. Sometimes staff excloses 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 Seasonal Exclosure fence.

Habitat enhancement

Following the nesting season of 2020, and for the five-month period October through February, camping, street-legal vehicles, and off-highway vehicles were allowed to use large portions of the Southern Exclosure. This recreational use results in large areas of flattened terrain and barren sand, with very limited scattered natural debris and vegetation.

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

Wrack and talitrids: Results from studies conducted by Drs. Jenny Dugan and Mark Page, researchers from the Marine Science Institute at the University of California Santa Barbara, showed greatly depressed invertebrate populations on the Southern Exclosure shoreline during the five months when open to

recreational vehicle use (October through February). The studies also showed that invertebrates cannot effectively recover species diversity and abundance on the Southern Exclosure shoreline in the following seven-month seasonal closure (March through September).

ODSVRA collects wrack in the open riding area and disperses it in the Southern Exclosure. Collection and distribution occur by hand and relocation by truck and trailer. In addition to providing cover, wrack on the shoreline provides a food resource supporting invertebrates, which in turn become prey for plover chicks, juveniles, and adults. Staff collects talitrids (commonly called beach hoppers) from outside the vehicle use area north of Grand Avenue and from South Oso Flaco, taking care to not deplete talitrid numbers from collection sites. Inoculating the wrack addition areas of the Southern Exclosure shoreline with talitrids establishes a breeding population, thus increasing the food resources available for plover chicks and juveniles during the breeding months. Amount of wrack and talitrids collected and dispersed varies from year to year depending on availability of materials and amount of invertebrates found, as well as allowable staff time.

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

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

Predator management

In addition to preventative measures such as fencing, single nest wire exclosures, and cover provided by habitat enhancement, park staff removes animal carcasses (which attract scavengers) in or adjacent to nesting and brood-rearing habitat and 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. Wildlife Innovations also experimented hazing avian predators using a powerful green laser on a limited number of occasions. When ODSVRA requires additional options for managing predators, Wildlife Innovations performs selective live-trapping and relocation of avian predators and California Wildlife Services conducts lethal removal of mammalian and avian predators (see section titled Predators and predator management on page 48 for additional information).

Selective collection and transfer of abandoned chicks and potentially viable eggs

Under select circumstances, ODSVRA staff collects abandoned but potentially viable eggs or chicks. Monitors consider if disturbance factors from visitors or park management efforts contribute 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 exclosure such as a circular exclosure, with suspected adult mortality; or abandoned eggs or chicks from a nest near the park's two-inch by four-inch exclosure fencing which can increase windblown sand deposition on the nest. First, monitors 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 transport the eggs to an approved facility for captive-rearing. For collected abandoned chicks, staff may first attempt to reunite them with their associated adults; if not possible, staff transports them to an approved facility for captive-rearing. Staff use a portable brooder during transport to maintain an appropriate temperature for the collected eggs or chicks, as directed by the rehabilitation trained

staff, or may use a portable hand warmer in the field while awaiting a brooder. 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 2021, least terns were first seen at ODSVRA on 29 April with one flying over the exclosure, and from 7 May onward terns were seen or heard daily. The last sighting was of a single adult over the Southern Exclosure on 27 August. During the previous 19 years, first sightings occurred between 8 April and 15 May (median=4 May) and last sightings occurred between 10 August and 28 September (median=9 September). 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 2021, there was a known minimum of 50 breeding pairs and an estimated maximum of 52 pairs, with 50 nests and broods active at the same time on 2-6 July. This is higher than both the 35-42 pairs in 2020 and the average of 40-43 pairs (range=23-60) for the 16-year period 2005-20 (Table 1, Figure 3).

Number, clutch size, and distribution of nests

There was a total of 53 nests, with the first nest initiated approximately 31 May and the last 4 July (Appendix A). During the 19-year period 2002-20, 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 52 nests with known complete clutch size, 11 had one egg, and 41 had two eggs, with an average clutch size of 1.79 eggs. This compares to an average of 1.87 for 2005-20 (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 52 nests with known location, 35 (67.3%) were in 6 exclosure and 17 (32.7%) were in 7 exclosure. In 2020, 27 (57.4%) and 20 (42.5%) were in 6 and 7 exclosure, respectively (Figure 4).

Clutch hatching rate

Of the 53 nests, 49 hatched and the clutch hatching rate for known location and fate nests was 94.1% (48/51) (Table 2). This compares to an average hatching rate of 83.3% (range=64.7-97.8%) for known location and fate nests during the 16-year period 2005-20 (Table 1). In 2021, the hatching rate was 97.1% (34/35) in 6 exclosure and 87.5% (14/16) in 7 exclosure. Fifty-six chicks hatched from a minimum of 62 eggs in 6 exclosure, 23 chicks hatched from a minimum of 31 eggs in 7 exclosure, and two chicks hatched from a minimum of two eggs from an unknown location nest. Of the four nests not known to hatch, three were lost due to abandonment (one post-term and two unknown if pre- or post-term) and one had an unknown fate (Appendix A).

Table 1. Nesting success of California least terns at ODSVRA from 1991-2021.

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 2006-21.

Year	Estimated no. breeding pairs	No. nests (no. known location and fate)	No. hatched nests (no. known location and fate)	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	0.60	0.65-0.73
1999	28-31	34 (31)	22 (22)	71	42	40	17	0.50	0.55-0.61
2000	4-5	5 (5)	4 (4)	80	8	50	4	0.80	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	0.40	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	1.20	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	1.00	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

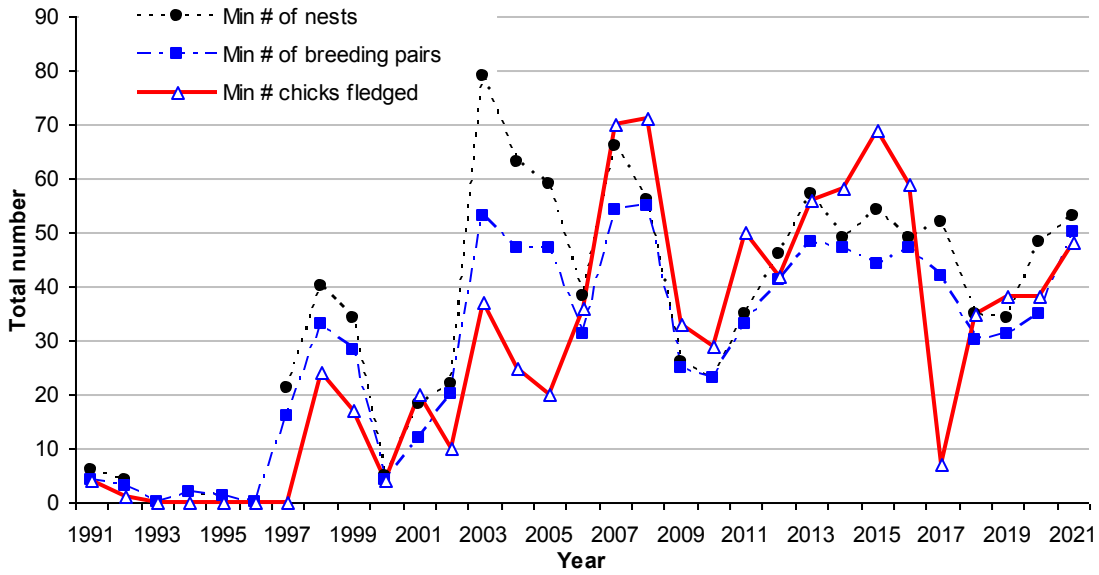

Figure 3. Number of California least tern nests, pairs, and fledglings at ODSVRA from 1991-2021.

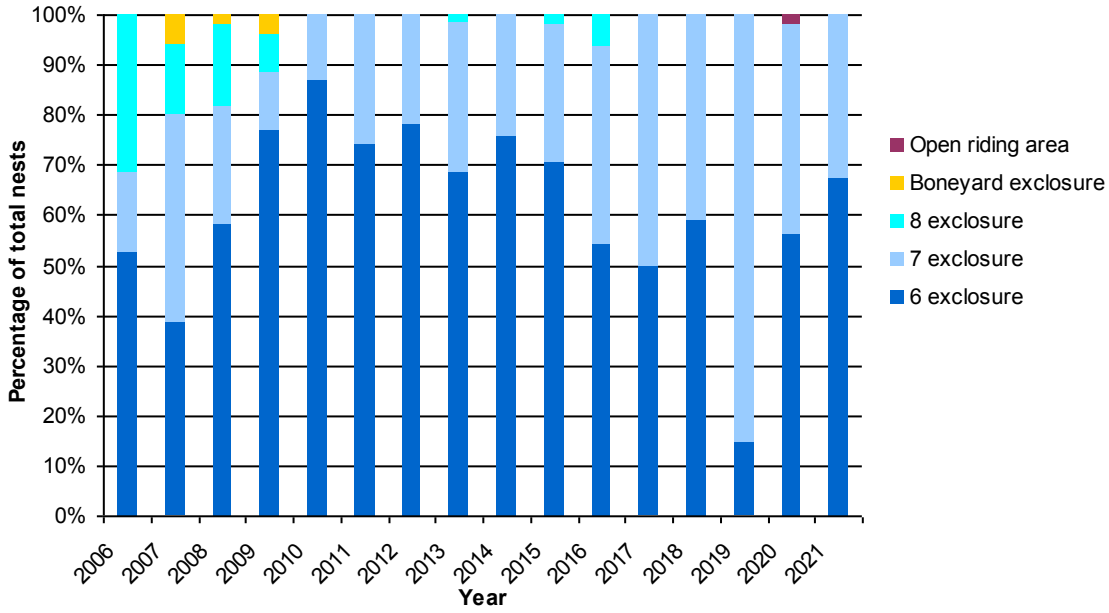

Figure 4. Distribution of known location California least tern nests as a percent of total nests at ODSVRA from 2006-21.

Table 2. Causes of California least tern nest loss at ODSVRA from 2002-21.
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				5	2		1					14
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
Total 2002-21	**50 32.5%**	**26 16.9%**	**22 14.3%**	**5 3.2%**	**29 18.8%**	**6 3.9%**	**1 0.6%**	**6 3.9%**	**2 1.3%**	**1 0.6%**	**5 3.2%**	**1 0.6%**	**154**

Chick fledging rate, juveniles produced per pair, and juvenile length of stay on-site
In 2021, fifty-seven of 81 hatching chicks were banded, with the majority receiving an individual color combination unique for the year. Forty-eight of the 81 chicks were seen when 21 days old or older for a fledging rate of 59.3%. The fledging rate for banded chicks was 75.4% (43/57) and 20.8% (5/24) for unbanded chicks (Appendix A). The 59.3% fledging rate for all chicks in 2021 compares to an average of 73.1% (range=17.9-90.9%) during the previous 15-year period 2006-20, when most chicks were banded to individual. In 2021, 50.0% (16/32) of the two-chick broods fledged both chicks. This compares to an average of 54.5% (range=0-86.4%) of 376 two-chick broods fledging both chicks during the previous 15 years, 2006-20. In 2021, the estimated number of fledglings produced per pair ranged from 0.92-0.96 and compares to an average of 1.11-1.18 for the previous 15 years (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 exclosure into the open riding area (two in 2010, by the same chick on the same day; one in 2011; two in 2013; and one in 2015). These chicks were monitored and directed back into the exclosure. From 2016-19, there were no known such occurrences. In 2020, ODSVRA was closed to public vehicle use and camping on 28 March due to COVID-19 and remained closed for the least tern nesting season. Unlike previous years, and due to the decrease in recreational activities in 2020, terns were seen roosting in the open riding area on a daily basis for the period of 2-24 July. This included chicks, juveniles, and adults in numbers ranging from one to 20. To protect and reduce disturbance to the roosting birds, close monitoring of terns in the open riding area occurred daily. In 2021, the park was open to camping and public vehicle use and least tern nests were

provided a 984-feet (300-meter) buffer closed from any public use (closed buffer area). There were no known occurrences of chicks moving outside of the closed buffer area and into the open riding area, but chicks were seen entering the closed buffer area from the Southern Exclosure on three occasions. On two occasions, one chick returned to the Southern Exclosure without direction. On the other occasion, one chick was picked up and placed back inside the Southern Exclosure.

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 method[1]. 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 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 2021, only 2.4% (1/42) of color-banded juveniles were confirmed remaining at ODSVRA for 21 days or longer post-fledging. This is much lower than the average of 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 16-year period 2006-21.

During this period, 662 color-banded fledglings (21 days old or older) were tracked at ODSVRA (sightings outside the park are not included). Numbers in parentheses are percentages of all banded fledglings for the year. Data for 2021 excludes one ODSVRA banded juvenile found dead on-site and not sighted post-fledge.

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 post-fledge
2006	3 (9%)	9 (26%)	7 (20%)	12 (34%)	4 (11%)	0 (0%)
2007	9 (14%)	13 (20%)	15 (23%)	18 (28%)	9 (14%)	1 (2%)
2008	12 (18%)	29 (43%)	16 (24%)	11 (16%)	0 (0%)	0 (0%)
2009	3 (10%)	14 (48%)	8 (28%)	3 (10%)	1 (3%)	0 (0%)
2010	3 (11%)	4 (14%)	14 (50%)	7 (25%)	0 (0%)	0 (0%)
2011	2 (4%)	5 (10%)	9 (18%)	31 (63%)	2 (4%)	0 (0%)
2012	3 (9%)	7 (20%)	11 (31%)	12 (34%)	2 (6%)	0 (0%)
2013	5 (10%)	12 (23%)	25 (48%)	10 (19%)	0 (0%)	0 (0%)
2014	2 (5%)	7 (17%)	18 (43%)	14 (33%)	1 (2%)	0 (0%)
2015	12 (21%)	10 (18%)	21 (38%)	10 (18%)	1 (2%)	2 (4%)
2016	22 (39%)	9 (16%)	19 (34%)	5 (9%)	1 (2%)	0 (0%)
2017	0 (0%)	3 (60%)	1 (20%)	1 (20%)	0 (0%)	0 (0%)
2018	3 (9%)	5 (15%)	13 (39%)	4 (12%)	8 (24%)	0 (0%)
2019	4 (12%)	16 (50%)	10 (31%)	2 (6%)	0 (0%)	0 (0%)
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%)
Total 2006-21	115 (17%)	171 (26%)	202 (31%)	142 (21%)	29 (4%)	3 (0%)

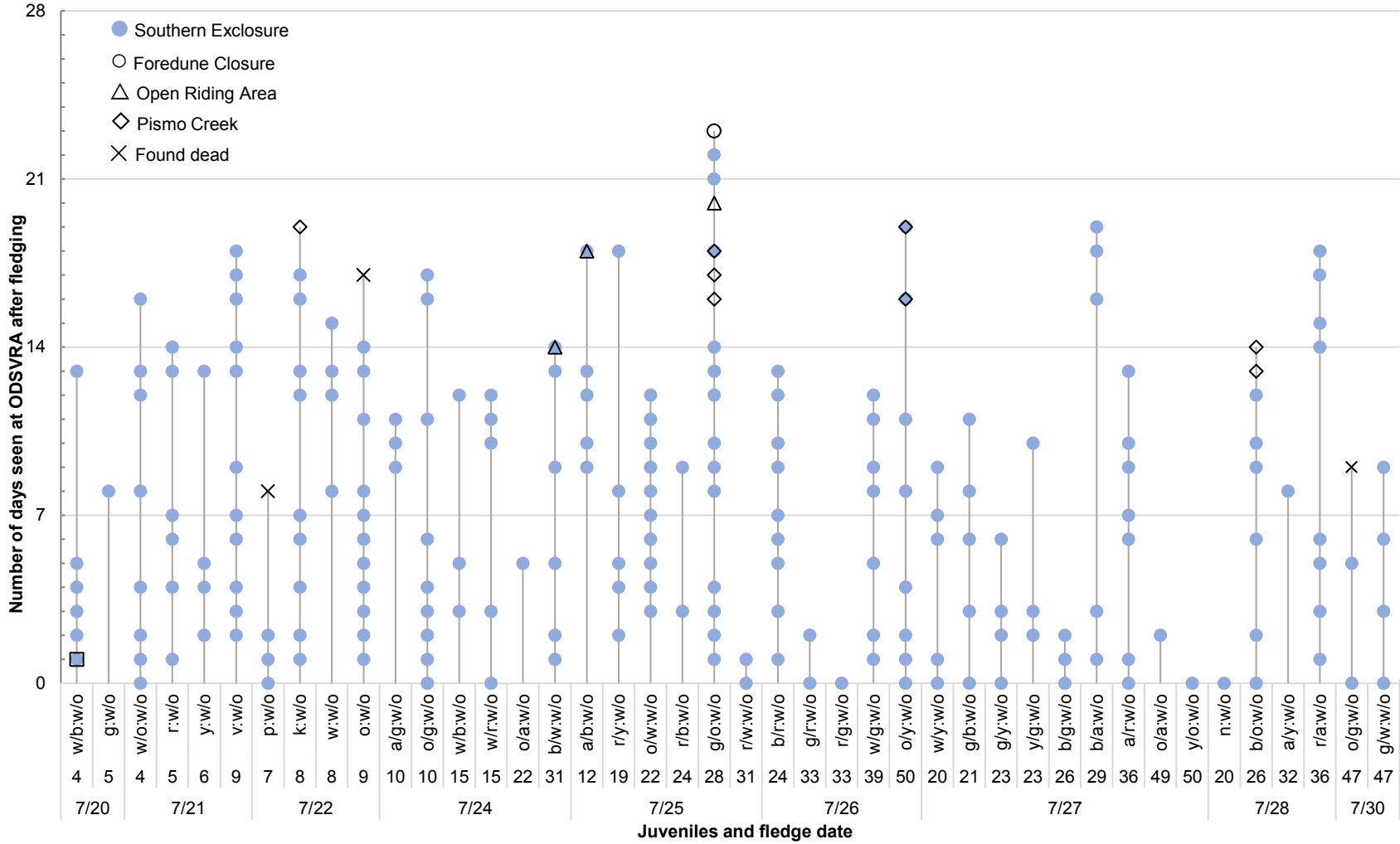

Figure 5. Number of days California least tern juveniles that hatched at ODSVRA in 2021 continued to be seen on-site after reaching fledge age (21 days old).

The horizontal axis provides the nest number from which each fledgling hatched and the date it fledged. The last date for three sets of two individuals with the same combination (6 individuals) determined from sightings with unique banded siblings, simultaneous sightings of two birds with the same combination, or confirmed death of one followed by sighting of the second. Two juveniles banded o/a:w/o seen simultaneously on 29 July and one (unknown origins) depredated on 6 August. Excludes one ODSVRA banded juvenile found dead on-site and not sighted post-fledge.

Injuries, mortality (other than eggs), and carcasses collected or observed
In 2021, there were three terns observed with injuries: a chick, juvenile, and adult. Details of the injuries are provided in Table H.1 in Appendix H. There was a minimum of 21 documented least tern mortalities (other than eggs) at ODSVRA in 2021. Twelve of the 21 mortalities were the results of predation or potential predation. Predators involved were peregrine falcon (*Falco peregrinus*) (peregrine) (one chick or juvenile and two juveniles), owl (three adults), northern harrier (*Circus hudsonius*) (harrier) (one chick or juvenile and one juvenile), suspected peregrine (one juvenile), and unidentified species (two chicks and one juvenile). Necropsy results of two of the chicks showed acute crush trauma and other injuries that could have been a result of predation. Documented mortality other than predation was six chicks, two juveniles and one adult. For carcasses that received a necropsy, reports are attached if available at the time of this report. Details of the carcasses 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 2021 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 15 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 (located in park) by ODSVRA banded adult and juvenile terns has been very low. Conditions at Oso Flaco Lake appeared poor the last three years, with an increased amount of algae growth on the lake's surface, and the few adults seen fishing had poor success. In 2021, terns were observed for the first time at multiple ponds of Monarch Dunes Golf Club (4.3 miles southeast). 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 non-park staff. Monarch Dunes Golf Club was surveyed in response to a non-staff report of tern use and three terns (two adults and one juvenile) were observed on 28 July. Surveys were limited due to difficulty to access ponds. From 2019-21, tern use of Oso Flaco Lake in the later part of the season has been much reduced compared to most previous years and no banded juveniles were documented during this period.

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 2021, there was a minimum of 52 banded adults with known origin documented at ODSVRA. Fifty of these birds were identified as banded at ODSVRA as chicks (banding began in 2003), and two were from birds banded as chicks in 2018 and 2019 from VSFB. Breeding was documented for a minimum of 31 banded adults and this is likely a substantial underestimate. At least 14 of the 31 adults were banded as chicks at ODSVRA, one was banded as a chick from VSFB, and the complete color combinations of the other 16 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 2012-21 (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. The oldest confirmed breeding adults at ODSVRA were two 11-year-old terns (w/b:b/y and w/b:w/g, both banded as chicks at ODSVRA in 2010) seen in 2021.

Least terns banded at other sites and seen at ODSVRA
From 2011 to 2021 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, an adult banded s:b was seen on 9 July and at least one adult banded s:b was documented breeding at ODSVRA in 2021, seen from 7 June to 8 August. In 2019, all VSFB chicks were banded s:r and at least one adult banded s:r was seen 17 July and 3 August in 2021 (Table D.1 in Appendix D).

Least terns banded at ODSVRA seen at other sites

In 2021, there were two-three least terns, banded as chicks at ODSVRA, documented at sites other than ODSVRA. An adult banded g/y:b, fledging from ODSVRA in 2017 or 2018, was seen at Ocean Park in Lompoc at the Santa Ynez River Estuary, Santa Barbara County, and a juvenile(s) banded w/b:w/o from either LT4 or LT15 nest was seen at Monarch Dunes Golf Club in Nipomo, San Luis Obispo County, and the San Diego Bay National Wildlife Refuge in Chula Vista, San Diego County (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. Surveys of the night roost were conducted on 97 days between 7 May-26 August in 2021. The night roost was located in the closed buffer area east of mid 6 exclosure. Counts at the night roost are minimums, as some or all birds would often arrive after it was too dark to count individuals. In 2021, there was a high count of 93 birds at the night roost on 12 June (Figure 6). This compares to an average night roost high count of 59 (range=35-95) from 2007-20. Both adults and juveniles were seen but it typically was too dark to distinguish plumage and age class.

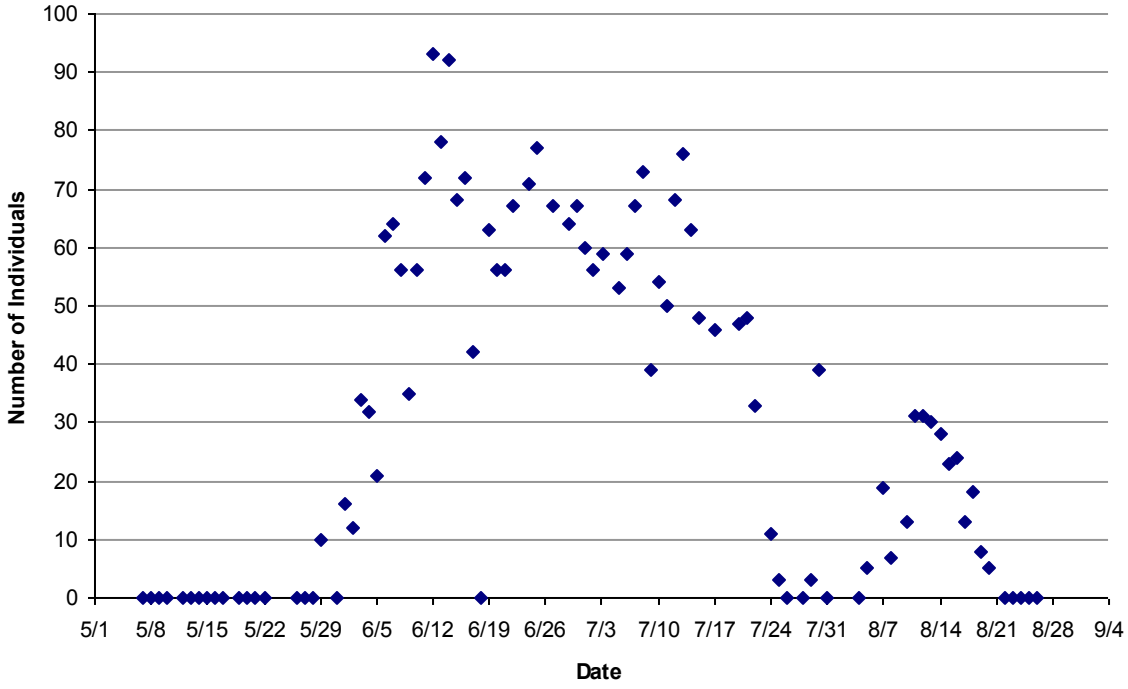

Figure 6. Number of California least terns counted at the ODSVRA night roost in 2021.
First survey on 7 May and roost first detected on 29 May.

Importance of ODSVRA least tern breeding colony

The ODSVRA least tern breeding colony has benefited from the increased level of protection and management actions provided since 2002. The colony is important in meeting statewide recovery goals as loss of breeding habitat has resulted in a fragmented population distribution and a limited number of remaining breeding sites (USFWS 1985, 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, all sites have management providing protective measures and monitoring. ODSVRA is the only site in San Luis Obispo County. Rancho Guadalupe Dunes Preserve (RGDP, referred to as Rancho Guadalupe Dunes County Park in previous CDPR reports), 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 18-year period 2004-21, ODSVRA produced a minimum of 784 juvenile terns while RGDP, VSFB, and COPR combined reported a range of 302-307 juveniles. In 2021, ODSVRA produced 48 juveniles compared to RGDP (no breeding), VSFB (8 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 2004-21.

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

	ODSVRA			RGDP, VSFB, and COPR combined	
Year	Est. no. breeding pairs	No. juveniles		Est. no. breeding pairs	No. juveniles
2004	47-55	25		15	0
2005	47-53	20		48	1
2006	31-35	36		7	7
2007	54-60	70		23	17
2008	55-56	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
Total juveniles produced		**784**			**302-307[1]**

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

WESTERN SNOWY PLOVER

Number of breeding adults

In 2021, there was a minimum of 195 breeding adults (107 males and 88 females) and of these 86 were banded with known origin. This is an increase of 2.6% from a minimum of 190 breeding adults in 2020 and compares to a range of 32-226 adults (average=149) for the 19-year period 2002-20. The average minimum number of breeding adults for the last five years (2017-21) is 197, increasing slightly to 200 for the last three years (Table 5, Figure 7)

Beginning in 2005, the USFWS has coordinated a rangewide window survey count of the U.S. Pacific coast breeding population of the snowy plover between the second half of May and first week of June. In 2021, the survey at ODSVRA counted 116 adult plovers (49 males, 53 females, and 14 of unknown sex), 59% of the minimum number documented for the entire season by known breeding activity. In 16 of the 17 years from 2005-21, the window survey count at ODSVRA was lower than the minimum number of breeding birds (54-95% of minimum number). It was higher (107%) than the minimum number in 2008. For the entire 17-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 20-year period 2002-21.

Year	Min. no. breeding adults	Min. no. breeding males	No. fledglings	No. fledges per breeding male[1]
2002	32	18	35	1.94
2003	84	52	107	2.06
2004	121	67	66	0.99
2005	116	65	82	1.26
2006	107	58	17	0.29
2007	79	47	66	1.40
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
Average for 20-year period 2002-21	151	84	121	1.43
Average for 5-year period 2017-21	197	109	144	1.34
Average for 3-year period 2019-21	200	112	115	1.02

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

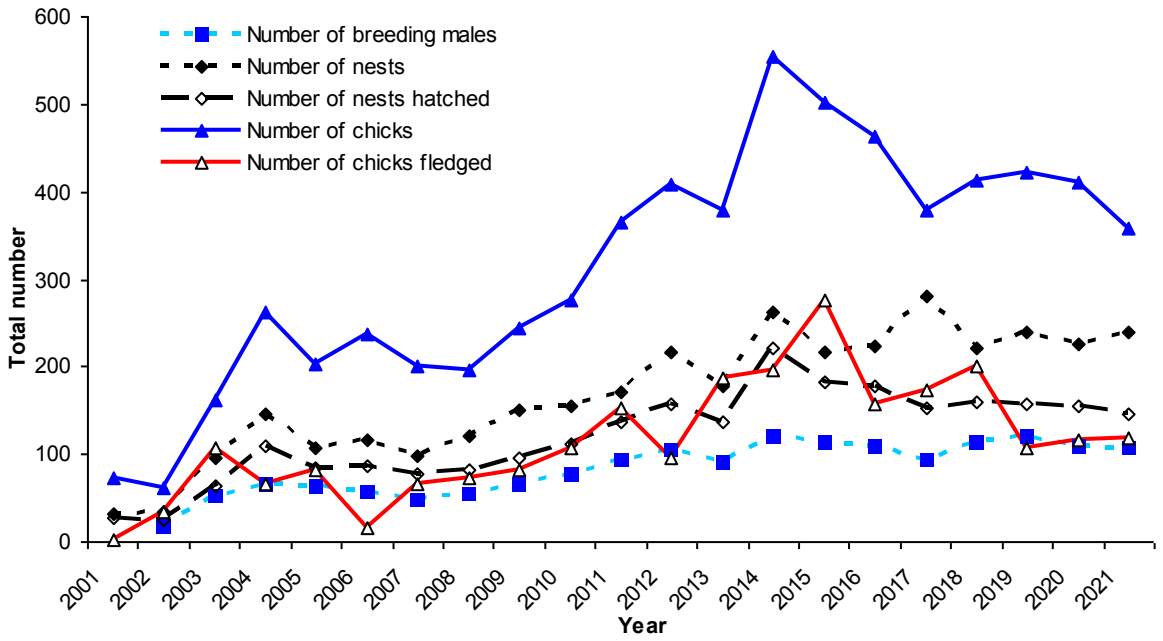

Figure 7. Number of snowy plover breeding males, nests, nests hatched, chicks, and chicks fledged at ODSVRA from 2001-21.

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 2005-21.

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%

Number and distribution of nests

There were 239 known nesting attempts, including 16 with unknown nest location, initiated between 21 March–10 July (Appendix B, see section titled Assignment of broods to nests in the Monitoring and Management Action section for unknown nest location description). Of the 223 nests from known locations, 132 (59.2%) were in the Southern Exclosure, 12 (5.4%) in North Oso Flaco, 17 (7.6%) in South Oso Flaco, 48 (21.5%) in the Foredune closure, 4 (1.8%) in the open riding area, 7 (3.1%) in the closed buffer area, one (0.4%) in Dunes Preserve approximately 2,300 feet north of the Foredune closure, one (0.4%) in Eucalyptus Tree revegetation area approximately 650 feet east of 6 exclosure, and one (0.4%) in Bigfoot revegetation area approximately 400 feet east of Foredune Central. More specifically for the Southern Exclosure, there were 61 nests in 6 exclosure, 43 in 7 exclosure, 21 in 8 exclosure, and seven in Boneyard exclosure. The total number of nests found outside the Southern Exclosure and Oso Flaco for the 19-year period 2001-19 was 32 and averaged 1.7 nests per year (range=0-7). This compares to 2020 and 2021 when 47 and 62 nests, respectively, were outside the Southern Exclosure and Oso Flaco. The maximum number of known location nests active at one time was 78 on 4 June, with the highest number in 6 exclosure (21 nests) (Table 7, Table 8, Figure 8, Figure 9, Appendix C, Table F.1 in Appendix F).

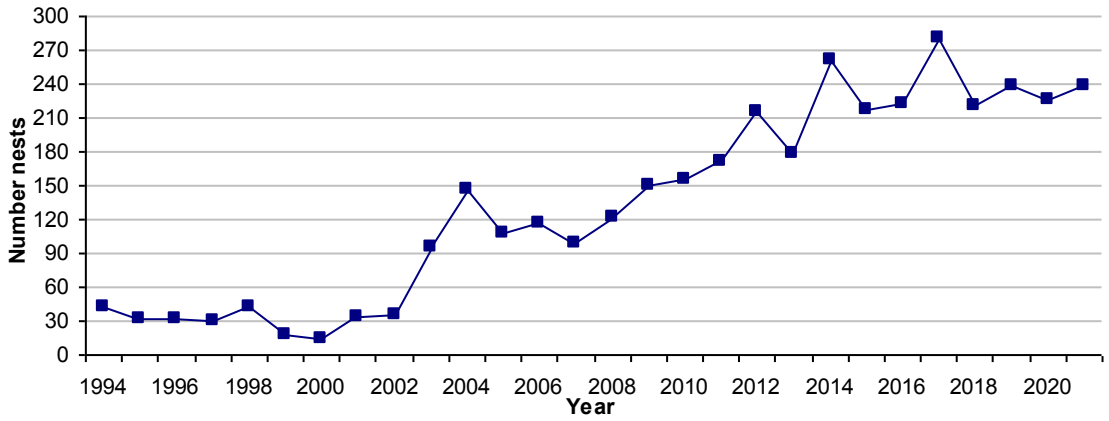

Figure 8. Number of snowy plover nests at ODSVRA from 1994-2021.

Table 7. Snowy plover nest distribution and success at ODSVRA in 2021.

Excludes 16 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	61 (59)	172	42	71.2
7 exclosure	43 (41)	117	23	56.1
8 exclosure	21 (21)	58	9	42.9
Boneyard exclosure	7 (7)	20	0	0.0
TOTAL SOUTHERN EXCLOSURE	**132 (128)**	**367**	**74**	**57.8**
Oso Flaco				
North Oso Flaco	12 (12)	33	6	50.0
South Oso Flaco	17 (17)	44	5	29.4
TOTAL OSO FLACO	**29 (29)**	**77**	**11**	**37.9**
Other				
Foredune closure	48 (48)	140	36	75.0
Closed buffer area	7 (7)	18	4	57.1
Open riding area	4 (4)	11	2	50.0
Dunes Preserve	1 (1)	3	1	100.0
Bigfoot reveg. area	1 (1)	3	1	100.0
Euc. Tree reveg. area	1 (1)	3	0	0.0
TOTAL OTHER	**62 (62)**	**178**	**44**	**71.0**
GRAND TOTAL	**223 (219)**	**622**	**129**	**58.9**

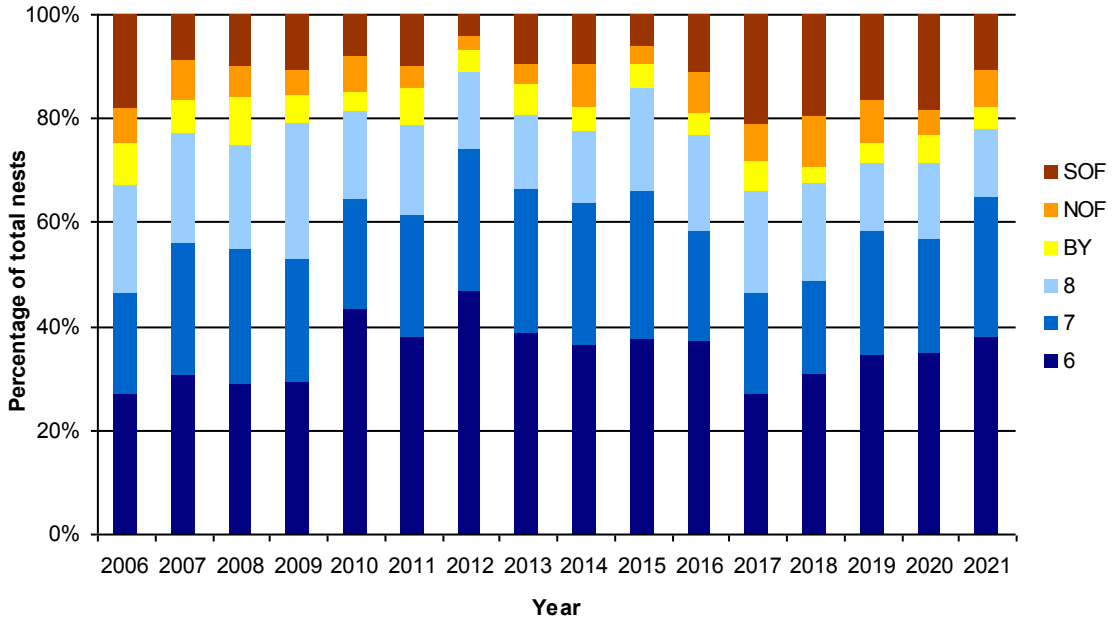

Figure 9. Distribution of snowy plover nests as a percent of total nests in the Southern Exclosure and Oso Flaco from 2006-21.

Includes all nest with known location in the Southern Exclosure and Oso Flaco. For the purpose of comparing to previous years, when nests were rarely found outside the Southern Exclosure and Oso Flaco, nests found in other areas were not included. 6 = 6 exclosure, 7 = 7 exclosure, 8 = 8 exclosure, BY = Boneyard exclosure, NOF = North Oso Flaco, SOF = South Oso Flaco

Table 8. Nesting success of snowy plovers at ODSVRA from 2001-21.

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 2001-21 is included as Table F.1 in Appendix F.

na = not available

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

Average clutch size, clutch loss, and nest hatching rate

There were 239 identified nesting attempts, including 16 known only by brood, and of these 145 hatched. For 206 nests with known complete clutch size (and excluding nesting attempts known only by brood) the average number of eggs was 2.89. This compares to the average of 2.90 eggs per clutch (range=2.86-2.96) for the 17-year period 2004-20. Excluding 20 nests (four with unknown fate and 16 detected by brood only), the nest hatching rate in 2021 was 58.9% (129/219). This compares to an average of 74.5% (range=60.9-86.2%) from 2002-20 (Table 8). The hatching rate in 2021 was higher in the Southern Exclosure (57.8%) than in Oso Flaco (37.9%), as has been the case in 18 of the previous 20 years (Table F.1 in Appendix F). The nest hatching rate for nests found outside the Southern Exclosure and Oso Flaco was 71% (44/62) (Table 7). In 2021, 96.7% (87/90) of nest loss was due to predation (54), wind (10), and nest abandonment (23). For the broader category of predation, documented avian predation accounted for 81.5% (44/54) of this loss, attributed to unidentified avian predator (23), harrier (11) and common raven (*Corvus corax*) (raven) (10) (Table 9, Table F.2 in Appendix F). Additionally, seven other nests, with hatched or abandoned pre-term fates, were partially depredated, including five eggs by harrier and four eggs by either unidentified or suspected predator (Appendix B). Twenty-eight abandoned potentially viable eggs from thirteen nests taken to Santa Barbara Zoo for captive-rearing and sixteen hatched (see Table F.4 in appendix F).

Table 9. Attributed causes of snowy plover nest loss at specific locations at ODSVRA in 2021.
Aband. = Abandoned, Euc. = Eucalyptus, reveg = revegetation

Area	Aband. pre-term	Aband. post-term	Aband. unknown pre- or post-term	Wind	Overwashed by tide	Failed, cause unknown	Unidentified predator	Unidentified Avian predator	Raven	Harrier	Coyote	Opossum
Southern Exclosure												
6 exclosure	4		1	2			1	6		3		
7 exclosure	3		1					7	2	4		1
8 exclosure	1			1			4	3		1	1	
Boneyard exclosure	1			1					2	3		1
TOTAL SOUTHERN EXCLOSURE	9		2	4			5	16	4	11	1	2
Oso Flaco												
North Oso Flaco	1					1	1	2	1			
South Oso Flaco	3		1	1		1	1	1	4			
TOTAL OSO FLACO	4		1	1		2	2	3	5			
Other												
Foredune closure	2	2	1	4	1			2				
Closed buffer area		1		1					1			
Open riding area	1							1				
Euc. Tree reveg. area								1				
TOTAL OTHER	3	3	1	5	1			4	1			
TOTAL ODSVRA	16	3	4	10	1	2	7	23	10	11	1	2

Snowy plover chicks in the open riding area

On 18 July, there were two chicks from one brood seen in the open riding area. The two 24- to 25-day-old chicks from the SP136 nest (hatched inside Foredune Central) were seen travelling in and out of the west portion of the Bigfoot revegetation area and open riding area. It is also suspected five chicks, from two known location nests, seen in the Bigfoot and the BBQ Flats revegetation areas on two days, may have traveled through the open riding area east of the Foredune closure to reach these areas. On 17 July, three chicks hatched from the SP187 nest on the Foredune Central shoreline and the banded chicks were seen in the Bigfoot revegetation area later the same day. On 22 July, two chicks from the SP139 nest (hatched inside Foredune North) were seen in the BBQ Flats revegetation area at 22 days old. In addition, on 17 July, three approximately one-day-old chicks were briefly seen in Bigfoot revegetation area; the chicks are from an unknown nest location (UNA3) and may have hatched from a nest within the revegetation area. Areas between the Foredune closure and these revegetation areas were closed to visitors 18-22 July using symbolic or wire fencing to protect broods (see map in Figure C.13 in Appendix C).

On 4 April, the SP15 three-egg nest was found in open sand at the southern end of Dunes Preserve, approximately 1,260 feet northeast of marker post 4 and adjacent to the open riding area. On 6 April, a bumpout was installed to provide a 492-foot (150-meter) buffer between the nest and the open riding area. On 27 April, chick fencing was installed around the nest with large openings left for the adults to easily access the nest. On 29 April, portions of the open riding area were temporarily closed, using symbolic fence and signs, to prepare a corridor of safe passage for the chicks. On 3 May, the nest had one egg with cracks and taps and two eggs with no cracks. All the openings in the chick fence were closed and sand ramps were created on the outside to allow the adults access to the nest but not allow chicks to exit. On 4 May, nest camera confirmed one chick hatched at 8:54 am and the chick remained at or close to the nest, attended by an adult, throughout the day and night. The two remaining eggs had no cracks (and no sign of fertilization in eggs when contents examined post season). On the morning of 5 May, park staff installed additional symbolic fencing to the corridor through the open riding area from the nest bumpout to the Foredune closure shoreline, to temporarily close the approximately 2,060-foot long area from all public access. The chick fencing around the nest was opened and the chick and two adults moved through the corridor (guided by park staff with permission from USFWS and CDFW) over a 45-minute period to reach the protected shore. On 6 May, the brood was seen on the Foredune closure shoreline and 6 exclosure shoreline. On 9 May, the chick was last seen on the 6 exclosure shoreline at 5 days old and did not fledge.

Chick fledging rate

Of the 359 snowy plover chicks hatched, 237 were banded and the fate of 122 unbanded chicks is believed known (Appendix B). Chick survival and fledging rates of unbanded chicks are obtained through a combination of intense monitoring of broods, banded associated adults, banded chick(s) in broods with unbanded chick(s), and banded broods present in the same area (reducing density of unbanded broods). Between 29 May–4 August, 5 unbanded broods (9 chicks) were observed on the Southern Exclosure, Oso Flaco, Bigfoot revegetation area, or Foredune closure shoreline and believed to be from known nests but could not be assigned to a particular nest (listed as UNA1-5 in Appendix B). Although these broods could not be assigned to a specific nest and location, all chicks were tracked and fledglings are included in totals. Additionally, there were 16 unbanded broods (38 chicks) observed on the shore and believed to be from nests that were not found. Seven of the 16 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 38.4% (91/237) and 23.0% (28/122) for unbanded chicks. The fledging rate for all chicks combined in 2021 was a moderate 33.1% (119/359) and follows two years of poor success (27.1% in 2019 and 28.5% in 2020). For comparison, there was an average fledging rate of 39.9% (range=7.4-66.0%) for the 17-year period 2002-18. For 2021, it is suspected that undocumented predation by harrier, peregrine, coyote, and possibly gull was an important factor in reduced chick survival. (Table 8, Table F.1 in Appendix F) (CDPR 2007-18).

In 2021, the early season had a slightly lower chick fledging rate (32.0%) compared to the late season (34.0%). In 13 of 19 years from 2003-21, 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 report for how early and late seasons were determined.) For all years in the 19-year period 2003-21, the average early season chick fledging rate (43.9%) was 12.5 percentage points higher than the average late season chick fledging rate (31.4%) (Figure 10, Figure 11, Figure 12).

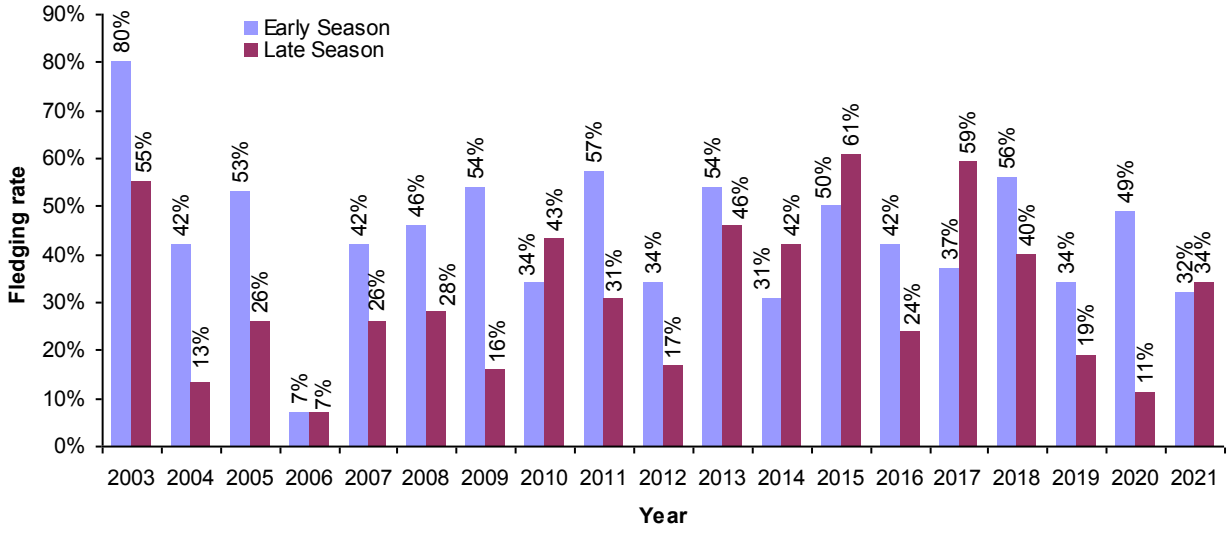

Figure 10. Fledging rate of chicks hatching in early season (prior to 20 June) and late season (20 June or later) at ODSVRA from 2003-21.

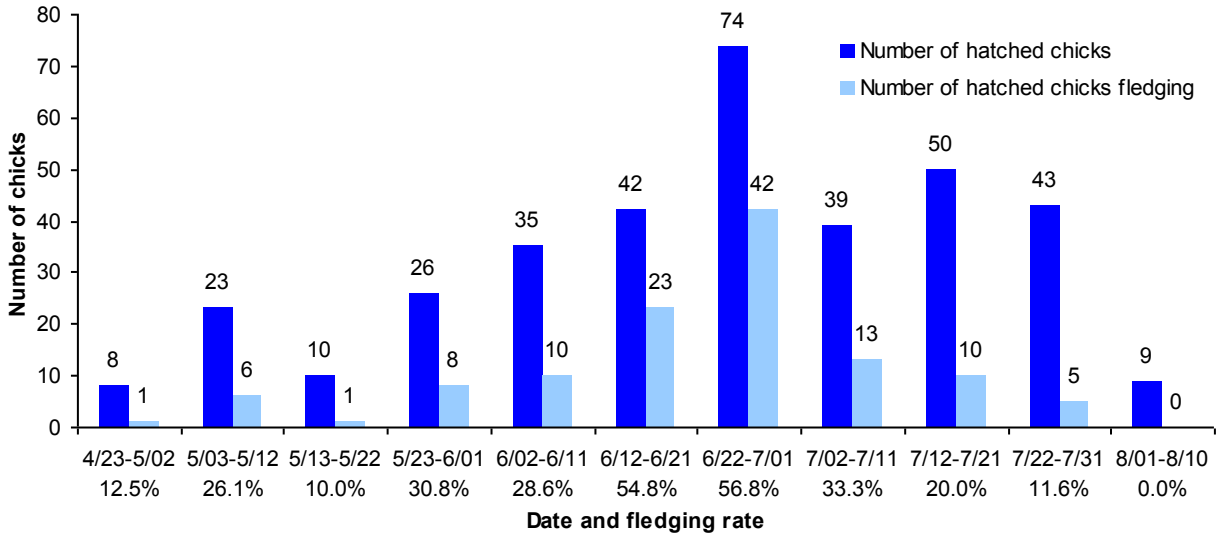

Figure 11. Number of snowy plover chicks hatching per 10-day period and number subsequently fledging at ODSVRA in 2021.

Includes all chicks with known fate (359). For broods that either originated from unknown location (38 chicks from 16 broods) or were not assigned to a specific nest (9 chicks from 5 broods) a hatch date was estimated within a 10-day period based on chick size.

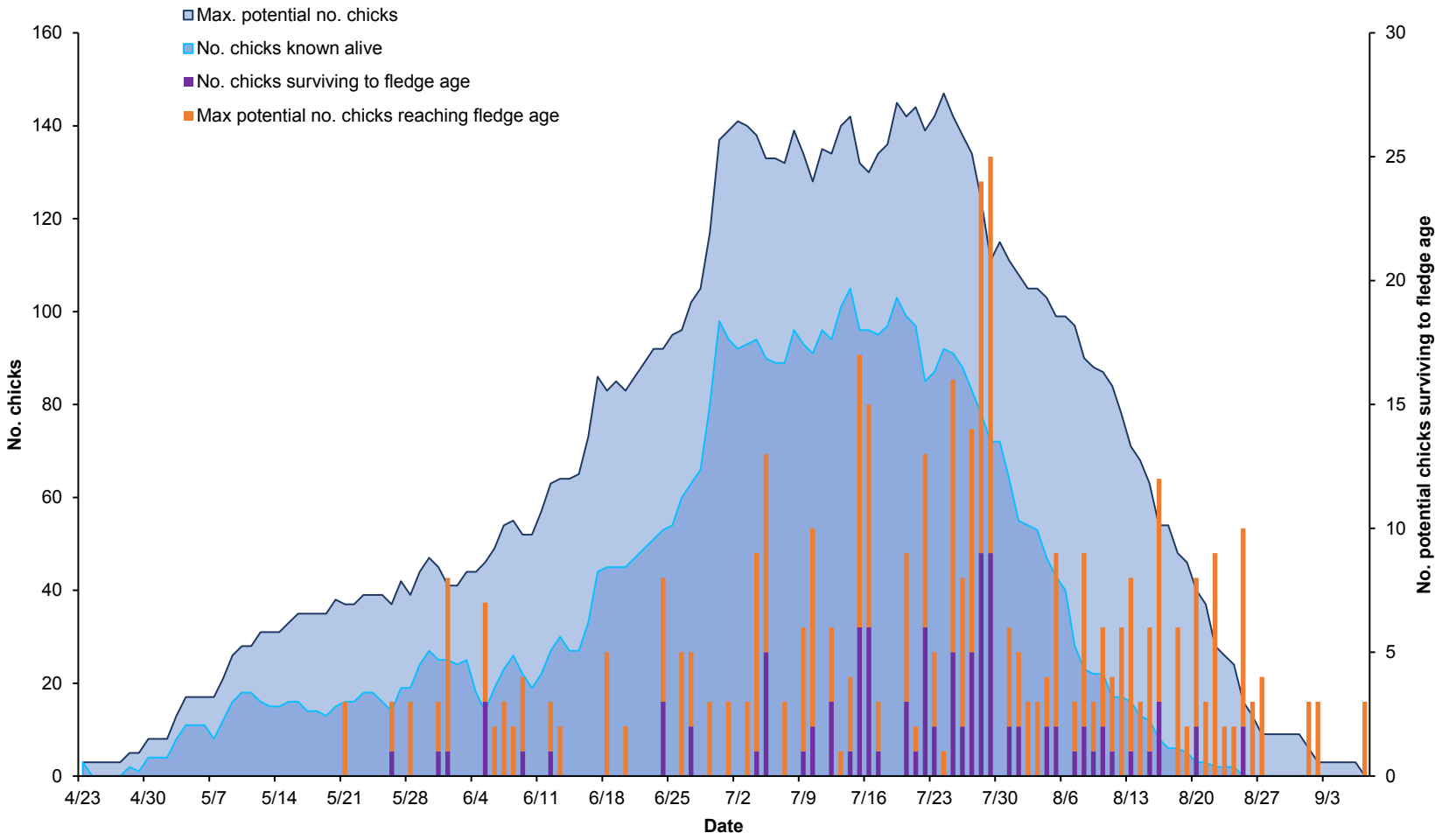

Figure 12. Chick survival and fledge rate from 23 April to 7 September at ODSVRA in 2021.

Of the total of 359 chicks hatching, 324 chicks (excludes 35 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 230 closely tracked chicks (217 banded and 13 unbanded chicks with banded siblings) from known location nests, 149 were believed lost. As has consistently been the case in previous years, chick loss measured in 5-day increments in 2021 was highest for very young chicks (0-4 days of age), accounting for 38.3% of total loss and at the lower end of the range 38%-64% (average=49%) from 2009-21 (Figure 13) (CDPR 2020). For 115 chicks reaching 16 days of age in 2021, the fledge rate was 70.4% (81/115). This is less than the average of 79% (range=71-93%) for the previous 12-year period 2009-20 and is lower than the results from a six-year (1977-82) study at Monterey Bay in Monterey County, California, that found at least 93% of the 124 chicks reaching 16 days of age fledged (Warriner et al. 1986).

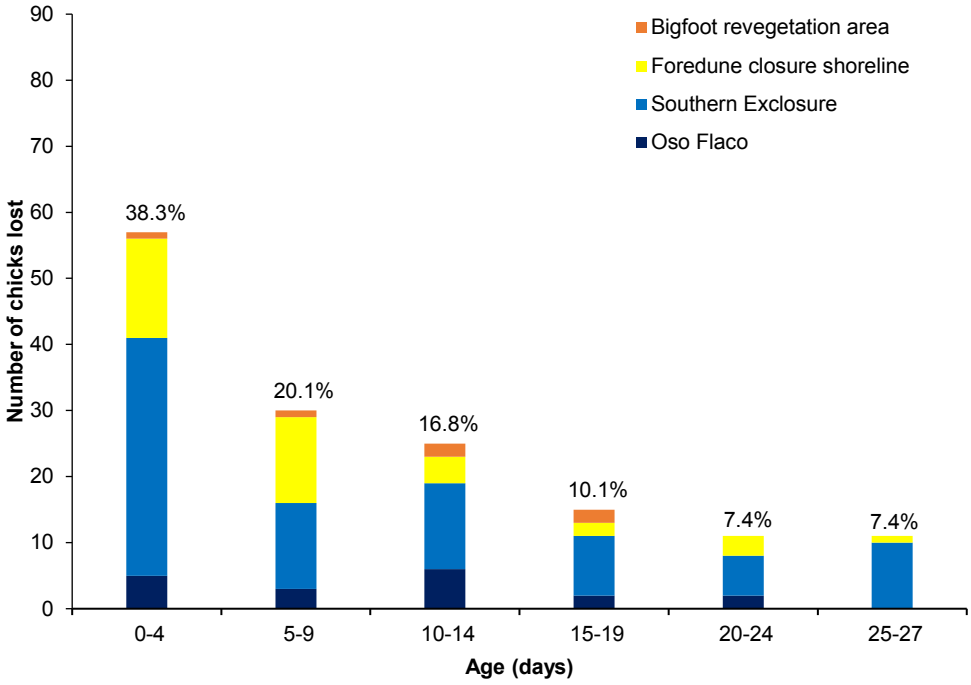

Figure 13. Loss of snowy plover chicks by age and location last seen at ODSVRA in 2021.

Number and percentage of total chicks lost shown for each age group. There were 230 chicks included in the analysis (217 banded and 13 unbanded with banded siblings); 149 of these were lost. Data excludes broods that could not clearly be identified and tracked individually, broods with an estimated hatch date, and one chick from the SP221 nest lost off-site (last seen south of ODSVRA on the Guadalupe-Nipomo Dunes NWR). 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 2021, the number of chicks fledging per male was 1.11 and compares to 1.06 in 2020. For the 19-year period 2002-2020, the average productivity was 1.45 fledglings per male and the number of fledglings produced per male has exceeded 1.2 in 14 of the 19 years (Table 5). (Note that if the number of breeding males is underestimated, the number of chicks fledged per male is an overestimate).

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

In 2021, there were five adults, four juveniles, and three chicks observed with injuries, details of the injuries are provided in Table H.2 in Appendix H. There was a minimum of 25 documented snowy plover

mortalities (other than eggs) at ODSVRA from 29 September of 2020 (subsequent to last year's report) to 3 October of 2021. Eighteen of the 25 mortalities were the results of predation. Predators involved were one peregrine (three chicks, one chick or juvenile, and one adult), one harrier (two chicks, two juveniles, three chicks or juveniles, and at least one unknown age), one American kestrel (*Falco sparverius*) (kestrel) (two chicks and two chicks or juveniles), and one owl (at least one unknown age). Documented mortality other than predation was two chicks, one juvenile, three adults, and one unknown age. Two adults and one juvenile were found in the closed buffer area, one adult and one with unknown age on the Southern Exclosure shoreline, and two chicks on the Foredune North 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 carcasses are provided in Table H.4 and H.5 in Appendix H.

Protection of known location and fate nests

Of the 219 nests from known location and with known fate, 97 were initiated within the wire mesh predator fencing of the Seasonal Exclosure that is installed at the beginning of the season (see Seasonal closure and fencing section description in the Monitoring and Management Actions section). These nests had a 53.6% (52/97) hatch rate. Due to the high avian predator activity in 2021, staff selectively installed additional nest protection for certain nests inside 6, 7, and 8 exclosures. These included four circulars: one hatched (25%), and three failed (two abandoned pre-term, one failed due to wind); six small circulars: five hatched (83%), and one failed (abandoned pre-term); and four mini-exclosures: three hatched (75%), and one failed (abandoned pre-term).

For the 6, 7, 8 exclosures, North Oso Flaco, and the Foredune closure, there were an additional 58 nests with known location and fate established on the shoreline outside of the Seasonal Exclosure. This portion of shoreline is protected only by symbolic rope fencing and signage that provides no predator protection but is designed to discourage vehicle and pedestrian trespass. Eleven of these received an individual circular exclosure and all hatched. One of these received an individual small circular and hatched. Forty-six nests did not receive single nest wire fence protection in part due to a combination of the following factors: avoiding disturbance of nearby broods, and concerns of potential nest abandonment due to adult mortality. Of these nests 60.9% (28/46) hatched.

In South Oso Flaco there were 17 nests from known location and known fate, all ultimately within seasonal symbolic rope fencing (visitor pedestrian use allowed on beach west of symbolic fencing). On several occasions nests were found west of or very near the symbolic fence and the fence was moved westward to provide more of a buffer between nests and pedestrians. Eight nests did not receive any single nest wire exclosure due to concerns of avoiding disturbance of nearby broods, windblown sand potentially burying eggs, or adult vulnerability to predators. Of these, all failed (six depredated, one abandoned pre-term, and one failed due to wind). Nine nests received circular exclosures and 55.6% hatched (5/9), and four nests failed (two abandoned pre-term, one abandoned, unknown if pre- or post-term, and one failed due to unknown cause).

Inside the Foredune closure, there were 33 nests with known location and known fate, all surrounded by nonpredator fencing. Six of these nests received bumpouts (one of these nests also had a mini-exclosure installed) and all hatched. The other 27 other nests had no additional fencing; 19 hatched (70.3%) and eight failed (two depredated, two abandoned pre-term, two abandoned post-term, and two failed due to wind).

Three nests were initiated in areas outside of the Seasonal Exclosure, Oso Flaco, Foredune closure, and shoreline areas. One nest was initiated in nonpredator-fenced Dunes Preserve north of Foredune North, which received a bumpout fence and hatched. Two nests found inside nonpredator-fenced revegetation areas: one in Bigfoot revegetation area east of Foredune Central, which received a circular and hatched; and one in Eucalyptus Tree revegetation area east of 6 exclosure, which was depredated before planned protective fencing could be installed.

In 2021, before the closed buffer area fencing was installed, four nests were initiated in the open riding area outside the Southern Exclosure, Oso Flaco, Foredune closure, and revegetation areas. From 2001 to 2021 (excluding 2020 when the park was closed to public vehicle access most of the season), the most nests found in a single year in the open riding area is four in 2021 (15 total, range 0-4, average 0.75). Of these four nests in 2021, all received nonpredator fencing, consisting of symbolic rope fencing or hard fencing. Two nests hatched (50%) and two failed (one depredated and one abandoned pre-term) (Table F.3 in Appendix F).

In 2021, seven nests were initiated inside the closed buffer area outside the Southern Exclosure, Foredune closure, and revegetation areas. All received nonpredator symbolic rope fencing. Four hatched (57%) and three failed (one depredated, one abandoned post-term, and one failed due to wind) (see Table F.3 in Appendix F for additional details of protective fencing measures for nests).

Banded snowy plovers breeding at ODSVRA in 2021

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 2021, the minimum number of breeding adults at ODSVRA was 195 birds, and of these 86 (44.1%) were banded and with known origins (Figure 14). For known origin banded birds, the great majority (88.4%, 76/86) represent recruitment from chicks banded and fledged from ODSVRA. Ten breeding birds originating from sites other than ODSVRA (and all banded as chicks) include one from Monterey Bay and nine from VSFB (Table D.4 in Appendix D).

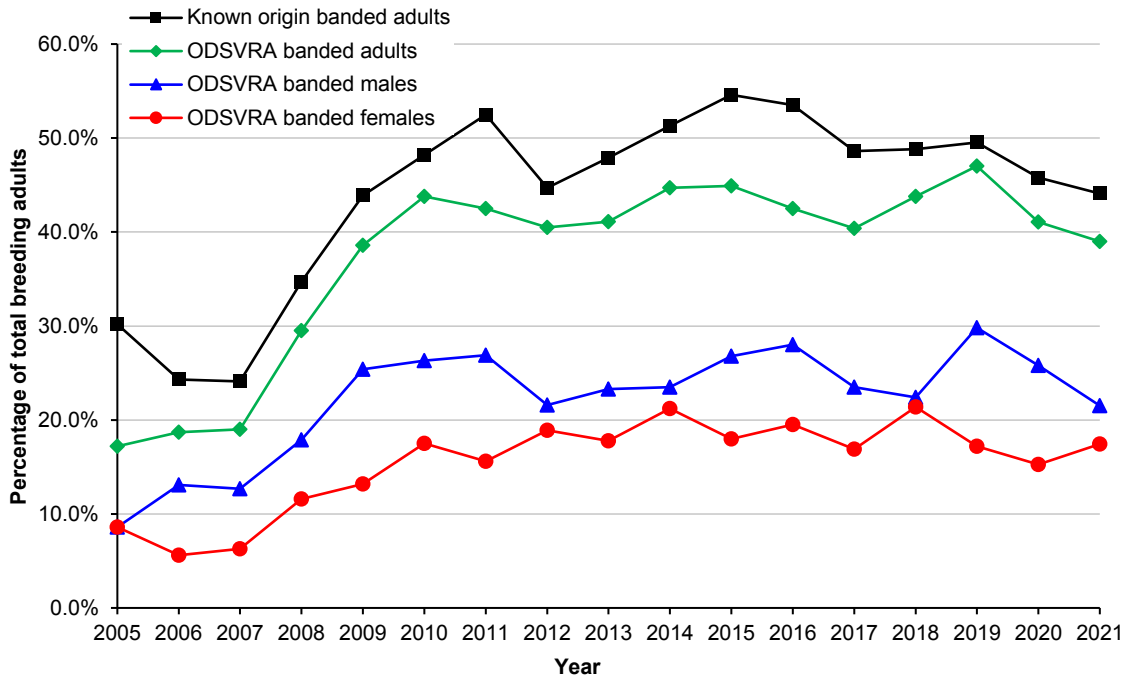

Figure 14. Percentages over the total calculated breeding population at ODSVRA of all known origin banded adults and the sum of males and females originally banded at ODSVRA breeding from 2005-21.

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

Snowy plovers banded at ODSVRA confirmed breeding elsewhere in 2021

Nine plovers banded at ODSVRA and breeding away from the park were confirmed in two counties of California: San Luis Obispo County (five in Morro Bay area) and Santa Barbara County (four at VSFB).

There was a minimum of 38 additional adult plovers banded at ODSVRA observed at other sites, ranging from Salinas River National Wildlife Refuge in Monterey County to Camp Pendleton in San Diego, 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 Monitoring and Management Actions for survey details). Between 7 October 2020 and 24 February 2021, single day wintering plover counts at ODSVRA ranged from 48-238 birds (single day high count on 25 November 2020). The shore was divided into five beach sections and the monthly average number of plovers (from four to five surveys) was obtained for each section. An average number of plovers for each beach section for the five-month winter period was obtained by averaging each month's average count. Of the five sections, the beach north of Grand Avenue had an average of one plover during the winter period (range=0-3); Grand Avenue to marker post 2 had an average of two (range=0-9); marker post 2 to marker post 6 had an average of 108 (range=66-138); marker post 6 to the southern boundary of the riding area, closed to public entry during the breeding season, had an average of 5 (range=1-12); and Oso Flaco had an average of 30 (range=22-46) (Figure 15).

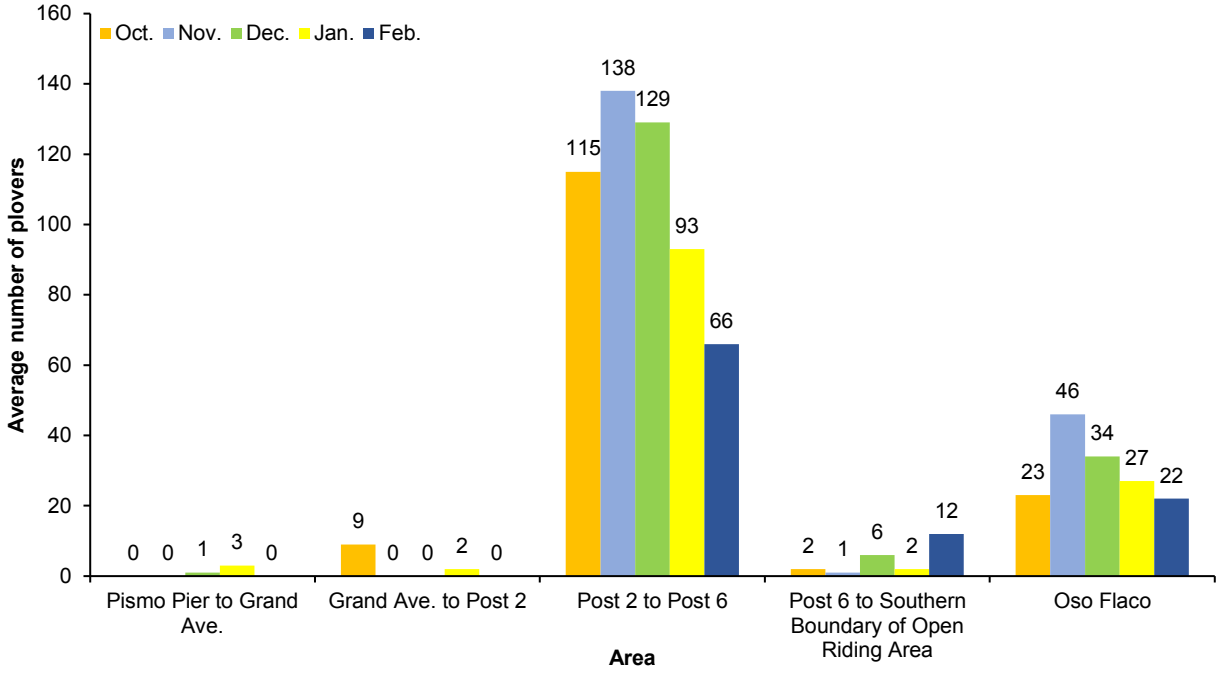

Figure 15. Monthly average number of snowy plovers observed during nonbreeding season surveys at ODSVRA from October 2020 to February 2021.

Surveys conducted four to five times a month.

Beginning in 2004, ODSVRA has participated in a snowy plover winter season window survey organized by USFWS and conducted in January throughout the U.S. Pacific coast. Plovers present during this time include birds from both the Pacific coast breeding population and interior breeding birds wintering on the coast. In 2021, the survey at ODSVRA counted 134 adult plovers and is similar to the average of 128 (range=116-134) during the previous 3-year period 2018-20. During the 18-year period 2004-21, the winter window survey has averaged 153 plovers (range=62-261).

Sixty-one banded snowy plovers were recorded during surveys from 1 October 2020 to 28 February 2021 at ODSVRA. These birds were banded at the following locations: 45 from ODSVRA; eight from VSFB in Santa Barbara County, California; three from the Monterey Bay area in Monterey County, California; four from Oregon state in Douglas, Lane and Coos counties; and one was missing bands and was from an unknown location (Table D.3 in Appendix D).

FACTORS INFLUENCING LEAST TERN AND SNOWY PLOVER REPRODUCTIVE SUCCESS

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

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

Quality of protected habitat and food resources
During the March through September least tern and snowy plover nesting season, habitat within the seasonal Southern Exclosure is protected and closed to public entry. Following the nesting season, for the five-month period October through February, the area is open to public use, including camping, street-legal vehicles, and off-highway vehicles. This recreational use results in some areas of flattened topography, less vegetation, and very limited scattered natural debris, especially on the Southern Exclosure shoreline. In most areas, especially in 8 exclosure and the western half of 6 and 7 exclosures, taller vegetated hummocks persist throughout the year. Areas of patchy cover can benefit plovers and terns during the nesting and chick-rearing periods and to make more such areas available materials, including surf-cast kelp (wrack), branches, driftwood, and woodchips, are placed in the 6, 7, and 8 exclosures. On the shoreline of 6, 7, and 8 exclosures, talitrids may be added to help restore populations of this important invertebrate prey 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 and Management Actions section).

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

Documented predator activity and management response in 2021

Species known to be predators of terns and plovers were documented by both number of days detected, as well as number of sightings (avian) and occurrences (mammalian) (see Monitoring and Management Actions section for more detail). Predator activity in the Foredune closure was recorded using the same methods for the Southern Exclosure and Oso Flaco but is not included in the totals for sightings or occurrences to keep comparisons between years consistent.

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 2021 season included peregrine, harrier, raven, kestrel, great horned owl (*Bubo virginianus*), and coyote. Five coyotes, one harrier, and four ravens were lethally removed. A peregrine, great horned owl, kestrel, and harrier were live-trapped and relocated (Table G.2 in Appendix G). Avian predators perched in sensitive areas were hazed when possible.

In 2021, no tern nests were identified as lost to predator. Fifty-four plover nests were identified lost to the following predators: coyote (1), opossum (2), harrier (11), raven (10), unidentified avian (23), and unidentified predator (7). From 2002-21, 2.3% (21/898) of all tern nests with known fate were documented lost to predators (14 mammalian, one gull, and six unidentified predator). During this same 20-year period, 10.7% (345/3223) of plover nests with known location and fate were documented lost to predation (51 mammalian, 230 avian, and 64 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) (CDPR 2002-2020).

In 2021, a relatively high 28 documented losses, other than eggs, to predation included 10 tern and 18 plover chicks, juveniles, and adults. Losses were to harrier (10), peregrine (8), kestrel (4), owl (4), suspected peregrine (1), and unidentified predator (1) (Table H.3 and Table H.5 in Appendix H). In addition, necropsy results for two tern chick carcasses found in the Southern Exclosure identified the cause of death to be from acute crush trauma, that could have been the result of predation (necropsy reports attached). Documented losses were also relatively high in 2020, with two tern chicks and 19 plover chicks, juveniles, and adults lost to peregrine (7), unidentified predator (6), coyote (4), gull (3), and harrier (1). In comparison, during the 18-year period 2002-19, average annual documented loss was one tern (range=0-7) and eight plovers (range=0-19) (CDPR 2002-2019).

Mammalian predators

Opossum

Virginia opossum (*Didelphis virginiana*) (opossum) tracks were documented on 12 days in the Southern Exclosure and Oso Flaco in 2021 and averaged 12 days per season (range=3-25) from 2007-20 (Figure 16). Opossum tracks were documented in the Foredune closure on four days in 2021. In 2021, two plover nests in the Southern Exclosure were depredated by opossum. From 2002-20, known nest loss to opossum was limited to two tern nests, occurring in 2010 and 2013.

Skunk

In 2021, striped skunk (*Mephitis mephitis*) (skunk) tracks were documented on four days in the Southern Exclosure and Oso Flaco compared to an average of 32 days per season (range=2-87) from 2007-20 (Figure 16). In 2021, skunk tracks in the Foredune closure were documented on one day. There were no known tern or plover nests lost to skunk in 2020 or 2021, compared to one in 2019, zero in 2018 and 23 (18 plover and five tern) in 2017. From 2002-16, known nest loss to skunk was limited to six plover nests: five in Oso Flaco from 2009-11 and one in Boneyard exclosure in 2016.

Raccoon

Raccoon (*Procyon lotor*) tracks were documented on only two days in the Southern Exclosure and Oso Flaco and compares to an average of 80 days (range=7-145) for the 14-year period 2007-20 (Figure 16). In 2021, documentation of raccoon tracks in the Foredune closure was from a single day. Tracks and scat found over the years indicated that raccoons commonly traveled across the exclosure to forage in the intertidal zone on prey that included mole crabs (*Emerita analoga*). From 2002-21, known nest loss to raccoons was limited to one tern nest in 6 exclosure in 2015 and two plover nests in Oso Flaco in 2010 and 2011.

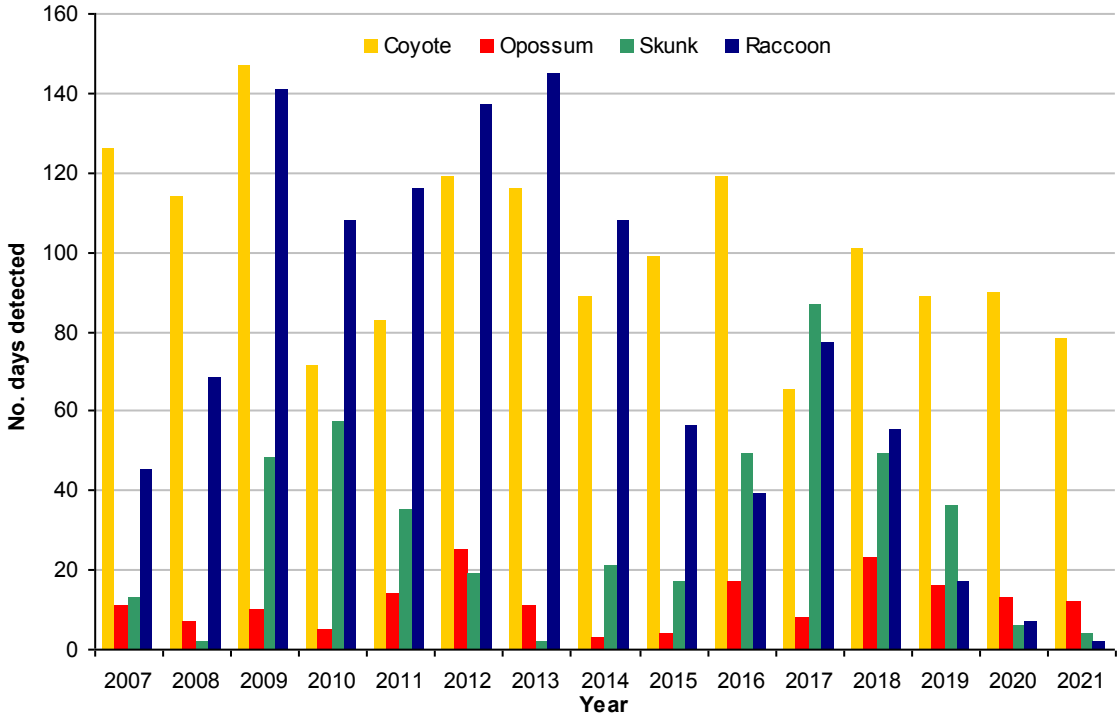

Figure 16. Number of days coyote, opossum, skunk, and raccoon were detected in the Southern Exclosure and Oso Flaco at ODSVRA from 2007-21.

Coyote

Live sightings of coyotes in the Seasonal Exclosure 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.

Five coyotes were removed in a targeted effort to reduce the threat of predation and disturbance due to coyote presence documented within sensitive nesting habitat. This is similar to the average of six removed per year from 2007-20 (range=3-11). Since 2002, coyote scat encountered by monitoring staff and contractors is checked in the field for plastic or aluminum bands used for banding least terns and snowy plovers. From 2002 to 2021, bands were found in coyote scat on five occasions: four in 2012, with four scat piles having a total of 11 bands (representing a minimum of one plover chick, two unknown age plovers, and one unknown age tern) and one in 2020, with a single coyote scat on 6 exclosure shoreline containing 15 snowy plover bands (representing a minimum of four individuals) (CDPR 2002-20).

Documented coyote activity for the Southern Exclosure and Oso Flaco in 2021 was slightly lower than the average of the previous 12-year period 2009-20 for the following three measures: 1) recorded on 78 days in 2021 compared to an average of 99 for the 12-year period, 2) 98 occurrences specific to the Southern Exclosure shoreline and North Oso Flaco shoreline compared to an average of 103, and 3) 157 occurrences for all areas of the Southern Exclosure and Oso Flaco compared to an average of 188 (Table 10). Coyote tracks were documented on 18 occurrences in the Foredune closure and shoreline in 2021. 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 2021, documented loss to coyote was limited to one plover nest. From 2002-20,

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) (Table 2, Table F.2 in Appendix F).

Table 10. Coyote occurrence in the Southern Exclosure and Oso Flaco at ODSVRA from 2009-21.
Date range is from 1 March to 10 September (a 194-day period). "Predator fenced Seasonal Exclosure" includes all areas inside the Southern Exclosure and North Oso Flaco seasonally exclosed with predator fencing.

Year	Predator fenced Seasonal Exclosure	6, 7, 8 exclosures 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)

Avian predators

In 2021, avian species were identified as a major factor in tern and plover losses attributed to predation. Of the 54 plover nests known depredated, a minimum of 81.5% (44/54) were lost to avian predators. Avian predators were also responsible for all but one of the 28 tern and plover chicks, juveniles, and adults documented as depredated. An adult male harrier and two ravens observed depredating plover nests were removed on 3 June and 8 June, respectively. Nest success of known fate plover nests increased from 34.9% (37/106) hatching on or prior to the removals, to 84.4% (108/128) after. Two additional ravens were lethally removed; one on 23 February and one on 30 April. A peregrine, kestrel, great horned owl, and non-target harrier were trapped, banded and relocated. Unsuccessful efforts were made to trap one subadult male harrier and one adult peregrine. Avian predators perched in sensitive areas were hazed when possible.

American kestrel

There were 81 documented sightings on 39 days of kestrels in specific areas of the Southern Exclosure and Oso Flaco in 2021 (Table 11, Table G.1 in Appendix G). This is higher than the average of 20 days per season (range=6-52) for the 14-year period 2007-20 (CDPR 2007-20). In 2021, kestrels were observed on 12 days (15 sightings) in the Foredune closure. Kestrels were primarily observed mid-June through mid-August perch-hunting and flying over sensitive areas, where they were hazed on 21 different occasions when perched. From 31 July to 4 August, an adult male kestrel was hunting plover chicks and juveniles daily and documented depredating two chicks and two chicks or juveniles. On 4 August, the kestrel was trapped from Eucalyptus Tree revegetation area and released on 6 August in Los Banos Wildlife Area, Merced County. In 2021, there was a minimum of four individuals observed in the nesting area: two females seen together on 30 July, one male trapped and banded on 5 August, and a second male observed after trapping the first.

Owl

The majority of owl "sightings" are from detection of tracks with fewer visual sightings. The level of owl activity, as evidenced by tracks, is difficult to estimate during daytime monitoring as there is limited entry into the nesting and chick-rearing areas to look for tracks. The tracks may extend only a short distance and can be covered quickly by windblown sand. In addition, accessibility to areas where tracks have often been noted previously (e.g., North Oso Flaco, 8 exclosure, 7.5 revegetation area) may vary between years, making direct comparison difficult. Most owl tracks documented at ODSVRA are likely from great horned owls; 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 2021, owl tracks were periodically documented in sensitive nesting and chick-rearing habitat, with owl presence detected on 24 days with 35 separate sightings in the Southern Exclosure and Oso Flaco (Table 11, Figure 17). For these same areas from 2007-20, owl activity was documented on an average of 28 days (range=5-53). In 2021, owls were documented on six days (six sightings) in the Foredune closure and a great horned owl was known to roost nearby during the daytime in the Pavilion Hill revegetation area. Great horned owl tracks were documented at the tern night roost in the closed buffer area and on two occasions were found at adult tern feather piles. An additional adult tern feather pile in the same area was found with owl tracks, suspected to be barn owl, present. An owl pellet found 1 September at the base of the 8 exclosure west fence contained four plastic plover bands representing a minimum of one plover of unknown age. On 22 June, a great horned owl was trapped from Eucalyptus North revegetation area and relocated to Winton Park, Fresno County.

Red-tailed hawk

Red-tailed hawks (*Buteo jamaicensis*) were observed perching and flying in the Southern Exclosure and Oso Flaco foredunes. In 2021, there was a minimum of two individuals (two individuals seen together on 16 May) observed in the nesting area. Red-tailed hawk presence in the Southern Exclosure and Oso Flaco was documented on 19 days (34 sightings) in 2021, fewer than the average of 41 days (range=7-74) of activity from 2007-20 (Table 11, Figure 17). There were no sightings of red-tailed hawk over the Foredune closure. Red-tailed hawks perched in the nesting area were hazed on 10 occasions in 2021. Hazing red-tailed hawks out of sensitive areas provided temporary relief but did not deter individual hawks from returning to ODSVRA. In 2017, a juvenile red-tailed hawk was observed eating a plover chick. This was the first and 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 and in 2021 both harrier presence and impacts were high. 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 2019-21 is 229 sightings on 78 days, an increase in sightings of 166% and days seen of 100% (Table 11, Figure 17) (CDPR 2007-20). In 2021, harrier presence was documented on 92 days (324 sightings) in the Southern Exclosure and Oso Flaco and on 17 days (29 sightings) in the Foredune closure. Based on age and sex, there was a minimum of five individuals (one adult female, one adult male, one subadult female, one subadult male, and one juvenile) observed during this season.

An adult male harrier was frequently seen hunting, catching avian prey, and eating plover eggs in 6, 7, and 8 exclosures beginning 6 March through 3 June. After prolonged trapping efforts were unsuccessful, the harrier was lethally removed on 3 June. Documented losses to this individual harrier included the full clutches of 11 plover nests (with additional losses suspected), three eggs from three nests that hatched one or more eggs, and two eggs from one abandoned nest (Table 9, Table F.2 in Appendix F).

From 21 July to 30 August, a subadult male harrier was observed in the 6, 7, and 8 exclosures actively hunting and catching plover and tern prey. Documented losses to this individual harrier included one tern chick or juvenile, one tern juvenile, two plover chicks, three plover chicks or juveniles, two plover juveniles, and at least one plover of unknown age (Table H.3 and H.5 in Appendix H). Unsuccessful attempts to trap this bird began 23 July and ended on 23 August. One non-target juvenile female harrier was trapped on 12 August in 6 exclosure when attempting to trap the subadult male harrier.

Table 11. Sightings of kestrel, large owl spp., red-tailed hawk, harrier, and peregrine in specific areas of the Southern Exclosure, Oso Flaco, and the Foredune closure at ODSVRA in 2021.

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	16	14	6	79	40	**155**
7 exclosure	16	7	7	88	40	**158**
8 exclosure	12	5	10	65	36	**128**
Boneyard exclosure	11	5	1	18	11	**46**
North Oso Flaco	15	1	7	45	21	**89**
South Oso Flaco	11	3	3	29	14	**60**
TOTAL	**81**	**35**	**34**	**324**	**162**	**636**
Foredune closure	15	6	0	29	38	**88**

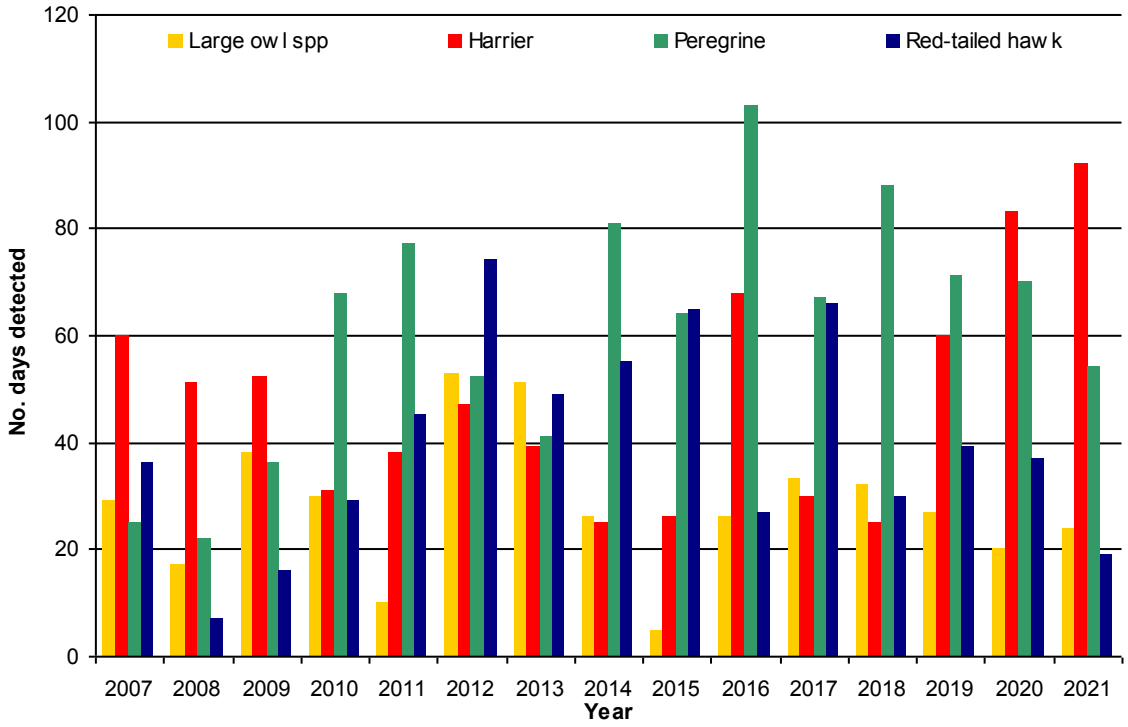

Figure 17. Number of days large owl spp., harrier, peregrine, and red-tailed hawk were detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2007-21.

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

Corvids (American crow and common raven)
American crows (*Corvus brachyrhynchos*) (crow) and common ravens are efficient predators at many tern and plover nesting sites and can have pronounced impacts over a short period of time. In 2021, crow sightings were limited to ten sightings over four days in the Southern Exclosure and Oso Flaco, including one event of three crows flying over South Oso Flaco (Table G.1 in Appendix G). For these same areas during the 14-year period 2007-20, crows were seen annually an average of five days (range 1-13) (CDPR 2007-20). In 2021, there was one observation of two crows flying over the Foredune closure.

In 2021, there were 87 sightings over 20 days of raven in the Southern Exclosure and Oso Flaco. This compares to the 13-year period 2008-20, when ravens averaged 15 sightings (range=1-35) on 6 days (range=1-14) (Table G.1 in Appendix G) (CDPR 2008-20). There were two sightings of raven in the Foredune closure on two days in 2021. Documented loss to raven included ten plover nests, with more loss suspected, and three ravens were lethally removed during the plover nesting season (Table 9, Table F.2 in Appendix F). One was trapped 30 April at a Japanese quail egg set placed at a previously depredated plover nest in Boneyard exclosure. On 8 June, two more ravens were removed in Oso Flaco after depredating at least one plover nest in the closed buffer area. An additional raven was preemptively removed on 23 February from a raven nesting area approximately 8.0 miles south of ODSVRA found in 2019 (Table G.2 in Appendix G). Eighty of the 89 raven sightings and eight of the ten plover nests depredated by raven occurred on or before 8 June, when the last two ravens were removed. In 2021, there were a minimum of six individuals observed during the nesting season, all observed together on 11 May.

Gulls
In 2021, there were no documented nests or chicks lost to gull, although plover chick loss to gulls is suspected during the season. 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 13 of the 17 years from 2004-20, gulls have been documented taking plover chicks. Between 2011-20, gulls took a minimum of 49 plover chicks, juveniles, and unknown age birds (CDPR 2011-20).

Peregrine falcon
Peregrine falcons were commonly observed actively hunting, perching, and consuming prey in the Southern Exclosure, Oso Flaco, and the Foredune closure in 2021. Peregrines hunting in areas of nesting plovers and terns, even when not focused on them, can cause disturbance that limits foraging time for plover chicks while increasing the risk of broods being separated or moved. Peregrines perched in nesting areas were hazed on 46 occasions, sometimes requiring repeated efforts before the bird left. Hazing peregrines out of sensitive areas provided temporary relief but did not deter individual peregrines from returning to ODSVRA.

In 2021, there were 162 sightings on 54 days of peregrines in the Southern Exclosure and Oso Flaco, slightly lower compared to the previous year (178 sightings on 70 days) and an average of 181 (range=38-362) sightings on 65 days (range=22-103) from 2008-20. The average number of days peregrines were recorded during the period 2008-20 was 65 (range=22-103) (Table 12). In the Foredune closure there were 38 sightings over 30 days in 2021.

In 2019, a subadult female peregrine was trapped, banded with a federal band on the left leg and a VID band (W49, white characters on black band) on the right leg, and relocated 179 miles from ODSVRA after confirmed observations of it eating plover chicks (CDPR 2019). In 2020 and 2021, this same peregrine was observed on multiple occasions eating plovers or plover-sized prey. Documented losses in 2021 included two plover chicks and one large plover chick or young juvenile, with additional losses suspected. A peregrine, suspected to be the same female peregrine, with similar behavior of running and catching plover

chicks on the ground, was observed depredating two additional chicks (Table H.5 in Appendix H). The female peregrine continued to be seen habitually hunting sensitive areas and trapping was attempted but was unsuccessful.

An unbanded, subadult female peregrine was frequently seen hunting and catching prey in 6, 7, and 8 exclosures beginning 12 April through 14 May. On 14 May, the peregrine was trapped and banded with a VID band (91AK, white characters on black band) on the left leg and a federal band on the right leg and relocated 481 miles from ODSVRA at Horse Creek near the Oregon border. On 1 August, the same peregrine was confirmed to have returned to ODSVRA and was observed eating a tern juvenile. The peregrine continued to remain on site until recaptured on 9 August. At the time of this report's release the peregrine is held, in coordination with CDFW, by a falconer for conditioning for later release. Total documented losses, all on or after 1 August, include one tern chick or juvenile and two tern juveniles, with additional losses suspected (Table H.3 in Appendix H).

A minimum of four individual peregrines were identified at ODSVRA this season: one juvenile, one banded subadult female (now with VID band 91AK) live-trapped from ODSVRA twice in 2021, one banded adult female (VID band W49) live-trapped at ODSVRA as a subadult in 2019, and one unbanded adult (unknown sex).

Table 12. Sightings of peregrine in specific areas of the Southern Exclosure and Oso Flaco at ODSVRA from 2008-21.

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

Year	6 exclosure	7 exclosure	8 exclosure	Boneyard exclosure	North Oso Flaco	South Oso Flaco	Total no. sightings (Total no. days detected)
2008	11	11	5	6	4	1	38 (22)
2009	13	13	13	6	9	20	74 (36)
2010	37	29	25	11	24	18	144 (68)
2011	39	45	40	32	37	12	205 (77)
2012	41	37	31	9	27	11	156 (52)
2013	28	23	19	2	14	14	100 (41)
2014	75	85	67	11	69	55	362 (81)
2015	41	31	28	15	19	29	163 (64)
2016	54	50	45	16	32	57	254 (103)
2017	31	35	40	8	37	41	192 (67)
2018	60	55	52	17	55	56	295 (88)
2019	45	36	28	15	32	33	189 (71)
2020	46	34	31	4	19	44	178 (70)
2021	40	40	36	11	21	14	162 (54)

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. Without this information, the seasonal productivity of terns and plovers at ODSVRA would be unknown and management effectiveness could not be assessed. Additionally, bands provide an opportunity to gain insight into predator impacts on chicks and fledglings. Banding of tern and plover chicks also provides information on natal site fidelity of terns and plovers fledged at ODSVRA, as well as migration to other sites.

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

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

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

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

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 Exclosure, 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 the nests and extend into the open riding area. Buffer fencing (nonpredator fencing) will be used for nests in the open riding area, with the fencing connected to the closest adjacent closure fencing, if appropriate. The bumpout and buffer size differs for plover and tern and is described below. In 2021, nest buffer distances were increased to comply with an agreement between ODSVRA and CDFW as stated in the January 2021 Biodiversity Management Plan (CDFW 2021).

Snowy plover nests: For plover nests found inside the Southern Exclosure or Foredune closure, and located close to the fence that borders the open riding area, a bumpout will be installed to provide a minimum 100-foot buffer distance between the nest and the open riding area. Prior to 2021, for any nest found outside the Southern Exclosure or Foredune closure (open riding area and revegetation areas; excludes Oso Flaco), a minimum 100-foot buffer was provided. Beginning 2021, for plover nests found outside the Southern Exclosure or Foredune closure, a minimum 492-foot (150-meter) buffer distance is provided. Bumpouts from revegetation areas will be installed, as necessary, to provide the required buffer distance.

Least tern nests: Prior to 2017, a 100-foot buffer distance was provided between a tern nest and the open riding area, the same distance as used for plovers. From 2017 to 2020, the buffer distance for tern nests was increased to 328 feet (100 meters), and further increased in 2021 to 984 feet (300 meters). Bumpout fencing or nonpredator fencing will be installed, as necessary, to provide the required buffer distance.

The above buffer distances of 2021 will continue to be used in 2022, to follow the CDFW agreement (CDFW 2021). 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. 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 exclosure will be installed until a larger buffer installation can be scheduled when staff time allows, materials are available, and weather conditions permit. The bumpout and buffer material consists of nonpredator fencing (unburied wire "field" fencing, not predator proof). 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 daily tern and plover monitoring tasks, fence maintenance, as well as other vehicles 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. Tern chicks and the night roost will also be monitored and the buffer size may be adjusted if 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, a fence corridor that can be closed to the public will be provided as appropriate prior to hatching and 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 will typically move toward the closest shoreline and establish a territory. In 2021, the Foredune closure shoreline was closed to the public on 8 April, after a nest was found in the Foredune closure, and extended to connect with the 6 exclosure shoreline. The area was reopened to the public on 8 September, after broods and nests were no longer present. On 29 April, portions of the open riding area were temporarily closed, using symbolic fence and signs, to provide a corridor of safe passage to the Foredune closure shoreline for a plover brood due to hatch from a nest in Dunes Preserve (SP15). On 5 May, the corridor partially set up 29 April in the open riding area was temporarily closed to public access and the plover brood was successfully moved by staff, with approval from CDFW and USFWS, from Dunes Preserve to the Foredune closure shoreline. On 17 and 22 July, plover broods were found in revegetation areas east of the Foredune closure that may have moved through the open riding area to reach the revegetation areas, and one plover brood was observed in the open riding area between the Foredune closure and the revegetation areas on 18 July. The area west of the revegetation area was immediately closed to prohibit

vehicle traffic and was reopened after broods were no longer present on 2 September (see section titled Snowy plover chicks in the open riding area on page 39, map in Figure C.13 in Appendix C).

In 2022, 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 if necessary. If approved within the ODSVRA Habitat Conservation Plan (HCP), broods found in the open riding area that are determined to be in critical danger from recreational activities, and when it is not possible 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 practical; 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 will 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 from entering nesting and chick-rearing habitat, as well as to limit vehicle and human trespass. The fence that has been installed seasonally in February since 2006 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 will become buried by sand which creates low sections in the fence. Coyotes will take advantage of the gaps and low spots to enter the exclosure, making nests and chicks vulnerable to predation. Additionally, gaps and downed fence can cause trespass issues. In 2021, and in the years past, 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 on the eastern fence line that borders the open riding area, or more as needed to maintain the fence for predator control. Staff also access closed buffer areas to repair fencing by hand and add additional fence material to close gaps and keep the fence at an optimal height.

On 9 October 2021, nonpredator fencing ("field" fencing) was installed in the Southern Exclosure area for the winter months, which is of a larger mesh size, unburied, and shorter in height (only four feet), providing a lower level of protection when compared to the predator fencing as described above. Prior to the 2022 season, it is recommended to remove the nonpredator fence and install predator fencing as has been used for the nesting exclosure since 2006 to prevent coyote and public trespass entry. The west fence of the exclosure fencing shall also be reinstalled prior to the nesting season, but may need to be removed post season to avoid being damaged during winter storms and high surf events.

To maintain the exclosure fence, it is recommended to 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 scans the area within and outside the exclosure fence line to determine if there is nesting activity near the fence, the area is monitored closely during operation to avoid any impacts to terns or plovers, and any sensitive areas are avoided by the equipment operator. Additional fencing options to help maintain the integrity of the predator exclosure fencing for year-round use should also be explored. 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.

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

Natural materials such as driftwood, woodchips, and wrack (surf-cast kelp) should be distributed in large amounts within the exclosures (including the shoreline) to enhance habitat features. Exclosure areas with lower productivity should be identified, and additional habitat enhancement activities should be explored and tested, with the goal of improving nesting and chick-rearing habitat in these areas. Since 2002, wrack has been gathered into trucks or trailers and unloaded into the exclosure by hand. Since 2008, woodchips have been loaded into trucks or trailers using ODSVRA heavy equipment operators and distributed by hand into the exclosure. Past attempts to utilize heavy equipment to collect and distribute large amounts of wrack from the open riding area to the exclosure shoreline resulted in more sand than wrack being collected when compared to hand collection. Additionally, in 2018 and 2019, ODSVRA heavy equipment operators used a dump truck to transport and unload large piles of woodchips, but these piles still needed to be distributed by hand within our exclosure. The dump truck was not equipped for use in 2020, was only available for a short period in 2021, and is not expected to be available for much of 2022.

In 2022, it is recommended that methods to better use heavy equipment for wrack collection and woodchip dispersal should be further explored. The goal would be to increase staff efficiency, allow larger amounts of wrack and woodchips to be dispersed, a broader distribution of material to provide shelter from wind and cover from predators, and help maintain larger populations of invertebrate prey over a broader area for snowy plover chicks, fledglings, and adults. The use of heavy equipment also needs to be balanced with other operational needs in the park.

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

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

Over the last several years there are areas that have developed dense vegetation within 6, 7, and 8 exclosures, and topography is very severe in areas of 8 exclosure. There is a noticeable decrease in nests where these conditions occur, partly because the substrate and viewshed for the incubating bird is not appropriate for nesting and partly because the large dune hummocks attract avian predators as perch locations (see hillshade and digital elevation modelling maps in Figure C.14 to C.16 in Appendix C). The foredune plants that have persisted in the exclosure include mainly sea rocket (*Cakile maritima*), beach bur (*Ambrosia chamissonis*), and Coastal sand verbena (*Abronia latifolia*). Experimental habitat manipulation is recommended for 2022 to improve nesting habitat focusing on removal of the nonnative sea rocket and larger dune hummocks. Modification of the habitat in 6, 7, and 8 exclosures would use heavy equipment to remove vegetation within an approximate 25-foot linear distance and enough of the foredune vegetation to create a "blow-out" of bare sand between the foredune habitat in the windward (northwest to southeast) direction. The goal of these blow-out areas would be to create a mosaic of plants and open sand areas attractive to snowy plovers for nesting. Prior to any habitat manipulation, park staff familiar with foredune plant species will verify sensitive listed plant species are absent and identify test areas dominated by sea rocket. The habitat manipulation will occur during the early season habitat enhancement and prior to any nest establishment, after the breeding activity has concluded in September, or in the winter. Monitors will document changes in tern and plover nesting numbers and nest fates in the experimental vegetation removal areas.

Continue to implement and monitor wrack addition to the Southern Exclosure shoreline and inoculation with wrack-associated invertebrates as a means to restore invertebrate species and biomass (these invertebrates are part of the prey base for snowy plover chicks, juveniles, and adults)
A five-year study (2007-11) by Drs. Jenifer Dugan and Mark Page, researchers from the Marine Science Institute at the University of California Santa Barbara (UCSB), examined the responses of invertebrate numbers and diversity in areas where wrack was added to the Southern Exclosure shoreline throughout the breeding season. The unpublished results indicated that the seven-month seasonal closure (March-September) is not a sufficient period of time for invertebrates to effectively and naturally recover species diversity and abundance on the Southern Exclosure shoreline following five months of recreational use. Invertebrate sampling is done (by Dr. Dugan through 2012 and by park staff since 2013) with one series of transects at the beginning of the season and repeated once at the end of the season. The survey is comprised of 10 transects in the Southern Exclosure and three transects in North Oso Flaco (as a control) and samples are sent to Dr. Dugan for analysis. Since 2012, park staff has inoculated wrack added to the shoreline with invertebrates following protocols developed by UCSB. For 2022, it is recommended to continue these inoculation protocols and to continue the beginning and end of season sampling, to document any changes to the invertebrate population on the Southern Exclosure shoreline. Wrack additions and invertebrate inoculations could occur during the winter or prior to 1 March if materials and staff levels allow.

Continue to evaluate physical features of the nesting and chick-rearing habitat in the Southern Exclosure using drone/Unmanned Aircraft Systems (UAS) equipment
Beginning in 2018, and each year afterward, drone equipment was used to experiment with photographing the Southern Exclosure habitat at the beginning and end of season. Flights were performed after consultation with USFWS or CDFW and 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 record placement of enhancement materials distributed by staff and can be used to assess nesting habitat. It is recommended for 2022 to perform beginning and end of season drone flights, using protocols previously developed in consultation with USFWS and CDFW. It is recommended to continue scheduling early season drone flights prior to the initiation of nests and end of season flights after the last chick has fledged from the area. If approved within the HCP and in consultation with USFWS, ODSVRA will include in our management the use of drone flights during the nesting season.

Continue weekly gull surveys at the trash dumpster area
Full park monthly gull surveys were done from 2008-15 and daily gull surveys at the trash dumpster area at marker post 2 were done from 2014-17. Beginning in 2018, surveys were limited to one to two surveys per week at the trash dumpster area. For the 2022 season, it is recommended to conduct two gull surveys per week at the trash dumpster area (see Monitoring and Management section for survey details).

Continue to look for an appropriate design to cover trash dumpsters
The predator management strategy at ODSVRA includes methods to discourage attracting predators to the site. 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 in the Fall of 2020. Prior to this, four to six large trash dumpsters (22 feet long, eight feet wide, and four foot high with 20 cubic yards capacity, open on top) were used and they attracted a large number of gulls landing on and foraging in the dumpsters. This new design, with a side door that is left open during the day and locked at night, appears to meet 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 in 2021 and less waste produced. The maximum number of gulls present at one time at the dumpster area during the 2021 nesting season was 59 on 6 June. This is lower than the max of 90 gulls counted on 14 June 2020, when the park was closed to camping, and much lower than the max of 297 on 7

July 2019 and 445 on 13 August 2018, years when the park was at full capacity. It is recommended for 2022 to cover all the trash dumpsters in the marker post 2 area in the newer design to exclude gulls and continue to monitor them. Any field observations of operational issues that arise should be addressed and designs modified, as necessary, to meet the needs of ODSRVA staff and visitors.

Ongoing management actions that will continue in 2022

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

- Oso Flaco area protection will continue at the same monitoring and management level as set in 2005 (Site Description).
- The Arroyo Grande Creek protected area will be clearly delineated as a closed area around the Arroyo Grande Creek and lagoon by using posts, symbolic rope, and signs, as practiced since 2006 (Site Description).
- Night vision equipment will continue to be used for monitoring the least tern night roost. Night vision goggles were used for monitoring since 2007 and a thermal scope (Trijicon REAP-IR) was used in 2019 and 2021. Night surveys were not performed in 2020 to avoid hazardous dune driving conditions at night. For 2022, the thermal scope will continue to be used and additional equipment options will be explored.
- Continue monitoring least tern juveniles and the night roost. Continue monitoring foraging activity at nearby freshwater lakes if time allows.
- Continue use of motion detector cameras for nest monitoring and train and permit additional monitoring staff as needed.
- Continue to use an anemometer with data logger from a wind tower to record daily wind speeds and direction.
- Continue option to use tern chick shelters.
- Continue option to use least tern chick fencing on the east side of the exclosure and a method to maintain the tern chick fencing will continue to be explored.
- Predator monitoring and management actions that have been in place since 2003 and 2004 will continue.
- The Southern Exclosure and North Oso Flaco shoreline will continue to be protected; this includes maintaining the posts and rope at marker post 6 and Oso Flaco boardwalk intertidal zones to minimize trespass, which has been part of the management actions in these locations since 2008.
- Continue use of 10-foot by 10-foot single nest exclosures with net tops, circular exclosures with net tops, and mini-exclosures as needed to protect nests from mammalian and avian predators. These small exclosures are not without risks to incubating adults and we will continue to closely monitor and evaluate their use.
- Surveys for plovers will continue during the nonbreeding season. These weekly surveys have been conducted since the winter of 2009-10.
- Continue to 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 2021.

Least tern chicks were banded with a size 1A blank aluminum band on the left leg and a single size 1A numbered aluminum federal band (covered with white over orange vinyl tape) on the right leg. Color tape was placed on the left band to create combinations unique to each individual. Chicks were weighed immediately prior to banding, typically at one to three days old. Twenty-four chicks from twenty-one 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.

Nest protection type: see Management Actions for description of Seasonal Exclosure and bumpout.

Location: 6 = 6 exclosure, 7 = 7 exclosure

U = unbanded, unk = unknown, ? = unconfirmed band combinations or colors

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (no. fledged)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
1	6		(31 May)	Abandoned post-term	22 Jul	1	0 (0)			Bumpout, Seasonal Exclosure	Nest found at 1 egg and seen incubated for a minimum 52-day period from 31 May to 21 July. On 22 July, 1 cracked egg found at nest with dried feathers and yolk visible. No egg found when walked to 13 August.
2	7	U	2 Jun	Hatch	25 Jun	2	1 (unk)	U		Bumpout, Seasonal Exclosure	On 2 July,1 unbanded chick last seen at 7 days old. One egg unknown fate.
3	7	g/y:b/w	5 Jun	Hatch	27 Jun	2	2 (1)	a:w/o (6.8) -:w/o (5.0)	-:w/o	Bumpout, Seasonal Exclosure	On 3 July, both chicks last seen at 6 days old. On 18 August, -:w/o fledgling found dead in 6 exclosure (see Table H.4 in Appendix H).
4	7	b/(r or o)?:g/y	6 Jun	Hatch	29 Jun	2	2 (2)	w/o:w/o (12.3) w/b:w/o (14.2)	w/o:w/o w/b:w/o	Bumpout, Seasonal Exclosure	Band combination w/b:w/o also used on 1 chick hatching from LT15 and both chicks fledged.
5	7	U o:b/w	7 Jun	Hatch	29 Jun	2	2 (2)	g:w/o (8.7) r:w/o (6.7)	g:w/o r:w/o	Bumpout, Seasonal Exclosure	
6	6	?:b/w	7 Jun	Hatch	30 Jun	2	2 (1)	y:w/o (8.4) l:w/o (5.3)	y:w/o	Bumpout, Seasonal Exclosure	On 2 July, l:w/o chick last seen alive at 1 day old and found dead in 6 exclosure on 6 July (see Table H.3 in Appendix H). Combination reused on LT53 chick.

Appendix A. California least tern nests at ODSVRA in 2021 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (no. fledged)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
7	6	U U	9 Jun	Hatch	1 Jul	2	2 (1)	p:w/o (9.2) U	p:w/o	Bumpout, Seasonal Exclosure	On 3 July, 1 chick banded p:w/o at 2 days old and 1 egg showed cracks. On 10 July, small, unbanded chick found dead at nest site. On 24 July, p:w/o fledgling last seen alive at 23 days old and found dead in 6 exclosure on 30 July (see Table H.4 in Appendix H).
8	6	w/b:w/g	9 Jun	Hatch	1 Jul	2	2 (2)	k:w/o (8.5) w:w/o (9.6)	k:w/o w:w/o	Bumpout, Seasonal Exclosure	
9	6	U Banded	9 Jun	Hatch	30 Jun	2	2 (2)	v:w/o (8.6) o:w/o (6.9)	v:w/o o:w/o	Bumpout, Seasonal Exclosure	On 5 August, o:w/o fledgling last seen alive at 36 days old. On 8 August, the depredated remains of o:w/o found at least tern night roost location east of 6 exclosure in closed buffer area (see Table H.3 in Appendix H).
10	6		11 Jun	Hatch	3 Jul	2	2 (2)	o/g:w/o (8.8) a/g:w/o (7.2)	o/g:w/o a/g:w/o	Bumpout, Seasonal Exclosure	Band combination o/g:w/o also used on 1 chick hatching from LT47. Both chicks banded o/g:w/o from LT10 and LT47 fledged.
11	6	U	12 Jun	Hatch	5 Jul	2	2 (unk)	U U		Bumpout, Seasonal Exclosure	On 5 July, both unbanded chicks last seen together on date of hatch. On 6 July, 1 unbanded chick last seen at 1 day old at the nest.
12	6	Banded U	12 Jun	Hatch	4 Jul	2	2 (1)	a/b:w/o (9.5) U	a/b:w/o	Bumpout, Seasonal Exclosure	On 6 July, 1 unbanded chick with deformed toes and feet was last seen at 2 days old. Unknown if unbanded chick fledged.
13	6		12 Jun	Hatch	7 Jul	2	1 (unk)	U		Bumpout, Seasonal Exclosure	On 7 July, 1 unbanded chick last seen on date of hatch. One egg unknown fate.
14	7		12 Jun	Hatch	3 Jul	2	2 (unk)	a/o:w/o (9.3) U		Bumpout, Seasonal Exclosure	On 8 July, both chicks last seen at 4 and 5 days old.
15	6	Banded?	12 Jun	Hatch	3 Jul	2	2 (2)	w/b:w/o (7.6) w/r:w/o (7.3)	w/b:w/o w/r:w/o	Bumpout, Seasonal Exclosure	Band combination w/b:w/o also used on 1 chick hatching from LT4 and both chicks fledged.
16	7	U	14 Jun	Hatch	6 Jul	2	2 (0)	b/y:w/o (18.2) o/b:w/o (15.4)		Bumpout, Seasonal Exclosure	On 12 July, chick banded o/b:w/o last seen at 6 days old and b/y:w/o last seen 20 July at 14 days old.
17	7		13 Jun	Hatch	4 Jul	2	2 (unk)	U U		Bumpout, Seasonal Exclosure	On 5 July, both unbanded chicks last seen at 0 and 1 day old.

Appendix A. California least tern nests at ODSVRA in 2021 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (no. fledged)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
18	7		13 Jun	Hatch	4 Jul	2	1 (unk)	U		Bumpout, Seasonal Exclosure	On 8 July, 1 unbanded chick last seen at 4 days old. One egg abandoned post-term. No sign of fertilization when egg contents examined.
19	6	Banded	13 Jun	Hatch	4 Jul	2	2 (1)	y/r:w/o r/y:w/o	r/y:w/o	Bumpout, Seasonal Exclosure	On 24 July, chick banded y/r:w/o last seen at 20 days old.
20	6	U g/y:?	15 Jun	Hatch	6 Jul	2	2 (2)	n:w/o (19.3) w/y:w/o (23.4)	n:w/o w/y:w/o	Bumpout, Seasonal Exclosure	
21	6		14 Jun	Hatch	5 Jul	2	2 (1)	g/b:w/o (12.1) U	g/b:w/o	Bumpout, Seasonal Exclosure	On 8 July, 1 unbanded chick last seen at 3 days old and unknown if fledged.
22	6	a/w:y/g Banded?	12 Jun	Hatch	3 Jul	2	2 (2)	o/w:w/o (9.1) o/a:w/o (9.5)	o/w:w/o o/a:w/o	Bumpout, Seasonal Exclosure	Band combinations o/w:w/o and o/a:w/o also used on 2 chicks hatching from LT49. Single o/w:w/o chick confirmed fledged. Based on location and age when chick confirmed fledged, assigned to LT22 for purposes of this report. Both chicks banded o/a:w/o fledged. On 6 August, one o/a:w/o fledgling (unknown if LT22 or LT49) depredated by peregrine on 6 exclosure shoreline (see Table H.3 in Appendix H).
23	6	Banded	14 Jun	Hatch	6 Jul	2	2 (2)	g/y:w/o (13.3) y/g:w/o (12.6)	g/y:w/o y/g:w/o	Bumpout, Seasonal Exclosure	
24	6	?:w/a U	13 Jun	Hatch	4 Jul	2	2 (2)	b/r:w/o (9.5) r/b:w/o (12.6)	b/r:w/o r/b:w/o	Bumpout, Seasonal Exclosure	
25	7	U	16 Jun	Hatch	8 Jul	1	1 (unk)	U		Bumpout, Seasonal Exclosure	On 10 July, 1 unbanded chick last seen at 2 days old.
26	7	g/y:? U?	13 Jun	Hatch	6 Jul	2	2 (2)	b/o:w/o (14.2) b/g:w/o (16.3)	b/o:w/o b/g:w/o	Bumpout, Seasonal Exclosure	
27	7		(15 Jun)	Unknown	3 Jul	2	0 (0)			Bumpout, Seasonal Exclosure	Nest seen incubated for a minimum 18-day period from 15 June to 2 July. One egg unknown fate and one egg abandoned, unknown if pre- or post-term. No sign of fertilization when egg contents examined post season.

Appendix A. California least tern nests at ODSVRA in 2021 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (no. fledged)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
28	6	Banded U	13 Jun	Hatch	4 Jul	1	1 (1)	g/o:w/o (10.2)	g/o:w/o	Bumpout, Seasonal Exclosure	
29	6	U g/y:a/b	15 Jun	Hatch	6 Jul	1	1 (1)	b/a:w/o (11.0)	b/a:w/o	Bumpout, Seasonal Exclosure	
30	6	g/y:y Banded	15 Jun	Hatch	6 Jul	1	1 (unk)	U		Bumpout, Seasonal Exclosure	On 8 July, 1 unbanded chick last seen at 2 days old.
31	6	U	12 Jun	Hatch	3 Jul	2	2 (2)	b/w:w/o (10.1) r/w:w/o (9.7)	b/w:w/o r/w:w/o	Bumpout, Seasonal Exclosure	
32	6	y/g:b/w s:b	16 Jun	Hatch	7 Jul	1	1 (1)	a/y:w/o (11.6)	a/y:w/o	Bumpout, Seasonal Exclosure	
33	7		12 Jun	Hatch	5 Jul	2	2 (2)	g/r:w/o (11.1) r/g:w/o (12.8)	g/r:w/o r/g:w/o	Bumpout, Seasonal Exclosure	On 8 July, r/g:w/o chick noted with missing hind toe when banded and was last seen 26 July at 21 days old.
34	7	g/y:w/a U	15 Jun	Hatch	6 Jul	1	1 (unk)	U		Bumpout, Seasonal Exclosure	On 13 July, 1 unbanded chick last seen at 7 days old.
35	7	y/g:b/w	16 Jun	Hatch	9 Jul	2	1 (0)	r/o:w/o (8.9)		Bumpout, Seasonal Exclosure	On 12 July, r/o:w/o chick last seen at 3 days old. One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
36	6	U U	15 Jun	Hatch	6 Jul	2	2 (2)	a/r:w/o (8.3) r/a:w/o (6.5)	a/r:w/o r/a:w/o	Bumpout, Seasonal Exclosure	
37	6		16 Jun	Hatch	8 Jul	2	1 (unk)	U		Bumpout, Seasonal Exclosure	On 10 July, 1 unbanded chick last seen at 2 days old. One egg unknown fate.
38	6	(y/o:y/g)?	16 Jun	Hatch	8 Jul	2	2 (unk)	U U		Bumpout, Seasonal Exclosure	On 24 July, both unbanded chicks last seen at 16 days old.
39	6	a/b:g/y U	14 Jun	Hatch	5 Jul	2	2 (1)	y/b:w/o (15.8) w/g:w/o (17.8)	w/g:w/o	Bumpout, Seasonal Exclosure	On 14 July, y/b:w/o chick last seen at 9 days old.
40	6		17 Jun	Hatch	8 Jul	2	1 (unk)	U		Bumpout, Seasonal Exclosure	On 17 July, 1 unbanded chick last seen at 9 days old. One egg abandoned post-term. No sign of fertilization when egg contents examined.
41	6	U	18 Jun	Hatch	9 Jul	1	1 (unk)	U		Bumpout, Seasonal Exclosure	On 12 July, 1 unbanded chick last seen at 3 days old.

Appendix A. California least tern nests at ODSVRA in 2021 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (no. fledged)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
42	7	s:b U	20 Jun	Hatch	11 Jul	2	2 (0)	g/a:w/o (9.5) U		Bumpout, Seasonal Exclosure	On 13 July, 1 unbanded chick last seen alive at 2 days old. On 14 July, 1 unbanded chick found dead near nest when banding g/a:w/o chick (see Table H.3 in Appendix H). On 26 July, g/a:w/o chick last seen at 15 days old.
43	6	g/y:y/o	18 Jun	Hatch	9 Jul	2	1 (0)	U		Bumpout, Seasonal Exclosure	On 9 July, 1 unbanded chick last seen on hatch date. One egg unknown fate.
44	6		20 Jun	Hatch	11 Jul	1	1 (unk)	U		Bumpout, Seasonal Exclosure	On 11 July, 1 unbanded chick last seen on hatch date.
45	6	Banded -:a/b	26 Jun	Hatch	19 Jul	2	2 (0)	o/r:w/o (8.9) y/a:w/o (11.7)		Bumpout, Seasonal Exclosure	On 26 July, o/r:w/o chick last seen at 7 days old and y/a:w/o chick last seen on 27 July at 8 days old. On 26 August, o/r:w/o chick found dead in 6 exclosure. (Small body size and highly decomposed.) (See Table H.4 in Appendix H).
46	7	U	28 Jun	Abandoned, unknown if pre- or post-term	22 Jul	2	0 (0)			Bumpout, Seasonal Exclosure	Nest incubated for a minimum 24-day period from 28 June to 21 July. On 29 July, 2 eggs at nest with large nonhatching holes and feathered embryos appearing dead, visible inside. No eggs found when nest walked to on 12 August.
47	6	w/b:b/y Banded	18 Jun	Hatch	9 Jul	2	2 (2)	g/w:w/o (10.5) o/g:w/o (8.7)	g/w:w/o o/g:w/o	Bumpout, Seasonal Exclosure	Band combination o/g:w/o also used on 1 chick hatching from LT10. Both chicks banded o/g:w/o from LT10 and LT47 fledged. On 8 August, 1 LT47 o/g:w/o fledgling depredated by harrier in 6 exclosure (see Table H.3 in Appendix H).
48	7	U	(29 Jun)	Abandoned, unknown if pre- or post-term	21 Jul	1	0 (0)			Bumpout, Seasonal Exclosure	Nest incubated for a minimum 23-day period from 29 June to 21 July. On 12 August, 1 egg found mostly buried. Approximately 3-week-old embryo in egg when contents examined post season.

Appendix A. California least tern nests at ODSVRA in 2021 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (no. fledged)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
49	6		15 Jun	Hatch	6 Jul	2	2 (1)	o/a:w/o (21.3) o/w:w/o (21.3)	o/a:w/o	Bumpout, Seasonal Exclosure	Band combinations o/w:w/o and o/a:w/o also used on chicks hatching from LT22. Single o/w:w/o chick confirmed fledged. Based on location and age when chick confirmed fledged, assigned to LT22 for purposes of this report. Both chicks banded o/a:w/o from LT22 and LT49 fledged. On 6 August, one o/a:w/o fledgling (unknown if LT22 or LT49) depredated by peregrine on 6 exclosure shoreline (see Table H.3 in Appendix H).
50	6	U a/y:b/w	14 Jun	Hatch	5 Jul	2	2 (2)	o/y:w/o (14.1) y/o:w/o (11.5)	o/y:w/o y/o:w/o	Bumpout, Seasonal Exclosure	
51	6	(s:b)? w/a:y/g	30 Jun	Hatch	21 Jul	1	1 (unk)	U		Bumpout, Seasonal Exclosure	On 22 July, 1 unbanded chick believed to be from LT51 was last seen 70 feet west of nest lying on its side, still alive but barely moving (see Table H.1 in Appendix H).
52	6	U	4 Jul	Hatch	25 Jul	2	1 (0)	a/w:w/o (25.3)		Bumpout, Seasonal Exclosure	On 31 July, a/w:w/o chick last seen at 6 days old. One egg abandoned post-term. No sign of fertilization when egg contents examined.
53	Unk		(25 Jun)	Hatch	(16 Jul)	2	2 (unk)	l:w/o (12.6) U			On 19 July, 2 small, unbanded chicks estimated to be 3 days old seen in 6 exclosure and one chick banded l:w/o. Band combination previously used on 1 chick hatching from LT6 on 1 July and found dead on 6 July. On 27 July, LT53 l:w/o chick found dead in 6 exclosure (see Table H.4 in Appendix H). Unknown if unbanded chick fledged.

APPENDIX B. SNOWY PLOVER NESTS AT ODSVRA IN 2021.

Plover chicks were banded to brood. Split hatch noted for nests when hatching of all chicks in the brood may have occurred over more than one day. The majority of unbanded chicks were not banded to avoid disturbing nearby young snowy plover broods.

In reading the codes of color-banded birds the left leg is shown first and separated by a colon from the right leg. If two bands are on a single leg the upper band is shown first. Colors for letter codes: a = aqua (light blue), b = dark blue, g = dark green, l = lime (light green), k = black, n = brown, o = orange, p = pink, r = red, s = silver (bare metal federal band), v = violet, w= white, y = yellow.

Location: 6 = 6 exclosure, 7 = 7 exclosure, 8 = 8 exclosure, BY = Boneyard exclosure, NOF = North Oso Flaco, SOF = South Oso Flaco, Foredune = Foredune closure, CBA = closed buffer area, ORA = open riding area, DP = Dunes Preserve, 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 Seasonal Exclosure, circular, small circular, mini-exclosure, nonpredator fencing, symbolic fence, and bumpout.

na = estimated date not available due to insufficient information

? = unconfirmed band combinations or colors

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

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (no. fledged)	No. chicks banded and combination	Nest protection type	Notes
1	7	F=U M=U	26 Mar	Abandoned pre-term	16 Apr	3	0 (0)		Mini-exclosure, Symbolic fence	On 12 April, camera confirmed adult male harrier eating 1 of 3 eggs in nest bowl. On 15 April, camera confirmed adult male harrier eating second egg in nest bowl and remaining 1 egg was protected with a mini- exclosure. The following day, 1 egg in active bowl marked and camera confirmed bird on nest until egg became fully buried later the same day. No evidence of adult attendance subsequently. On 19 April, 1 abandoned egg taken to Santa Barbara Zoo (see Table F.4 in Appendix F).
2	6	F=U M=U	30 Mar	Depredated, avian	21 Apr	3	0 (0)		Seasonal Exclosure	Lost during period of nest loss to harrier and raven.
3	7	F=rr:pw M=pg:by	30 Mar	Depredated, avian	1 May	3	0 (0)		Seasonal Exclosure	On 28 April, 3 eggs present. On 30 April, nest at 1 egg and egg with dent in shell and large avian tracks present at nest. Nest not seen incubated subsequently. On 3 May, harrier seen landing next to nest, nest walked to after and still at 1 egg. On 6 June, no eggs at nest. Nest considered depredated by avian predator with harrier suspected. Lost during period of nest loss to harrier and raven.

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
4	NOF	F=U M=U	30 Mar	Hatch	3 May	3	2 (1)	2 bb:gy	Circular, Symbolic fence	On 3 May, 1 immobile chick taken to Pacific Wildlife Care, then reunited in North Oso Flaco with adult and sibling on 6 May (see Table H.2 in Appendix H). On 4 May, 1 abandoned egg taken to Santa Barbara Zoo (see Table F.4 in Appendix F).
5	7	F=U M=U	31 Mar	Abandoned pre-term	10 Apr	3	0 (0)		Symbolic fence	Nest seen incubated from 4 to 9 April. On 10 April, 1 egg found 90% buried at nest bowl, egg marked and reset with other 2 eggs. No evidence of adult attendance subsequently. On 12 April, 3 eggs found 90% buried, 2 eggs marked and reset along with 1 previously marked egg. No sign of fertilization in eggs when contents examined post season.
6	7	F=U M=U	29 Mar	Depredated, avian	26 Apr	3	0 (0)		Seasonal Exclosure	On 24 April, 3 eggs present and nest last seen incubated 25 April. On 26 April, no eggs at nest. Lost during period of nest loss to harrier and raven.
7	Foredune	F=U M=U	31 Mar	Depredated, avian	16 Apr	3	0 (0)		Nonpredator fence	On 7 April, 3 eggs present and nest last seen incubated on 15 April. On 16 April, no eggs at nest. Lost during period of nest loss to harrier and raven.
8	6	F=U M=U	2 Apr	Depredated, avian	24 Apr	3	0 (0)		Seasonal Exclosure	On 7 April, 3 eggs present. Nest last seen incubated on 23 April. On 24 April, no eggs at nest. Lost during period of nest loss to harrier and raven. Male observed with foot injury on 17 March and 1 April (see Table H.2 in Appendix H).
9	7	F=U M=U	2 Apr	Hatch	8 May	3	2 (2)	2 pv:bg	Mini-exclosure, Seasonal Exclosure	One egg (without cracks) abandoned post-term. Approximately 2.5-week-old embryo in egg when contents examined post season.
10	6	F=U M=pv:rb	27 Mar	Hatch	28 Apr	3	2 (1)	2 gg:aa	Seasonal Exclosure	One egg unknown fate.
11	SOF	F= M=	na	Depredated	5 Apr	≥2	0 (0)		Symbolic fence	On 2 April, nest found at 2 eggs and never seen incubated. On 7 April, no eggs at nest.
12	8	F=ga:ry M=U	3 Apr	Wind	9 Apr	2	0 (0)		Symbolic fence	No sign of fertilization in eggs when contents examined post season.
13	6	F=pg:ar M=U	29 Mar	Hatch	30 Apr	3	3 (0)	3 pg:vv	Seasonal Exclosure	
14	6	F=U M=	21 Mar	Unknown	27 Apr	3	0 (0)		Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2021 (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	DP	F=ga:wy M=U	31 Mar	Hatch	4 May	3	1 (0)	1 ga:ga	Bumpout, Symbolic fence, Nonpredator fence	Nest in Dunes Preserve fenced area closed to the public. On 5 May, 1 unbanded chick moved with both adults to shoreline west of marker post 4 via a temporary symbolic rope fence corridor. From here they continued south to Foredune closure shoreline. Two eggs (without cracks) abandoned post-term. No sign of fertilization in eggs when contents examined post season.
16	7	F=U M=U	22 Mar	Hatch	23 Apr	3	3 (0)	3 vv:ga	Seasonal Exclosure	
17	Foredune	F=U M=gg:ob	6 Apr	Hatch	12 May	3	3 (1)	3 vv:vw	Bumpout, Mini-exclosure, Nonpredator fence	Due to recent nest predations, mini-exclosure installed on 10 May to provide protection from avian predators.
18	7	F=U M=vg:bw	6 Apr	Hatch (Split)	9 May	3	3 (0)	2 vv:vv 1 unbanded	Small circular, Seasonal Exclosure	
19	8	F=U M=	31 Mar	Depredated	11 Apr	3	0 (0)		Symbolic fence	Lost during period of nest loss to harrier and raven.
20	6	F=U M=U	29 Mar	Depredated, avian	26 Apr	3	0 (0)		Seasonal Exclosure	Nest considered depredated by avian predator with harrier suspected. Lost during period of nest loss to harrier and raven.
21	SOF	F=U M=U	5 Apr	Failed, unknown cause	23 Apr	3	0 (0)		Circular, Symbolic fence	Nest with 3 eggs on 14 April, 2 eggs on 21 April, and 1 egg on 23 April. Nest last seen incubated on 22 April.
22	7	F=bb:gr M=	24 Mar	Depredated, harrier	23 Apr	3	0 (0)		Seasonal Exclosure	On 23 April, last seen incubated at 9:02 am, and at 2:19 pm nest walked to and no eggs in bowl with harrier tracks near bowl.
23	7	F=U M=	27 Mar	Depredated, harrier	21 Apr	3	0 (0)		Symbolic fence	On 21 April, camera confirmed adult male harrier eating eggs at nest.
24	8	F=U M=vg:rw	8 Apr	Depredated, avian	28 Apr	3	0 (0)		Symbolic fence	On 25 April, 3 eggs present. Nest last incubated on 27 April. On 28 April, no eggs at nest. Lost during period of nest loss to harrier and raven.
25	SOF	F= M=bb:or	8 Apr	Abandoned pre-term	13 Apr	2	0 (0)		Symbolic fence	Two eggs abandoned pre-term. No sign of fertilization in eggs when contents examined post season.

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
26	Foredune	F=bb:ov M=U	8 Apr	Abandoned post-term	6 Jun	3	0 (0)		Nonpredator fence	Nest incubated for 59 days from 8 April to 5 June. On 12 April, 2 eggs present, 1 in nest bowl on top of sand mound, second egg at base of slope and appeared to have rolled out of nest. Second egg replaced in nest bowl. On 14 April, 3 eggs present in nest on sloped sand mound. On 15 April at 2 am, camera showed 2 of the 3 eggs disappeared and some sand movement, possibly got buried. Two eggs missing pre-term. One egg consistently incubated subsequently until 5 June. No sign of fertilization in egg when contents examined post season.
27	Foredune	F=ny:wl M=U	11 Apr	Depredated, avian	4 May	3	0 (0)		Nonpredator fence	On 3 May, 3 eggs present and nest incubated. On 4 May, no eggs at nest. Lost during period of nest loss to harrier and raven.
28	6	F= M=	3 Apr	Depredated, harrier	3 May	3	0 (0)		Seasonal Exclosure	
29	6	F=U M=U	9 Apr	Depredated, harrier	30 Apr	3	0 (0)		Seasonal Exclosure	
30	7	F= M=	29 Mar	Depredated, avian	26 Apr	3	0 (0)		Seasonal Exclosure	Lost during period of nest loss to harrier and raven.
31	8	F= M=	na	Depredated, avian	13 Apr	3	0 (0)		Seasonal Exclosure	Lost during period of nest loss to harrier and raven.
32	6	F=U M=U	7 Apr	Hatch	9 May	3	2 (0)	2 ga:bv	Circular, Symbolic fence	On 21 April, 3 eggs in nest bowl. On 22 April, a harrier was seen landing at nest and eating, and shortly after only 2 eggs were present in nest bowl.
33	BY	F=pg:vr M=U	6 Apr	Depredated, harrier	21 Apr	3	0 (0)		Seasonal Exclosure	On 21 April, camera confirmed adult male harrier eating eggs at nest.
34	BY	F= M=	11 Apr	Depredated, raven	25 Apr	3	0 (0)		Seasonal Exclosure	
35	BY	F=U M=U	5 Apr	Depredated, harrier	16 Apr	3	0 (0)		Seasonal Exclosure	On 16 April, camera confirmed adult male harrier eating eggs at nest.
36	NOF	F=Banded M=	11 Apr	Depredated, avian	24 Apr	3	0 (0)		Seasonal Exclosure	On 18 April, 3 eggs present. Nest last seen incubated on 23 April. On 24 April, no eggs at nest. Lost during period of nest loss to harrier and raven.
37	8	F=U M=U	8 Apr	Hatch (Split)	10 May	3	2 (0)	2 bb:pg	Circular, Symbolic fence	On 19 April, camera confirmed adult male harrier eating one egg.
38	7	F=ga:pr M=pg:ow	11 Apr	Depredated, raven	10 May	3	0 (0)		Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
39	SOF	F=vg:rg M=pg:by	13 Apr	Depredated, avian	21 Apr	2	0 (0)		Symbolic fence	On 19 April, 2 eggs present. Nest last seen incubated on 20 April. On 21 April, no eggs at nest. Lost during period of nest loss to harrier and raven.
40	6	F=U M=	31 Mar	Depredated, avian	25 Apr	3	0 (0)		Seasonal Exclosure	On 14 April, 3 eggs present. Nest last seen incubated on 24 April. On 25 April, no eggs at nest. Lost during period of nest loss to harrier and raven.
41	SOF	F= M=	na	Wind	17 Apr	1	0 (0)		Symbolic fence	No sign of fertilization in egg when contents examined post season.
42	BY	F= M=	5 Apr	Depredated, raven	25 Apr	3	0 (0)		Seasonal Exclosure	
43	Reveg. area	F=U M=rr:bw	14 Apr	Hatch	16 May	3	2 (0)	2 unbanded	Circular, Symbolic fence, Nonpredator fence	Nest inside Bigfoot revegetation area adjacent to open riding area. On 25 April, 3 eggs in nest with 1 broken and with spilled yolk (possibly depredated by unknown species).
44	SOF	F=vv:gw M=U	12 Apr	Abandoned pre-term	27 Apr	3	0 (0)		Circular, Symbolic fence	Nest last incubated on 24 April and active plover tracks at nest until 26 April. On 27 April, 3 eggs 50% buried in nest bowl with no plover tracks, eggs reset on top of sand and marked, and camera was placed and confirmed no subsequent incubation. On 28 April, 3 abandoned eggs 40% buried and taken to Santa Barbara Zoo (see Table F.4 in Appendix F).
45	6	F=U M=U	1 Apr	Hatch (Split)	3 May	3	3 (0)	3 bb:gb	Seasonal Exclosure	
46	6	F=U M=pv:ob	12 Apr	Abandoned pre-term	9 May	3	0 (0)		Bumpout, Circular, Seasonal Exclosure	One egg missing pre-term. Nest last incubated on 8 May. On 11 May, 2 abandoned eggs taken to Santa Barbara Zoo (see Table F.4 in Appendix F). On 15 August, 1 abandoned egg found in former nest area, most likely previously buried and exposed by wind. No sign of fertilization in egg when contents examined post season.
47	8	F=vg:yy M=vv:wr	13 Apr	Hatch	15 May	3	2 (1)	2 unbanded	Small circular, Seasonal Exclosure	One egg unknown fate.
48	8	F= M=	13 Apr	Depredated, avian	19 Apr	3	0 (0)		Seasonal Exclosure	On 20 April, no eggs at nest and eggshell fragments present. Nest considered depredated by avian predator with harrier suspected. Lost during period of nest loss to harrier.
49	6	F=U M=U	2 Apr	Hatch	4 May	3	3 (1)	3 gg:bg	Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
50	7	F=bb:ba M=pg:yb	6 Apr	Hatch	8 May	3	2 (1)	2 pg:wa	Mini-exclosure, Seasonal Exclosure	On 3 May, camera confirmed adult male harrier eating 1 egg at nest.
51	7	F= M=	10 Apr	Depredated, avian	3 May	3	0 (0)		Seasonal Exclosure	On 23 April, 3 eggs present. Nest last seen incubated on 2 May. On 3 May, no eggs at nest. Lost during period of nest loss to harrier and raven.
52	Foredune	F=U M=vg:ba	16 Apr	Hatch	21 May	3	2 (0)	2 gg:wy	Bumpout, Nonpredator fence	One egg (without cracks) abandoned post- term. No sign of fertilization in egg when contents examined post season.
53	ORA	F=U M=	21 Apr	Abandoned pre-term	29 Apr	2	0 (0)		Symbolic fence, Nonpredator fence	On 22 April, nest found at 1 egg in area open to the public and protected with symbolic fencing until replaced with nonpredator fencing on 23 April. On 30 April, 2 abandoned eggs taken to Santa Barbara Zoo (see Table F.4 in Appendix F).
54	Foredune	F=U M=U	21 Apr	Hatch	23 May	3	2 (0)	2 unbanded	Bumpout, Nonpredator fence	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
55	8	F= M=	na	Depredated, harrier	1 May	3	0 (0)		Symbolic fence	
56	BY	F=U M=	25 Apr	Depredated, harrier	4 May	2	0 (0)		Seasonal Exclosure	
57	7	F=U M=	na	Depredated, harrier	6 May	≥2	0 (0)		Seasonal Exclosure	
58	Reveg. area	F=bb:(gr)? M=	19 Apr	Depredated, avian	30 Apr	3	0 (0)		Nonpredator fence	Nest inside Eucalyptus Tree revegetation area adjacent to open riding area. On 27 April, 3 eggs present. Nest last seen incubated on 29 April. On 30 April, no eggs at nest. Lost during period of nest loss to harrier and raven.
59	Foredune	F=ga:bg M=ga:ba	26 Apr	Hatch	29 May	3	2 (0)	2 bb:yg	Circular, Symbolic fence	One egg (without cracks) abandoned post- term. Approximately 3-week-old embryo in egg when contents examined post season.
60	6	F=gg:gr M=bb:w-	18 Apr	Hatch (Split)	20 May	3	3 (0)	3 bb:yy	Circular, Seasonal Exclosure	
61	6	F=U M=	29 Apr	Depredated, harrier	7 May	≥2	0 (0)		Seasonal Exclosure	
62	Foredune	F=U M=	25 Apr	Wind	21 May	2	0 (0)		Circular, Symbolic fence	On 21 May, 2 eggs were unburied and replaced in nest bowl. On 22 May, 2 abandoned eggs taken to Santa Barbara Zoo (see Table F.4 in Appendix F).
63	7	F=U M=U	28 Apr	Hatch	30 May	3	3 (2)	2 bb:ao 1 unbanded	Circular, Symbolic fence	One banded and 1 unbanded chick fledged.
64	6	F=pg:yb M=bb:yb	27 Apr	Hatch	29 May	3	3 (0)	3 bb:oo	Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
65	ORA	F=bb:wv M=vg:pg	1 May	Depredated, avian	15 May	3	0 (0)		Symbolic fence, Nonpredator fence	On 1 May, nest found at 1 egg in area open to the public and protected with symbolic fencing until replaced with nonpredator fencing on 6 May. On 6 May, 3 eggs present. Nest last seen incubated on 14 May. On 15 May, no eggs at nest. Lost during period of nest loss to harrier and raven.
66	SOF	F= M=	1 May	Depredated, raven	6 May	2	0 (0)		Symbolic fence	
67	Foredune	F= M=	22 Apr	Abandoned pre-term	7 May	3	0 (0)		Nonpredator fence	Three eggs abandoned pre-term. Approximately 0.5-week-old embryo in eggs when contents examined post season.
68	SOF	F=U M=U	3 May	Depredated, raven	6 May	2	0 (0)		Symbolic fence	
69	Foredune	F= M=	25 Apr	Abandoned pre-term	8 May	3	0 (0)		Nonpredator fence	Three eggs abandoned pre-term. No sign of fertilization in eggs when contents examined post season.
70	NOF	F=U M=U	3 May	Hatch (Split)	5 Jun	3	3 (1)	3 bb:yr	Circular, Symbolic fence	
71	Foredune	F=U M=nb:rr	2 May	Hatch	5 Jun	3	3 (0)	3 unbanded	Symbolic fence	On 7 June, male observed with left leg injury (see Table H.2 in Appendix H).
72	6	F=U M=	na	Depredated, avian	7 May	≥1	0 (0)		Seasonal Exclosure	On 4 May, nest found at 1 egg. Nest last seen incubated on 6 May. On 8 May, no eggs at nest. Lost during period of nest loss to harrier and raven.
73	8	F= M=	3 May	Abandoned pre-term	17 May	3	0 (0)		Circular, Seasonal Exclosure	On 19 May, 3 abandoned eggs taken to Santa Barbara Zoo (see Table F.4 in Appendix F).
74	7	F= M=	na	Unknown	9 May	≥1	0 (0)		Seasonal Exclosure	On 8 May, 1 egg found at nest and never seen incubated. On 9 May, 1 egg 70% buried at nest with no plover tracks and reset on sand surface. On 15 May, 1 egg with large crack and no plover tracks at bowl, egg marked. On 26 May, no egg in nest and one cracked eggshell 3 feet from nest bowl. Clumped sand at nest suggesting predator activity.
75	6	F=bb:ww M=U	7 May	Wind	20 May	2	0 (0)		Circular, Seasonal Exclosure	On 22 May, 2 abandoned eggs taken to Santa Barbara Zoo (see Table F.4 in Appendix F).
76	ORA	F=U M=ny:wl	9 May	Hatch (Split)	8 Jun	3	3 (0)	3 pv:ab	Symbolic fence, Nonpredator fence	On 9 May, nest found at 1 egg in area open to the public and protected with symbolic fencing until replaced with a single nest exclosure on 13 May.

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
77	7	F=U M=	na	Depredated, avian	11 May	3	0 (0)		Seasonal Exclosure	On 9 May, 3 eggs present. Nest last seen incubated on 10 May. On 11 May, no eggs at nest. Lost during period of nest loss to harrier and raven.
78	7	F=U M=U	2 May	Depredated, harrier	31 May	3	0 (0)		Seasonal Exclosure	On 31 May, camera confirmed adult male harrier eating eggs at nest.
79	7	F=bb:wa M=U	7 May	Hatch	12 Jun	3	2 (1)	1 ga:ob 1 unbanded	Small circular, Seasonal Exclosure	One egg abandoned post-term. Approximately 3-week-old embryo in egg when contents examined post season. Banded chick fledged.
80	7	F=Banded M=(??):(bw)?	na	Depredated, raven	11 May	≥1	0 (0)		Seasonal Exclosure	
81	CBA	F=U M=	2 May	Depredated, raven	8 Jun	3	0 (0)		Nonpredator fence	On 10 May, 3 egg nest found inside already installed nonpredator fencing for previous failed nest SP53.
82	6	F=U M=U	5 May	Hatch	6 Jun	2	2 (0)	2 gg:ag	Circular, Symbolic fence	
83	6	F=U M=U	3 May	Abandoned pre-term	20 May	3	0 (0)		Small circular, Seasonal Exclosure	On 22 May, 3 abandoned eggs taken to Santa Barbara Zoo (see Table F.4 in Appendix F).
84	6	F=U? M=bb:rr	25 Apr	Hatch	27 May	3	3 (2)	3 ga:vb	Seasonal Exclosure	
85	Foredune	F=rr:bb M=vg:ay	10 May	Hatch	12 Jun	3	3 (0)	3 pv:vg	Bumpout, Nonpredator fence	
86	6	F=vv:rv M=nb:oy	9 May	Hatch	11 Jun	3	2 (0)	2 unbanded	Small circular, Seasonal Exclosure	One egg unknown fate.
87	6	F= M=	9 May	Depredated, avian	16 May	3	0 (0)		Seasonal Exclosure	On 13 May, 3 eggs present and last seen incubated on 15 May. On 16 May, no eggs at nest. Lost during period of nest loss to harrier and raven.
88	SOF	F=U M=U	11 May	Hatch	12 Jun	3	2 (1)	2 ga:br	Circular, Symbolic fence	One egg (without cracks) abandoned post-term. No sign of fertilization in egg when contents examined post season.
89	SOF	F=nb:al M=U	11 May	Hatch (Split)	16 Jun	3	2 (1)	2 pv:ba	Circular, Symbolic fence	One egg (with cracks) unknown fate, egg or hatched chick not seen subsequently.
90	7	F=pg:pb M=pv:wy	6 May	Hatch	7 Jun	2	2 (2)	2 gg:by	Seasonal Exclosure	
91	6	F=U M=gg:ww	6 May	Hatch	7 Jun	3	3 (3)	3 vg:ab	Seasonal Exclosure	
92	6	F= M=	27 Apr	Depredated	20 May	3	0 (0)		Seasonal Exclosure	On 14 May, 3 eggs present and last seen incubated on 19 May. On 20 May, no eggs at nest. Lost during period of nest loss to harrier and raven.

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
93	NOF	F= M=	10 May	Depredated, raven	30 May	3	0 (0)		Seasonal Exclosure	
94	BY	F= M=	12 May	Wind	21 May	3	0 (0)		Seasonal Exclosure	Nest last incubated in high winds on 20 May. On 21 May, 3 eggs 100% buried placed on sand surface and marked. On 22 May, 3 abandoned eggs were unburied and taken to Santa Barbara Zoo (see Table F.4 in Appendix F).
95	CBA	F=U M=U	11 May	Hatch	15 Jun	2	1 (0)	1 unbanded	Symbolic fence, Nonpredator fence	One egg unknown fate. On 15 June, 1 unbanded chick at nest bowl with right leg extended abnormally and did not appear to be able to walk. Transferred to Pacific Wildlife Care (see Table H.2 in Appendix H).
96	6	F=U M=U	30 Apr	Hatch	1 Jun	3	3 (0)	2 pv:bb 1 unbanded	Small circular, Seasonal Exclosure	
97	6	F=U M=U	5 May	Abandoned pre-term	23 May	2	0 (0)		Seasonal Exclosure	On 22 May, nest seen incubated after camera confirmed adult male harrier eating 1 egg at nest. On 23 May, 1 egg present and camera confirmed nest last incubated at 10:06 pm. One egg abandoned pre-term. Approximately 1.5-week-old embryo in egg when contents examined post season.
98	Foredune	F=no:ol M=vv:ra	14 May	Hatch	16 Jun	3	2 (0)	2 pv:br	Symbolic fence	One egg (with cracks) unknown fate.
99	6	F=U M=U	10 May	Hatch	11 Jun	3	3 (1)	3 pv:ww	Seasonal Exclosure	
100	Foredune	F=U M=U	6 May	Hatch	7 Jun	3	3 (0)	3 ga:yw	Symbolic fence	On 28 August, carcass of ga:yw chick found on Foredune closure shoreline (see Table H.6 in Appendix H).
101	Foredune	F= M=	8 May	Wind	20 May	3	0 (0)		Symbolic fence	
102	CBA	F=U M=ga:wr	16 May	Hatch	18 Jun	3	2 (2)	2 pg:ba	Symbolic fence, Nonpredator fence	On 23 June, 1 abandoned egg (with cracks) taken to Santa Barbara Zoo (see Table F.4 in Appendix F).
103	NOF	F=pv:by M=U	na	Failed, unknown cause	21 May	1	0 (0)		Symbolic fence	On 16 May, nest found at 1 egg and last seen incubated 20 May. On 27 May, no eggs at nest.
104	NOF	F=U M=U	14 May	Hatch (Split)	17 Jun	3	2 (1)	2 bb:ro	Symbolic fence	One egg (without cracks) unknown fate.
105	Foredune	F=vg:bw M=	4 May	Overwash by tide	26 May	3	0 (0)		Symbolic fence	
106	7	F=U M=	10 May	Abandoned pre-term	28 May	2	0 (0)		Seasonal Exclosure	Nest last seen incubated on 27 May. No sign of fertilization in eggs when contents examined post season.

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
107	Foredune	F=U M=U	16 May	Hatch (Split)	17 Jun	3	2 (0)	2 pg:wy	Bumpout, Nonpredator fence	One egg (without cracks) abandoned post- term. No sign of fertilization in egg when contents examined post season.
108	7	F=ga:pr M=pg:ow	na	Depredated, avian	23 May	1	0 (0)		Seasonal Exclosure	On 18 May, nest found at 1 egg and last seen incubated 22 May. On 23 May, no eggs at nest and abundant plover over- tracking. Nest considered depredated by avian predator with harrier suspected. Lost during period of nest loss to harrier and raven.
109	Foredune	F=ny:wl M=U	12 May	Hatch (Split)	13 Jun	3	3 (3)	3 ga:wb	Symbolic fence	
110	Foredune	F=gg:yr M=U	15 May	Hatch	16 Jun	2	1 (1)	1 pv:aa	Nonpredator fence	One egg (without cracks) abandoned post- term. No sign of fertilization in egg when contents examined post season.
111	Foredune	F=ga:ry M=U	2 May	Hatch	3 Jun	3	3 (0)	3 pv:vv	Nonpredator fence	
112	NOF	F=U M=gg:rb	17 May	Depredated, avian	27 May	3	0 (0)		Symbolic fence	On 21 May, 2 eggs in nest bowl and 1 egg outside of bowl was marked and replaced in nest. Nest last seen incubated on 26 May. On 27 May, no eggs at nest and possible crow or raven tracks at nest. Nest considered depredated by avian predator with corvid suspected. Lost during period of nest loss to harrier and raven.
113	6	F=banded M=U	15 May	Hatch (Split)	16 Jun	3	3 (1)	1 pv:wa 2 unbanded	Seasonal Exclosure	Three 4-day-old chicks of the SP113 nest adopted by SP116 female beginning 20 June and the banded chick fledged.
114	CBA	F=U M=U	22 May	Abandoned post-term	10 Aug	3	0 (0)		Symbolic fence, Nonpredator fence	Nest incubated for 79 days from 24 May to 10 August. No sign of fertilization in eggs when contents examined post season.
115	Foredune	F=bb:ba M=U	21 May	Hatch	22 Jun	3	3 (1)	3 pv:bo	Symbolic fence	
116	6	F=pg:ar M=	na	Abandoned pre-term	21 Jun	3	0 (0)		Symbolic fence	Nest seen incubated for 29 days from 23 May to 20 June. Associated female adopted three 4-day-old chicks from SP113 brood beginning 20 June and 1 fledged. Two eggs no sign of fertilization and 1 egg with approximately 3.5-week-old embryo when contents examined post season.

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
117	ORA	F=rr:pw M=pg:by	25 May	Hatch (Split)	26 Jun	3	3 (2)	3 ga:wo	Symbolic fence	On 26 May, nest found at 1 egg in area open to the public and protected with symbolic fencing until replaced with a single nest exclosure on 27 May. On 1 September, an owl pellet was found on 8 shoreline with 4 bands likely from a fledgling from this nest (see Table H.5 in Appendix H).
118	7	F=bb:vw M=ga:pr	na	Abandoned, unknown if pre- or post-term	24 Jun	3	0 (0)		Bumpout, Seasonal Exclosure	On 26 May, nest found at 3 eggs and bumpout installed with symbolic rope fence. On 28 May, 1 egg floated abnormally high, 2 eggs had slight inward dents and were not floated. No predator tracks seen around nest. On 14 June, 2 eggs at nest, 1 with large inward dent and dried yolk, second with 2 small puncture holes, and third egg not located. Clumps of wet sand found indicative of egg contents spilled. On 25 June, 1 egg with small hole and no wet contents visible. On 12 August, no eggs at nest. Nest seen incubated 29 days from 26 May to 23 June.
119	Foredune	F=U M=pv:ob	16 May	Hatch	17 Jun	3	3 (2)	3 vg:vw	Nonpredator fence	On 30 July, one 43-day-old fledgling observed with left leg injury and less active (see Table H.2 in Appendix H). On 5 August, one 49-day-old fledgling depredated by harrier in 6 exclosure (see Table H.5 in Appendix H).
120	Foredune	F=nb:oy M=U	11 May	Hatch	12 Jun	3	1 (0)	1 unbanded	Nonpredator fence	Camera confirmed female is banded but unable to confirm left leg bands. Two eggs unknown fate.
121	Foredune	F= M=U	25 Apr	Hatch	27 May	3	2 (1)	2 gg:wa	Nonpredator fence	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
122	6	F=U M=U	24 May	Hatch	25 Jun	3	3 (2)	3 unbanded	Symbolic fence	
123	7	F= M=	na	Depredated, avian	2 Jun	≥2	0 (0)		Symbolic fence	On 28 May, 2 eggs present and last seen incubated 1 June. On 2 June, no eggs at nest and small shell fragments present. Nest considered depredated by avian predator with harrier suspected. Lost during period of nest loss to harrier and raven.

Appendix B. Snowy plover nests at ODSVRA in 2021 (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	6	F=U M=U	22 May	Hatch	23 Jun	3	1 (1)	1 vg:ob	Symbolic fence	Two eggs (without cracks) abandoned post- term. One egg no sign of fertilization and 1 egg with approximately 0.5-week-old embryo when contents examined post season.
125	6	F= M=pg:vg	20 May	Hatch (Split)	21 Jun	3	3 (2)	3 bb:po	Seasonal Exclosure	From 23 July to 13 August, 2 bb:po fledglings observed at various times on 8 exclosure shoreline with toe or leg injures (see Table H.2 in Appendix H).
126	6	F=U M=bb:pb	16 May	Hatch (Split)	17 Jun	3	3 (3)	3 unbanded	Seasonal Exclosure	
127	Foredune	F=U M=ga:bg	26 May	Hatch	27 Jun	3	3 (2)	3 vv:ya	Bumpout, Nonpredator fence	On 29 May, nest found at 1 egg in Foredune closure and bumpout installed with symbolic rope fence.
128	8	F=U M=vg:yg	27 May	Depredated	9 Jun	3	0 (0)		Symbolic fence	On 2 June, 3 eggs present and last seen incubated on 8 June. On 9 June, no eggs at nest.
129	7	F=bb:ww M=U	26 May	Hatch (Split)	27 Jun	3	3 (0)	3 pv:va	Seasonal Exclosure	
130	8	F= M=	na	Depredated	10 Jun	≥2	0 (0)		Symbolic fence	On 2 June, 2 eggs present and last seen incubated on 9 June. On 10 June, no eggs and spilled egg contents, including yolk, in nest.
131	6	F= M=	23 May	Hatch	24 Jun	2	2 (2)	2 unbanded	Seasonal Exclosure	One adult confirmed unbanded (sex unknown).
132	8	F= M=	28 May	Depredated	9 Jun	3	0 (0)		Symbolic fence	On 2 June, 3 eggs present. Nest last seen incubated on 8 June. On 9 June, no eggs at nest.
133	Foredune	F=U M=U	25 May	Hatch	26 Jun	3	1 (0)	1 unbanded	Symbolic fence	Two eggs unknown fate.
134	6	F=U M=U	29 May	Wind	12 Jun	3	0 (0)		Seasonal Exclosure	
135	NOF	F=U M=	25 May	Abandoned pre-term	16 Jun	3	0 (0)		Symbolic fence	On 10 June, 3 eggs at nest. On 11 June, only 1 egg at nest 60% buried and 2 eggs missing pre-term, potentially buried. Nest last active with plover tracks on 15 June. Approximately 1-week-old embryo in remaining egg when contents examined post season.
136	Foredune	F=U M=rr:ab	22 May	Hatch (Split)	23 Jun	3	2 (2)	2 ga:oa	Nonpredator fence	One egg (without cracks) abandoned post- term. Approximately 2-week-old embryo in egg when contents examined post season.
137	Foredune	F=bb:go M=U	28 May	Hatch	29 Jun	3	3 (0)	3 unbanded	Nonpredator fence	

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
138	6	F=bb:gr M=vv:bw	18 May	Hatch	19 Jun	3	2 (1)	2 bb:ry	Seasonal Exclosure	One egg (without cracks) abandoned post- term. No sign of fertilization in egg when contents examined post season. On 11 July, 1 chick likely eaten by banded adult peregrine (suspected bird with VID band W49) in southeast portion of 7.5 revegetation area (see Table H.5 in Appendix H).
139	Foredune	F=U M=U	28 May	Hatch	30 Jun	3	2 (2)	2 pv:pv	Nonpredator fence	One egg (with abnormal cracks) abandoned post-term. On 22 July, 2 chicks found inside BBQ Flats revegetation area after initially being seen on the Foredune closure shoreline, and symbolic fence installed to close off the open riding area between BBQ Flats revegetation area and Foredune closure.
140	Foredune	F= M=	na	Wind	11 Jun	3	0 (0)		Nonpredator fence	
141	Foredune	F=U M=U	16 May	Hatch	17 Jun	3	3 (2)	3 vg:aa	Nonpredator fence	
142	Unknown	F= M=-:y/g	na	Hatch	(25 May)	≥2	2 (1)	2 ga:bo		On 29 May, found as brood of 2 small, unbanded chicks on South Oso Flaco shoreline.
143	Foredune	F=U M=U	na	Abandoned post-term	5 Aug	1	0 (0)		Nonpredator fence	Nest found at 1 egg on 27 May and seen incubated for 65 days from 2 June to 5 August. Camera confirmed nest last incubated at 10:19 pm on 5 August. No sign of fertilization in egg when contents examined post season.
144	6	F=U M=U	31 May	Hatch (Split)	2 Jul	3	2 (0)	2 unbanded	Symbolic fence	One egg abandoned post-term. Approximately 3.5-week-old embryo in egg when contents examined post season.
145	6	F=bb:og M=U	25 May	Hatch (Split)	26 Jun	3	2 (1)	2 pg:ww	Seasonal Exclosure	One egg (without cracks) abandoned post- term. No sign of fertilization in egg when contents examined post season.
146	Unknown	F=U M=U	na	Hatch	(30 May)	3	3 (0)	3 vv:aa		On 2 June, found as brood of 3 small, unbanded chicks in Foredune closure.
147	7	F=U M=pv:yb	29 May	Hatch	30 Jun	3	2 (1)	2 rr:rb	Seasonal Exclosure	One egg (without cracks) missing post- term.
148	7	F=vg:yy M=vg:bw	28 May	Hatch	29 Jun	3	3 (2)	3 unbanded	Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
149	6	F=U M=U	28 May	Hatch (Split)	29 Jun	3	3 (2)	2 vg:bo 1 unbanded	Seasonal Exclosure	Two banded chicks fledged. On 7 August, after harrier was observed eating least tern prey inside 6 exclosure, prey site was walked to and a regurgitated pellet was found containing violet, green, orange, and blue plastic bands with tape, possibly representing one plover fledgling from this nest (see Table H.5 in Appendix H).
150	7	F=U M=	18 May	Depredated, opossum	6 Jun	3	0 (0)		Symbolic fence	
151	6	F=U M=U	5 May	Hatch	6 Jun	3	3 (0)	3 gg:ga	Symbolic fence	
152	7	F=U M=U	29 May	Hatch	30 Jun	3	3 (0)	3 unbanded	Symbolic fence	
153	Unknown	F=ga:ba M=U	na	Hatch	(31 May)	3	3 (2)	3 gg:gg		On 3 June, found as brood of 3 small, unbanded chicks on 7 exclosure shoreline.
154	7	F=U M=U	29 May	Hatch	30 Jun	3	2 (2)	2 pv:av	Seasonal Exclosure	One egg (without cracks) abandoned post- term. No sign of fertilization in egg when contents examined post season.
155	6	F=vv:ab M=U	28 May	Hatch	29 Jun	3	3 (3)	3 pv:wo	Seasonal Exclosure	
156	6	F=U M=U	30 May	Hatch	1 Jul	2	2 (1)	2 rr:vw	Seasonal Exclosure	
157	NOF	F=U M=U	4 Jun	Hatch	8 Jul	2	2 (1)	2 unbanded	Symbolic fence	
158	CBA	F=U M=U	3 Jun	Hatch (Split)	5 Jul	3	3 (0)	3 ga:ao	Symbolic fence, Nonpredator fence	On 7 July, a 1- to 2-day-old ga:oa chick seen limping on left leg after aggression seen between brooding adults, only 1 chick seen subsequently (see Table H.2 in Appendix H).
159	7	F=U M=U	29 May	Hatch (Split)	30 Jun	3	3 (2)	2 vv:vr 1 unbanded	Seasonal Exclosure	
160	SOF	F=vg:rg M=pg:by	30 May	Abandoned, unknown if pre- or post-term	1 Jul	3	0 (0)		Circular, Symbolic fence	On 7 June, 3 eggs in nest and circular installed. On 21 June, 2 eggs in nest bowl and third egg well outside of nest bowl down dune slope (this egg left in place and last date 3 eggs seen). One egg missing pre-term. On 28 June and 30 June, 2 eggs re-centered in circular. On 3 July, 2 abandoned eggs taken to Santa Barbara Zoo (see Table F.4 in Appendix F).
161	CBA	F=U M=U	na	Wind	9 Jun	1	0 (0)		Symbolic fence, Nonpredator fence	No sign of fertilization in egg when contents examined post season.

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
162	6	F=U M=ga:pv	29 May	Hatch (Split)	30 Jun	3	2 (2)	2 unbanded	Symbolic fence	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
163	8	F=U M=U	23 May	Hatch	24 Jun	3	3 (2)	3 vv:yw	Circular, Small circular, Symbolic fence	On 10 June, nest protected with a 5-foot diameter circular exclosure until replaced with a 7-foot diameter circular on 11 June.
164	NOF	F= M=	na	Depredated	9 Jun	3	0 (0)		Seasonal Exclosure	On 7 June, nest seen incubated. On 8 June, 3 eggs present. On 9 June, no eggs at nest and abundant plover over-tracking.
165	Foredune	F= M=	na	Wind	13 Jun	3	0 (0)		Nonpredator fence	
166	7	F=ga:pr M=pg:ow	27 May	Hatch	28 Jun	3	3 (2)	3 bb:pr	Seasonal Exclosure	On 15 and 17 July, ga:pr female appeared to limp on right leg but no problems noted subsequently (see Table H.2 in Appendix H).
167	6	F=U M=bb:bw	6 Jun	Hatch	8 Jul	3	2 (0)	2 pg:ab	Seasonal Exclosure	One egg (with cracks) unknown fate. On 20 July, male adopted a 4-day-old pv:vr chick from SP197. This chick was last seen on 22 July at 6 days old.
168	6	F=U M=pv:rb	1 Jun	Hatch	3 Jul	3	2 (2)	2 ga:vr	Seasonal Exclosure	One egg (without cracks) abandoned post- term. No sign of fertilization in egg when contents examined post season.
169	8	F=vg:bw M=U	29 May	Hatch (Split)	30 Jun	3	3 (1)	3 unbanded	Symbolic fence	
170	Foredune	F=ga:wy M=U	28 May	Hatch (Split)	29 Jun	3	3 (2)	3 unbanded	Symbolic fence	
171	Foredune	F= M=pv:gb	2 Jun	Hatch	4 Jul	3	3 (2)	3 pg:gg	Symbolic fence	
172	Foredune	F=ga:py M=gg:rb	30 May	Hatch	1 Jul	3	3 (1)	3 bb:yv	Nonpredator fence	
173	6	F= M=	na	Abandoned, unknown if pre- or post-term	na	2	0 (0)		Seasonal Exclosure	On 13 June, nest found as 2 eggs abandoned, unknown if pre- or post-term. No sign of fertilization in eggs when contents examined post season.
174	7	F=U M=U	2 Jun	Hatch (Split)	4 Jul	3	3 (0)	2 vg:vo 1 unbanded	Symbolic fence	
175	6	F=pg:yb M=bb:w-	8 Jun	Hatch	10 Jul	3	2 (1)	2 unbanded	Seasonal Exclosure	One egg (without cracks) abandoned post- term. No sign of fertilization in egg when contents examined post season.
176	CBA	F=bb:ar M=U	15 Jun	Hatch (Split)	14 Jul	3	2 (0)	2 pv:gg	Symbolic fence, Nonpredator fence	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
177	8	F=U M=rr:aw	6 Jun	Hatch	8 Jul	3	3 (1)	3 unbanded	Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
178	7	F=U M=U	1 Jun	Unknown	8 Jul	3	0 (0)		Seasonal Exclosure	Nest seen incubated for 25 days from 13 June to 7 July. Nest located in debris patch and difficult to see. On 8 July, no eggs at nest.
179	SOF	F=U M=bb:or	9 Jun	Hatch	11 Jul	3	1 (1)	1 rr:va	Circular, Symbolic fence	On 18 June, symbolic fence moved west to decrease possible pedestrian disturbance. Two eggs abandoned post-term. No sign of fertilization in eggs when contents examined post season.
180	Unknown	F= M=U	na	Hatch	(7 Jun)	≥2	2 (2)	2 unbanded		On 12 June, found as brood of 1 small, unbanded chick on 6 exclosure shoreline. Two chicks seen with brood beginning 15 June.
181	Unknown	F=U M=U	na	Hatch	(11 Jun)	3	3 (1)	3 unbanded		On 14 June, found as brood of 3 small, unbanded chicks on 6 exclosure shoreline.
182	SOF	F=U M=	18 Jun	Abandoned pre-term	1 Jul	3	0 (0)		Circular, Symbolic fence	On 20 June, symbolic fence moved west to decrease possible pedestrian disturbance. Camera confirmed nest last incubated on 1 July at 10:10 pm. On 3 July, 3 abandoned eggs taken to Santa Barbara Zoo (see Table F.4 in Appendix F).
183	6	F=U M=U	9 Jun	Hatch	11 Jul	3	3 (1)	3 rr:ba	Seasonal Exclosure	
184	6	F=gg:gr M=U	13 Jun	Hatch	15 Jul	3	1 (0)	1 unbanded	Seasonal Exclosure	Two eggs abandoned post-term. No sign of fertilization in eggs when contents examined post season.
185	7	F=ga:ba M=U	10 Jun	Hatch	12 Jul	3	2 (1)	2 unbanded	Symbolic fence	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
186	6	F= M=	na	Unknown	14 Jul	1	0 (0)		Seasonal Exclosure	Nest seen incubated for 27 days from 17 June to 13 July. On 24 June, 1 egg at nest. On 2 July, 1 egg at nest had no cracks but was tapping. Not walked to subsequently while active. On 13 August, no eggs at nest.
187	Foredune	F=U M=ga:ba	15 Jun	Hatch	17 Jul	3	3 (0)	3 vg:ra	Symbolic fence	
188	Foredune	F=U M=U	5 Jun	Hatch	7 Jul	3	2 (2)	2 pg:vw	Nonpredator fence	One egg (with cracks) unknown fate. On 3 October, the carcass of a pg:vw juvenile was found in the open riding area (see Table H.6 in Appendix H).
189	Foredune	F=U M=U	29 May	Hatch (Split)	30 Jun	3	3 (2)	3 unbanded	Nonpredator fence	
190	Foredune	F=ga:ry M=U	11 Jun	Hatch (Split)	13 Jul	3	3 (0)	3 unbanded	Nonpredator fence	Nest camera confirmed first chick hatched 13 July, second chick hatched 14 July, and third chick hatched 15 July.

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
191	8	F=U M=U	17 Jun	Hatch	19 Jul	3	3 (1)	3 unbanded	Symbolic fence	SP191 produced 3 chicks that remained unbanded. SP214 produced 1 chick that also remained unbanded and was same age as SP191 chicks. When chicks were 2 days old, SP214 vg:yg male adopted SP191 chicks and 1 chick fledged, but not known if original SP214 chick or an adopted SP191 chick.
192	6	F=U M=U	12 Jun	Hatch	14 Jul	3	3 (1)	3 vg:wr	Seasonal Exclosure	
193	6	F=bb:ov M=ga:vg	17 Jun	Hatch	19 Jul	3	2 (1)	1 vv:rw 1 vv:r-	Seasonal Exclosure	On 22 June, 3 eggs in nest, 1 with small hole with visible yolk inside. One egg unknown fate. On 28-29 July, a banded 9- to 10-day-old chick observed with right leg injury (see Table H.2 in Appendix H). On 30 July, 1 chick confirmed lost white band on right leg and fledged. On 2 August, kestrel observed depredating a banded chick in 6 exclosure (see Table H.5 in Appendix H).
194	7	F=U M=pg:yb	20 Jun	Hatch	22 Jul	≥1	1 (0)	1 unbanded	Symbolic fence	On 22 June, nest found at 1 egg. To avoid disturbing young snowy plover and least tern broods, nest not walked to again and total egg number unknown.
195	SOF	F=U M=U	21 Jun	Hatch	23 Jul	3	3 (2)	3 rr:vv	Circular, Symbolic fence	Beginning on 9 August, 2 chicks raised by male south of park boundary on Guadalupe-Nipomo Dunes NWR shoreline and both fledged.
196	Foredune	F=U M=vg:ba	11 Jun	Hatch	13 Jul	3	3 (2)	3 vv:ar	Nonpredator fence	On 11 September, 1 vv:ar fledgling seen with pismo clam closed on toe on left foot (see Table H.2 in Appendix H).
197	8	F=U M=vg:rw	14 Jun	Hatch	16 Jul	3	3 (1)	3 pv:vr	Circular, Symbolic fence	One 4-day-old chick adopted by SP167 brood beginning 20 July and not known to fledge.
198	Unknown	F=ga:or M=rr:r-	na	Hatch	(20 Jun)	≥2	2 (2)	2 ga:va		On 23 June, found as brood of 2 small, unbanded chicks on North Oso Flaco shoreline.
199	6	F=U M=U	16 Jun	Hatch	18 Jul	3	2 (0)	2 unbanded	Symbolic fence	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
200	Foredune	F=nb:oy M=gg:ob	20 Jun	Hatch	22 Jul	3	1 (0)	1 unbanded	Nonpredator fence	Two eggs abandoned post-term. No sign of fertilization in eggs when contents examined post season.
201	NOF	F=U M=gn:rr	23 Jun	Hatch	25 Jul	3	3 (0)	3 ga:ra	Circular, Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
202	Foredune	F=U M=	19 Jun	Hatch	21 Jul	3	3 (0)	3 rr:vb	Nonpredator fence	
203	Foredune	F=U M=gg:gb	15 Jun	Hatch (Split)	17 Jul	3	3 (1)	3 rr:aa	Nonpredator fence	
204	7	F=U M=U	25 Jun	Hatch	29 Jul	3	3 (0)	3 vg:wo	Symbolic fence	
205	Foredune	F= M=	na	Abandoned, unknown if pre- or post-term	na	3	0 (0)		Symbolic fence	On 25 June, nest found as 3 eggs abandoned, unknown if pre- or post-term. No sign of fertilization in eggs when contents examined post season.
206	SOF	F=U M=Banded	23 Jun	Depredated, raven	6 Jul	3	0 (0)		Symbolic fence	
207	7	F= M=	11 Jun	Hatch	13 Jul	3	1 (0)	1 unbanded	Seasonal Exclosure	Two eggs abandoned post-term. No sign of fertilization in eggs when contents examined post season.
208	6	F=yg:wl M=U	23 Jun	Hatch	25 Jul	3	3 (0)	3 vg:rr	Seasonal Exclosure	
209	6	F=ga:bg M=bb:yb	9 Jun	Hatch	11 Jul	3	3 (0)	3 vg:oa	Seasonal Exclosure	
210	Foredune	F= M=vv:ra	24 Jun	Hatch	26 Jul	3	2 (0)	2 vv:go	Nonpredator fence	One egg (without cracks) abandoned post- term. No sign of fertilization in egg when contents examined post season.
211	SOF	F=U M=	27 Jun	Depredated, raven	6 Jul	3	0 (0)		Symbolic fence	
212	Foredune	F=rr:bb M=vg:ay	21 Jun	Hatch	23 Jul	3	3 (0)	3 unbanded	Nonpredator fence	
213	7	F=U? M=U	25 Jun	Hatch	27 Jul	3	2 (0)	2 vg:go	Symbolic fence	One egg abandoned post-term. Approximately 2-week-old embryo in egg when contents examined post season.
214	8	F=U M=vg:yg	17 Jun	Hatch	19 Jul	3	1 (0)	1 unbanded	Symbolic fence	Two eggs abandoned post-term. No sign of fertilization in eggs when contents examined post season. SP191 produced 3 chicks that remained unbanded. SP214 produced 1 chick that also remained unbanded and was same age as SP191 chicks. When chicks were 2 days old, SP214 vg:yg male adopted SP191 chicks and 1 chick fledged, but not known if original SP214 chick or an adopted SP191 chick.
215	7	F=(bb:vw)? M=ga:pr	26 Jun	Hatch	28 Jul	3	2 (1)	2 vg:yo	Seasonal Exclosure	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.
216	8	F=U M=vg:vy	14 Jun	Hatch	16 Jul	≥2	1 (0)	1 unbanded	Seasonal Exclosure	One egg abandoned post-term. No sign of fertilization in egg when contents examined post season.

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
217	Foredune	F=U M=U	22 Jun	Hatch (Split)	24 Jul	3	3 (0)	3 vv:oa	Symbolic fence	On 4 August, 1 of 2 vv:oa chicks seen with a limp (see Table H.2 in Appendix H).
218	6	F=U M=U	18 Jun	Hatch (Split)	20 Jul	3	3 (0)	2 pg:bo 1 unbanded	Seasonal Exclosure	On 14 August, subadult male harrier seen depredating a 24-day-old banded chick of this brood on Foredune closure shoreline (see Table H.5 in Appendix H).
219	8	F=U M=	na	Depredated, coyote	13 Jul	3	0 (0)		Seasonal Exclosure	
220	6	F=pg:ar M=	5 Jul	Hatch	10 Aug	3	3 (0)	3 unbanded	Mini-exclosure, Seasonal Exclosure	On 10 August, during period of high nest loss to harrier, camera and mini-exclosure installed on nest with 1 egg, 1 hatching chick, and 1 dry chick. On 11 August, three 1-day-old chicks last seen on 6 exclosure shoreline.
221	SOF	F=vg:rg M=pg:by	4 Jul	Hatch	5 Aug	3	2 (0)	2 gg:vy	Circular, Symbolic fence	On 6 August, 1 egg (without cracks) abandoned post-term in nest bowl. On 7 August, no eggs in nest bowl.
222	7	F= M=U light	2 Jul	Hatch (Split)	3 Aug	3	3 (0)	2 ga:vy 1 unbanded	Seasonal Exclosure	
223	NOF	F=U M=	28 Jun	Hatch	30 Jul	3	1 (0)	1 unbanded	Small circular, Symbolic fence	Two eggs abandoned post-term. One egg no sign of fertilization and 1 egg with approximately 3-week-old embryo when contents examined post season.
224	6	F=U M=U	22 Jun	Hatch	24 Jul	3	3 (0)	3 unbanded	Seasonal Exclosure	
225	8	F= M=	na	Depredated, opossum	16 Jul	≥1	0 (0)		Seasonal Exclosure	
226	7	F= M=	4 Jul	Hatch	5 Aug	3	1 (0)	1 unbanded	Symbolic fence	On 27 July, 3 eggs at nest. Nest in area difficult to view. On 5 August, 1 small unbanded chick seen east of nest while female incubates nest, then female leaves nest to east out of sight. Nest not incubated subsequent days. On 12 August, no eggs at nest, abundant plover over- tracking, and raptor tracks near nest bowl with egg fragments and clumps of sand. Harrier depredation suspected. Two eggs unknown fate.
227	6	F= M=U	28 Jun	Hatch	30 Jul	3	3 (0)	3 unbanded	Seasonal Exclosure	
228	6	F=U M=	25 Jun	Hatch (Split)	27 Jul	3	3 (0)	1 gg:br 2 unbanded	Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2021 (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=pv:by M=U	na	Hatch	(24 Jun)	3	3 (3)	3 bb:rv		On 29 June, found as brood of 3 small, unbanded chicks on North Oso Flaco shoreline.
230	BY	F= M=	na	Abandoned pre-term	na	3	0 (0)		Seasonal Exclosure	On 18 August, nest found as 3 eggs abandoned pre-term. One egg no sign of fertilization and 2 eggs with approximately 3-week-old embryos when contents examined post season.
231	Unknown	F=U M=vv:ra	na	Hatch	(30 Jul)	3	3 (0)	3 unbanded		On 4 August, found as brood of 3 small, unbanded chicks on Foredune closure shoreline.
232	Unknown	F=U M=U	na	Hatch	(25 Jun)	≥1	1 (0)	1 unbanded		On 30 June, found as brood of 1 unbanded chick on North Oso Flaco shoreline.
233	Unknown	F=vg:yb M=U	na	Hatch	(26 Jun)	3	3 (1)	3 unbanded		On 30 June, found as brood of 3 small, unbanded chicks on Foredune closure shoreline. On 20 July, a chick carcass from this nest was collected from the Foredune closure shoreline (see Table H.6 in Appendix H).
234	Unknown	F= M=rr:bw	na	Hatch	(8 Jul)	≥2	2 (0)	2 unbanded		On 14 July, found as brood of 2 small, unbanded chicks on 7 exclosure shoreline.
235	Unknown	F=ga:av M=ga:yb	na	Hatch	(12 Jul)	≥2	2 (1)	2 unbanded		On 16 July, found as brood of 2 small, unbanded chicks on 8 exclosure shoreline.
236	Unknown	F= M=U	na	Hatch	(19 Jul)	3	3 (1)	3 pg:br		On 20 July, found as brood of 3 small, unbanded chicks on 8 exclosure shoreline.
237	Unknown	F= M=U	na	Hatch	(21 Jul)	≥2	2 (0)	2 unbanded		On 24 July, found as brood of 1 small, unbanded chick on 7 exclosure shoreline. Two chicks seen with brood beginning 2 August.
238	Unknown	F= M=U	na	Hatch	(24 Jul)	≥1	1 (1)	1 unbanded		On 29 July, found as brood of 1 small, unbanded chick on South Oso Flaco shoreline.
239	Unknown	F= M=nb:rr	na	Hatch	(28 Jul)	3	3 (1)	3 gg:pv		On 29 July, found as brood of 3 small, unbanded chicks on Foredune closure shoreline.
234	Unknown	F= M=rr:bw	na	Hatch	(8 Jul)	≥2	2 (0)	2 unbanded		On 14 July, found as brood of 2 small, unbanded chicks on 7 exclosure shoreline.
235	Unknown	F=ga:av M=ga:yb	na	Hatch	(12 Jul)	≥2	2 (1)	2 unbanded		On 16 July, found as brood of 2 small, unbanded chicks on 8 exclosure shoreline.
236	Unknown	F= M=U	na	Hatch	(19 Jul)	3	3 (1)	3 pg:br		On 20 July, found as brood of 3 small, unbanded chicks on 8 exclosure shoreline.

Appendix B. Snowy plover nests at ODSVRA in 2021 (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
237	Unknown	F= M=U	na	Hatch	(21 Jul)	≥2	2 (0)	2 unbanded		On 24 July, found as brood of 1 small, unbanded chick on 7 exclosure shoreline. Two chicks seen with brood beginning 2 August.
238	Unknown	F= M=U	na	Hatch	(24 Jul)	≥1	1 (1)	1 unbanded		On 29 July, found as brood of 1 small, unbanded chick on South Oso Flaco shoreline.
239	Unknown	F= M=nb:rr	na	Hatch	(28 Jul)	3	3 (1)	3 gg:pv		On 29 July, found as brood of 3 small, unbanded chicks on Foredune closure shoreline.
234	Unknown	F= M=rr:bw	na	Hatch	(8 Jul)	≥2	2 (0)	2 unbanded		On 14 July, found as brood of 2 small, unbanded chicks on 7 exclosure shoreline.
235	Unknown	F=ga:av M=ga:yb	na	Hatch	(12 Jul)	≥2	2 (1)	2 unbanded		On 16 July, found as brood of 2 small, unbanded chicks on 8 exclosure shoreline.
236	Unknown	F= M=U	na	Hatch	(19 Jul)	3	3 (1)	3 pg:br		On 20 July, found as brood of 3 small, unbanded chicks on 8 exclosure shoreline.
237	Unknown	F= M=U	na	Hatch	(21 Jul)	≥2	2 (0)	2 unbanded		On 24 July, found as brood of 1 small, unbanded chick on 7 exclosure shoreline. Two chicks seen with brood beginning 2 August.
238	Unknown	F= M=U	na	Hatch	(24 Jul)	≥1	1 (1)	1 unbanded		On 29 July, found as brood of 1 small, unbanded chick on South Oso Flaco shoreline.
239	Unknown	F= M=nb:rr	na	Hatch	(28 Jul)	3	3 (1)	3 gg:pv		On 29 July, found as brood of 3 small, unbanded chicks on Foredune closure shoreline.
234	Unknown	F= M=rr:bw	na	Hatch	(8 Jul)	≥2	2 (0)	2 unbanded		On 14 July, found as brood of 2 small, unbanded chicks on 7 exclosure shoreline.
235	Unknown	F=ga:av M=ga:yb	na	Hatch	(12 Jul)	≥2	2 (1)	2 unbanded		On 16 July, found as brood of 2 small, unbanded chicks on 8 exclosure shoreline.
236	Unknown	F= M=U	na	Hatch	(19 Jul)	3	3 (1)	3 pg:br		On 20 July, found as brood of 3 small, unbanded chicks on 8 exclosure shoreline.
237	Unknown	F= M=U	na	Hatch	(21 Jul)	≥2	2 (0)	2 unbanded		On 24 July, found as brood of 1 small, unbanded chick on 7 exclosure shoreline. Two chicks seen with brood beginning 2 August.
238	Unknown	F= M=U	na	Hatch	(24 Jul)	≥1	1 (1)	1 unbanded		On 29 July, found as brood of 1 small, unbanded chick on South Oso Flaco shoreline.
239	Unknown	F= M=nb:rr	na	Hatch	(28 Jul)	3	3 (1)	3 gg:pv		On 29 July, found as brood of 3 small, unbanded chicks on Foredune closure shoreline.

Appendix B. Snowy plover nests at ODSVRA in 2021 (continued).

Insufficient information available to assign the following broods to a specific nest. Most to all of these broods were likely from nests with an assigned number, known to hatch, and with chicks not banded at nest. The majority of chicks could not be banded to avoid disturbing nearby young snowy plover broods.
UNA = unassigned nest

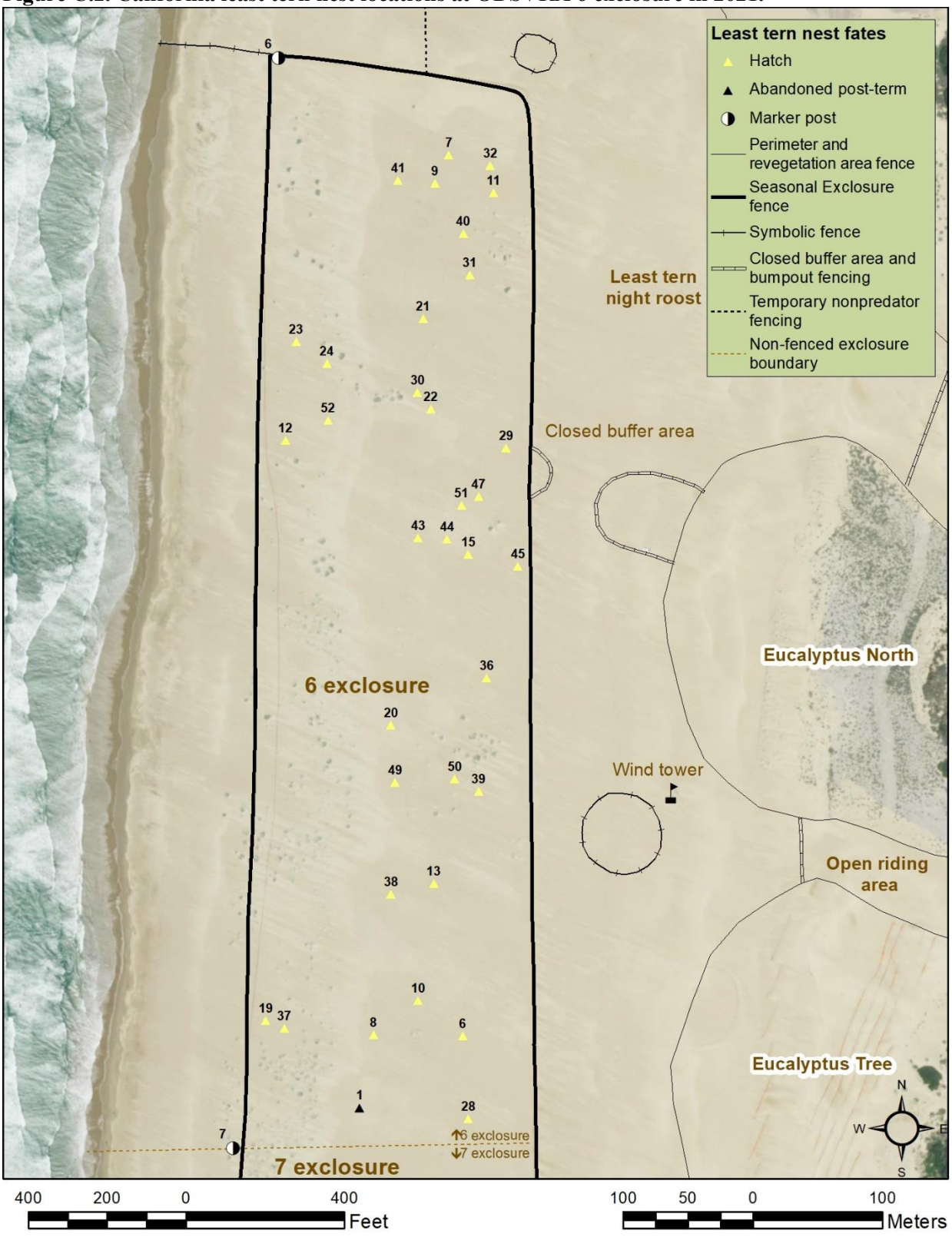
Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (no. fledged)	No. chicks banded and combination	Nest protection type	Notes
UNA1	Unknown	F= M=	na	Hatch	(20-May)	-	1 (0)	1 unbanded	-	On 29 May, found as brood of 1 medium-sized, unbanded chick on Foredune closure shoreline.
UNA2	Unknown	F= M=U	na	Hatch	(27-Jun)	-	3 (0)	3 unbanded	-	On 29 June, found as brood of 3 small, unbanded chicks on Foredune closure shoreline.
UNA3	Unknown	F=U M=	na	Hatch	(16-Jul)	-	3 (0)	3 unbanded	-	On 17 July, found brood of 3 small, unbanded chicks in Bigfoot revegetation area. One weak, but able to walk and run, chick last seen on 4 August with swollen featherless spot on neck and chest (see Table H.2 in Appendix H).
UNA4	Unknown	F= M=U	na	Hatch	(16-Jul)	-	1 (0)	1 unbanded	-	On 26 July, found brood of 1 medium-sized, unbanded chick on 8 exclosure shoreline.
UNA5	Unknown	F= M=U	na	Hatch	(10-Jul)	-	1 (0)	1 unbanded	-	On 31 July, found brood of 1 medium-sized, unbanded chick on 6 exclosure shoreline and not seen again subsequently.

APPENDIX C. MAPS OF ALL CALIFORNIA LEAST TERN AND SNOWY PLOVER NEST LOCATIONS AT ODSVRA IN 2021.

Figure C.1. California least tern and snowy plover nest locations at ODSVRA in 2021.

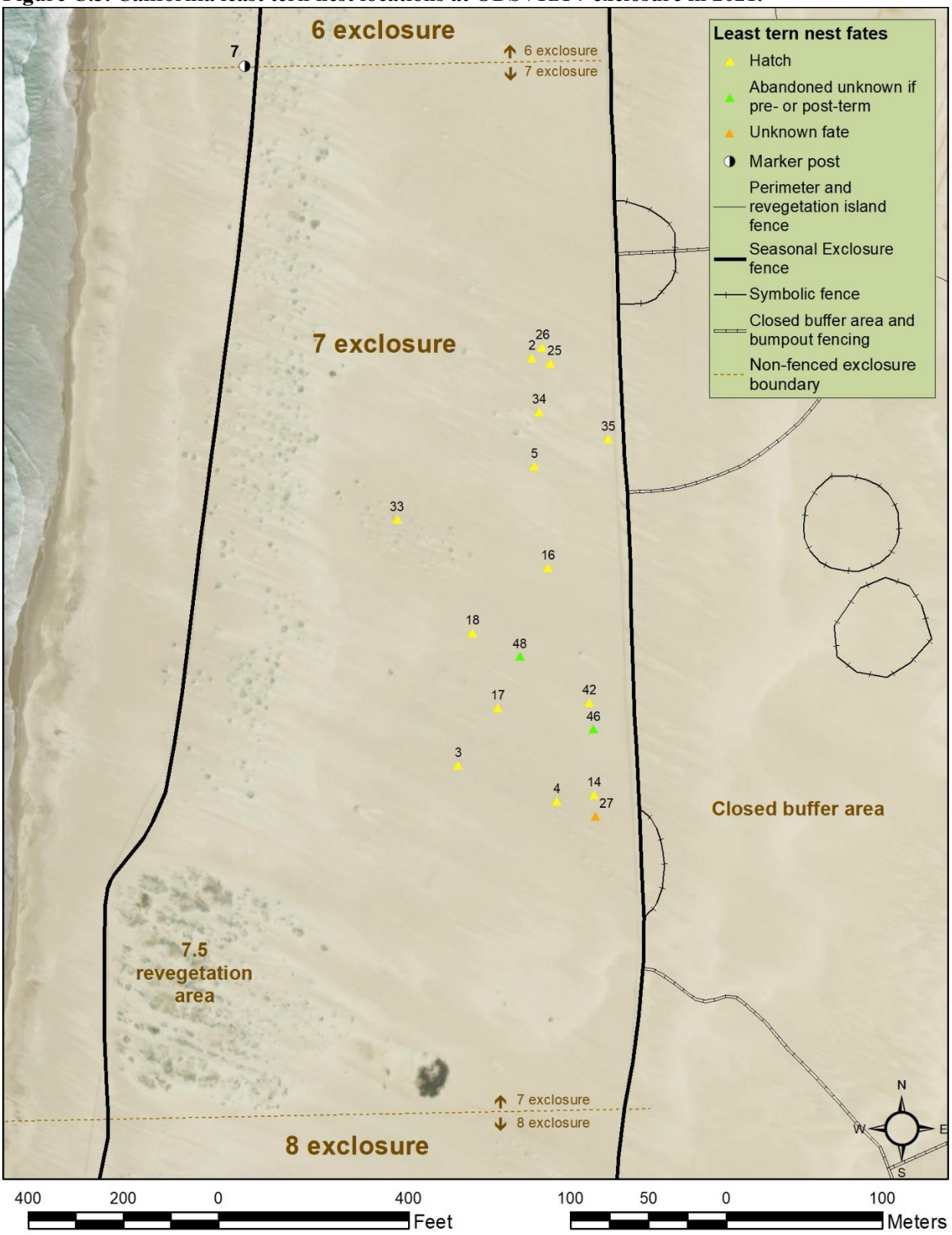
Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

Figure C.2. California least tern nest locations at ODSVRA 6 exclosure in 2021.



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

Figure C.3. California least tern nest locations at ODSVRA 7 exclosure in 2021.



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

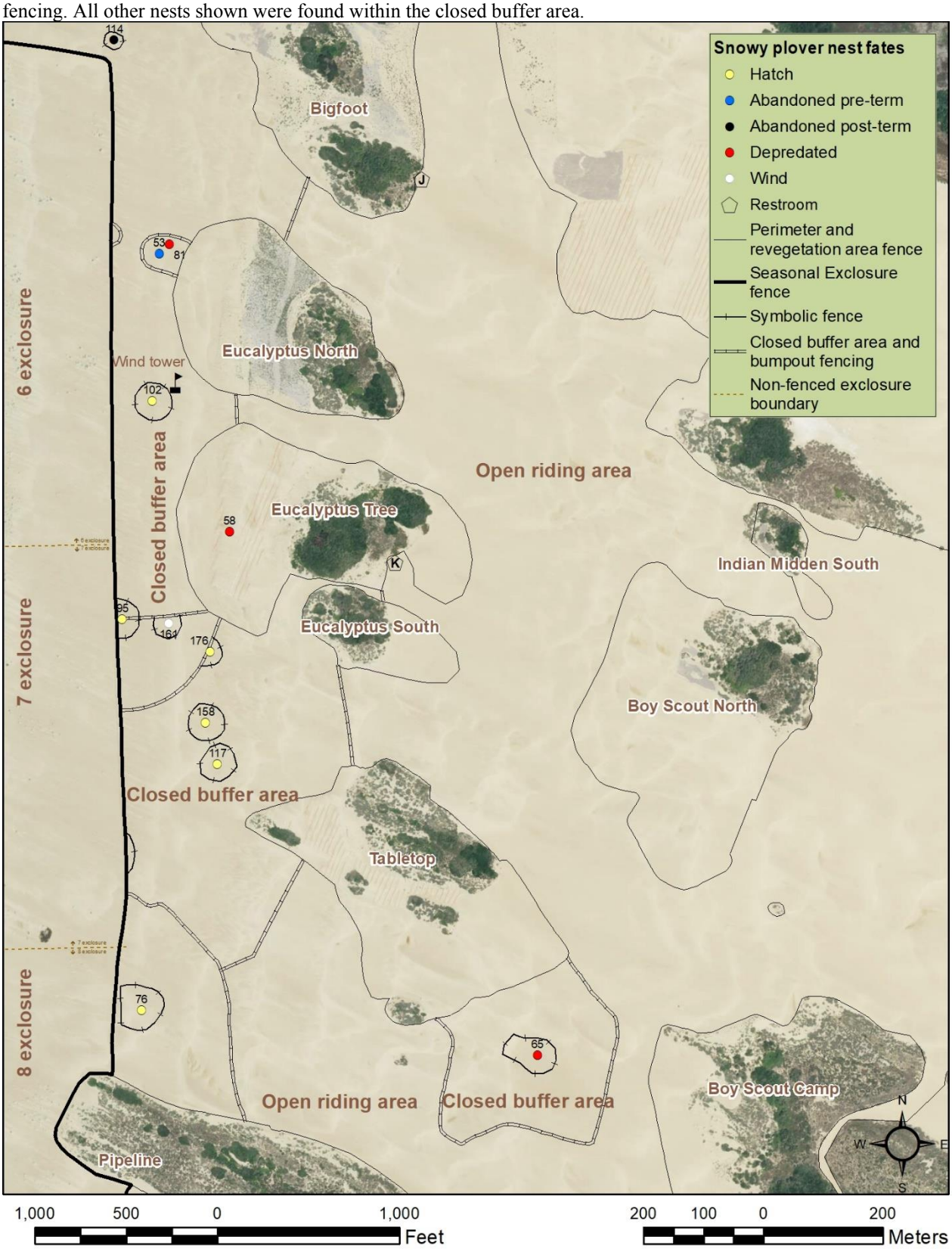
Figure C.4. Snowy plover nest location at ODSVRA Dunes Preserve in 2021.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

Figure C.5. Snowy plover nest locations at ODSVRA Foredune closure (includes alleyway and shoreline nests), and Bigfoot revegetation area in 2021.

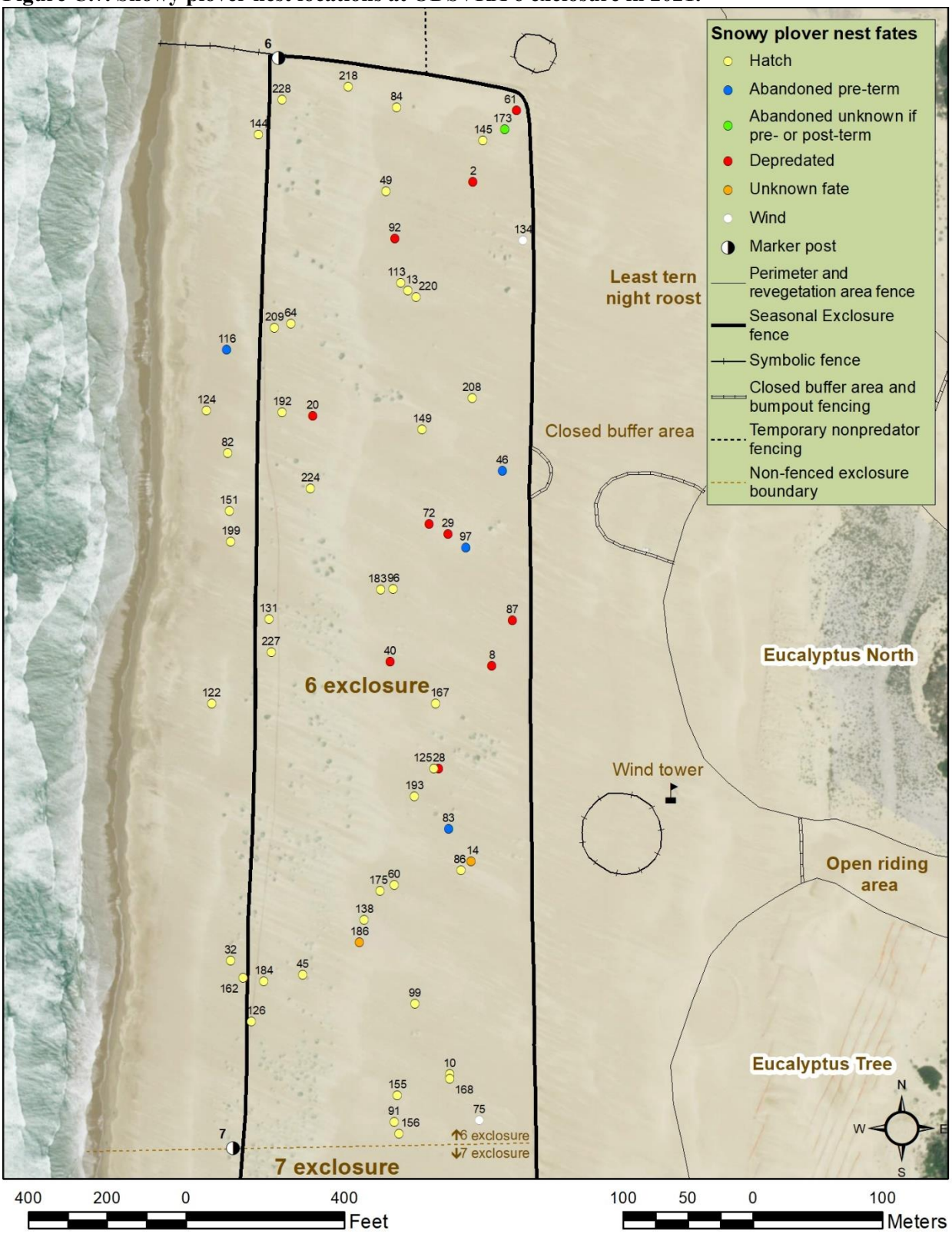
Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

Figure C.6. Snowy plover nest locations at ODSVRA open riding area and closed buffer area in 2021. Open riding area nests include SP53, SP65, SP76 and SP114, all initiated prior to installation of closed buffer area fencing. All other nests shown were found within the closed buffer area.



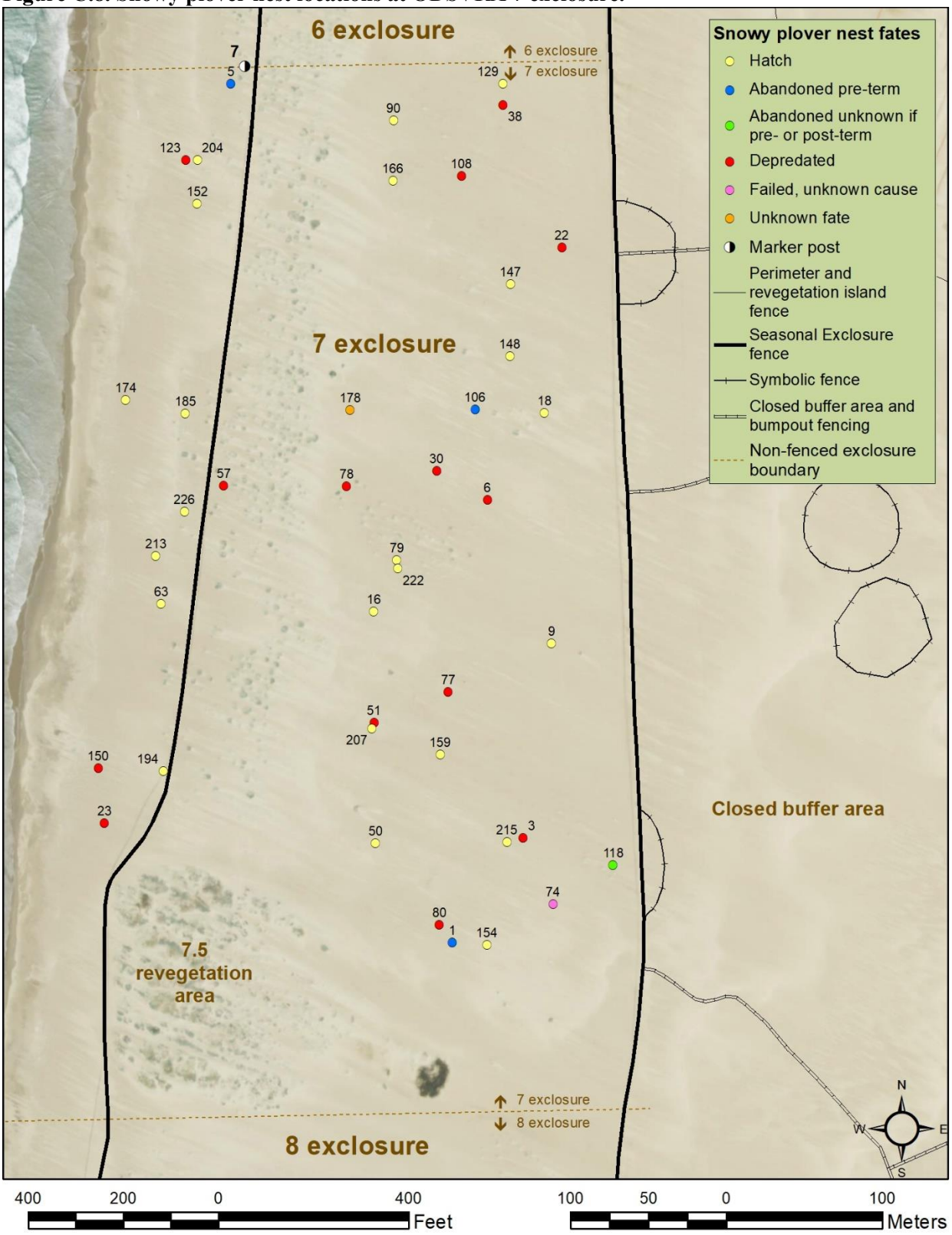
Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

Figure C.7. Snowy plover nest locations at ODSVRA 6 exclosure in 2021.



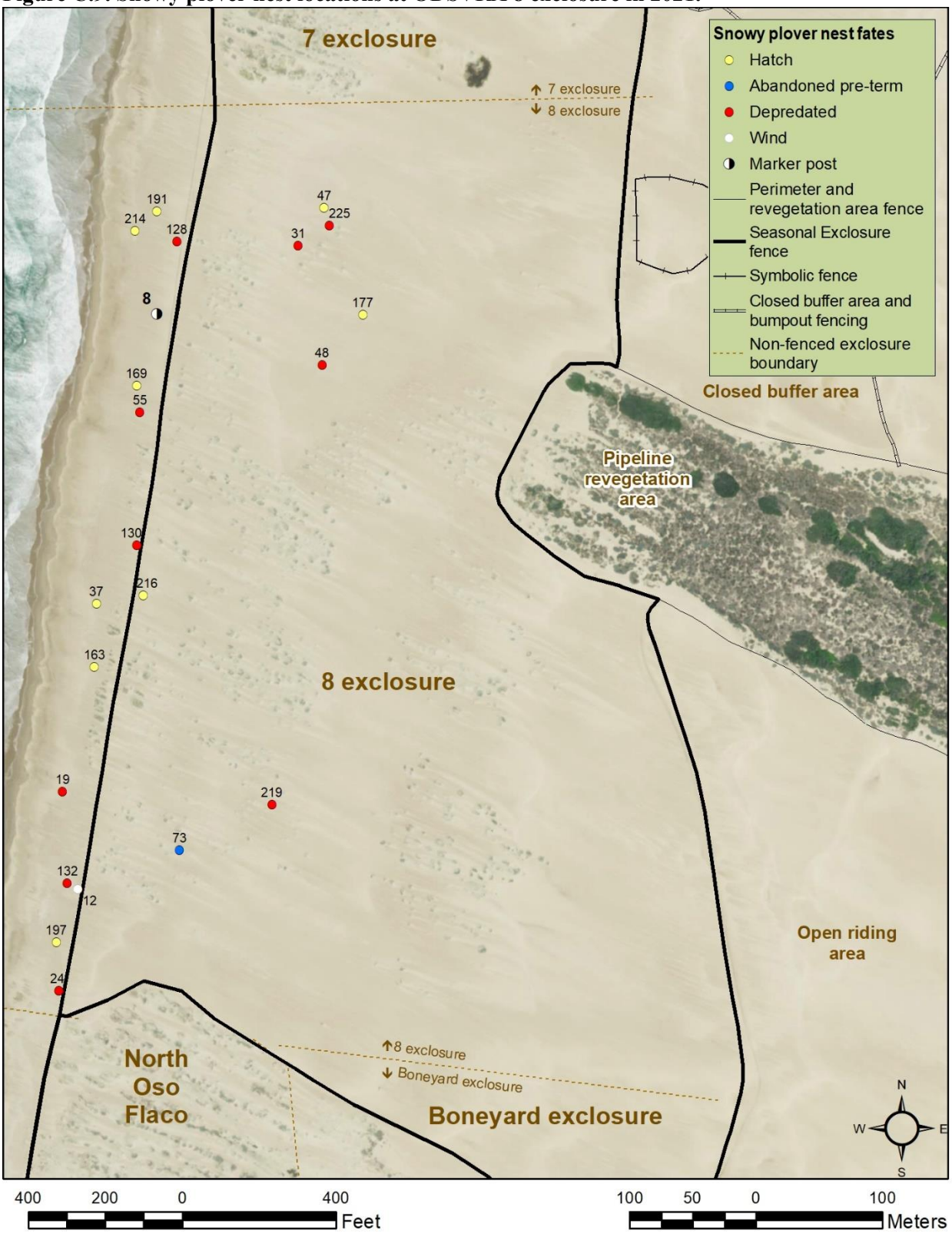
Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

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



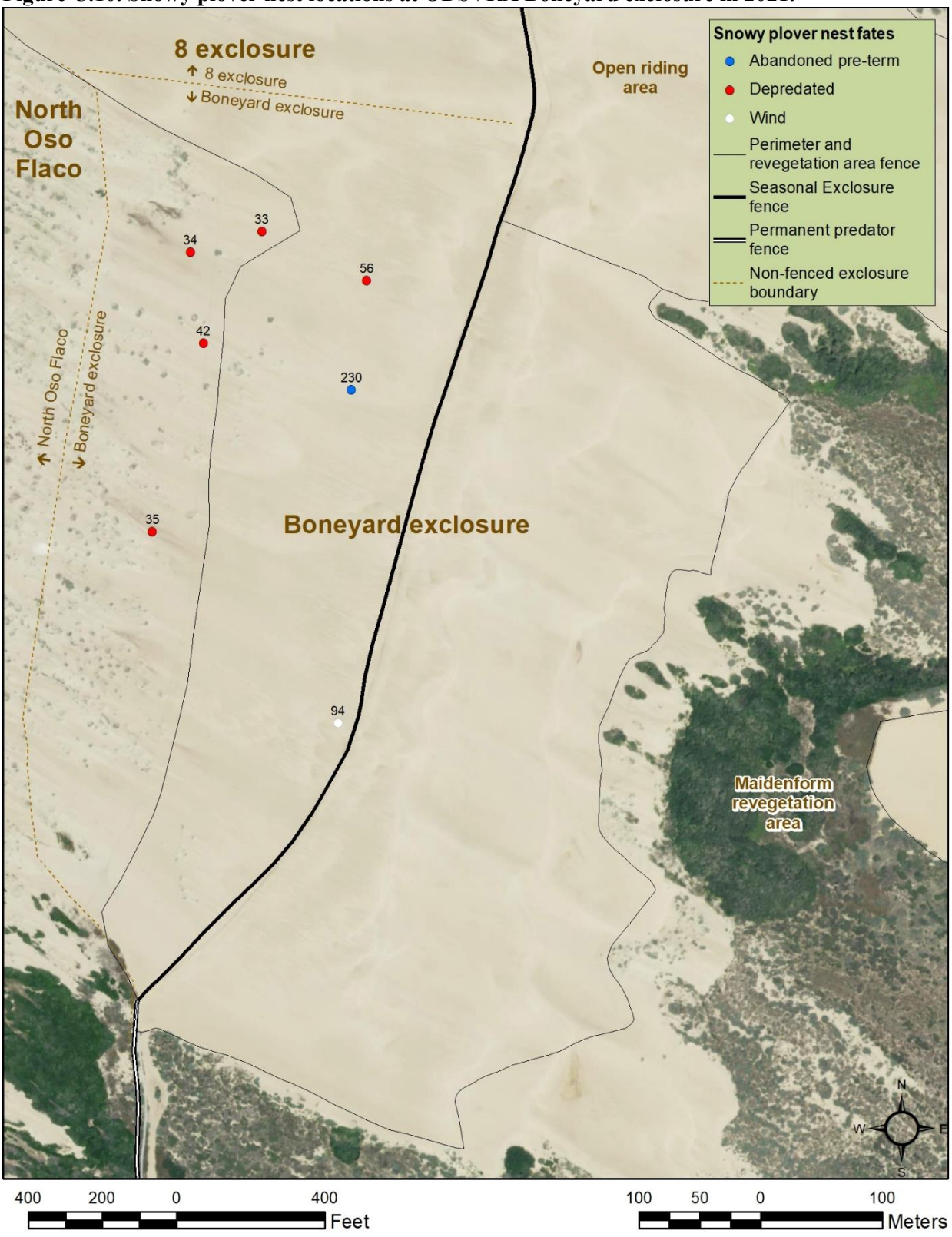
Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

Figure C.9. Snowy plover nest locations at ODSVRA 8 exclosure in 2021.



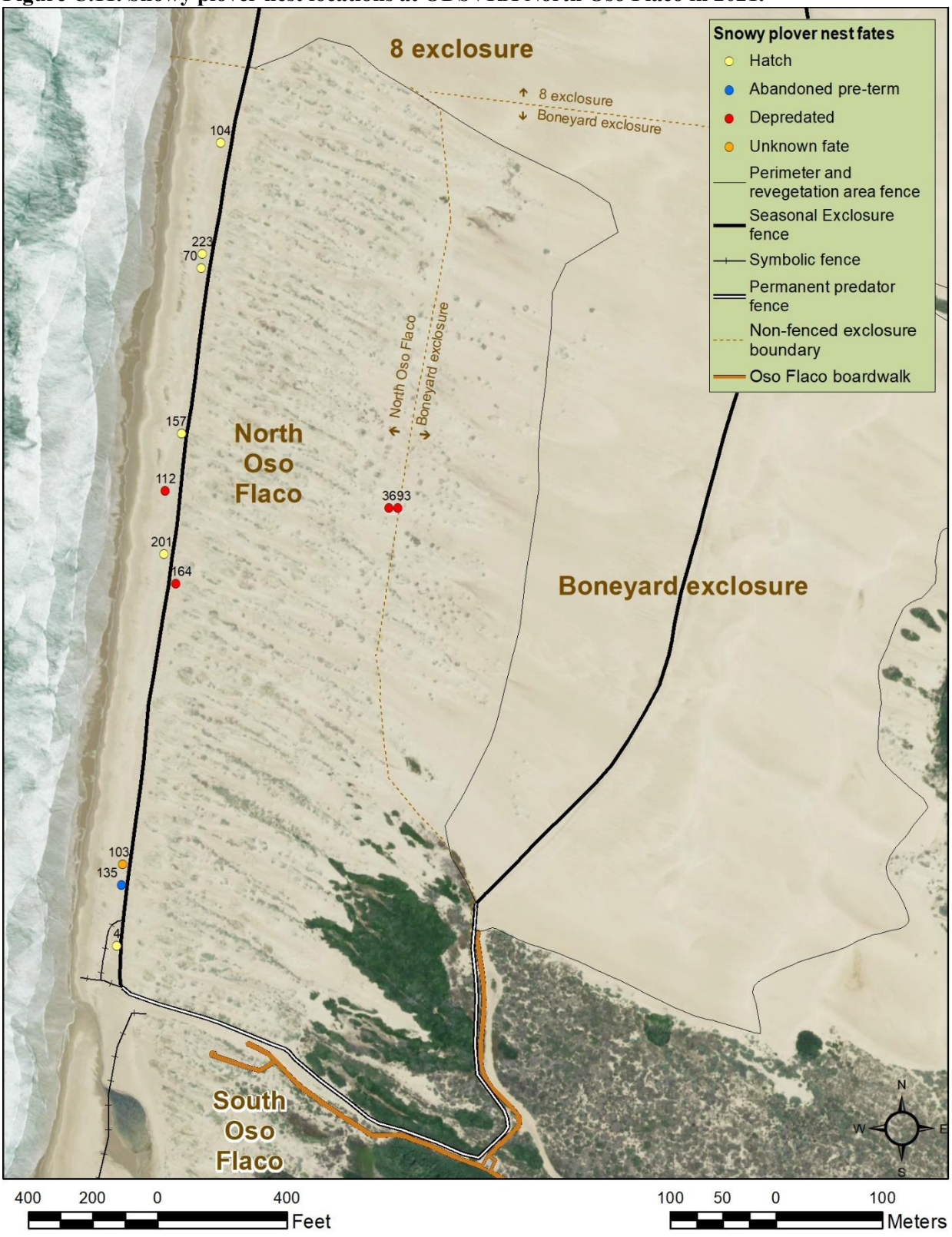
Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

Figure C.10. Snowy plover nest locations at ODSVRA Boneyard exclosure in 2021.



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

Figure C.11. Snowy plover nest locations at ODSVRA North Oso Flaco in 2021.

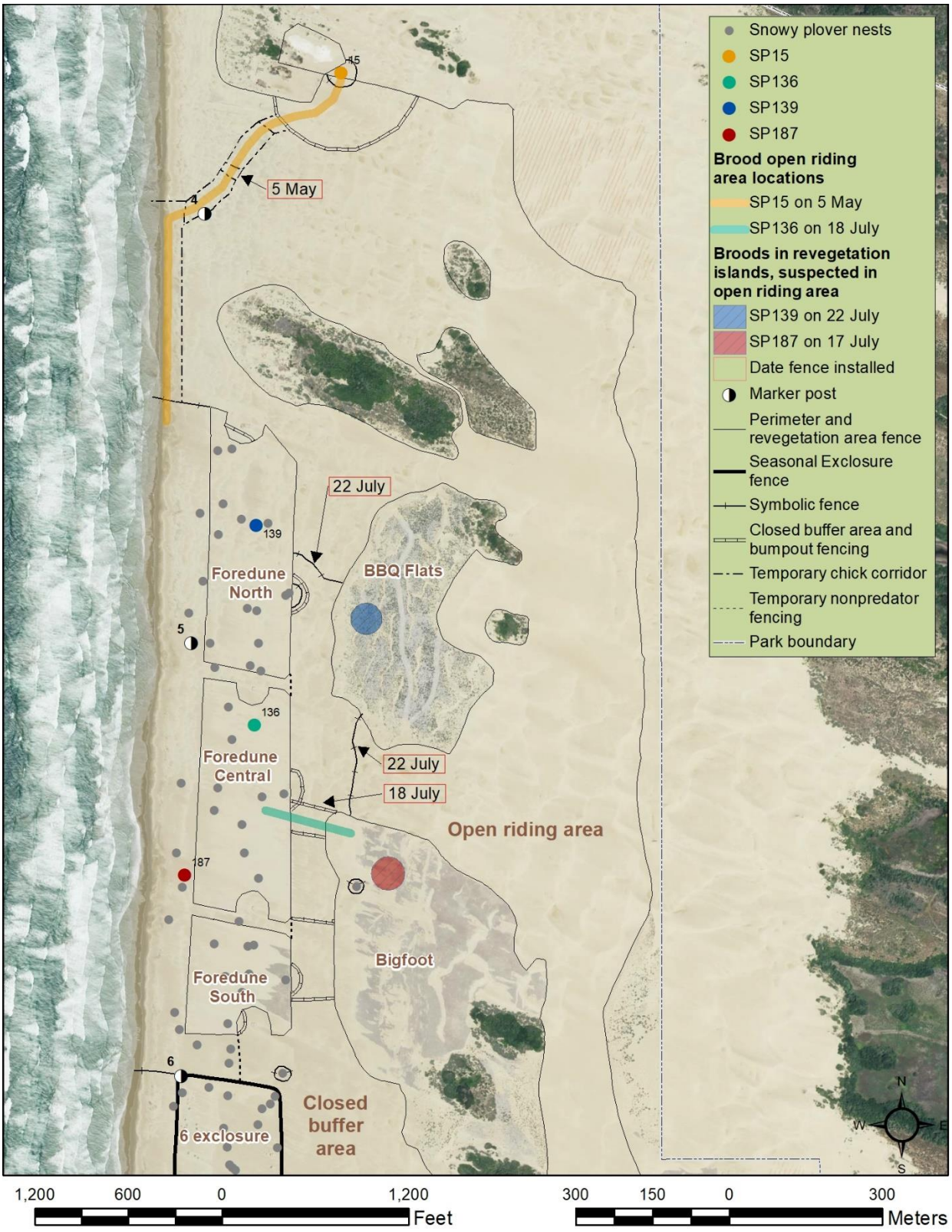


Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

Figure C.12. Snowy plover nest locations at ODSVRA South Oso Flaco in 2021.

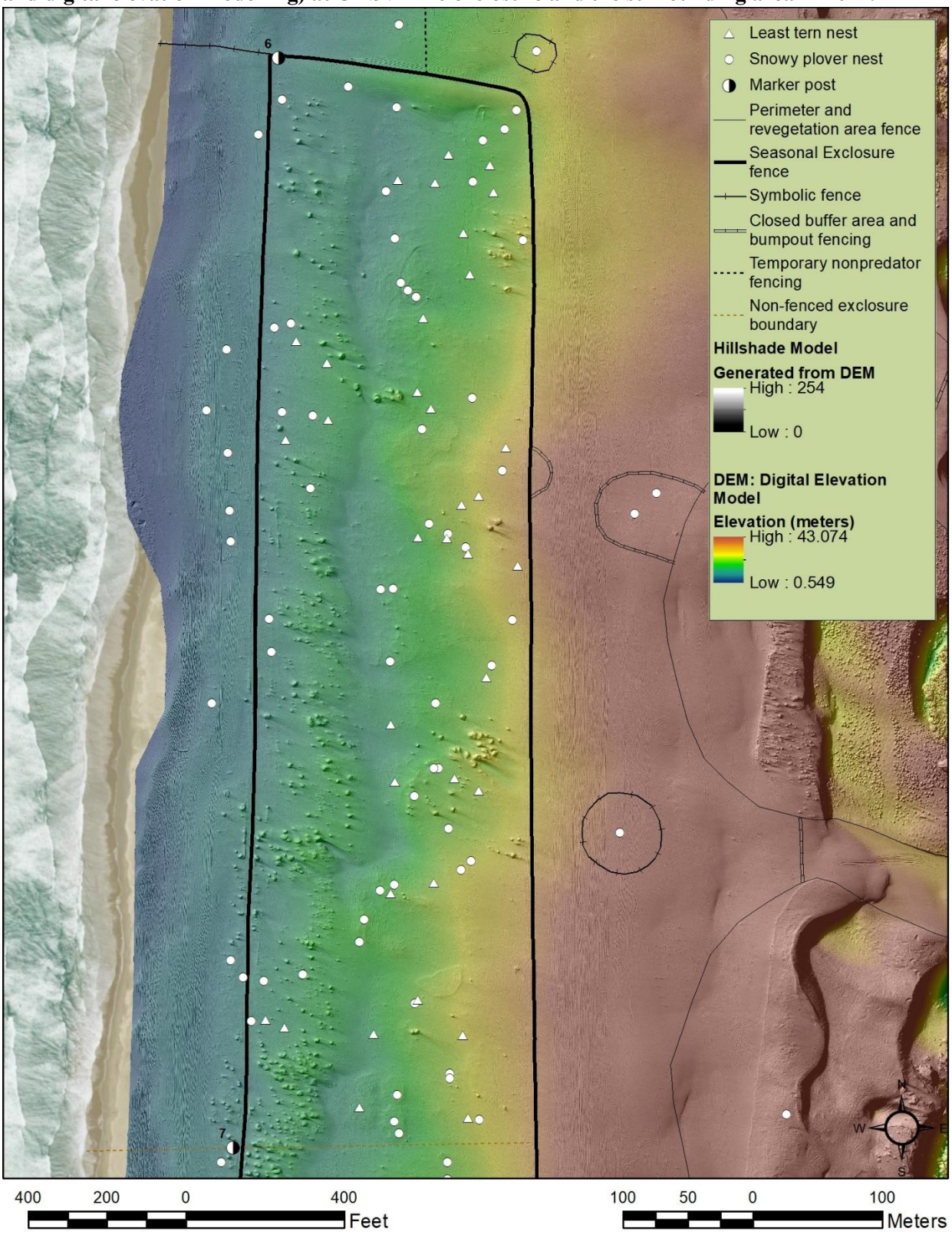
Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

Figure C.13. Snowy plover broods observed or suspected at ODSVRA open riding area and their associated nest locations in 2021.



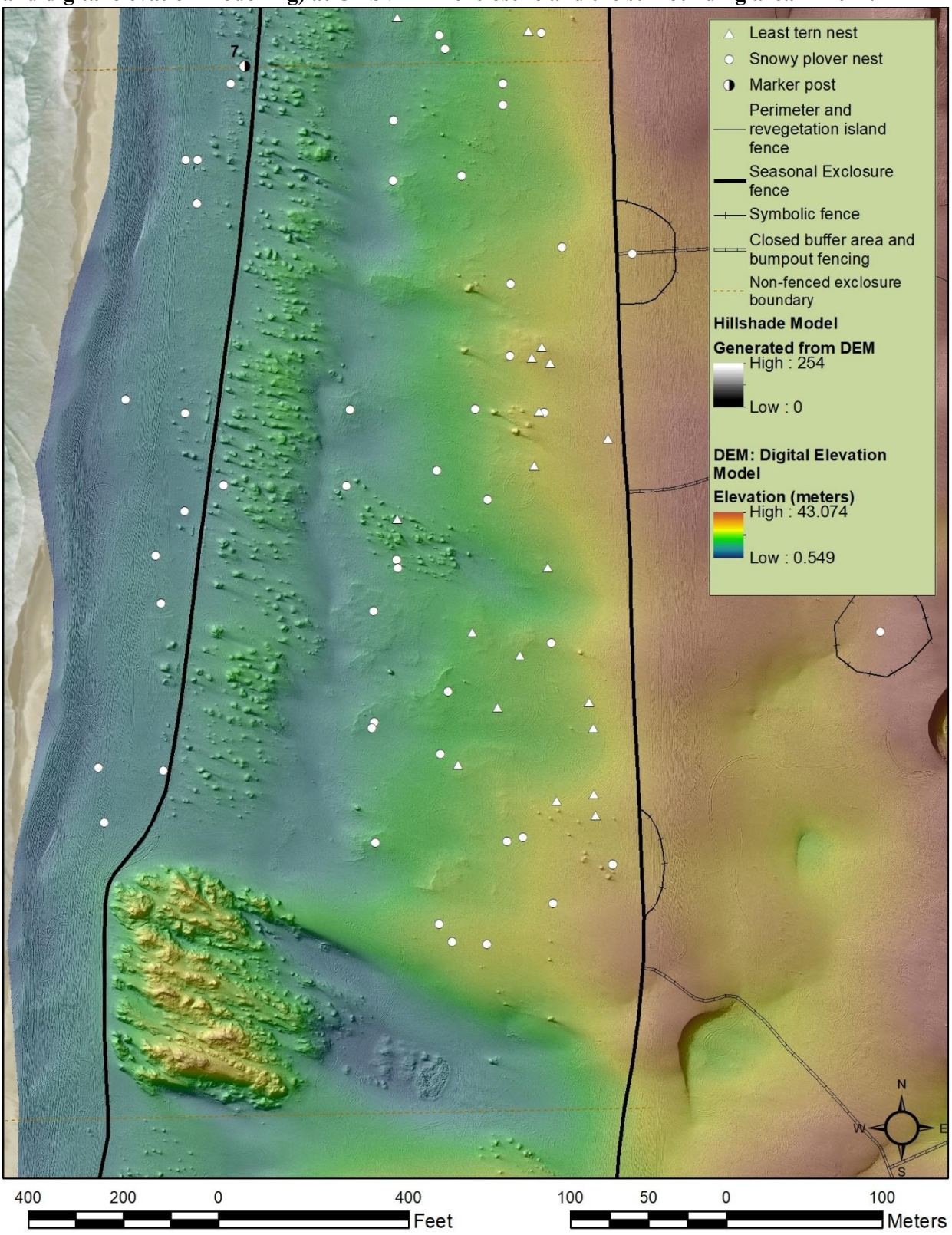
Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

Figure C.14. California least tern and snowy plover nest locations in relation to topography (hillshade and digital elevation modelling) at ODSVRA 6 exclosure and the surrounding area in 2021.



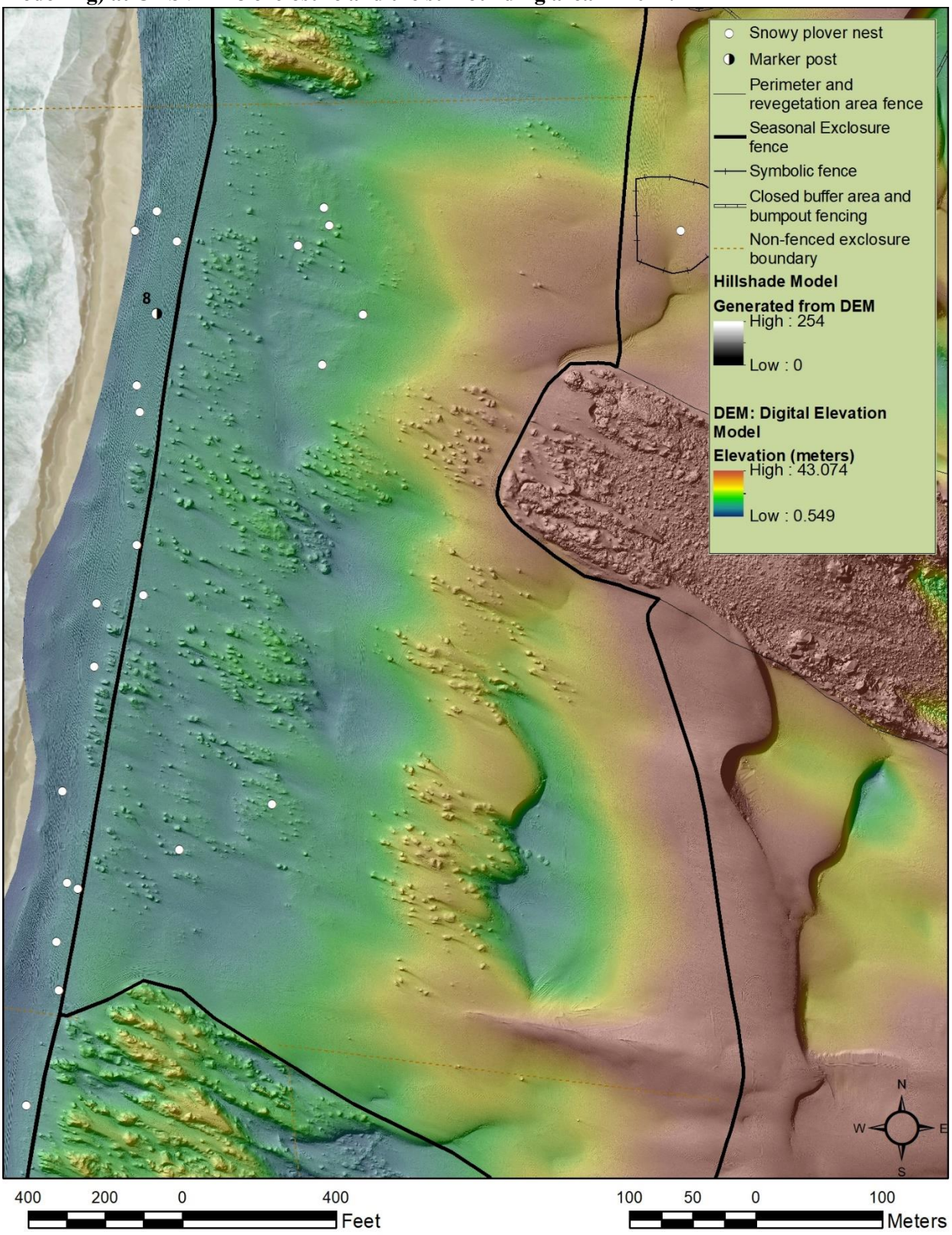
Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

Figure C.15. California least tern and snowy plover nest locations in relation to topography (hillshade and digital elevation modelling) at ODSVRA 7 exclosure and the surrounding area in 2021.



Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2021 (continued).

Figure C.16. Snowy plover nest locations in relation to topography (hillshade and digital elevation modelling) at ODSVRA 8 exclosure and the surrounding area in 2021.



APPENDIX D. BANDED CALIFORNIA LEAST TERNS AND SNOWY PLOVERS.

Table D.1. Banded California least terns recorded at ODSVRA in 2021.

Juveniles fledged from ODSVRA in 2021 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 B.)

Band	Origin and Year Banded	Dates Seen	Notes
-:a/b	ODSVRA unknown year	6/2, 6/14, 7/22	LT45 breeding adult. Multiple birds banded at ODSVRA with a/b on the right leg.
-:g/o	ODSVRA 2008 or 2011	8/6	
-:o/y	ODSVRA unknown year	8/10	Multiple birds banded at ODSVRA with o/y on right leg.
-:w/a	ODSVRA unknown year	6/9	Multiple birds banded at ODSVRA with w/a on right leg.
a/b:g/y	ODSVRA 2014	7/7, 7/10, 8/3, 8/6	LT39 breeding adult.
a/w:y/g	ODSVRA 2015	7/9	LT22 breeding adult.
a/y:b/w	ODSVRA 2012	7/8, 8/6, 8/12	LT50 breeding adult.
b/o:-	ODSVRA unknown year	5/31, 7/30, 8/14, 8/15, 8/16	Multiple birds banded at ODSVRA with b/o on left leg.
b/r:b/w	ODSVRA 2012	6/17	
b/r:y/g	ODSVRA 2015	5/28, 5/31	
b/w:g/w	ODSVRA 2011	6/7	
b/w:r/w	ODSVRA 2011	5/31	
g/o:y/g	ODSVRA 2015	8/6, 8/8	
g/w:y/g	ODSVRA 2015	6/7, 6/23, 8/6	On 6 August, bird banded g/w:y/g seen with a right leg injury (see Table H.1 in Appendix H).
g/y:-	ODSVRA unknown year	8/9	Multiple birds banded at ODSVRA with g/y on left leg.
g/y:a	ODSVRA 2008 or 2018	6/7, 8/3, 8/5	
g/y:a/b	ODSVRA 2008 or 2018	6/2, 7/10, 7/30, 8/15	LT29 breeding adult.
g/y:b/a	ODSVRA 2018	8/5	
g/y:b/w	ODSVRA 2008, 2012, or 2018	6/28, 7/1, 8/7	LT3 breeding adult.
g/y:g/y	ODSVRA 2008, 2014, or 2017	6/9, 7/30, 8/7	
g/y:k	ODSVRA 2017 or 2018	6/9, 7/13, 7/28	
g/y:o	ODSVRA 2008 or 2018	8/6, 8/8, 8/12	
g/y:w/a	ODSVRA 2008 or 2018	8/2, 8/6	LT34 breeding adult.
g/y:y	ODSVRA 2008 or 2018	6/7, 6/14, 7/28, 8/12	LT30 breeding adult.
g/y:y/a	ODSVRA 2008	6/9	

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

Table D.1. Banded least terns recorded at ODSVRA in 2021 (continued).

Band	Origin and Year Banded	Dates Seen	Notes
g/y:y/o	ODSVRA 2008 or 2018	7/8, 7/9, 8/4, 8/5, 8/15, 8/16, 8/17, 8/19	LT43 breeding adult.
g:w/b	ODSVRA 2013	8/2	
k:w/b	ODSVRA 2013	8/4	
l:y/g	ODSVRA 2015	8/6	
o/a:y/g	ODSVRA 2015	7/27, 8/2	
o/r:b/w	ODSVRA 2012	6/6	
o/w:a/y	ODSVRA 2019	7/12, 7/28	
o/w:b	ODSVRA 2019	6/21	
o/w:o	ODSVRA 2019	7/30	
o/w:r/y	ODSVRA 2019	7/11	
o:b/w	ODSVRA 2012	7/1, 7/28	LT5 breeding adult.
s:-	Unknown	8/5, 8/8, 8/10, 8/12, 8/15	Multiple sites may band with only the federal band. Also may be any ODSVRA fledgling from 2003 when all banded S:G/Y, or any ODSVRA fledgling that lost the right band and tape on a metal band.
s:b	VSFB 2018	6/7, 7/28, 7/30, 8/3, 8/6, 8/8	LT32 and LT42 breeding adult. In 2018 VSFB banded all chicks with s:b.
s:r	VSFB 2019	7/17, 8/3	In 2019 VSFB banded all chicks with s:r.
w/a:y/g	ODSVRA 2015	7/22	LT51 breeding adult.
w/b:b/y	ODSVRA 2010	6/8, 7/9	LT47 breeding adult.
w/b:g/y	ODSVRA 2007 or 2014	8/2	
w/b:w/g	ODSVRA 2010	7/30, 8/10	LT8 breeding adult.
w/b:y/g	ODSVRA 2015	7/2	
w/r:w/b	ODSVRA 2013	7/27	
y/g:b/w	ODSVRA 2006, 2012, or 2016	7/2, 7/9, 7/10, 7/29, 8/4, 8/5	LT32 and LT35 breeding adult.
y/g:o/a	ODSVRA 2016	6/13	
y/g:w/b	ODSVRA 2006, 2013, or 2016	5/29, 6/9	
y/g:w/r	ODSVRA 2016	8/8	On 8 August, remains of y/g:w/r adult found on 6 exclosure shore and sent for necropsy, but report not available at the writing of this report (see Table H.4 in Appendix H).
y/o:g/y	ODSVRA 2007 or 2014	5/29, 8/3, 8/4	
y/o:w/b	ODSVRA 2009	6/30, 7/2	

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

Table D.1. Banded least terns recorded at ODSVRA in 2021 (continued).

Band	Origin and Year Banded	Dates Seen	Notes
y/o:y/g	ODSVRA 2015	8/5	
y/r:w/b	ODSVRA 2009 or 2013	5/28, 5/31, 7/28	Most of yellow tape has warn from left leg band with mostly only red tape remaining.

Appendix D. Banded 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 2021.
This is a partial list based on information received from monitors and managers.

Band Combination	Year Banded	Location Seen	County	Dates Seen	Notes
w/b:w/o	2021	Monarch Dunes Golf Club	San Luis Obispo	7/28	Juvenile. Two chicks banded and fledged in 2021 with this combination.
		San Diego Bay National Wildlife Refuge	San Diego	8/31, 9/2, 9/7	
g/y:b	2017 or 2018	Ocean Park, Santa Ynez River Estuary	Santa Barbara	7/2	

Table D.3. Banded snowy plovers recorded at ODSVRA 1 October 2020 to 28 February 2021.

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

SB = State Beach, 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 2020	Lane, OR	10/28, 11/25, 12/7, 12/11, 12/21, 12/22, 12/29, 1/4, 1/5, 1/7, 1/11, 1/15, 1/16, 1/17, 1/18, 1/23, 1/25, 2/6, 2/28	
g/y:y	North Overlook 2020	Douglas	10/28, 12/5, 12/11, 12/12, 12/19, 1/4, 1/18, 1/23, 1/25, 2/19, 2/24	
g/r:b	Tenmile Creek 2019	Douglas	10/7, 2/24	
o/w/o:y	New River 2020	Coos	10/27, 10/28, 10/30, 11/3	
Yy:yy	Zmudowski SB 2020	Monterey, CA	10/2	Upper yellow band on left leg above leg joint.
yb:rr	Salinas River NWR 2010	Monterey	11/18	
yg:wl	Reservation Road 2016	Monterey	10/3, 10/4, 10/7, 10/15, 10/16, 10/17, 10/19, 10/23, 10/24, 10/27, 10/28, 11/3, 11/6, 11/13, 11/25, 11/29, 12/7, 12/8, 12/18, 12/21, 12/22, 12/26, 12/29, 1/3, 1/4, 1/8, 1/9, 1/11, 1/13, 1/19, 1/24, 1/25, 2/1, 2/6, 2/14, 2/15, 2/22, 2/23	
bb:ba	ODSVRA 2019	SLO	2/20, 2/23, 2/28	
bb:go	ODSVRA 2019	SLO	2/14	
bb:gr	ODSVRA 2012 or 2015	SLO	2/21, 2/23	
bb:og	ODSVRA 2020	SLO	10/2, 10/3, 10/4, 10/5, 10/6, 10/8, 10/9, 10/15, 10/19, 10/28, 11/7, 11/12, 11/19, 11/21, 11/23, 11/24, 11/28, 12/11, 12/12, 12/20, 12/21, 12/22, 12/26, 12/31, 1/3, 1/6, 1/7, 1/8, 1/9, 1/11, 1/15, 1/16, 1/17, 1/18, 1/23, 1/24, 2/1, 2/6, 2/15, 2/23, 2/27	
bb:or	ODSVRA 2016 or 2017	SLO	10/23	
bb:ov	ODSVRA 2019	SLO	10/3, 10/5, 10/6, 10/7, 10/9, 10/10, 10/27, 10/28, 10/31, 11/13, 11/18, 11/23, 11/29, 12/7, 12/19, 12/22, 12/26, 12/28, 12/31, 1/4, 1/5, 1/15, 1/17, 1/18, 1/19, 1/23, 1/24, 1/26, 1/31, 2/1, 2/7, 2/15	
bb:pa	ODSVRA 2019	SLO	10/2, 10/3, 10/5, 10/6	
bb:rr	ODSVRA 2016 or 2017	SLO	12/8, 1/7	
ga:av	ODSVRA 2020	SLO	10/17, 10/23, 10/24, 10/27, 11/3, 11/6, 11/8, 11/18, 11/20, 12/6, 12/8, 12/11, 12/12, 12/22	
ga:ba	ODSVRA 2020	SLO	10/2, 10/3, 10/8, 10/9, 10/10, 10/15, 10/17, 10/19, 10/23, 10/27, 10/28, 11/3, 11/6, 11/8, 11/9, 11/13, 11/20, 12/7, 12/8, 12/22, 12/24, 12/27, 12/29, 1/2, 1/3, 1/4, 1/7, 1/9, 1/15, 1/17, 1/18, 1/19, 1/20, 1/24, 1/25, 1/31, 2/7, 2/15, 2/17, 2/24	Two birds confirmed on 4 January and 17 February 2021.

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

Table D.3 Banded snowy plovers recorded at ODSVRA 1 October 2020 to 28 February 2021 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
ga:bg	ODSVRA 2020	SLO	10/3, 10/4, 10/5, 10/6, 10/9, 10/15, 10/19, 10/22, 10/27, 10/28, 11/6, 11/20, 11/21, 11/23, 11/29, 12/6, 12/8, 12/11, 12/12, 12/16, 12/20, 12/21, 12/22, 12/24, 12/27, 12/28, 12/29, 12/31, 1/5, 1/8, 1/9, 1/13, 1/15, 1/16, 1/17, 1/18, 1/24, 2/1, 2/2, 2/5, 2/6, 2/13, 2/14, 2/15, 2/17, 2/22, 2/24	
ga:by	ODSVRA 2020	SLO	11/3	
ga:ow	ODSVRA 2013 or 2014	SLO	10/6	
ga:pr	ODSVRA 2016 or 2017	SLO	10/6, 11/19, 11/23, 11/24, 12/23, 1/18, 2/15, 2/17, 2/24, 2/27	
ga:py	ODSVRA 2011	SLO	10/4, 10/6, 10/8, 10/16, 10/17, 10/24, 10/27, 10/28, 10/31, 11/3, 11/6, 11/8, 11/20, 11/21, 12/7, 12/11, 12/25, 12/26, 12/29, 1/4, 1/6, 1/7, 1/10, 1/11, 1/15, 1/17, 1/18, 1/25, 1/31, 2/6, 2/13, 2/14, 2/17, 2/20, 2/24	
ga:ry	ODSVRA 2017	SLO	10/3, 10/4, 10/5, 10/6, 10/7, 10/8, 10/15, 10/16, 10/23, 10/27, 10/28, 11/3, 11/11, 11/19, 11/24, 11/29, 12/15, 12/22, 1/6, 2/11, 2/15, 2/16, 2/22, 2/24, 2/25	
ga:ww	ODSVRA 2016 or 2017	SLO	10/8, 10/14, 10/15, 10/28, 10/31, 11/6, 11/11, 11/19, 11/21, 11/23, 11/24, 12/23, 1/6, 1/11	
ga:wy	ODSVRA 2018	SLO	10/2, 10/3, 10/4, 10/7, 10/10, 10/17, 10/19, 10/24, 11/6, 12/6, 12/7, 12/11, 12/12, 12/21, 12/22, 12/23, 12/26, 12/28, 12/31, 1/4, 1/17, 1/31, 2/7, 2/14, 2/15, 2/17, 2/20, 2/22, 2/24	
gg:ob	ODSVRA 2019	SLO	10/2, 10/4, 10/9, 10/12, 10/16, 10/23, 10/24, 10/27, 10/31, 11/14, 11/23, 12/6, 12/11, 12/20, 12/24, 12/27, 12/29, 1/3, 1/4, 1/7, 1/8, 1/9, 1/15, 1/16, 1/17, 1/18, 1/19, 1/24, 1/31, 2/8, 2/13, 2/14, 2/15, 2/22	On 27 December 2020, bird banded gg:ob seen with a right leg injury (see Table H.2 in Appendix H).
gg:rb	ODSVRA 2016 or 2018	SLO	10/4, 10/6, 10/7, 10/9, 10/16, 10/17, 10/19, 10/23, 10/27, 11/14, 11/18, 11/23, 11/25, 12/7, 12/18, 12/21, 12/24, 1/3, 1/4, 1/5, 1/7, 1/9, 1/10, 1/15, 1/17, 1/18, 1/19, 1/25, 2/13, 2/17, 2/22, 2/24, 2/26, 2/27	
pg:ag	ODSVRA 2019	SLO	10/2, 10/4, 10/6, 10/7, 10/9, 10/16, 10/23, 11/7, 11/11, 11/12, 11/14, 11/17, 11/19, 11/28	
pg:ar	ODSVRA 2014	SLO	10/2, 10/3, 10/4, 10/5, 10/7, 10/8, 10/17, 10/19, 10/21, 10/27, 10/28, 11/3, 11/13, 11/14, 11/23, 11/29, 12/6, 12/7, 12/11, 12/12, 12/20, 12/21, 12/22, 12/26, 12/29, 12/31, 1/3, 1/4, 1/7, 1/8, 1/9, 1/10, 1/11, 1/15, 1/18, 1/19, 1/24, 1/31, 2/1, 2/5, 2/6, 2/7, 2/11, 2/17, 2/20, 2/22, 2/23, 2/25, 2/28	
pg:by	ODSVRA 2017 or 2018	SLO	10/3, 10/4, 10/8, 10/9, 10/14, 10/17, 11/11, 11/19, 11/24, 12/23, 1/6, 1/10, 1/18, 2/15, 2/24, 2/28	
pg:ow	ODSVRA 2015 or 2016	SLO	10/2, 10/5, 10/7, 10/8, 10/10, 10/14, 10/17, 10/21, 10/23, 10/24, 10/28, 11/11, 11/19, 11/23, 11/24, 12/16, 12/23, 1/6, 1/11, 2/15, 2/24, 2/27	Two birds observed on site on 7 October and 23 December 2020.

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

Table D.3 Banded snowy plovers recorded at ODSVRA 1 October 2020 to 28 February 2021 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
pg:pb	ODSVRA 2014 or 2015	SLO	10/6, 10/8	
pg:rg	ODSVRA 2018	SLO	12/16	
pg:vr	ODSVRA 2018	SLO	10/7, 10/14, 10/15, 10/27, 10/28, 11/11, 11/21, 11/24, 12/23, 1/6, 1/18, 2/15, 2/17	
pg:yb	ODSVRA 2015 or 2017	SLO	10/7, 10/10	
pv:by	ODSVRA 2015	SLO	2/17	
pv:ob	ODSVRA 2015 or 2017	SLO	10/2, 10/6, 10/7, 10/8, 10/17, 10/24, 10/27, 11/6, 11/19, 11/21, 1/18, 2/13, 2/15	
pv:rb	ODSVRA 2016	SLO	10/2, 10/3, 10/4, 10/5, 10/7, 10/9, 10/15, 10/16, 10/21, 10/25, 11/6, 11/7, 11/12, 11/19, 11/24, 11/28, 12/11, 12/12, 12/16, 12/24, 12/26, 1/7, 1/8, 1/9, 1/10, 1/11, 1/18, 1/25, 1/31, 2/15, 2/17, 2/24, 2/25, 2/28	
pv:wy	ODSVRA 2014 or 2015	SLO	10/2, 10/6, 10/9, 10/15, 10/23, 10/24, 10/27, 11/11, 11/20, 2/23	
rr:aw	ODSVRA 2017	SLO	2/28	
rr:bb	ODSVRA 2016 or 2017	SLO	10/3, 10/5, 10/6, 10/7, 10/16, 10/19, 10/25, 10/27, 10/28, 11/18, 11/25, 11/28, 11/29, 12/12, 12/26, 12/27, 1/11, 1/18, 1/24, 1/25, 2/6, 2/24, 2/28	
rr:pw	ODSVRA 2014	SLO	2/28	
vg:ao	ODSVRA 2020	SLO	10/5, 10/7, 10/8, 10/9, 10/10, 10/15, 12/23, 1/6, 1/18	
vg:aw	ODSVRA 2011 or 2013	SLO	11/9	
vg:ay	ODSVRA 2018	SLO	10/3, 10/6, 11/3, 11/4, 11/18, 11/23, 12/7, 12/11, 12/21, 12/26, 12/28, 12/29, 12/31, 1/3, 1/4, 1/7, 1/11, 1/15, 1/17, 1/18, 1/23, 1/24, 1/25, 2/1, 2/7, 2/15, 2/24	
vg:bw	ODSVRA 2016 or 2017	SLO	10/3, 10/6, 10/7, 10/9, 10/15, 10/17, 10/24, 10/27, 10/28, 11/6, 11/14, 11/25, 12/7, 12/11, 12/19, 12/20, 12/22, 12/25, 12/28, 12/29, 1/3, 1/4, 1/9, 1/10, 1/17, 1/18, 1/19, 1/24, 1/31, 2/1, 2/2, 2/14, 2/15, 2/17, 2/28	
vg:rg	ODSVRA 2017 or 2018	SLO	10/14, 10/19, 11/19, 11/24, 12/16, 12/23, 1/18, 2/24	
vg:rw	ODSVRA 2018	SLO	2/15, 2/21, 2/24, 2/25	
vg:wa	ODSVRA 2020	SLO	10/21	
vv:ay	ODSVRA 2018	SLO	10/3	
vv:gw	ODSVRA 2015 or 2017	SLO	2/15, 2/24	

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

Table D.3 Banded snowy plovers recorded at ODSVRA 1 October 2020 to 28 February 2021 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
vv:rv	ODSVRA 2020	SLO	10/2, 10/3, 10/5, 10/6, 10/9, 10/16, 10/22, 10/28, 11/3, 11/8, 11/9, 11/14, 11/23, 12/7, 12/16, 12/21, 12/22, 12/25, 12/29, 1/3, 1/7, 1/9, 1/13, 1/15, 1/17, 1/18, 1/19, 1/24, 1/25, 1/31, 2/1, 2/15, 2/17, 2/28	
-:y/g	VSFB unknown	Santa Barbara	1/6, 2/17, 10/6, 10/7, 10/14, 10/21, 11/19	Federal service band is exposed metal above yellow tape.
a:g/o/g	VSFB 2017	Santa Barbara	10/3, 10/4, 10/7, 10/14, 10/21, 10/24, 11/19, 12/23, 1/6, 1/18, 1/23, 2/15, 2/17	On federal service band on left leg there is exposed metal above blue tape.
nb:al	VSFB 2020	Santa Barbara	11/19	
nb:rr	VSFB 2020	Santa Barbara	10/31, 11/6, 11/8, 11/9, 11/14, 12/7, 12/11, 12/18, 12/21, 12/22, 12/26, 12/29, 1/9, 1/11, 1/15, 1/17, 1/18, 1/23, 1/25, 1/31, 2/1, 2/8, 2/13, 2/15, 2/22, 2/28	
nw:al	VSFB 2020	Santa Barbara	10/6, 10/7	
ny:wg	VSFB 2017	Santa Barbara	10/3, 10/10, 10/15, 10/16, 10/23, 10/24, 11/14, 11/20, 12/12, 1/5, 1/7, 1/16	
ny:wl	VSFB 2020	Santa Barbara	10/2, 10/4, 10/5, 10/6, 10/7, 10/9, 10/12, 10/17, 10/27, 10/28, 11/3, 11/6, 11/8, 11/9, 11/14, 11/23, 12/7, 12/11, 12/21, 12/22, 12/28, 12/29, 12/31, 1/11, 1/17, 1/18, 1/24, 1/25, 1/31, 2/7, 2/8, 2/15, 2/22, 2/24	
s-:g-	VSFB 2012	Santa Barbara	10/27	
b-:g-	Unknown	Unknown	10/2, 10/6, 10/17, 10/28	On federal service band on left leg there is exposed metal below blue tape.

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2021.

Juveniles fledged from ODSVRA in 2021 are not included. All birds were banded as chicks unless otherwise noted. Chicks banded outside of San Luis Obispo County are noted in order north to south. Some sites band to brood and can have more than one bird with the same combination. (For a description of color band letter codes see Appendix B.)

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

F = Female, M = Male

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
y/a:v		Siltcoos 2020	Lane, OR	4/7, 4/14, 4/17	
g/y:y		North Overlook 2020	Douglas	6/7, 6/14, 7/28, 8/12	
o/w/o:y		New River 2020	Coos	4/1, 4/17, 4/19, 4/23, 4/26	
av:gr		Point Reyes 2021	Marin, CA	9/1	
av:va		Point Reyes 2021	Marin	9/9	Juvenile.
wb:bo		Pajaro Spit 2015	Santa Cruz	7/22	
yb:rr		Salinas River NWR 2010	Monterey	3/20, 4/3, 4/16, 5/12, 5/18, 6/1	
yg:wl	F	Reservation Road 2016	Monterey	3/21, 3/24, 6/25, 6/26, 7/8, 7/14, 7/25, 7/27, 7/29, 8/26, 8/29, 9/1, 9/4, 9/9, 9/11	ODSVRA breeding female.
ba:ag		Fort Ord 2021	Monterey	9/9	Juvenile.
by:wo		Fort Ord 2021	Monterey	8/9	Juvenile.
yb:bo		Fort Ord 2021	Monterey	7/31	Juvenile.
bb:ag		ODSVRA 2020	SLO	7/3	
bb:ar	F	ODSVRA 2017 or 2018	SLO	4/1, 4/24, 5/6, 5/7, 5/25, 6/14, 7/5, 7/15, 7/16, 7/22	
bb:ba	F	ODSVRA 2019	SLO	4/7, 5/10, 5/12, 5/23, 6/23, 6/24, 7/3, 7/4, 8/15, 8/18, 8/21, 8/22, 8/23	ODSVRA breeding female.
bb:bo		ODSVRA 2020	SLO	3/27, 4/3, 4/5, 4/23	
bb:bw	M	ODSVRA 2018	SLO	6/8, 7/8, 7/10, 7/16, 7/20, 7/25, 7/27, 7/28	ODSVRA breeding male
bb:go	F	ODSVRA 2019	SLO	3/26, 3/31, 4/20, 4/28, 5/6, 5/7, 5/15, 5/29, 5/31, 6/2, 6/30, 7/1	ODSVRA breeding female.
bb:gr	F	ODSVRA 2012 or 2015	SLO	6/15, 6/19, 7/3, 7/5, 8/16	ODSVRA breeding female.
bb:oa		ODSVRA 2019	SLO	6/7, 6/8	
bb:og	F	ODSVRA 2020	SLO	3/27, 3/29, 4/21, 5/11, 5/15, 5/22, 6/1, 6/15, 6/23, 7/1, 7/14, 8/8, 8/16, 8/17, 8/27, 8/30, 8/31, 9/1, 9/3, 9/4, 9/5, 9/7, 9/8, 9/9, 9/11, 9/15	ODSVRA breeding female.
bb:or	M	ODSVRA 2016 or 2017	SLO	4/14, 6/3, 6/4, 6/26, 7/5, 7/16, 7/17, 7/22, 7/23, 7/26, 7/27, 7/28, 7/30, 8/9, 8/15	ODSVRA breeding male.

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2021 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
bb:ov	F	ODSVRA 2019	SLO	3/7, 3/11, 3/18, 3/23, 4/1, 5/11, 6/5, 6/8, 6/13, 6/15, 7/2, 7/16, 7/30, 8/10, 8/14, 8/16, 8/17, 8/27, 8/30, 8/31, 9/5, 9/7, 9/10	ODSVRA breeding female.
bb:pb	M	ODSVRA 2019	SLO	4/28, 5/14, 6/20, 6/21, 6/22, 6/23, 6/24, 6/25, 6/27, 6/29, 7/2, 7/5, 7/8, 7/10, 7/12, 7/13, 7/14, 7/15, 7/16, 7/17, 7/25	ODSVRA breeding male.
bb:pv		ODSVRA 2019	SLO	5/15	
bb:rr	M	ODSVRA 2016 or 2017	SLO	4/2, 4/5, 4/7, 4/14, 5/7, 5/8, 5/14, 5/22, 5/29, 5/30, 6/1, 6/3, 6/6, 6/8, 6/9, 6/10, 6/18, 6/19, 6/20, 6/24, 6/27, 6/29, 7/1, 7/2, 7/7	ODSVRA breeding male.
bb:vw	F	ODSVRA 2018	SLO	5/14, 5/18, 6/19, 6/21, 6/22, 7/9, 7/29	ODSVRA breeding female.
bb:w-	M	ODSVRA unknown	SLO	5/21, 5/29, 6/1, 6/7, 6/8, 6/21, 7/3, 7/15, 7/16, 7/19, 7/21, 7/22, 7/25, 7/27, 7/28, 7/30, 7/31, 8/2, 8/3, 8/4, 8/5, 8/7, 8/8, 8/10	ODSVRA breeding male.
bb:wa	F	ODSVRA 2019	SLO	6/13, 7/16	ODSVRA breeding female.
bb:wv	F	ODSVRA 2020	SLO	4/15, 4/25, 7/2	ODSVRA breeding female.
bb:ww	F	ODSVRA 2020	SLO	3/31, 4/2, 4/28, 7/1, 7/3, 7/5, 7/17, 8/12, 8/13, 8/16, 8/18, 8/26, 8/28, 9/2	ODSVRA breeding female.
bb:yb	M	ODSVRA 2011, 2013 or 2015	SLO	4/23, 5/2, 5/6, 5/8, 5/18, 5/29, 6/1, 6/3, 6/21, 7/11, 7/12, 7/13, 7/14, 7/16	ODSVRA breeding male.
ga:ag		ODSVRA 2020	SLO	3/20	
ga:av	F	ODSVRA 2020	SLO	4/3, 4/7, 6/5, 6/27, 7/17, 8/28	ODSVRA breeding female.
ga:ba	M & F	ODSVRA 2020	SLO	3/7, 3/8, 3/24, 3/27, 3/28, 4/3, 4/7, 4/9, 4/16, 4/20, 4/28, 4/30, 5/5, 5/6, 5/7, 5/13, 5/28, 5/29, 5/30, 5/31, 6/1, 6/3, 6/5, 6/7, 6/8, 6/12, 6/16, 6/18, 6/21, 6/22, 6/27, 7/1, 7/4, 7/8, 7/12, 7/13, 7/16, 7/17, 7/19, 7/20, 7/22, 7/23, 7/30, 8/5, 8/13, 8/21, 8/26, 8/29, 8/31, 9/1, 9/9, 9/11	ODSVRA breeding male and female.
ga:bg	M & F	ODSVRA 2020	SLO	3/11, 3/12, 3/18, 3/23, 3/26, 4/7, 4/9, 4/29, 4/30, 5/14, 5/15, 5/20, 5/28, 5/30, 5/31, 6/1, 6/3, 6/5, 6/7, 6/12, 7/1, 7/2, 7/7, 7/13, 7/14, 7/20, 7/21, 7/23, 7/24, 7/27, 7/28, 7/31, 9/10	ODSVRA breeding male and female.
ga:gb		ODSVRA 2018	SLO	6/17	
ga:or	F	ODSVRA 2016 or 2017	SLO	3/22, 3/31, 6/23	ODSVRA breeding female.
ga:pr	M & F	ODSVRA 2016 or 2017	SLO	4/2, 4/3, 4/8, 4/12, 4/13, 5/11, 5/16, 5/23, 6/16, 7/3, 7/4, 7/5, 7/15, 7/16, 7/17, 7/22, 7/26, 8/5, 8/8, 8/9, 8/10, 8/11, 8/12, 8/14, 8/17, 8/20, 8/21, 8/26	ODSVRA breeding male and female. On 15 July, female banded ga:pr seen with a right leg injury (see Table H.2 in Appendix H).

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2021 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
ga:pv	M	ODSVRA 2020	SLO	5/28, 7/8, 7/14, 7/15, 7/17, 7/24, 7/27, 7/29, 7/30, 8/1, 8/3, 8/5, 8/10	ODSVRA breeding male.
ga:py	F	ODSVRA 2011	SLO	3/23, 3/28, 3/30, 3/31, 4/1, 4/2, 4/8, 4/9, 4/10, 5/29, 6/1, 6/3, 6/4, 6/16, 7/6, 7/7, 7/9, 7/17, 7/20, 7/30, 8/10, 8/16, 8/23, 8/26, 8/27, 9/1, 9/2, 9/3, 9/4, 9/11	ODSVRA breeding female.
ga:ry	F	ODSVRA 2017	SLO	4/3, 4/7, 5/6, 6/5, 6/8, 7/19, 7/30, 8/8, 8/10, 8/12, 8/14, 8/15, 8/16, 8/26, 8/27, 8/28, 8/31, 9/7	ODSVRA breeding female.
ga:vg	M	ODSVRA 2020	SLO	6/7, 6/8, 6/12, 6/13, 7/19, 7/21, 8/1, 8/8	ODSVRA breeding male.
ga:vw		ODSVRA 2020	SLO	3/21, 3/24, 3/25, 4/13, 4/16, 4/17, 5/12, 5/13, 5/15, 5/30, 5/31, 6/1, 6/2, 6/6, 6/27, 7/3, 7/5, 7/9, 7/28, 8/6	On 30 May, bird banded ga:vw seen with a left leg injury (see Table H.2 in Appendix H).
ga:wr	M	ODSVRA 2015 or 2016	SLO	4/28, 4/29, 5/12, 5/16, 5/22, 6/3, 6/19, 6/20, 6/21, 6/22, 6/23, 6/24, 6/25, 6/26, 6/27, 7/14, 7/16	ODSVRA breeding male.
ga:wy	F	ODSVRA 2018	SLO	3/4, 3/9, 3/11, 3/15, 3/18, 3/20, 3/23, 3/27, 4/2, 4/5, 4/12, 5/6, 5/7, 5/8, 5/12, 5/26, 5/31, 6/1, 6/3, 6/4, 6/19, 7/1, 7/2, 7/6, 7/8, 7/16, 8/14, 8/15, 8/16, 8/17, 8/20, 8/27, 8/28, 8/30, 8/31, 9/8	ODSVRA breeding female.
ga:yb	M	ODSVRA 2017 or 2018	SLO	5/22, 6/5, 6/26, 7/3, 7/16, 7/17, 7/21, 7/23, 7/25, 7/29, 7/30, 8/5, 8/6, 8/8, 8/9, 8/10, 8/11, 8/12, 8/14, 8/15, 8/16, 8/17	ODSVRA breeding male.
gg:ba		ODSVRA 2019	SLO	5/8	
gg:gb	M	ODSVRA 2016 or 2018	SLO	4/14, 4/25, 4/29, 5/31, 6/13, 7/20, 7/22, 7/24, 7/26, 7/27, 7/28, 7/30, 8/1, 8/5, 8/6, 8/8, 8/10, 8/12, 8/15	ODSVRA breeding male.
gg:go		ODSVRA 2019	SLO	5/21, 5/23, 5/26, 5/31	
gg:gr	F	ODSVRA 2011 or 2013	SLO	5/30, 5/31, 6/3, 6/10, 7/18, 7/19, 8/6	ODSVRA breeding female.
gg:oa		ODSVRA 2019	SLO	5/18	
gg:ob	M	ODSVRA 2019	SLO	3/7, 3/19, 3/20, 3/22, 3/23, 3/25, 3/30, 4/1, 4/3, 4/7, 4/9, 4/23, 5/2, 5/5, 5/6, 5/11, 5/12, 5/13, 5/14, 5/16, 5/22, 5/23, 5/29, 6/1, 6/3, 6/8, 6/10, 6/20, 6/24, 6/25, 6/26, 7/5, 7/16, 7/19, 7/23, 7/30, 8/8, 8/12, 8/16, 8/17, 8/24, 8/26, 8/27, 8/28, 8/31	ODSVRA breeding male.
gg:or		ODSVRA 2014 or 2015	SLO	8/14	
gg:oy		ODSVRA 2018	SLO	5/15	

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2021 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
gg:rb	M	ODSVRA 2016 or 2018	SLO	3/4, 3/5, 3/8, 3/9, 3/11, 3/20, 3/27, 4/3, 4/8, 4/9, 4/12, 4/13, 4/20, 5/6, 5/11, 5/18, 5/22, 5/23, 6/1, 6/2, 6/3, 6/4, 6/5, 6/12, 6/13, 6/16, 6/17, 6/18, 6/19, 6/21, 6/22, 6/23, 6/25, 7/6, 7/7, 7/9, 7/17, 7/25, 7/26, 8/11, 8/15, 8/26, 8/27, 8/29, 9/2, 9/5, 9/11, 9/22	ODSVRA breeding male.
gg:wr		ODSVRA 2014 or 2016	SLO	8/21	
gg:ww	M	ODSVRA 2018	SLO	4/29, 5/3, 5/12, 6/3, 6/18, 6/19, 6/21, 6/27, 7/1, 7/12, 7/23	ODSVRA breeding male.
gg:yr	F	ODSVRA 2017 or 2018	SLO	5/3, 5/6, 5/30, 6/11, 6/14, 6/17	ODSVRA breeding female.
pg:ar	F	ODSVRA 2014	SLO	5/1, 5/2, 5/3, 5/7, 5/8, 5/12, 5/13, 5/14, 5/15, 5/24, 5/29, 6/2, 6/3, 6/9, 6/14, 6/17, 6/20, 6/21, 6/22, 6/24, 6/25, 6/27, 6/28, 7/2, 7/4, 7/8, 8/9, 8/10, 8/12, 8/25, 8/26, 9/11	ODSVRA breeding female.
pg:by	M (2)	ODSVRA 2017 or 2018	SLO	3/30, 3/31, 4/1, 4/13, 5/11, 5/12, 5/24, 5/26, 5/30, 5/31, 6/1, 6/3, 6/4, 6/21, 6/27, 7/9, 8/2, 8/5, 8/6, 8/8, 8/9, 8/11, 8/14, 8/18, 8/19, 8/26, 8/28	ODSVRA breeding males (2).
pg:ow	M	ODSVRA 2015 or 2016	SLO	4/3, 4/8, 4/12, 4/13, 4/14, 4/15, 4/27, 5/16, 5/20, 5/23, 5/31, 6/2, 6/3, 6/16, 6/23, 7/1, 7/3, 7/4, 7/5, 7/15, 7/16, 7/22, 7/29, 8/1, 8/4, 8/18, 8/28, 9/24	ODSVRA breeding male.
pg:pb	F	ODSVRA 2014 or 2015	SLO	4/12, 4/14, 6/7, 6/13, 7/5, 7/26, 8/21, 8/28	ODSVRA breeding female.
pg:vg	M	ODSVRA 2014 or 2015	SLO	6/22, 7/20, 7/31	ODSVRA breeding male.
pg:vr	F	ODSVRA 2018	SLO	3/22, 4/14	ODSVRA breeding female.
pg:yb	M & F	ODSVRA 2015 or 2017	SLO	4/23, 5/12, 5/29, 6/4, 6/10, 6/20, 7/1, 8/2, 8/5	ODSVRA breeding male and female.
pv:by	F	ODSVRA 2015	SLO	3/19, 3/26, 3/31, 5/11, 5/18, 5/21, 5/22, 5/30, 6/19, 6/30, 7/5	ODSVRA breeding female.
pv:gb	M	ODSVRA 2020	SLO	5/28, 5/30, 6/1, 6/2, 6/3, 6/8, 6/12, 6/14, 6/25, 6/27, 6/29, 7/1, 7/6, 7/7, 7/9, 7/17, 7/23, 7/25, 7/27, 7/28, 7/31	ODSVRA breeding male.
pv:ob	M	ODSVRA 2015 or 2017	SLO	3/30, 4/15, 6/19, 6/20, 6/21, 6/22, 6/24, 6/27, 7/1, 7/16, 8/8, 8/10, 8/11, 8/16, 8/17, 8/18, 8/26, 8/28, 9/7, 9/9	ODSVRA breeding male.
pv:rb	M	ODSVRA 2016	SLO	3/29, 4/2, 4/28, 4/29, 5/12, 5/14, 5/25, 7/6, 7/16, 7/17, 7/22, 7/25, 7/28, 7/31, 8/3, 8/4, 8/5, 8/6, 8/7, 8/11, 8/18, 8/21, 8/26, 9/2, 9/30	ODSVRA breeding male.
pv:wy	M	ODSVRA 2014 or 2015	SLO	4/2, 6/3, 6/7, 6/16, 6/27, 7/1, 8/14, 8/18	ODSVRA breeding male.
pv:yb	M	ODSVRA 2012	SLO	3/22, 5/9, 6/2, 6/3, 6/24, 6/27, 6/30, 7/1, 7/3, 7/4, 7/17, 7/29, 8/11	ODSVRA breeding male.

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2021 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
rr:ab	M	ODSVRA 2016 or 2017	SLO	4/20, 5/8, 5/11, 5/31, 6/3, 6/7, 6/14, 6/21, 6/25, 6/26, 6/29, 7/1, 7/2, 7/6, 7/7, 7/18, 7/19, 7/23, 7/25, 7/26, 7/28, 7/30	ODSVRA breeding male.
rr:aw	M	ODSVRA 2017	SLO	3/2, 5/20, 5/31, 6/10, 6/11, 6/18, 6/19, 6/28, 7/1, 7/8, 7/9, 7/12, 7/17, 7/20, 7/21, 7/22, 7/23, 7/28, 7/29, 7/30, 7/31, 8/3, 8/4, 8/5, 8/7, 8/8, 8/11, 8/13, 8/21, 8/22, 8/28	ODSVRA breeding male.
rr:bb	F	ODSVRA 2016 or 2017	SLO	3/7, 4/3, 4/7, 5/3, 5/6, 5/11, 5/16, 5/17, 6/20, 7/23, 7/25, 8/21, 8/27, 8/29, 9/1, 9/4, 9/11	ODSVRA breeding female.
rr:bw	M	ODSVRA 2016 or 2017	SLO	4/1, 4/3, 4/5, 4/7, 4/14, 4/16, 4/17, 5/17, 5/18, 6/19, 7/14, 7/17, 8/4, 8/9, 8/26	ODSVRA breeding male.
rr:or		ODSVRA 2010	SLO	3/31	Lost orange band on right leg and now rr:r-. First observed as rr:r- on 30 May, 2021.
rr:pw	F	ODSVRA 2014	SLO	4/1, 4/23, 4/30, 5/26, 5/30, 6/17, 6/27, 7/26, 8/13	ODSVRA breeding female.
rr:r-	M	ODSVRA 2010	SLO	5/30, 6/4, 6/23, 6/24, 6/25, 6/26, 6/27, 6/29, 6/30, 7/1, 7/3, 7/25	ODSVRA breeding male. Originally banded rr:or, last seen as rr:or on 31 March, 2021.
vg:ag		ODSVRA 2017 or 2018	SLO	7/9	
vg:ao		ODSVRA 2020	SLO	4/10, 6/4, 6/13, 6/22, 7/10, 9/30	
vg:ar		ODSVRA 2018	SLO	7/25	
vg:ay	M	ODSVRA 2018	SLO	3/7, 5/3, 5/6, 5/16, 5/20, 5/23, 5/31, 6/1, 6/2, 6/20, 7/3, 7/17, 7/23, 7/24, 7/25, 7/26, 7/27, 7/28, 7/29, 7/30, 8/1, 8/3, 8/5, 8/6, 8/7, 8/8, 8/11, 8/13, 8/14, 8/15, 8/16, 8/24, 8/26, 8/27, 9/11	ODSVRA breeding male.
vg:ba	M	ODSVRA 2019	SLO	3/19, 3/27, 3/28, 3/31, 4/1, 4/7, 4/8, 4/9, 5/11, 5/23, 5/31, 6/1, 6/3, 6/7, 6/9, 6/18, 6/19, 6/22, 6/25, 6/27, 6/28, 7/2, 7/13, 7/22, 7/27, 8/6, 8/10, 8/13, 8/15, 8/18, 8/21, 9/30	ODSVRA breeding male.
vg:bv		ODSVRA 2020	SLO	9/15	
vg:bw	M & F	ODSVRA 2016 or 2017	SLO	3/29, 4/1, 4/7, 4/21, 5/12, 5/15, 5/16, 5/18, 5/21, 6/2, 6/3, 6/4, 6/10, 6/25, 6/30, 7/1, 7/2, 7/3, 7/4, 7/5, 7/6, 7/7, 7/9, 7/12, 7/16, 7/17, 7/24, 7/25, 7/29, 7/30, 8/3, 8/6, 8/10, 8/16, 8/17, 8/18, 8/30, 9/1, 9/7	ODSVRA breeding male and female.
vg:pg	M	ODSVRA 2018	SLO	4/15, 4/25, 5/2, 6/7, 7/5	ODSVRA breeding male.
vg:rg	F	ODSVRA 2017 or 2018	SLO	4/13, 4/18, 4/19, 5/11, 6/3, 6/4, 6/28, 7/20, 8/3, 9/30	ODSVRA breeding female.

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2021 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
vg:rw	M	ODSVRA 2018	SLO	3/31, 4/7, 4/13, 4/14, 4/16, 4/19, 4/24, 5/15, 6/17, 6/26, 6/27, 7/1, 7/14, 7/16, 7/28, 8/2, 8/6, 8/8, 8/9, 8/11, 8/12, 8/14, 8/17, 8/19	ODSVRA breeding male.
vg:vy	M	ODSVRA 2015 or 2016	SLO	6/19, 7/3, 7/22, 7/26	ODSVRA breeding male.
vg:yb	F	ODSVRA 2020	SLO	7/1, 7/2, 7/4, 7/6, 7/8, 7/15	ODSVRA breeding female.
vg:yg	M	ODSVRA 2018	SLO	5/20, 5/26, 5/29, 6/19, 6/23, 7/3, 7/19, 7/21, 7/24, 7/25, 7/28, 7/29, 8/8, 8/10, 8/14, 8/16, 8/17, 8/19	ODSVRA breeding male.
vg:yy	F	ODSVRA 2016 or 2018	SLO	5/16, 6/17, 7/1, 7/3, 7/4, 7/5, 7/6, 7/12, 7/14, 7/18, 7/20, 7/26	ODSVRA breeding female.
vv:ab	F	ODSVRA 2017 or 2018	SLO	3/24, 4/14, 4/20, 4/23, 4/25, 5/14, 5/15, 6/30, 7/1, 7/2, 7/3, 7/4	ODSVRA breeding female.
vv:bw	M	ODSVRA 2014 or 2015	SLO	5/31, 6/19, 6/27, 7/3, 7/5, 7/17, 7/24	ODSVRA breeding male.
vv:gw	F	ODSVRA 2015 or 2017	SLO	4/16, 6/17	ODSVRA breeding female.
vv:ra	M (2)	ODSVRA 2020	SLO	4/14, 5/6, 5/8, 5/11, 5/14, 5/16, 5/21, 6/1, 6/12, 6/18, 6/19, 6/21, 6/24, 7/1, 7/2, 7/4, 7/7, 7/17, 7/18, 7/22, 7/24, 7/25, 7/26, 7/28, 7/29, 7/30, 7/31, 8/1, 8/2, 8/4, 8/5, 8/6, 8/11, 8/12, 8/13, 8/15, 8/21	ODSVRA breeding males (2).
vv:rr		ODSVRA 2016 or 2018	SLO	8/21	
vv:rv	F	ODSVRA 2020	SLO	3/30, 4/3, 4/7, 5/13, 5/15, 6/13, 6/14, 6/19, 7/16, 7/28, 8/3, 8/11, 8/12, 8/18, 8/28, 8/30, 8/31, 9/1, 9/3, 9/10	ODSVRA breeding female.
vv:wr	M	ODSVRA 2015 or 2016	SLO	5/20, 5/26, 6/9, 8/9	ODSVRA breeding male.
py:ag		Santa Barbara Zoo 2021	Santa Barbara	8/17, 8/18	Juvenile. Released at Coal Oil Point Reserve.
py:gw		Santa Barbara Zoo 2021	Santa Barbara	8/15	Juvenile. Released at Coal Oil Point Reserve.
-:y/g	M	VSFB unknown	Santa Barbara	3/29, 6/6, 6/22, 7/16	ODSVRA breeding male. Federal service band has exposed metal above yellow tape.
a:g/o/g		VSFB 2017	Santa Barbara	6/7	On federal service band on left leg there is exposed metal above aqua tape.
gn:rr	M	VSFB 2017	Santa Barbara	6/4, 6/16, 6/30, 7/12, 7/25, 7/28, 7/29, 8/1, 8/2, 8/3	ODSVRA breeding male. On federal service band on left leg there is exposed metal above brown tape.
l:y/g		VSFB 2016	Santa Barbara	8/6	
nb:al	F	VSFB 2020	Santa Barbara	3/31, 5/11, 6/2, 6/5, 6/17, 6/19, 6/27, 7/25, 7/27, 7/30, 9/30	ODSVRA breeding female.

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

Table D.4. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2021 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
nb:oy	M & F	VSFB 2016	Santa Barbara	4/7, 4/29, 5/13, 6/2, 6/3, 6/7, 6/9, 6/13, 6/14, 6/15, 6/17, 6/18, 6/19, 6/20, 6/24, 6/25, 6/27, 7/17, 7/23	ODSVRA breeding male and female.
nb:rr	M	VSFB 2020	Santa Barbara	3/12, 3/21, 4/5, 4/17, 4/23, 4/28, 5/14, 5/20, 5/30, 6/5, 6/6, 6/7, 6/8, 6/9, 6/10, 6/12, 6/13, 6/19, 7/2, 8/1, 8/5, 8/8, 8/11, 8/19, 8/20, 8/21, 8/22, 8/26, 9/1, 9/2, 9/4, 9/9, 9/11	ODSVRA breeding male. On 7 June, bird banded nb:rr seen with a left leg injury (see Table H.2 in Appendix H).
no:ol	F	VSFB 2020	Santa Barbara	5/6, 5/8, 5/14, 5/21, 5/31, 6/18, 6/21, 6/29, 7/2, 7/22, 7/26, 8/6, 8/10, 8/12, 8/16, 8/17, 8/18, 8/27, 8/28, 8/31, 9/5, 9/7, 9/9, 9/15	ODSVRA breeding female. On federal service band on left leg there is exposed metal above orange tape.
no:rg		VSFB 2017	Santa Barbara	8/16	
nr:ol		VSFB 2020	Santa Barbara	4/23	
ny:gv		VSFB 2021	Santa Barbara	9/10	Juvenile.
ny:wg		VSFB 2017	Santa Barbara	3/15, 3/26, 5/14	
ny:wl	M & F	VSFB 2020	Santa Barbara	3/7, 3/11, 3/12, 3/14, 3/17, 3/20, 3/28, 3/29, 5/8, 5/12, 5/14, 6/1, 6/9, 6/10, 6/16, 6/17, 6/18, 6/19, 6/22, 6/24, 7/1	ODSVRA breeding male and female.
o:b/w		VSFB 2014	Santa Barbara	7/28	
lg:rg		Coronado 2021	San Diego	9/17	Juvenile.

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2020 to 28 February 2021.

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 B.)

SB = State Beach, SP = State Park, SLO = San Luis Obispo, VSFB = Vandenberg Space Force Base, NB = Naval Base

Band Combination	Year Banded	Location Seen	County	Dates Seen
gg:ol	2019	Eel River	Humboldt	10/3, 12/17, 12/19, 1/16
rr:pw	2014	Manchester Beach	Mendocino	10/2, 11/4, 1/19
ga:or	2016 or 2017	Salmon Creek Beach	Sonoma	10/9, 11/19, 12/31
pv:by	2015	Point Reyes	Marin	10/10
vg:ya	2020	Point Reyes	Marin	11/11
pg:bg	2015 or 2016	Laguna Creek Beach	Santa Cruz	11/12, 11/24
vg:rw	2018	Laguna Creek Beach	Santa Cruz	12/23
bb:gr	2012 or 2015	Seabright SB	Santa Cruz	11/2, 11/25
ga:pr	2016 or 2017	Seabright SB	Santa Cruz	10/27
bb:ba	2019	Sunset SB	Santa Cruz	11/2, 11/14
pv:og	2018	Del Monte Beach	Monterey	11/25, 2/19
gg:pb	2012 or 2013	Arroyo Laguna	SLO	10/21, 10/27, 11/10, 11/17, 12/1
vv:gw	2015 or 2017	Arroyo Laguna	SLO	11/10, 11/17, 12/7, 12/23
vv:pa	2020	Arroyo Laguna	SLO	11/17, 12/7, 12/23
gg:pb	2012 or 2013	San Simeon SP	SLO	2/16, 2/22
vv:pa	2020	San Simeon SP	SLO	2/16
gg:pb	2012 or 2013	Santa Rosa Creek	SLO	12/7, 12/20, 2/2
pv:gy	2018	Santa Rosa Creek	SLO	10/21, 11/4, 11/23, 12/7
bb:ar	2017 or 2018	Villa Creek	SLO	10/2, 10/6, 10/15, 10/18, 10/20, 10/27, 10/28, 10/29, 10/30, 11/1, 11/2, 11/3, 11/7, 11/10, 11/11, 11/12, 11/17, 11/22, 11/24, 12/1, 12/4, 12/8, 12/18, 12/26, 12/31, 1/1, 1/5, 1/26, 1/29, 2/2, 2/17
gg:oa	2019	Villa Creek	SLO	10/13, 10/22, 10/27, 11/1, 11/3, 11/11, 11/17, 11/24, 12/8, 12/25, 12/31, 1/5, 2/2, 2/9, 2/17
vg:rv	2020	Villa Creek	SLO	11/1
ga:pv	2020	Morro Strand SB	SLO	2/9
gg:oa	2019	Morro Strand SB	SLO	1/29
gg:pb	2012 or 2013	Morro Strand SB	SLO	12/8
pv:gy	2018	Morro Strand SB	SLO	12/8
rr:ag	2017	Morro Strand SB	SLO	10/6, 10/18, 10/20, 10/27, 11/17, 12/8, 12/23
vg:ao	2020	Morro Strand SB	SLO	10/27
vg:rv	2020	Morro Strand SB	SLO	10/6, 10/8, 10/13, 10/27, 11/10, 11/26, 12/25, 2/9
vv:or	2015 or 2016	Morro Strand SB	SLO	2/9, 2/17
bb:bo	2020	Morro Bay Sandspit	SLO	10/13, 10/16, 10/20, 11/3, 11/17, 12/1, 12/8, 2/9
ga:pv	2020	Morro Bay Sandspit	SLO	10/16, 10/20, 11/3, 12/8
pg:ag	2019	Morro Bay Sandspit	SLO	12/8, 2/9
pv:gb	2020	Morro Bay Sandspit	SLO	10/3, 10/13
rr:ag	2017	Morro Bay Sandspit	SLO	2/9
vg:rv	2020	Morro Bay Sandspit	SLO	2/9
vv:ra	2020	Morro Bay Sandspit	SLO	10/20, 11/3, 11/10, 11/17
pg:ag	2019	Guadalupe NWR	SLO	11/24
bb:wa	2019	VSFB	Santa Barbara	10/16
ga:aw	2018	VSFB	Santa Barbara	10/18

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

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2020 to 28 February 2021 (continued).

Band Combination	Year Banded	Location Seen	County	Dates Seen
gg:av	2019	VSFB	Santa Barbara	10/10, 10/16, 1/19
gg:rb	2016 or 2018	VSFB	Santa Barbara	10/10, 10/16, 1/19
rr:aw	2017	VSFB	Santa Barbara	10/16, 1/19, 2/17
vg:ag	2017 or 2018	VSFB	Santa Barbara	10/13, 10/16, 1/1, 1/9, 1/10, 1/14, 1/20, 1/26, 2/6, 2/7, 2/9, 2/22, 2/25, 2/28
vv:ra	2020	VSFB	Santa Barbara	10/16, 1/19
ga:aw	2018	Jalama Beach	Santa Barbara	12/31, 1/20, 2/19
ga:or	2016 or 2017	Jalama Beach	Santa Barbara	10/8, 2/19
pv:yr	2017 or 2018	Jalama Beach	Santa Barbara	10/8, 12/31, 1/20
vg:vg	2018	COPR	Santa Barbara	1/22
vv:bo	2019	McGrath SB	Ventura	1/21
ga:ba	2020	Point Mugu	Ventura	10/2, 10/16, 11/10
ga:gy	2020	Point Mugu	Ventura	10/16
bb:ba	2019	Zmudowski SB	Monterey	12/16
ga:gy	2020	Zuma Beach	Los Angeles	11/27, 2/11
bb:bb	2018	Camp Pendleton	San Diego	1/20
bb:vb	2011, 2013 or 2014	Camp Pendleton	San Diego	2/3, 2/24
vg:bv	2020	Mission Bay	San Diego	11/16, 12/2, 12/10, 1/22, 1/24, 2/22
ga:av	2020	Ocean Beach	San Diego	10/21
vg:bv	2020	Coronado NB	San Diego	10/21

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 2021.

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.
Guadalupe NWR = Guadalupe-Nipomo Dunes National Wildlife Refuge, Guadalupe RP = Guadalupe Restoration Project, NWR = National Wildlife Refuge, SB = State Beach, SLO = San Luis Obispo, RGDP = Rancho Guadalupe Dunes Preserve, VSFB = Vandenberg Space Force Base
M = male, F = female

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
pv:yb	2012		Eden Landing	Alameda	8/30, 9/13, 9/21	
rr:ag	2017		Eden Landing	Alameda	3/8	
bb:gr	2012 or 2015		Half Moon Bay	San Mateo	7/30, 8/19	
vg:rw	2018		Laguna Creek Beach	Santa Cruz	8/25, 9/17, 9/21	
vg:ya	2020		Salinas River NWR	Monterey	5/19	
gg:pb	2012 or 2013		Arroyo Laguna	SLO	8/10, 9/21	
gg:pb	2012 or 2013		San Simeon SB	SLO	3/20, 3/23	
vv:pa	2020		San Simeon SB	SLO	3/23	
bb:ar	2017 or 2018		Villa Creek	SLO	3/11, 3/12, 3/13, 3/15, 3/16, 3/17, 3/18, 3/19, 7/26, 9/2, 9/4, 9/9, 9/21, 9/23	
bb:bo	2020		Villa Creek	SLO	4/28, 5/3, 5/4, 5/5, 5/10, 5/11, 5/12, 5/13, 5/17, 5/18, 5/19, 5/20, 6/3, 6/4, 6/9, 6/28, 6/29, 6/30, 7/1, 7/2, 7/7, 7/9, 7/11, 7/12, 7/13	Villa Creek breeding bird.
bb:or	2016 or 2017		Villa Creek	SLO	6/7, 6/11	
gg:oa	2019		Villa Creek	SLO	3/2, 3/3, 3/4, 3/11, 3/12, 3/14, 3/15, 3/16, 3/17, 3/18, 3/22, 3/26, 3/29, 4/1, 4/5, 4/7, 4/9, 4/10, 4/12, 4/13, 4/14, 4/15, 4/16, 4/19, 4/26, 4/28, 6/28, 6/30, 7/2, 7/7, 7/8, 7/9, 7/12, 7/13, 7/14, 7/15, 7/16, 7/20, 7/21, 7/22, 7/23, 7/26, 7/28, 7/29, 7/30, 8/1, 8/2, 8/4, 8/5, 8/6, 8/10, 8/12, 8/16, 8/17, 8/18, 8/19, 8/20, 8/23, 8/25, 8/27, 8/31, 9/2, 9/4, 9/9, 9/21, 9/23	Villa Creek breeding adult
ga:pv	2020		Morro Strand SB	SLO	4/5, 4/13, 4/19, 4/20, 4/22, 4/26, 3/19, 3/30, 4/1	
ga:wb	2021		Morro Strand SB	SLO	8/16	Juvenile.
gg:oa	2019		Morro Strand SB	SLO	4/20	
rr:ag	2017		Morro Strand SB	SLO	3/11	
vg:rv	2020		Morro Strand SB	SLO	4/1, 4/13, 4/20, 4/27, 4/28, 8/5	
vv:or	2015 or 2016	M	Morro Strand SB	SLO	4/1, 4/2, 4/5, 4/6, 4/8, 4/9, 4/14, 4/22, 4/23, 4/26, 4/28, 3/2, 3/5, 3/16, 3/18, 3/22, 3/23, 3/24, 3/26, 5/12, 5/18, 5/19, 5/21, 5/24, 5/25, 5/26, 5/28, 6/2, 6/3, 6/4, 6/8, 6/9, 6/28, 6/29, 6/30, 7/6, 7/8, 7/12, 7/15, 8/5, 8/6, 8/10, 8/12, 8/19, 8/20	Morro Strand breeding male.
bb:bo	2020		Morro Bay Sandspit	SLO	4/8, 4/12, 4/26, 4/27, 4/30, 5/7, 5/27, 7/19, 7/21, 7/23, 7/26, 7/27, 7/29, 8/2, 8/5, 8/20, 8/23, 8/25, 8/27, 9/2, 9/7, 9/23	Morro Bay Sandspit breeding bird.
ga:pv	2020		Morro Bay Sandspit	SLO	5/17, 8/27, 9/16, 9/21	
gg:ba	2019		Morro Bay Sandspit	SLO	8/17	

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 2021 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
gg:pb	2012 or 2013	F	Morro Bay Sandspit	SLO	4/7, 4/9, 4/12, 4/13, 4/16, 5/5, 5/18, 5/26, 6/3, 6/4, 6/28, 6/30, 7/7	Morro Bay Sandspit breeding female.
pg:ag	2019		Morro Bay Sandspit	SLO	4/3, 8/25	
pv:bg	2021		Morro Bay Sandspit	SLO	8/18	Juvenile.
pv:pv	2021		Morro Bay Sandspit	SLO	9/21	Juvenile.
vg:rv	2020		Morro Bay Sandspit	SLO	8/31, 9/10	
vv:or	2015 or 2016		Morro Bay Sandspit	SLO	4/30, 5/4, 5/5, 8/27	
vv:ra	2020		Morro Bay Sandspit	SLO	3/8, 3/11, 3/12, 3/22, 3/24, 3/26, 8/18, 8/31, 9/10, 9/16, 9/21, 9/23	
vv:vo	2020		Morro Bay Sandspit	SLO	9/7	
bb:ba	2019		Guadalupe NWR	SLO	5/13, 5/26, 6/16, 7/1, 7/21	
bb:bw	2018		Guadalupe NWR	SLO	4/27, 5/21, 5/26	
bb:po	2021		Guadalupe NWR	SLO	8/17	Juvenile.
bb:rv	2021		Guadalupe NWR	SLO	8/10	Juvenile.
ga:ob	2021		Guadalupe NWR	SLO	8/10	Juvenile.
ga:vw	2020		Guadalupe NWR	SLO	5/13, 5/21, 5/26, 6/23	
ga:wb	2021		Guadalupe NWR	SLO	8/17	Juvenile.
gg:by	2021		Guadalupe NWR	SLO	8/17	Juvenile.
gg:ol	2019		Guadalupe NWR	SLO	3/23, 4/1, 4/21, 4/27, 5/4, 5/13, 6/23, 8/17	
gg:yr	2017 or 2018		Guadalupe NWR	SLO	4/21, 3/17	
pg:by	2017 or 2018		Guadalupe NWR	SLO	4/21, 4/28, 5/4, 8/17, 8/18, 8/19	
pg:ow	2015 or 2016		Guadalupe NWR	SLO	4/28, 5/4	
pg:yb	2015 or 2017		Guadalupe NWR	SLO	3/2	
pv:ob	2015 or 2017		Guadalupe NWR	SLO	3/2, 3/9, 5/13, 8/10	
rr:ba	2021		Guadalupe NWR	SLO	8/10	Juvenile.
rr:bw	2016 or 2017		Guadalupe NWR	SLO	5/21, 9/2	
rr:pw	2014		Guadalupe NWR	SLO	5/21	
rr:vw	2021		Guadalupe NWR	SLO	8/17	Juvenile.
vg:ao	2020		Guadalupe NWR	SLO	3/9, 8/10, 8/17	
vg:ob	2021		Guadalupe NWR	SLO	8/17	Juvenile.
vg:rv	2020		Guadalupe NWR	SLO	7/21	
bb:aa	2020		Guadalupe RP	SLO	4/2, 4/12, 4/28, 6/18, 6/25	
bb:ag	2020		Guadalupe RP	SLO	5/7	
bb:ar	2017 or 2018		Guadalupe RP	SLO	8/30	
bb:bb	2018		Guadalupe RP	SLO	3/11, 3/24, 4/12, 4/16, 4/19, 4/22, 4/28, 5/5, 5/14, 5/19, 5/24, 6/16, 7/9, 7/23, 7/28, 8/30	
bb:gg	2013 or 2014		Guadalupe RP	SLO	3/5, 3/8, 3/31	
bb:gw	2018		Guadalupe RP	SLO	6/16, 6/18, 8/4	
bb:gy	2021		Guadalupe RP	SLO	6/30	Juvenile.
bb:po	2021		Guadalupe RP	SLO	9/3	Juvenile.
bb:pr	2021		Guadalupe RP	SLO	8/30	Juvenile.
bb:rv	2021		Guadalupe RP	SLO	8/30	Juvenile.
bb:rw	2014 or 2015		Guadalupe RP	SLO	8/30	
bb:yr	2021		Guadalupe RP	SLO	8/30	Juvenile.
ga:br	2021		Guadalupe RP	SLO	8/9	Juvenile.
ga:gy	2020		Guadalupe RP	SLO	4/28	

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 2021 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
ga:ob	2021		Guadalupe RP	SLO	8/9, 8/20, 8/24, 8/30, 9/7	Juvenile.
gg:by	2021		Guadalupe RP	SLO	7/26, 8/4	Juvenile.
gg:ob	2019		Guadalupe RP	SLO	8/4, 8/20	
gg:wr	2014 or 2016		Guadalupe RP	SLO	8/30	
gg:yr	2017 or 2018		Guadalupe RP	SLO	6/18, 6/30, 8/27	
pv:aa	2021		Guadalupe RP	SLO	8/27	Juvenile.
pv:bg	2021		Guadalupe RP	SLO	7/9, 8/27	Juvenile.
pv:bo	2021		Guadalupe RP	SLO	8/9, 8/20, 8/30	Juvenile.
pv:yr	2017 or 2018		Guadalupe RP	SLO	4/30, 6/14, 6/18, 6/21	
rr:bw	2016 or 2017		Guadalupe RP	SLO	8/24	
rr:vw	2021		Guadalupe RP	SLO	9/7	Juvenile.
bb:ag	2020		RGDP	Santa Barbara	7/4	
ga:gy	2020		RGDP	Santa Barbara	5/10	
ga:vb	2021		RGDP	Santa Barbara	8/13	Juvenile.
vg:ar	2018		RGDP	Santa Barbara	6/21	
bb:go	2019		VSFB	Santa Barbara	7/8	
bb:or	2016 or 2017		VSFB	Santa Barbara	8/17	
bb:ry	2021		VSFB	Santa Barbara	8/24, 9/20, 9/22	Juvenile.
bb:yr	2021		VSFB	Santa Barbara	8/9, 8/16	Juvenile.
ga:aw	2018		VSFB	Santa Barbara	3/3, 3/29	
ga:gv	2020		VSFB	Santa Barbara	4/26, 5/6, 5/11, 5/22, 6/8, 6/29, 7/9, 7/20, 8/11, 8/24, 9/15, 9/20, 9/22	
ga:or	2016 or 2017		VSFB	Santa Barbara	3/1, 3/3, 3/19, 6/28, 6/30, 7/15, 7/19, 7/21, 7/25, 7/26, 7/28, 7/30, 8/4, 8/12, 8/20, 9/22, 9/25, 9/28	
ga:pv	2020		VSFB	Santa Barbara	4/27	
ga:vb	2021		VSFB	Santa Barbara	8/3	Juvenile.
ga:wb	2021		VSFB	Santa Barbara	8/13, 8/17	Juvenile.
gg:av	2019	F	VSFB	Santa Barbara	3/2, 3/4, 3/18, 3/30, 4/13, 4/15, 4/22, 4/30, 5/4, 5/13, 6/17, 6/22, 6/29, 7/6, 7/15, 7/22, 7/27, 8/11, 8/16, 8/24, 9/20, 9/22	VSFB breeding female.
gg:aw	2017 or 2018	F	VSFB	Santa Barbara	4/13, 5/4, 3/2, 3/16, 3/18, 3/30, 4/1, 5/6, 5/13, 5/14, 5/22, 5/27, 7/15, 7/26, 7/29, 8/9, 8/11, 8/13, 9/15, 9/29	VSFB breeding female.
gg:gg	2021		VSFB	Santa Barbara	7/27	Juvenile.
gg:pv	2021		VSFB	Santa Barbara	3/4	Juvenile.
gg:rb	2016 or 2018	F	VSFB	Santa Barbara	3/4, 3/16, 3/18, 3/25, 3/30, 4/15, 4/20, 4/22, 4/26, 4/28, 5/6, 5/11, 5/13, 5/22, 5/27, 6/1, 6/22, 6/29, 7/9, 7/27, 7/29, 8/3, 8/11, 8/16, 8/24, 9/22	VFSB breeding female.
gg:ww	2018		VSFB	Santa Barbara	7/25	
pv:bg	2021		VSFB	Santa Barbara	7/15	Juvenile.
pv:wa	2021		VSFB	Santa Barbara	8/24	Juvenile.

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

Table D.6. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2021 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
pv:yr	2017 or 2018	F	VSFB	Santa Barbara	3/3, 3/17, 3/19, 3/24, 3/31, 4/2, 4/6, 4/21, 4/29, 5/14, 5/17, 6/2, 6/4, 6/7, 6/9, 6/16, 6/18, 6/21, 6/23, 7/2, 7/5, 7/8, 7/14, 7/15, 7/16, 7/21, 7/23, 7/28, 8/4, 8/6, 8/12, 8/17, 9/16, 9/22	VFSB breeding female.
rr:vw	2021		VSFB	Santa Barbara	8/25	Juvenile.
vg:ag	2017 or 2018		VSFB	Santa Barbara	3/3, 3/8, 3/17, 3/24	
vv:ra	2020		VSFB	Santa Barbara	4/1, 4/13, 4/15, 4/22, 4/30, 5/4, 3/2, 3/16, 3/18, 3/30, 5/13, 5/22, 6/1, 6/29	
vv:yw	2021		VSFB	Santa Barbara	8/17	Juvenile.
ga:aw	2018		Jalama Beach	Santa Barbara	9/30	
pv:yr	2017 or 2018		Jalama Beach	Santa Barbara	9/29, 9/30	
bb:ry	2021		Coal Oil Point Reserve	Santa Barbara	9/28, 9/29, 9/30	Juvenile.
ga:pb	2016 or 2017		Coal Oil Point Reserve	Santa Barbara	4/14	
ga:vb	2021		Coal Oil Point Reserve	Santa Barbara	7/27	Juvenile.
pg:ba	2021		Coal Oil Point Reserve	Santa Barbara	9/4, 9/6, 9/8, 9/9	Juvenile.
pg:gg	2021		Coal Oil Point Reserve	Santa Barbara	9/23, 9/29	Juvenile.
vg:vg	2018		Coal Oil Point Reserve	Santa Barbara	3/2, 4/13	
bb:by	2010 or 2013		McGrath SB	Ventura	7/19	
bb:go	2019		McGrath SB	Ventura	7/12, 8/9, 8/24	
gg:wa	2021		McGrath SB	Ventura	8/9	Juvenile.
vv:bo	2019		McGrath SB	Ventura	3/29, 5/26, 6/1, 6/8, 9/7	
vv:bo	2019		Mandalay SB	Ventura	3/16	
ga:gy	2020		Zuma Beach	Los Angeles	3/9	
ga:vg	2020		Huntington Beach	Orange	5/9	
vg:bv	2020		Mission Bay	San Diego	3/10	
bb:oa	2019		Naval Base Coronado	San Diego	3/1, 3/4, 3/8, 3/11, 3/18, 3/22, 3/25, 4/1, 4/5, 4/12, 4/15, 4/19, 4/26, 4/29, 5/3, 5/17	
bb:bb	2018		Camp Pendleton	San Diego	3/13	
bb:vb	2011, 2013 or 2014		Camp Pendleton	San Diego	3/2, 3/5, 3/8, 3/9, 3/12, 3/16, 3/18	
bb:wa	2019		Camp Pendleton	San Diego	4/19	
pv:bg	2021		Camp Pendleton	San Diego	7/26, 8/5, 8/6	Juvenile.
pv:bg	2021		Tijuana Estuary	San Diego	8/12	Juvenile.

APPENDIX E. CALIFORNIA LEAST TERN REPRODUCTIVE SUCCESS REPORTED FOR CURRENT OR RECENT BREEDING SITES IN SAN LUIS OBISPO AND SANTA BARBARA COUNTIES FROM 2004-21.

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 and 2020, 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 COPR (pers. comm. Jessica Nielson).

na = estimated number not available at time of 2020 report

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 or recent breeding sites in San Luis Obispo and Santa Barbara counties from 2004-21 (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

[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, 2001-21.

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

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 known fledged
	Southern Exclosure	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 exclosure [1]	3	3	3	100	9	0	0
2001	**Total**	**33**	**30**	**26**	**87**	**71**	**3**	**4**
	Southern Exclosure	33	33	25	76	62	35	56
	Oso Flaco	2	2	0	0	0	0	0
2002	**Total**	**35**	**35**	**25**	**71**	**62**	**35**	**56**
	Southern Exclosure	74	73	52	71	136	91	68
	Oso Flaco	13	13	5	38	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 exclosure [2]	2	2	1	50	3	2	67
2003	**Total**	**94**	**93**	**62**	**67**	**160**	**106**	**67**
	Southern Exclosure	113	111	87	78	208	59	29
	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
2004	**Total**	**142**	**140**	**105**	**75**	**251**	**66**	**27**
	Southern Exclosure	79	79	60	76	142	57	40
	Oso Flaco	22	22	18	82	49	23	47
	East of BY exclosure [2]	2	2	2	100	6	2	33
2005	**Total**	**103**	**103**	**80**	**78**	**197**	**82**	**42**
	Southern Exclosure	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
2006	**Total**	**117**	**114**	**87**	**76**	**230**	**17**	**7**
	Southern Exclosure	76	76	61	80	159	58	37
	Oso Flaco	15	15	9	60	20	4	20
2007	**Total**	**91**	**91**	**70**	**77**	**179**	**62**	**35**
	Southern Exclosure	100	100	73	73	172	64	37
	Oso Flaco	19	19	8	42	19	5	26
2008	**Total**	**119**	**119**	**81**	**68**	**191**	**69**	**36**
	Southern Exclosure	125	124	86	69	221	79	36
	Oso Flaco	23	22	8	36	22	2	9
	Pismo Lagoon	1	1	0	0	0	0	0
2009	**Total**	**149**	**147**	**94**	**64**	**243**	**81**	**33**

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

Table F.1. Nesting success of snowy plovers in identifiable areas at ODSVRA, 2001-21 (continued).

Year	Area	No. known location nests	No. nests with known location and known fate	No. nests with known location hatching	% nests hatching	No. chicks from known location	No. chicks from known location fledged	% chicks known fledged
	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
2010	**Total**	**153**	**150**	**109**	**73**	**269**	**103**	**0**
	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
2011	**Total**	**165**	**160**	**131**	**82**	**345**	**148**	**43**
	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
2012	**Total**	**211**	**203**	**152**	**75**	**374**	**89**	**24**
	Southern Exclosure	147	144	115	80	286	123	43
	Oso Flaco	23	23	15	65	39	25	64
2013	**Total**	**170**	**167**	**130**	**78**	**327**	**172**	**53**
	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
2014	**Total**	**246**	**239**	**206**	**86**	**514**	**177**	**34**
	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
2015	**Total**	**203**	**195**	**168**	**86**	**442**	**239**	**54**
	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
2016	**Total**	**210**	**193**	**166**	**85**	**410**	**125**	**30**
	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
2017	**Total**	**273**	**238**	**145**	**61**	**348**	**160**	**46**
	Southern Exclosure	145	139	111	80	274	131	48
	Oso Flaco	61	61	33	54	84	43	51
2018	**Total**	**206**	**200**	**144**	**72**	**358**	**174**	**49**
	Southern Exclosure	172	163	118	72	299	82	27
	Oso Flaco	57	56	30	54	75	13	17
	Euc. North reveg. area	1	1	1	100	3	1	33
2019	**Total**	**230**	**220**	**149**	**68**	**377**	**96**	**25**

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

Table F.1. Nesting success of snowy plovers in identifiable areas at ODSVRA, 2001-21 (continued).

Year	Area	No. known location nests	No. nests with known location and known fate	No. nests with known location hatching	% nests hatching	No. chicks from known location	No. chicks from known location fledged	% chicks known fledged
	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]	21	21	18	86	49	21	43
	Bigfoot reveg. area[5]	1	1	1	100	3	0	0
2020	**Total**	**214**	**197**	**142**	**72**	**360**	**95**	**27**
	Southern Exclosure	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
2021	**Total**	**223**	**219**	**129**	**59**	**312**	**103**	**33**

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

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

[3]In 2015 and 2016, brood with approximately one-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.

[4]In 2020, 1 nest found on the Foredune closure shoreline was reported as an open riding area location nest, and was changed to the location of Foredune closure for the 2021 report in order to conform with current location designations.

[5]Bigfoot revegetation area located approximately 295 feet east of Foredune central. In 2020, referred to as “Pawprint” revegetation area.

Table F.2. Attributed causes of snowy plover nest loss in Southern Exclosure and Oso Flaco at ODSVRA from 2002-21.

Flooded nests include nests overwashed by tide and nests flooded by creek. The percentage of total loss for each cause is shown for the 20-year period 2002-21. 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 Exclosure, Aband. = Abandoned, Corvid = crow or raven

Year	Area	Aband. pre-term	Aband. post-term	Aband. unknown pre- or post-term	Wind	Failed, cause unknown	Unidentified predator	Avian predator	Gull	Corvid	Raven	Harrier	Peregrine	Coyote	Raccoon	Skunk	Opossum	Flooded	Total
	So. Excl.			6		1								1					**8**
2002	Oso Flaco			2															**2**
	So. Excl.	17	2				3				1								**23**
2003	Oso Flaco	2				1	1				4								**8**
	So. Excl.	12				7	2				2			1					**24**
2004	Oso Flaco	4				2	3											1	**10**
	So. Excl.	9	3			7													**19**
2005	Oso Flaco	2	1				1												**4**
	So. Excl.	5	4			2	1		3					4					**19**
2006	Oso Flaco			1			1		3									2	**7**
	So. Excl.	4	1			9					1								**15**
2007	Oso Flaco	2				2					1			1					**6**
	So. Excl.	10		3		2	2	5	1			2						1	**26**
2008	Oso Flaco	3		1				4	1			1						2	**12**
	So. Excl.	9	1			3	5	16	2			1						1	**38**
2009	Oso Flaco	4				2	1	5								1		1	**14**
	So. Excl.	5	2		9		4	6										2	**28**
2010	Oso Flaco	1			2			2							1	2		1	**9**
	So. Excl.	6	3	1	1	2	1	5		3									**22**
2011	Oso Flaco						2			2					1	2			**7**
	So. Excl.	11	1	3	6	3	3	5		3		5	1	1				1	**43**
2012	Oso Flaco	3	1		1														**5**
	So. Excl.	5	5		15	3	1												**29**
2013	Oso Flaco	3	2		2				1										**8**
	So. Excl.	13	1	4		2												1	**21**
2014	Oso Flaco	6		1	1		1							1				1	**11**

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

Table F.2. Attributed causes of snowy plover nest loss in Southern Exclosure and Oso Flaco at ODSVRA from 2002-21 (continued).

Year	Area	Aband. pre-term	Aband. post-term	Aband. unknown pre- or post-term	Wind	Failed, cause unknown	Unidentified predator	Avian predator	Gull	Corvid	Raven	Harrier	Peregrine	Coyote	Raccoon	Skunk	Opossum	Flooded	Total
	So. Excl.	11	1	4	1	2		2			1							2	**24**
2015	Oso Flaco	1				1	1				3								**6**
	So. Excl.	5	7	2	2	3										1			**20**
2016	Oso Flaco	4				1	1		1									1	**8**
	So. Excl.	5	3	3	1	11	9	2	2		6			1		15			**58**
2017	Oso Flaco	5		2	2	15					4			1		3		2	**34**
	So. Excl.	9	3	5		2		3			5							1	**28**
2018	Oso Flaco	2		2	3		2	10	5					4					**28**
	So. Excl.	3		2	3	3		6	10	1	12	1				1		3	**45**
2019	Oso Flaco	3		1		2	4	2	4		1			4				5	**26**
	So. Excl.	3	1		4	1	7	8			2	3		1				2	**32**
2020	Oso Flaco			2	5	3		2			1							1	**14**
	So. Excl.	9		2	4		5	16			4	11		1			2		**54**
2021	Oso Flaco	4		1	1	2	2	3			5								**18**
		151	**38**	**35**	**46**	**63**	**43**	**74**	**18**	**7**	**34**	**23**	**1**	**10**	**0**	**17**	**2**	**14**	**576**
2002-21 Total nest loss	So. Excl.	26.2%	6.6%	6.1%	8.0%	10.9%	7.5%	12.8%	3.1%	1.2%	5.9%	4.0%	0.2%	1.7%	0.0%	3.0%	0.3%	2.4%	
		49	**4**	**13**	**17**	**31**	**20**	**28**	**15**	**2**	**19**	**1**	**0**	**11**	**2**	**8**	**0**	**17**	**237**
	Oso Flaco	20.7%	1.7%	5.5%	7.2%	13.1%	8.4%	11.8%	6.3%	0.8%	8.0%	0.4%	0.0%	4.6%	0.8%	3.4%	0.0%	7.2%	
2002-21 Grand Total So. Excl. and Oso Flaco		**200**	**42**	**48**	**63**	**94**	**63**	**102**	**33**	**9**	**53**	**24**	**1**	**21**	**2**	**25**	**2**	**31**	**813**
		24.6%	5.2%	5.9%	7.7%	11.6%	7.7%	12.5%	4.1%	1.1%	6.5%	3.0%	0.1%	2.6%	0.2%	3.1%	0.2%	3.8%	

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

Table F.3. Nest protection used at ODSVRA in 2021.

Included in table are 219 nests with both known location and known fate. Nonpredator fencing includes symbolic fencing and hard fencing not maintained as predator fencing. Percent in parentheses is percent nests hatched. rav = raven; ha = harrier; av = avian; un = unknown predator; coy = coyote; op = opossum; pre = abandoned pre-term; pos = abandoned post-term; ukp = abandoned unknown pre- or post-term; w = wind; fld = flooded; unk = failed, cause unknown.

	Seasonal Exclosure					Nonpredator fencing				
Area	No additional fencing	Bumpout	Circular	Small circular	Mini	No additional fencing	Bumpout	Circular	Small circular	Mini
Southern Exclosure										
6 exclosure	**43**		**3**[1]	**3**	**1**	**7**		**2**		
Nests hatched	30 (70%)		1 (33%)	2 (67%)	1 (100%)	6 (86%)		2 (100%)		
Nests depredated	10 (3 ha, 6 av, 1 un)									
Nests failed other causes	3 (1 pre, 1 ukp, 1 w)		2 (1 pre,1 w)	1 (1 pre)		1 (1 pre)				
7 exclosure	**23**	**1**		**2**	**3**	**11**		**1**		
Nests hatched	11 (48%)			2 (100%)	2 (67%)	7 (58%)		1 (100%)		
Nests depredated	11 (2 rav, 3 ha, 6 av)					3 (1 ha, 1 av, 1 op)				
Nests failed other causes	1 (1 pre)	1 (1 ukp)			1 (1 pre)	1 (1 pre)				
8 exclosure	**6**		**1**	**1**		**10**		**3**[2]		
Nests hatched	2 (33%)			1 (100%)		3 (30%)		3 (100%)		
Nests depredated	4 (2 av, 1 coy, 1 op)					6 (1 ha, 1 av, 4 un)				
Nests failed other causes			1 (1 pre)			1 (1 w)				
Boneyard	**7**									
Nests hatched	0 (0%)									
Nests depredated	5 (2 rav, 3 ha)									
Nests failed other causes	2 (1 pre, 1 w)									
SOUTHERN EXCLOSURE TOTALS	**79**	**1**	**4**	**6**	**4**	**28**		**6**		
Nests hatched	43 (52%)		1 (25%)	5 (83%)	3 (75%)	16 (57%)		6 (100%)		
Nests depredated	30 (4 rav, 9 ha, 14 av, 1 un, 1 coy, 1 op)					9 (2 ha, 2 av, 4 un, 1 op)				
Nests failed other causes	6 (3 pre, 1 ukp, 2 w)	1 (1 ukp)	3 (2 pre, 1 w)	1 (1 pre)	1 (1 pre)	3 (2 pre, 1 w)				
Oso Flaco										
North Oso Flaco	**3**					**5**		**3**	**1**	
Nests hatched						2 (40%)		3 (100%)	1 (100%)	
Nests depredated	3 (1 rav, 1 av, 1 un)					1 (av)				
Nests failed other causes						2 (1 pre, 1 unk)				
South Oso Flaco						**8**		**9**		
Nests hatched						0 (0%)		5 (56%)		
Nests depredated						6 (4 rav, 1 av, 1 un)				
Nests failed other causes						2 (1 pre, 1 w)		4 (2 pre, 1 ukp, 1 unk)		
OSO FLACO TOTALS	**3**					**13**		**12**	**1**	
Nests hatched						2 (15%)		8 (67%)	1 (100%)	
Nests depredated	3 (1 rav, 1 av, 1 un)					7 (4 rav, 2 av, 1 un)				
Nests failed other causes						4 (2 pre, 1 w , 1 unk)		4 (2 pre, 1 ukp, 1 unk)		

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

Table F.3. Nest protection used at ODSVRA in 2021 (continued).

	Seasonal Exclosure					Nonpredator fencing				
Area	No additional fencing	Bumpout	Circular	Small circular	Mini	No additional fencing	Bumpout	Circular	Small circular	Mini
Other										
Foredune closure						**40**	**5**	**2**		**1**[3]
Nests hatched						29 (73%)	5 (100%)	1 (100%)		1 (100%)
Nests depredated						2 (2 av)				
Nests failed other causes						9 (2 pre, 2 pos, 1 ukp, 3 w , 1 fld)		1 (1 w)		
Closed buffer area						**7**				
Nests hatched						4 (57%)				
Nests depredated						1 (1 rav)				
Nests failed other causes						2 (1 pos, 1 w)				
Open riding area						**4**				
Nests hatched						2 (50%)				
Nests depredated						1 (1 av)				
Nests failed other causes						1 (1 pre)				
Dunes Preserve							**1**			
Nests hatched							1 (100%)			
Nests depredated										
Nests failed other causes										
Revegetation areas						**1**		**1**		
Nests hatched								1 (100%)		
Nests depredated						1 (av)				
Nests failed other causes										
OTHER TOTALS						**52**	**6**	**3**		**1**
Nests hatched						35 (67%)	6 (100%)	2 (67%)		1 (100%)
Nests depredated						5 (1 rav, 4 av)				
Nests failed other causes						12 (3 pre, 3 pos, 1 ukp, 4 w , 1 fld)		1 (1 w)		
GRAND TOTAL	**82**	**1**	**4**	**6**	**4**	**93**	**6**	**21**	**1**	**1**
Nests hatched	43 (52%)		1 (25%)	5 (83%)	3 (75%)	53 (57%)	6 (100%)	16 (76%)	1 (100%)	1 (100%)
Nests depredated	33 (5 rav, 9 ha, 15 av, 2 un, 1 coy, 1 op)					21 (5 rav, 2 ha, 8 av, 5 un, 1 op)				
Nests failed other causes	6 (3 pre, 1 ukp, 2 w)	1 (1 ukp)	3 (2 pre, 1 w)	1 (1 pre)	1 (1 pre)	19 (7 pre, 3 pos, 1 ukp, 6 w , 1 fld, 1 unk)		5 (2 pre, 1 ukp, 1 w , 1 unk)		

[1]SP46 nest included in circular category, also had a bumpout installed.
[2]SP163 nest included in circular category, also had a small circular installed for 1 day prior to regular circular installation.
[3]SP17 nest included in mini category, also had a bumpout installed.

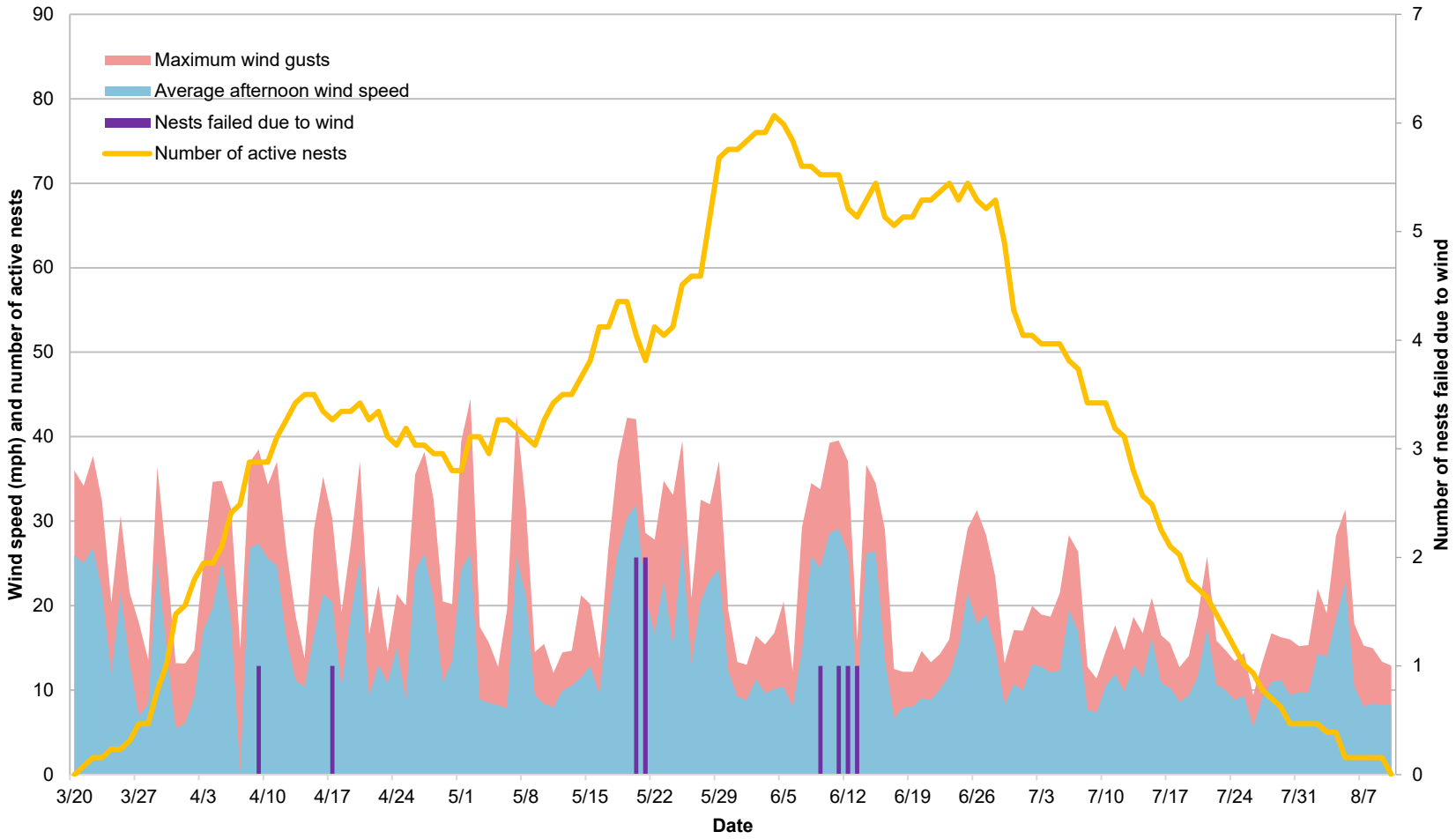


Figure F.1. Daily wind speed data (daily afternoon average and daily maximum wind gust) and snowy plover nest loss attributed to wind at ODSVRA from 14 March to 9 August 2021.

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 exclosure 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.

Table F.4. Selective transfer of abandoned potentially viable snowy plover eggs to Santa Barbara Zoo, Santa Barbara County in 2021.
All eggs transferred to Santa Barbara Zoo on same day collected. All fledglings were released at Coal Oil Point Reserve (COPR) in Santa Barbara County. No ODSVRA chicks were raised in captivity in 2021.

Nest no.	No. eggs collected	Date collected	No. eggs hatched	Band combinations of fledglings	Release date (age)	Notes
1	1	19 April	1	py:ag	21 June (51 days)	On 28 March, nest found with 2 eggs in 7 exclosure. On 2 April, nest had 3 eggs and a camera was installed. On 12 April, nest camera photos show adult male harrier eating 1 egg and a plover returned to incubate remaining 2 eggs. On 15 April, adult male harrier eats a second egg and a mini-exclosure installed at remaining egg. Nest camera photos show a bird incubating inconsistently on 16 April from 11:05 am to 7:25 pm until egg becomes fully buried by wind. On 17 April, egg was unburied and reset on surface. On 19 April, egg determined to be abandoned and collected. One chick hatched on 1 May.
44	3	28 April	2	py:ow py:rr	19 July (62 days)	On 14 April, nest found at 2 eggs in South Oso Flaco. On 17 April, nest had 3 eggs. On 19 April, a circular exclosure was installed. Inconsistent incubation was first observed on 23 April and the nest was last seen incubated on 24 April. On 27 April, 3 half-buried eggs were reset on surface. On 28 April, 3 abandoned eggs were collected. Two eggs hatched on 18 May.
53	2	30 April	2	py:gg py:vv	19 July (54 days)	On 22 April, nest found with 1 egg in the open riding area 300 feet east of 6 exclosure and temporary symbolic fence was installed around the nest. On 23 April, nest had 2 eggs and the symbolic fence was replaced with nonpredator fencing 89 to 184 feet from the nest to the open riding area in a configuration to allow for a safe vehicle travel corridor. On 28 April, the nest was last seen incubated. On 30 April, the 2 eggs were determined to be abandoned and collected. Both eggs hatched on 26 May.
4	1	4 May	1	py:wy	21 June (48 days)	On 31 March, nest found with 1 egg on the North Oso Flaco shoreline approximately 200 feet north of the public boardwalk beach entrance. On 7 April, nest had 3 eggs and a circular exclosure was installed. On 3 May, 2 chicks hatched (1 was weak and taken to PWC [see Table H.2 in Appendix H]) and 1 egg (with cracks and peeping) was being attended immediately against the inside edge of the circular. The banded chick and remaining egg were placed back in the center of the circular exclosure. On 4 May, egg determined to be abandoned, was collected, and hatched in the brooder during transport the same day.
46	2	11 May	1	U	na	On 14 April, nest found with 2 eggs in 6 exclosure. On 18 April, nest had 3 eggs. On 30 April, 1 egg was missing pre-term and a circular exclosure was installed on the 2 eggs remaining at the nest. On 8 May, the nest was last seen incubated and only 1 egg remained at the nest. On 9 May, 1 egg in nest and second egg found buried (replaced in nest). On 11 May, 2 eggs determined to be abandoned and were collected. One egg hatched 18 May, and the chick was born with an eye deformity and later lost the eye. The chick reached fledge age, but was considered not releasable, and options for captivity are being investigated by Santa Barbara Zoo as of the writing of this report.
73	3	19 May	2	py:ga py:aa	19 July (42 days, 43 days)	On 6 May, nest found with 2 eggs in 8 exclosure. On 7 May, nest had 3 eggs. On 9 May, a circular exclosure was installed. On 16 May, nest last seen incubated. On 17 May, nest had 3 partially buried eggs and 1 set of plover tracks. On 18 May, 3 eggs unburied and reset on surface. On 19 May, 3 fully buried eggs were recovered, determined to be abandoned, and collected. One egg had no development and 2 hatched 6-7 June.
75	2	22 May	1	na	na	On 8 May, nest found with 1 egg in 6 exclosure. On 10 May, nest had 2 eggs and a circular exclosure was installed. On 19 May, nest last seen incubated followed by high afternoon winds. On 20 May, 2 fully buried eggs reset on surface. On 21 May, 2 fully buried eggs again reset on surface. On 22 May, 2 fully buried eggs recovered, determined to be abandoned, and collected. One egg hatched 11 June. The chick reached fledge age but was treated for an injured foot and died on 15 July at 34 days old.

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

Table F.4. Selective transfer of abandoned potentially viable snowy plover eggs to Santa Barbara Zoo, Santa Barbara County, California in 2021 (continued).

Nest no.	No. eggs collected	Date collected	No. eggs hatched	Band combinations of fledglings	Release date (age)	Notes
83	3	22 May	1	py:gw	19 July (39 days)	On 10 May, nest found with 3 eggs on the 6 exclosure shoreline. On 12 May, a small circular exclosure was installed. On 20 May, 3 eggs found scattered within circular and were reset at nest. On 21 May, nest appeared partially buried. Camera photos confirmed nest last incubated on 19 May at 5:05 am and the 3 abandoned eggs were collected on 22 May. One egg hatched 10 June.
94	3	22 May	1	py:yr	20 Sept. (96 days)	On 12 May, nest found with 1 egg in Boneyard exclosure. On 20 May, nest last seen incubated and 3 eggs becoming buried during high afternoon winds. On 21 May, 3 fully buried eggs reset on surface. On 22 May, 3 abandoned eggs (partially to fully buried) collected. One egg hatched 16 June.
62	2	22 May	1	py:ww	19 July (50 days)	On 30 April, nest found on Foredune closure shoreline. On 4 May, nest had 2 eggs and a circular exclosure was installed. On 20 May, nest last seen incubated. On 21 May, 2 buried eggs reset on surface. On 22 May, 2 partially buried abandoned eggs collected. One chick failed to hatch from its egg and 1 hatched 1 June.
102	1	23 June	1	na	na	On 16 May, nest found with 1 egg in closed buffer area east of 6 exclosure. On 15 June, nest had 3 eggs (2 with slight cracks, 1 without cracks). On 18 June, 2 chicks hatched. On 19 June, 1 egg remained in nest (modest cracks and no sounds), brood of 2 banded chicks moved to 6 exclosure shoreline, and remaining egg last seen incubated on this day at 4:43 pm. On 23 June, the remaining abandoned egg (with cracks and peeps) collected. Egg hatched 25 June, chick born with an underdeveloped wing and curled toes, and was euthanized on 28 June at 3 days old.
182	3	3 July	0	na	na	On 18 June, nest found with 1 egg in South Oso Flaco. On 22 June, nest had 3 eggs and a circular exclosure was installed. Beginning 27 June, the nest had inconsistent incubation. On 31 May, a camera was installed. Camera confirmed nest last incubated at 8:10 pm on 1 July and 3 abandoned eggs were collected on 3 July. All three eggs had no development and did not hatch.
160	2	3 July	2	py:ra py:wa	20 Sept. (72 days, 74 days)	On 6 June, nest found with 3 eggs in South Oso Flaco. On 7 June, a circular exclosure was installed. On 21 June, 2 eggs were being incubated and 1 unattended egg was half-buried down slope from the nest and approximately 20 feet from the circular exclosure. On 27 June, the 2 eggs remaining in the nest were being incubated, not centered within the circular exclosure and approximately 1 foot away from edge. On 28 June, 2 eggs (no cracks or sounds) were moved approximately 1 foot closer to center of circular and original nest location. On 30 June, 1 egg incubated at the nest, a second egg (no cracks or sounds) found 3 inches outside of circular exclosure, and a third egg not located. The 2 eggs were moved together 1.5 feet southeast of the original nest location to be away from a steep slope within the circular exclosure, and plover quickly returned to incubate eggs. On 2 July, the 2 eggs were determined to be abandoned and were collected. One egg hatched 8 July and the second egg hatched 10 July.

APPENDIX G. PREDATOR SUMMARY TABLES AND FIGURES.

Table G.1. Summary of predators detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2021.

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 (no remaining chicks). Min no. individ. = minimum number of different individuals identified during season. This number was not determined for mammals or owls as these species are primarily nocturnal with occurrences detected by tracks. For a summary of depredated tern and plover nests refer to Table 2 in the California least tern section and Table F.2 in Appendix F. Refer to Table H.3 and Table H.5 in Appendix H for a summary of depredated terns and plovers, other than eggs, in 2021.

Species	First date observed	Last date observed	No. days detected	Min. no. individ.	Notes
Mammalian					
Coyote	8 Mar	19 Aug	78	-	Most common on the Southern Exclosure shoreline (primarily during June to August). Noted inside the Seasonal Exclosure on 20 days (26 occurrences). One plover nest inside 8 exclosure documented depredated by coyote. Five coyotes were removed this season.
Opossum	24 Mar	7 Aug	12	-	Activity primarily noted in the Southern Exclosure irregularly March to June. There was 1 documentation in 6 exclosure in August. Two plover nests, one in 7 exclosure and one in 8 exclosure documented depredated by opossum.
Raccoon	5 Apr	17 Jul	2	-	Number of days detected is the lowest documented since comparable observations began in 2007. Activity noted once in 8 exclosure and once in Boneyard exclosure.
Skunk	29 Mar	31 Aug	4	-	Number of days detected is the third lowest documented since comparable observations began in 2007. Activity noted on 7 occurrences over 4 days in 6, 7, 8 and Boneyard exclosures.
Avian					
American crow	22 Mar	13 Jul	4	3	Observations irregular during season and mostly in Boneyard exclosure and Oso Flaco. Three crows seen at the same time on 22 June.
Kestrel	8 Mar	22 Aug	39	4	Frequent sightings June to August. Observed hunting in all areas of the Southern Exclosure and Oso Flaco. Documented loss to kestrel include 4 plovers (2 chicks and 2 chick or juveniles). Minimum of 4 individuals based on sex characteristics observed during season: 2 females seen together on 30 July, 1 male trapped and banded on 5 August, and a second male observed after trapping of first male.
Common raven	23 Apr	18 Aug	20	6	Primarily observed flying over the Southern Exclosure and Oso Flaco in late April to early June. Ten plover nests were documented lost to raven. A total of 3 ravens were lethally removed, on or prior to 8 June. Sightings were reduced June through August (6 sightings over 4 days) and 2 nests were depredated by raven on 23 and 27 June. Six ravens seen at the same time flying over Boneyard exclosure on 11 May.
Cooper's hawk	22 March	1 Aug	3	1	Observed over 8 exclosure, Boneyard exclosure and North Oso Flaco.
Gull spp.	Present daily throughout season				Gulls were present the length of the shoreline of the Southern Exclosure and Oso Flaco.

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 2021 (continued).

Species	First date observed	Last date observed	No. days detected	Min. no. individ.	Notes
Harrier	6 Mar	30 Aug	92	5	Observed throughout the Southern Exclosure and Oso Flaco, (primarily in 6, 7, and 8 exclosures) in flight and perching, sometimes over an extended period. Observed multiple times pursuing, and consuming prey from inside the Seasonal Exclosure. Documented loss to harrier include 11 plover nests, 2 terns (1 chick or juvenile and 1 juvenile) and 8 plovers (2 chicks, 3 chicks or juveniles, 2 juveniles, and at least 1 unknown age). One abandoned nest had 2 eggs depredated by harrier and an additional 3 active plover nests had 1 egg depredated by harrier and subsequently hatched the remaining 1-2 eggs. On 3 June, a male harrier was lethally removed. After removal no other nests were documented depredated by harrier. On 12 August, a non-target juvenile female harrier was trapped and relocated. Minimum of 5 individuals (based on age and sex characteristics) observed during season: 1 adult female, 1 adult male, 1 subadult female, 1 subadult male, and 1 juvenile female.
Osprey	Common throughout season				Although not documented as a predator of plovers or terns, ospreys (*Pandion haliaetus*) are included in this table due to the disturbance they can cause when perched for long periods of time in sensitive areas. Primarily observed flying over the Southern Exclosure shoreline and occasionally perched and eating fish. Hazed as appropriate.
Large owl spp.	8 Mar	1 Aug	24		Great horned owl and barn owl documented on-site, but observations and tracks indicate great horned owl make up the majority of owl presence. Activity primarily noted in the Seasonal Exclosure. Three tern adults were depredated by owls. Four plastic bands representing a minimum of one plover of unknown age were found in an owl pellet at the base of the 8 exclosure west fence.
Peregrine	5 Mar	30 Aug	54	4	Observed throughout the Southern Exclosure and Oso Flaco in flight and perching, sometimes over an extended period. Observed multiple times pursuing and/or consuming prey on the shoreline and inside the Seasonal Exclosure and Oso Flaco. Documented loss to peregrine include 3 terns (1 chick or juvenile and 2 juveniles) and 5 plovers (3 chicks, 1 chick or juvenile, and 1 adult). Clipped wings of a tern juvenile were also found suggesting a possible additional peregrine depredation. On 14 May, a subadult female peregrine was trapped, banded, and released off-site. On 9 August, the same subadult female was trapped again and at the time of this report's release is held, in coordination with CDFW, by a falconer for conditioning to release later. Minimum of 4 individuals (based on bands and/or age and sex characteristics) observed during season: 1 banded adult female, 1 unbanded adult, 1 banded subadult female, and 1 juvenile.
Red-tailed hawk	13 Mar	22 Jul	19	2	Observed throughout the Southern Exclosure and Oso Flaco. Two individuals seen at same time on 16 May.

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

Table G.2. Mammalian and avian predators removed or trapped and relocated under predator management actions for least terns and snowy plovers at ODSVRA in 2021.

Five coyotes, four ravens, and one harrier were lethally removed. One peregrine (trapped twice in 2021), one great horned owl, one kestrel, and one harrier (non-targeted individual) were live-trapped and relocated (release date in parentheses). The relocated peregrine that returned to ODSVRA is being held at the time of this report's release, in coordination with CDFW, by a falconer for conditioning to release later. All animals trapped or removed were within ODSVRA boundaries, with the exception of one raven removed off-site with the permission of the landowner.

Date	Species	Age/Sex	Location
Lethally removed			
23 Feb	raven	adult	Brown Road, Santa Maria
23 Apr	coyote	adult	South Oso Flaco
30 Apr	raven	adult	Boneyard exclosure
12 May	coyote	adult	Maidenform revegetation area
3 Jun	harrier	adult male	Eucalyptus North revegetation area
8 Jun	raven	adult	South Oso Flaco
8 Jun	raven	adult	South Oso Flaco
26 Jun	coyote	adult	Open riding area near Maidenform revegetation area
30 Jun	coyote	adult	South Oso Flaco
19 Aug	coyote	adult	South Oso Flaco
Live-trapped and relocated			
14 May (16 May) and 9 Aug (NA)	peregrine	subadult female	Boy Scout Camp revegetation area on 14 May Arroyo Grande Creek on 9 August
22 Jun (24 Jun)	great horned owl	adult female	Eucalyptus North revegetation area
4 Aug (6 Aug)	kestrel	adult male	Eucalyptus Tree revegetation area
12 Aug (12 Aug)	harrier[1]	juvenile female	6 exclosure

[1]Non-target individual released off-site

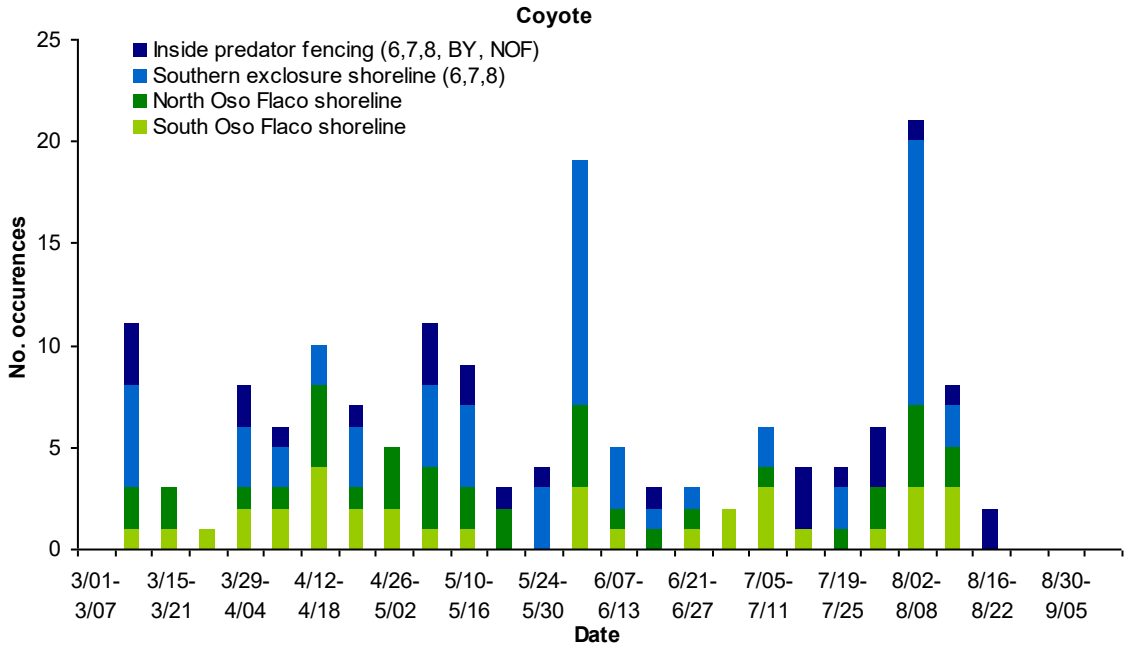
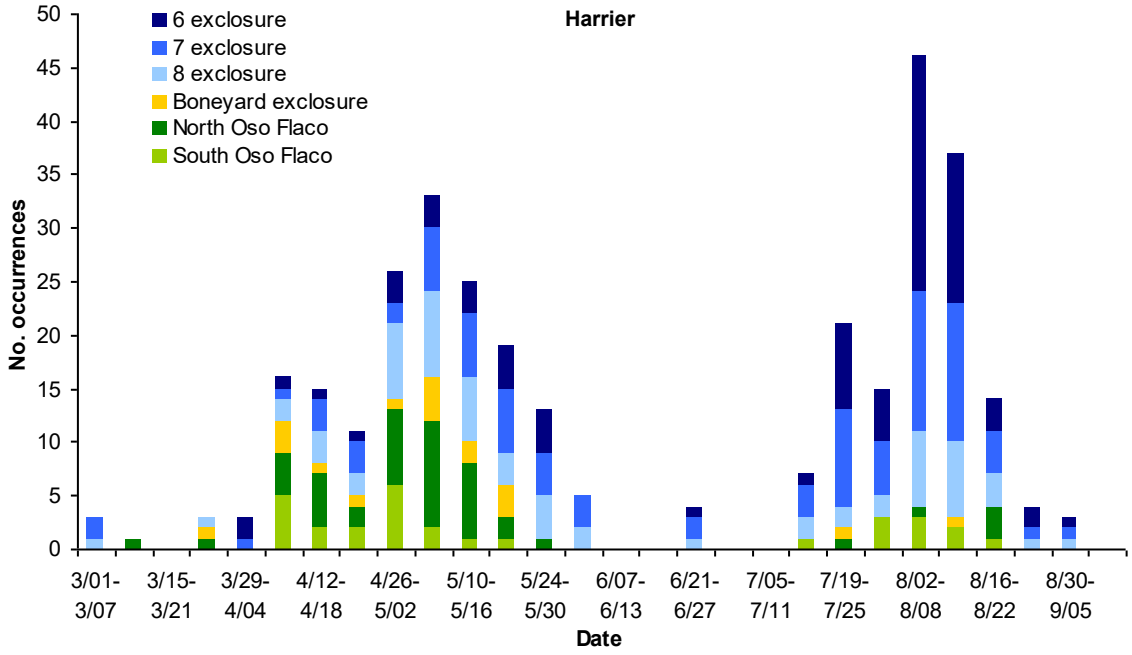


Figure G.1. Coyote occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2021.

Observations from 1 March–10 September (a 194-day period). Coyote presence is documented for the Southern Exclosure shoreline (6, 7, and 8 exclosures), North Oso Flaco shoreline, South Oso Flaco shoreline, and inside the predator fencing of both the Southern Exclosure (6, 7, 8, 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.



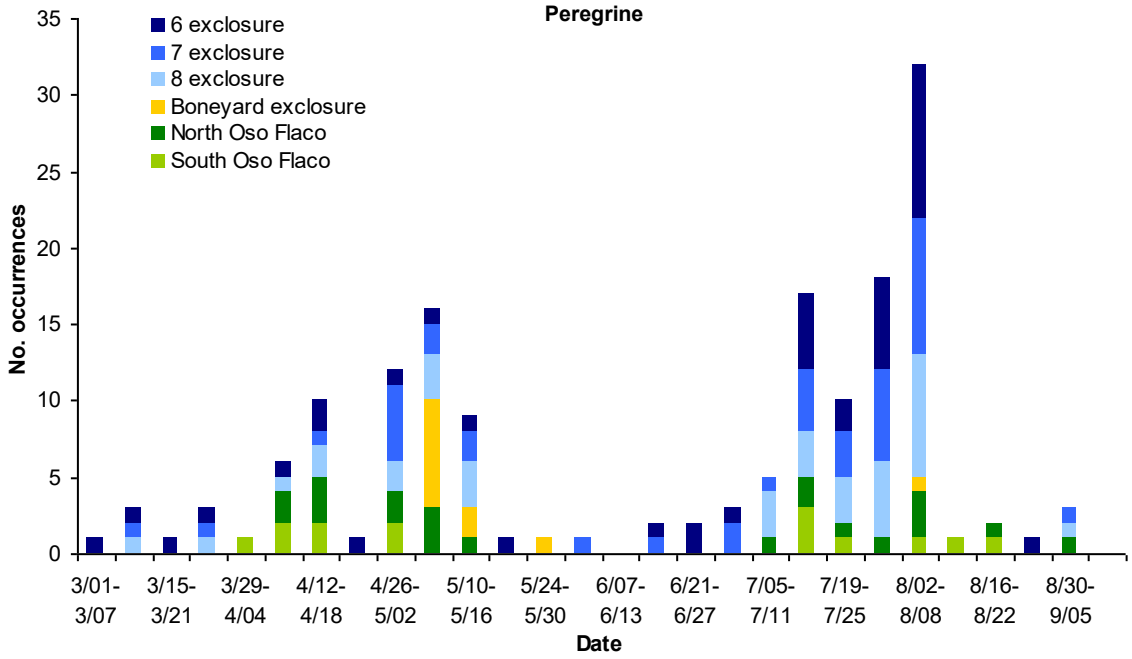


Figure G.2. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2021.
Observations from 1 March–10 September (a 194-day period).

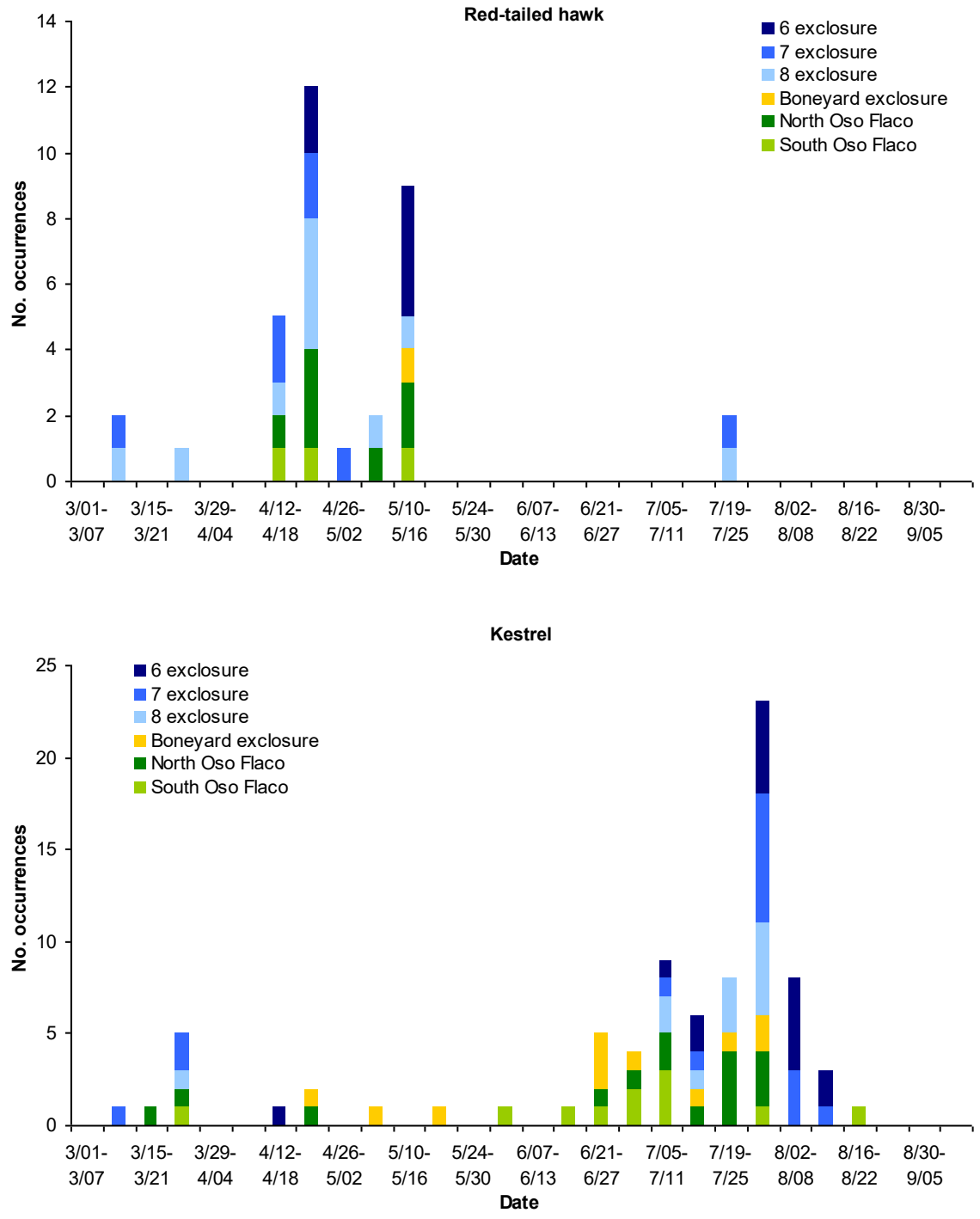


Figure G.2. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2021 (continued).
Observations from 1 March–10 September (a 194-day period).

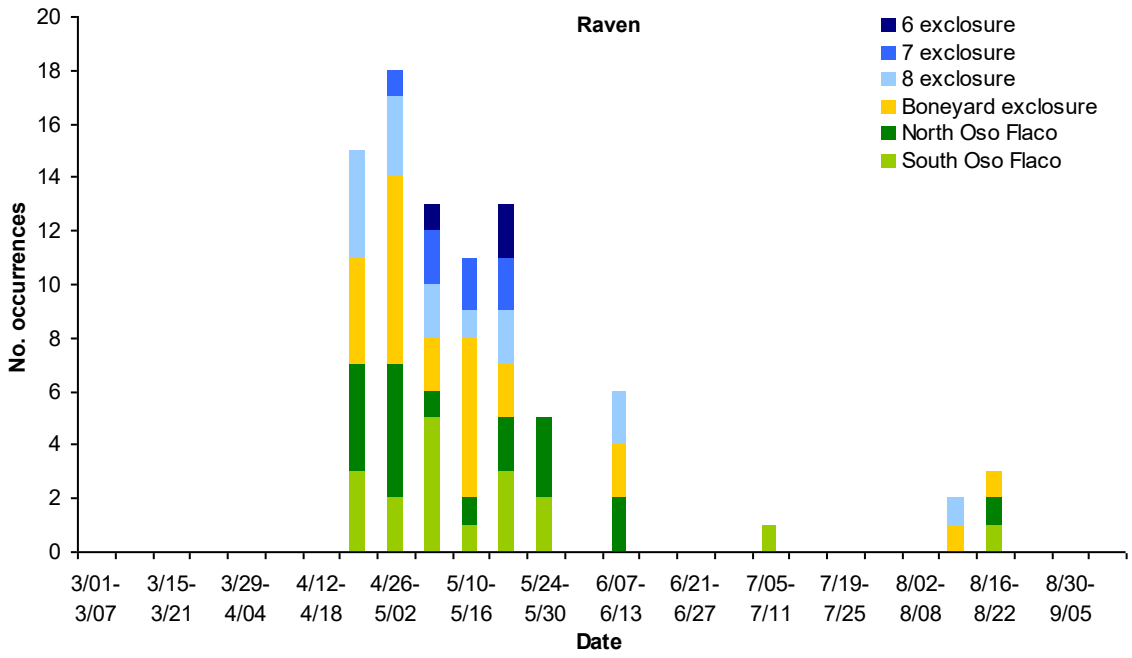


Figure G.2. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2021 (continued).
Observations from 1 March–10 September (a 194-day period).

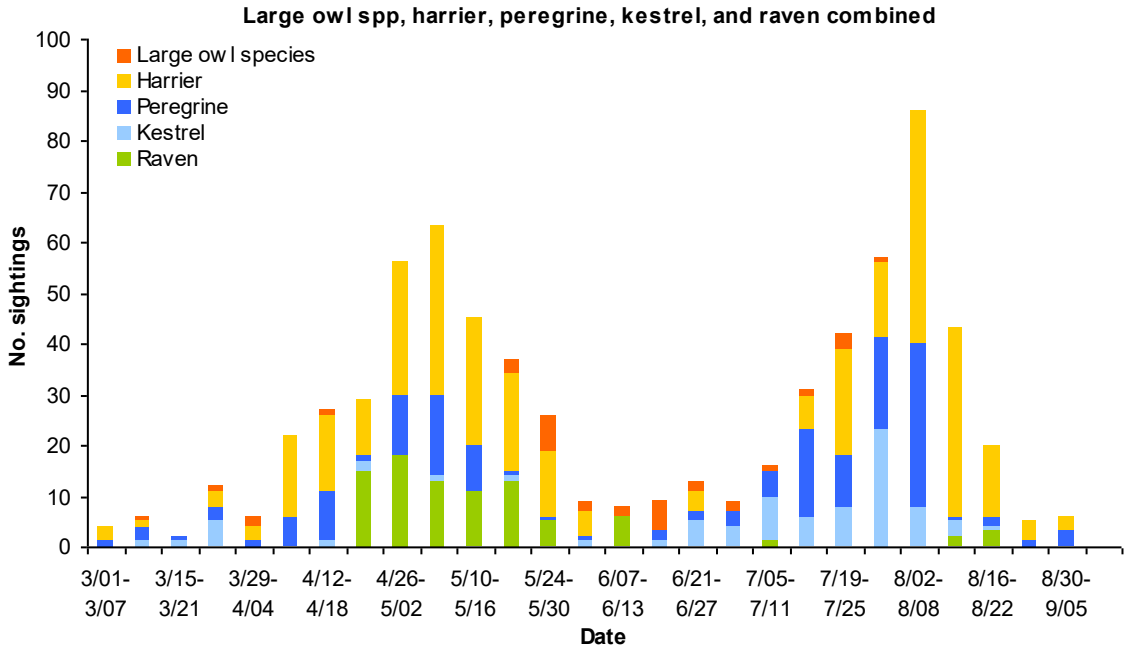


Figure G.2. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2021 (continued).
Observations from 1 March–10 September (a 194-day period).

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 California least terns in 2021.

No. (age)	Location	Notes
1 (chick)	6 exclosure	On 22 July, a 1-day-old unbanded tern chick from the LT51 nest was observed laying on its side in 6 exclosure west of the nest. The chick was seen moving slightly as the associated adult, banded w/a:y/g, landed nearby and attempted to feed it a fish. The chick was not relocated after this date.
1 (juvenile)	6 exclosure shoreline	On 5 August, an unbanded juvenile tern was observed on 6 exclosure shoreline walking with splayed legs and the left leg held out at an odd angle, but was flight capable. The bird was not relocated again.
1 (adult)	6 exclosure shoreline	On 6 August, an adult tern banded g/w:y/g was observed on the 6 exclosure shoreline with a right leg injury. It was walking awkwardly while not putting weight on its right leg, was flight capable, but fell forward when attempting to land. The bird was not relocated after this date. This tern was banded as a chick at ODSVRA in 2015 and was previously seen 7 and 23 June 2021 on the 6 exclosure shoreline with no noted injury.

Table H.2. Sightings of injured snowy plovers from December 2020 to 11 September 2021.

Includes one injured bird seen in December, subsequent to the 2020 annual report. PWC=Pacific Wildlife Care, Morro Bay, CA

No. (age)	Location	Notes
1 (adult)	Riding area	On 27 December 2020 to January 4 2021, a plover banded gg:ob was observed on the shoreline between post 3 and post 4 in the riding area with an right leg injury. The bird was mostly hopping with right leg held above the ground or limping and not putting full weight on the leg. The leg did not look swollen and the bands appeared normal and free moving. A plover banded gg:ob was subsequently seen in the same general shoreline area with no observable injury, but it is possible for more than 1 adult to have the same band combination.
1 (adult)	South Oso Flaco, 6 exclosure	On 17 March, an unbanded plover was observed in South Oso Flaco putting very little weight on the right foot. On 1 April, an unbanded male plover, associated with the SP8 nest, was observed in 6 exclosure with a similar injury and assumed to be the same bird. The nest was depredated and the male was not observed with an injury subsequently.
1 (chick)	North Oso Flaco shoreline	On 3 May, the 3 egg SP4 nest in a circular exclosure on the North Oso Flaco shoreline hatched 2 chicks, 1 of which was very weak and immobile and not brooded by the adult. The immobile chick was placed in a warmed brooder and transported to PWC the same day. (On 4 May, the remaining and abandoned egg was collected and taken to Santa Barbara Zoo). The chick at PWC was treated for hypothermia, recovered, and was reunited with its associated adult and sibling chick on 6 May (see attached medical record). Both chicks were last seen together on 7 May at 4 days old and 1 fledged.
1 (adult)	Foredune North shoreline	On 30 May, a male plover banded ga:vw was observed with a left leg injury. The bird was limping and not putting full weight on the leg, the green band was positioned higher on the leg, but no swelling was observed on the leg. The bird was observed from 31 May to 14 June in the same condition and the green band was confirmed to be free moving on the leg more than once. A male banded ga:vw was subsequently seen with no observable injury in the same general shoreline area, but it is possible for more than 1 adult to have the same band combination.
1 (adult)	Foredune North shoreline	On 7 June, a male plover banded nb:rr was observed on the Foredune closure shoreline with a left leg injury while brooding its chicks from the SP71 nest. The bird was holding up its left leg, hopping, and putting very little weight on the leg. The bird was seen on multiple days from 8-16 June moving normally without injury while attending the SP71 chick(s) in the same area of the Foredune closure shoreline.
1 (chick)	Closed buffer area east of 6 exclosure	On 15 June, the SP95 nest east of 6 exclosure hatched 1 chick that had the right leg extended abnormally outward from its body and it could not stand. The unbanded chick was transported to PWC the same day for veterinarian treatment. The condition of the chick did not improve and it died at PWC on 22 June (see attached medical record and necropsy report).

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

Table H.2. Sightings of injured snowy plovers from December 2020 to 11 September 2021 (continued).

No. (age)	Location	Notes
1 (chick)	7 exclosure	On 7 July, a 1- to 2-day-old chick, banded ga:oa from the SP158 nest, was observed with a left leg injury in 7 exclosure. The chick was limping with limited mobility after adult aggression was observed between the associated unbanded female and other adults in the area. The following day, the chick was with the adult in the same general area of 7 exclosure, and the leg condition had not improved. The chick was not seen subsequently.
1 (adult)	7 exclosure shoreline	On 15 and 17 July, a female plover banded ga:pr, associated with the SP166 brood, was observed putting less weight on the right leg and occasionally stumbling while walking and foraging. The bird was subsequently seen attending the SP166 brood with no noted injury and 2 chicks from the nest fledged.
2 (juvenile)	8 exclosure shoreline	On 23 July, a 31- to 32-day-old plover juvenile, banded bb:po from the SP125 nest, was seen on the 8 exclosure shoreline with the toes of the left leg pointed upwards and weight only placed on the heel of the foot. On 28 July, the sibling juvenile plover, also banded bb:po, was observed holding its left leg up and hopping on the right leg. From 29 July to 11 August, both juveniles were seen with their respective left leg injuries, appeared to slightly improve over time, putting more weight put on the legs and foraging fairly normally.
1 (chick)	6 exclosure	On 28-29 July, a banded plover chick was observed in 6 exclosure with a right leg injury, possibly the 9- to 10-day-old chick from the SP193 nest banded vv:rw, but band combination unconfirmed. It was holding up the right leg at an odd angle and hopping on the left leg. Two chicks hatched from this nest, both chicks were seen 1 August, but 1 had lost the right band on the right leg, and the chick with the missing band fledged.
1 (juvenile)	6 exclosure	On 30 July, a 43-day-old plover juvenile, banded vg:vw from the SP119 nest, was observed in 6 exclosure with a left leg injury and less active than the sibling juvenile. The 2 juveniles were not seen subsequently, but 1 was depredated by a harrier on 5 August (see Table H.5 in this Appendix).
1 (chick)	Bigfoot revegetation area	On 4 August, an approximately 19-day-old unbanded chick from an unknown nest location (UNK3) was observed in Bigfoot revegetation island with a swollen, featherless spot on its neck and chest. It was able to walk and run but appeared weak. This chick was not relocated subsequently.
1 (chick)	Bigfoot revegetation area	On 4 August, a 10- to 11-day-old plover chick, banded vv:oa from the SP217 nest, was observed in the southwest portion of Bigfoot revegetation area limping and holding up the left leg, with the uninjured sibling chick and associated adults nearby. Only 1 uninjured chick was seen 6 August, the injured chick not seen subsequently, and no chicks fledged.
1 (juvenile)	Foredune North shoreline	On 11 September, a 60-day-old juvenile plover, banded vv:ar from the SP196 nest, was observed on the Foredune closure shoreline with a clam attached to a toe on the left foot. On 12 September, the bird was captured and taken to PWC where the clam was removed, the toe was amputated, and was given veterinarian treatment. The bird recovered and was able to walk putting pressure on both feet, with only a slight thickening of a digit on the left foot and was released 4 October to Foredune North (see attached medical record). The bird was subsequently seen walking and behaving normally.

Table H.3. Documented and potential predation of California least terns in 2021.

Necropsy results on one tern carcass is pending at time of report and results may change category of mortality. MWVCRC=CDFW, Office of Spill Prevention and Response, Marine Wildlife Veterinary Care and Research Center, Santa Cruz, CA.

No. (age)	Predator	Location	Notes
Documented predation			
1 (adult)	Great horned owl	Closed buffer area east of 6 exclosure	On 19 May, feather remains of an adult tern were found in the night roost area, 200 feet east of northern 6 exclosure in the closed buffer area, with great horned owl tracks next to the remains.
1 (adult)	Owl sp.	Closed buffer area east of 6 exclosure	On 16 June, tern feather remains found 300 feet east of north 6 exclosure in the closed buffer area with owl tracks, possibly barn owl, landing next to the tern remains.

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

Table H.3. Documented and potential predation of least terns in 2021 (continued).

No. (age)	Predator	Location	Notes
1 (juvenile)	Peregrine (subadult male, VID band 91AK)	6 and 7 exclosure	On 1 August, a banded peregrine lands in 6 exclosure and flies with prey to 7 exclosure. Feather remains collected at perch location were of a juvenile tern.
1 (juvenile)	Avian, suspected peregrine	6 exclosure	On 4 August, remains of a tern included snipped wings, a head, and feathers were found in southern 6 exclosure, possibly a peregrine depredation. Wing measurements are of a young juvenile. No predator tracks were found.
1 (juvenile)	Peregrine (subadult male, VID band 91AK)	6 exclosure shoreline	On 6 August, a banded peregrine catches a tern juvenile on the 6 shore and perches with it on the west Foredune south fence. Prey confirmed to be a juvenile, banded o/a:w/o from either the LT22 or LT49 nest.
1 (chick or juvenile)	Harrier (subadult male)	6 exclosure shoreline	On 7 August, a harrier lands briefly on 6 exclosure shore and carries prey into 6 exclosure. Remains were of a tern, older chick or young juvenile, also present was a pellet with 4 snowy plover bands.
1 (chick or juvenile)	Peregrine (subadult male, VID band 91AK)	6 exclosure	On 7 August, a banded peregrine catches an older tern chick or young juvenile and perches in 6 exclosure briefly before flying with prey to the east fence of Foredune South. The peregrine reperched several times after multiple hazing attempts. Feather remains collected in perch locations confirm it was eating a young least tern, either a large chick or juvenile.
1 (juvenile)	Harrier (subadult male)	6 and 7 exclosure	On 8 August, a harrier was flying from 7.5 revegetation area with prey item and perches with it in 6 exclosure. Remains of a tern juvenile, banded o/g:w/o from the LT47 nest (identified by unique USGS band number), were found at the perch location.
1 (juvenile)	Unknown	Closed buffer area east of 6 exclosure	On 8 August, a tern juvenile carcass and clumps of plucked feathers spread out around it, banded o:w/o from the LT9 nest, was found in the night roost area approximately 400 feet east of the eastern 6 exclosure fence. Coyote tracks went directly up to carcass but it is unclear if coyote caused the death. The bird was last seen alive on the 6 exclosure shoreline on 5 August at 35 days old. The carcass was intact and appeared fresh, was frozen, sent to MWVCRC for necropsy, and results are pending.
1 (adult)	Great horned owl	Closed buffer area east of 6 exclosure	On 18 August, feather remains of an adult tern were found in the night roost area, 100 feet east of the northern 6 exclosure in the closed buffer area, with great horned owl tracks in the area.
Potential predation			
1 (chick)	Unknown	6 exclosure	On 6 July, a tern chick carcass, banded l:w/o from the LT6 nest, was found in 6 exclosure. The chick was last seen alive at the nest on 2 July when 1 day old. The carcass was intact and appeared fresh. It was frozen, sent to MWVCRC, and results indicate cause of death was acute crush trauma, accompanied by potential predation injuries to the lower abdomen (see attached necropsy report).
1 (chick)	Unknown	7 exclosure	On 14 July, an unbanded tern chick carcass was found approximately 70 feet west of its LT42 nest in 7 exclosure. The chick was last seen alive on 13 July when 3 days old in the same general nest area. The carcass was missing its left foot and eyes but was otherwise intact. The remains were frozen, sent to MWVCRC, and necropsy results indicate cause of death was acute severe crush trauma, accompanied by potential degloving or predation injuries to both feet.

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 or potential predation, of California least terns in 2021.

Necropsy results on two tern carcasses pending at time of report and results may change category of mortality. MWVCRC=CDFW, Office of Spill Prevention and Response, Marine Wildlife Veterinary Care and Research Center, Santa Cruz, CA.

No. (age)	Location	Notes
1 (chick)	6 exclosure	On 10 July, a small, unbanded tern chick carcass was found at its LT7 nest in 6 exclosure. The chick hatched approximately 3 July but was not seen prior to finding as a carcass. The intact but desiccated carcass was frozen, sent to MWVCRC for necropsy, and results are pending.
1 (chick)	6 exclosure	On 27 July, a tern chick carcass was observed from a distance in 6 exclosure but could not be collected due to the proximity of young plover broods. On 26 August, the carcass was collected and identified as l:w/o chick from the LT53 nest. The chick was last seen alive on 19 July at 3 days old. The intact carcass was dry and desiccated, not appropriate for necropsy, and cause of death is unknown.
1 (juvenile)	6 exclosure	On 30 July, a tern juvenile carcass, banded p:w/o from the LT7 nest, was in 6 exclosure. The juvenile was last seen alive on 24 July at 23 days old on the 6 exclosure shoreline. The intact and fresh carcass was found with a shoelace protruding from its mouth and appeared to have died from choking. It was frozen, sent to MWVCRC for necropsy, and results are pending.
1 (adult)	6 exclosure shoreline	On 8 August, a tern adult carcass, banded y/g:w/r, was found on the 6 exclosure shoreline below the high tide line. The carcass was intact but appeared in moderate decomposition, and coyote tracks circle and pass within 1 foot of the carcass, but no evidence the tern was depredated. It was frozen, sent to MWVCRC for necropsy, and results are pending. The tern, banded as a chick in 2016, was not seen alive in 2021, but a tern with this band combination was seen each year from 2018-20.
1 (juvenile)	7 exclosure	On 18 August, a tern juvenile carcass, banded w/o on its right leg and missing it's left foot, was found in 7 exclosure. The unique USGS band number identifies the individual as banded -:w/o from the LT3 nest, and was last confirmed alive on 3 July at 6 days old. The intact carcass was dry and desiccated, not appropriate for necropsy, and cause of death is unknown.
1 (chick)	6 exclosure	On 25 August, an unbanded tern chick carcass was found in 6 exclosure. The intact carcass was dry and desiccated, not appropriate for necropsy, and cause of death is unknown.
1 (chick)	6 exclosure	On 26 August, a tern chick carcass was found in 6 exclosure tucked under a piece of wood. Both feet were missing and no bands were located in the area. The carcass was dry and desiccated, not appropriate for necropsy, and cause of death is unknown.
1 (chick)	6 exclosure	On 26 August, a tern chick carcass, banded o/r:w/o from the LT45 nest, was found in 6 exclosure. The chick was last seen alive on 27 July in the exclosure at 7 days old. The carcass was found tucked under a log with twine tangled around its legs. The intact carcass was dry and desiccated, not appropriate for necropsy, and cause of death is unknown.
1 (chick)	6 exclosure	On 26 August, a tern chick carcass was found partially buried in 6 exclosure. Both legs were missing and no bands were located in the area. The carcass was dry and desiccated, not appropriate for necropsy, and cause of death is unknown.

Table H.5. Documented predation of snowy plovers from 1 March to 30 September 2021.

No. (age)	Predator	Location	Notes
1 (adult)	Peregrine	South Oso Flaco	On 2 April, depredated remains consisting of a plover bill and feathers were found on the South Oso Flaco shoreline with peregrine tracks nearby.
1 (chick)	Peregrine (adult female, VID band W49)	7 exclosure	On 11 July, a peregrine was observed perched in 7.5 revegetation area in south 7 exclosure eating a prey item. After peregrine flew, 1 plover leg with "ry" bands was located at perch spot, identifying it as a chick from the SP138 nest.
2 (chick)	Peregrine (adult female, banded)	Foredune closure shoreline	On 12 July, a peregrine was observed depredating 2 plover chicks from the Foredune closure shoreline. Observed by Wildlife Innovations contractor and no additional details are provided.
2 (1 chick and 1 chick or juvenile)	Kestrel (male)	6 and 7 exclosures	On 2 August, a kestrel flew from 6 exclosure with prey and lands with it in 6 exclosure, and prey confirmed to be a banded plover chick from the SP193 nest. The kestrel then flew to 7 exclosure and catches prey and carries it to Eucalyptus North revegetation area, where prey was observed to be a large plover chick or young juvenile.
1 (chick)	Kestrel (male)	6 exclosure shoreline	On 3 August, a kestrel catches prey from the southern 6 exclosure shoreline and carries it to Eucalyptus Tree revegetation area. Wing and feather remains confirm the prey was a plover chick.

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 2021 (continued).

No. (age)	Predator	Location	Notes
1 (chick or juvenile)	Kestrel (male)	Bigfoot revegetation area	On 4 August, a kestrel was perched on the Bigfoot revegetation area fence eating an unbanded plover chick or young juvenile. No remains were found at the perch location after kestrel departed.
1 (juvenile)	Harrier (subadult male)	6 exclosure	On 5 August, a harrier was observed eating a 49-day-old plover juvenile, banded vg:vw from the SP119 nest, in 6 exclosure.
1 (chick or juvenile)	Peregrine (adult female, VID band W49)	Foredune Central shoreline	On 7 August, a peregrine was observed landing with avian prey on the west fence of Foredune Central. The peregrine was flushed and collected prey feather remains were those of a large chick or young juvenile plover.
≥1 (unknown)	Harrier (subadult male)	6 exclosure shoreline	On 7 August, a harrier lands briefly on 6 exclosure shore and carries prey into 6 exclosure. Remains of a tern and a pellet containing 4 plover bands (violet, orange, blue, and green) were found. The bands indicate a minimum of 1 plover of unknown age had earlier been depredated.
1 (chick)	Harrier (subadult male)	6 exclosure	On 7 August, a harrier was hunting over 6 exclosure where it caught an unidentified prey item. It landed in Foredune South then Foredune South shoreline with the prey. The harrier began hunting over 6 exclosure again, landed on 6 shoreline, and ate a second prey item. The feather remains collected from the second prey item were those of a plover chick.
1 (chick or juvenile)	Harrier (subadult male)	6 exclosure	On 7 August, a harrier was observed catching a prey item in 6 exclosure and landing on the 7 exclosure shoreline with the prey. Feather remains collected were those of a large chick or young juvenile.
2 (chicks or juveniles)	Harrier (subadult male)	6 and 7 exclosure shoreline	On 8 August, a harrier was observed catching and eating a plover chick or young juvenile on the 6 exclosure shoreline, then catching a second chick or young juvenile on the 7 exclosure shoreline and eating it in 7 exclosure. No remains were located at either location.
1 (juvenile)	Harrier (subadult male)	Foredune Central shoreline	On 9 August, a harrier was observed catching a banded plover juvenile on the Foredune Central shoreline. Immediately after, the same harrier was seen catching a second avian prey item from the Foredune Central shoreline and lands with it in Foredune South, but no remains found to confirm species.
1 (chick)	Harrier (subadult male)	Foredune South shoreline	On 14 August, a harrier was observed catching a banded plover from the Foredune South shoreline and lands with it in Foredune South. No remains were found, just a few feathers, but based on partial bands observed and location, it was determined to be a 24-day-old chick from the SP218 nest.
≥1 (unknown)	Owl species	8 exclosure	On 1 September, an owl pellet at the base of a wood post of the west fence of 8 exclosure containing 4 plover bands (green, aqua, white, and orange) was found. The bands indicate a minimum of 1 plover of unknown age had earlier been depredated.

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

Table H.6. Mortality, other than documented predation, of snowy plovers in 2021.

No carcasses were found December 2020, subsequent to the 2020 annual report. Necropsy results on several plovers pending at time of report and results may change category of mortality. MWVCRC=CDFW, Office of Spill Prevention and Response, Marine Wildlife Veterinary Care and Research Center, Santa Cruz, CA.

No. (age)	Location	Notes
1 (chick)	Foredune North shoreline	On 18 July, a snowy plover chick carcass was observed on the Foredune closure shoreline but could not be immediately collected due to the proximity of young plover broods. The carcass of an unbanded chick was collected on 20 July, and based on location and size, it is likely from the SP233 brood. Three chicks hatched from this nest and all chicks were seen 5 July at 9 days old, 2 chicks were seen on 12 July, and 1 fledged. The desiccated but intact carcass was frozen, sent to MWVCRC for necropsy, and results are pending.
1 (chick)	Foredune South shoreline	On 28 August, a snowy plover chick carcass, banded ga:yw from the SP100 nest, was found on the Foredune closure shoreline. Three chicks hatched from this nest on 7 June, 2 chicks were seen on 10 June, and 1 chick was last seen on 16 June at 9 days old. The intact carcass was dried and desiccated, not appropriate for necropsy, and cause of death is unknown.
1 (adult)	Open riding area, west of marker post 5	On 11 September, an unbanded snowy plover adult carcass was found in the open riding area above the high tide line west of marker post 5. The carcass was flattened, found in tire tracks, and appeared fresh. It was frozen, sent to MWVCRC for necropsy, and results are pending.
1 (adult)	6 exclosure shoreline	On 17 September, an unbanded snowy plover adult carcass was found on the 6 exclosure shoreline above the high tide line and underneath a piece of wood. The intact carcass appeared moderately decomposed, was frozen, sent to MWVCRC for necropsy, and results are pending.
1 (unknown)	7 exclosure shoreline	On 19 September, a snowy plover left leg with vg bands was found on the 7 exclosure shoreline underneath a wood piece. Other body parts or bands that would identify the bird were not located in the area.
1 (adult)	Open riding area, north of marker post 5	On 22 September, an unbanded snowy plover adult carcass was found in the open riding area, east of the Foredune North, and north of marker post 5. The right eye was detached but the carcass was otherwise intact. It was frozen, sent to MWVCRC for necropsy, and results are pending.
1 (juvenile)	Open riding area, south of marker post 8	On 3 October, a snowy plover juvenile carcass, banded pg:vw from the SP188 nest, was found in the open riding area, below the high tide line, and south of marker post 8. Two chicks, both banded pg:vw, fledged from SP188 and were seen together on 10 August at 34 days old. One juvenile was last seen on 9 September at 64 days old. The intact carcass was frozen, sent to MWVCRC for necropsy, and results are pending.

Oceano Dunes State Vehicular Recreation Area

2021 Predator Management Report

Submitted To:

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Introduction

Prior to the 2021 California Least Tern (Sternula antillarum browni) (CLTE) and Western Snowy Plover (Charadrius nivosus nivosus) (SNPL) nesting season, USDA-APHIS-Wildlife Services entered into an agreement with Oceano Dunes State Vehicular Recreation Area (ODSVRA) to conduct predator management activities in the CLTE and SNPL nesting areas. Wildlife Specialist (WS) Hannah Garland was assigned to the ODSVRA project to monitor and selectively remove mammalian or avian predators to protect nesting CLTE and SNPL.

WS Hannah Garland began working on site at the ODSVRA project on March 31st, 2020 and worked until May 21st, 2021 for the protection of CLTE and SNPL. Hannah resigned her position on May 21st due to a family illness that required her attention. Wildlife Services District Supervisor Eric Covington, Assistant District Supervisor Barry Lowry and Wildlife Specialist Donald Simms provided coverage throughout the remainder of the 2021 CLTE and SNPL nesting season.

Methods

Throughout this SNPL and CLTE nesting season a variety of predator management methods were utilized. Methods utilized include surveying, trapping, hazing, and shooting.

Predator surveys were performed regularly by Wildlife Services during the SNPL and CLTE nesting season. Surveys were conducted by vehicle and on foot in order to search for evidence of predator activity on the property. Leupold® BX-4 Pro Guide HD 10x42mm binoculars and 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 exclosure within the revegetation areas (Appendix 1), along the South Oso Flaco shoreline and in the agricultural fields east of Oso Flaco Lake and south to Brown Road in Santa Barbara County. Additionally, Wildlife Services stayed in regular communication with State Parks staff to share information about predator sightings and activity.

Trapping was one of the primary methods of predator control used during the 2021 nesting season. The main type of trap used was Bridger #1-1/2 and #3 padded leg-hold traps used in an attempt 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 plover nests using quail eggs. A cage trap was also set during the off season in an attempt to trap feral swine.

Wildlife Services regularly assisted Jake Manley with Wildlife Innovations with trapping and hazing of problematic raptors on the Oceano Dunes property. Wildlife Services stayed in regular communication with Jake about the location and habits of avian predators. Wildlife Services Personnel was unable to assist Jake after Hannah Garland resigned due to time constraints. Prior to her resignation, Hannah assisted Jake with avian trapping duties.

Firearms were the method used for euthanasia of animals captured in traps and free ranging animals. The only exception was one raven that was euthanized by cervical dislocation.

Euthanasia was conducted with either a Ruger® 77/22 bolt action rifle or a Ruger® Single Six single action revolver, both chambered in 22 Long Rifle. Ammunition for the firearm was CCI® Short Range Green lead free ammunition. Ravens and the northern harrier were euthanized with a Benelli® M2 12-gauge semi-automatic shotgun with Federal Premium FS Steel 3-inch shells with #4 and #2 shot. One coyote was called in and removed with a custom-built rifle on a Savage® bolt action chambered in 6.5 Creedmor. Ammunition for the 6.5 Creedmor was hand loaded and fired a 127 grain Barnes® LRX all copper bullet.

In past nesting seasons, attempts to bait ravens using a secondary method whereby platforms were erected, and boiled chicken eggs were fixed to the platform to habituate the ravens to return to the location regularly. Trail cameras were placed nearby to confirm raven presence at the platforms. No attempts were made in the 2021 nesting season to attract ravens to egg platforms but will hopefully be a successful method of raven control at ODSVRA in future nesting seasons.

The method of using egg platforms 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 corvicide 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 2021 SNPL and CLTE nesting season had a high number of predators present that included common ravens, northern harriers, peregrine falcons, American kestrels, both barn and Great-horned owls, Virginia opossums and coyotes. Jake Manley focused on trapping raptor species and WS focused on mammals, ravens and the lethal removal of a northern harrier. Common ravens and northern harriers were responsible for the largest number of predations during this nesting season. Common ravens were documented to have predated ten SNPL nests while northern harriers were responsible for predating 11 SNPL nests, two SNPL juveniles, two SNPL chicks, three SNPL chicks or juveniles, at least one SNPL of an unknown age, one CLTE chick or juvenile, and one CLTE juvenile. There were an additional 23 SNPL nests taken from unknown avian predators, some of which were likely taken from common ravens and northern harriers. Peregrine falcons were documented to have predated one SNPL adult, three SNPL chicks, one SNPL chick or juvenile, two CLTE juveniles and one CLTE chick or juvenile. An additional CLTE juvenile was likely taken by a peregrine falcon but was not confirmed. American kestrels were documented to have predated two SNPL chicks and two SNPL chicks or juveniles. Barn owls and Great-horned owls were both observed near the nesting areas at ODSVRA this nesting season. It is confirmed that owls of either species were responsible for predating at least one SNPL of an unknown age, and three CLTE adults. A Virginia opossum was documented to have predated two SNPL nests and coyotes were documented to predate one SNPL nest. Coyote tracks were observed multiple times traveling the shoreline between the Oso Flaco Boardwalk and the northern nesting exclosures. In past nesting seasons, coyotes were responsible for predating on SNPL chicks while traveling the shoreline and could have been

responsible for unknown chick losses this season as well. There were seven SNPL nests that were predated by unknown predators. Sixteen SNPL nests were abandoned pre-term and four were abandoned either pre or post term while two CLTE nests were abandoned pre or post term as well. The high presence of predators this season could be one reason for some of those nest abandonments.

Five coyotes (*Canis latrans*) were removed during the 2021 nesting season. The first coyote was trapped between Oso Flaco Lake and the foredunes on the south side of Oso Flaco Creek. The second coyote was trapped east of the North Boneyard Gate in the Maidenform Re-vegetation Area. The third coyote had traveled south along the shoreline and was tracked from the shoreline at the Oso Flaco Boardwalk, through the Maidenform Re-vegetation Area, Across the open riding area and was shot just east of the riding area near Boy Scout. The fourth coyote was trapped on the south side of Oso Flaco Lake. The fifth coyote was trapped on the north side of Oso Flaco Road on the west side of Oso Flaco Lake near the area where the paved road turns to dirt (Table 1) (Appendix 1). All coyotes trapped were captured in Bridger #3 padded jaw leg-hold traps.

In 2020, a male adult northern harrier was responsible for depredating several SNPL nests throughout the nesting season. Attempts were made by Bob Chapman with Bloom Biological, Inc (the avian specialist onsite in 2020) to trap the harrier but were unsuccessful. In the 2021 nesting season, it is believed the same harrier was responsible for taking several SNPL nests. Staff from State Parks Resources visually observed several nests being depredated by harriers. Jake Manley attempted to trap the harrier but was unsuccessful in his attempts to trap it. On May 11th, State Parks was given approval from USFWS and CDFW to lethally remove the harrier. While attempts were being made by WS staff to remove the harrier, Jake Manley continued attempts to trap with no success. On June 3rd, WS was successful in lethally removing the harrier. After the removal, no additional nest predation by harriers was documented. A sub-adult male harrier was observed predating SNPL and CLTE chicks and juveniles after the lethal removal of the adult male harrier. Trapping attempts were made to capture this individual with no success. While attempting to trap the sub-adult male harrier, a female harrier was captured.

Common ravens have been a predation threat to nesting SNPL throughout their entire range, including ODSVRA. During the 2021 SNPL and CLTE nesting season, a total of ten SNPL nests were confirmed to have been predated by CORAs. Due to ravens being a serious threat to nesting SNPL at ODSVRA in past seasons, WS began raven removal activities prior to the SNPL nest initiation. This season, a total of three CORAs were removed by USDA-WS staff and one raven was trapped and removed by WS staff working with Jake Manley.

In several past seasons, a pair of ravens that was suspected of predating on SNPL nest from the Guadalupe Preserve to ODSVRA was found nesting along Brown Road in Santa Barbara County. WS was successful in removing that pair of ravens in 2020 but observed other ravens frequenting the area. On February 23rd, one CORA was shot and removed from Brown Road. A second raven was trapped and removed by WS staff working with Jake Manley on April 30th. A pair of ravens began depredating nests early in the nesting season this year. It is suspected that this pair of ravens was responsible for most of the raven predation that occurred in the early part of the nesting season. On June 8th, WS was able to remove this pair of ravens off Oso Flaco

Road just north of Oso Flaco Lake (Table 1). A fifth raven was removed off a neighboring property on March 30th and was recorded under their permit.

Throughout the nesting season, WS conducted other duties as time permitted. WS would report predator sightings to State Parks Resources Staff. WS also kept in communication with Jake Manley and reported sightings of raptors. Gull predation was a concern throughout the latter part of the nesting season. WS staff would watch groups of gulls along the shoreline to try to observe predation events and be able to respond quickly if one was observed.

On July 23rd, a local farmer who leases farmland from State Parks reported that feral swine had entered State Parks property. The swine had rooted up and damaged a reactor that scrubs nitrogen from water that is runoff from agricultural irrigation. WS set up trail cameras to determine the number of swine involved and to decide the best approach to removing them from the property. Pictures taken from the trail camera verified that only one large swine was responsible for the damage. On August 4th, WS was successful in removing the feral swine from State Parks property. The farmer has since installed 2,600 feet of eight-foot tall fencing around most of the area where the feral swine was entering the farmland to reduce the chances of more feral swine from entering the farmland.

Future Recommendations

WS recommends that state parks continue to check the exclosure fencing regularly for changes in the sand that may cause gaps or mounded sand. This will 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 beginning February 1st. 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 in hazing effort so that nesting SNPL and CLTE are not hazed 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).

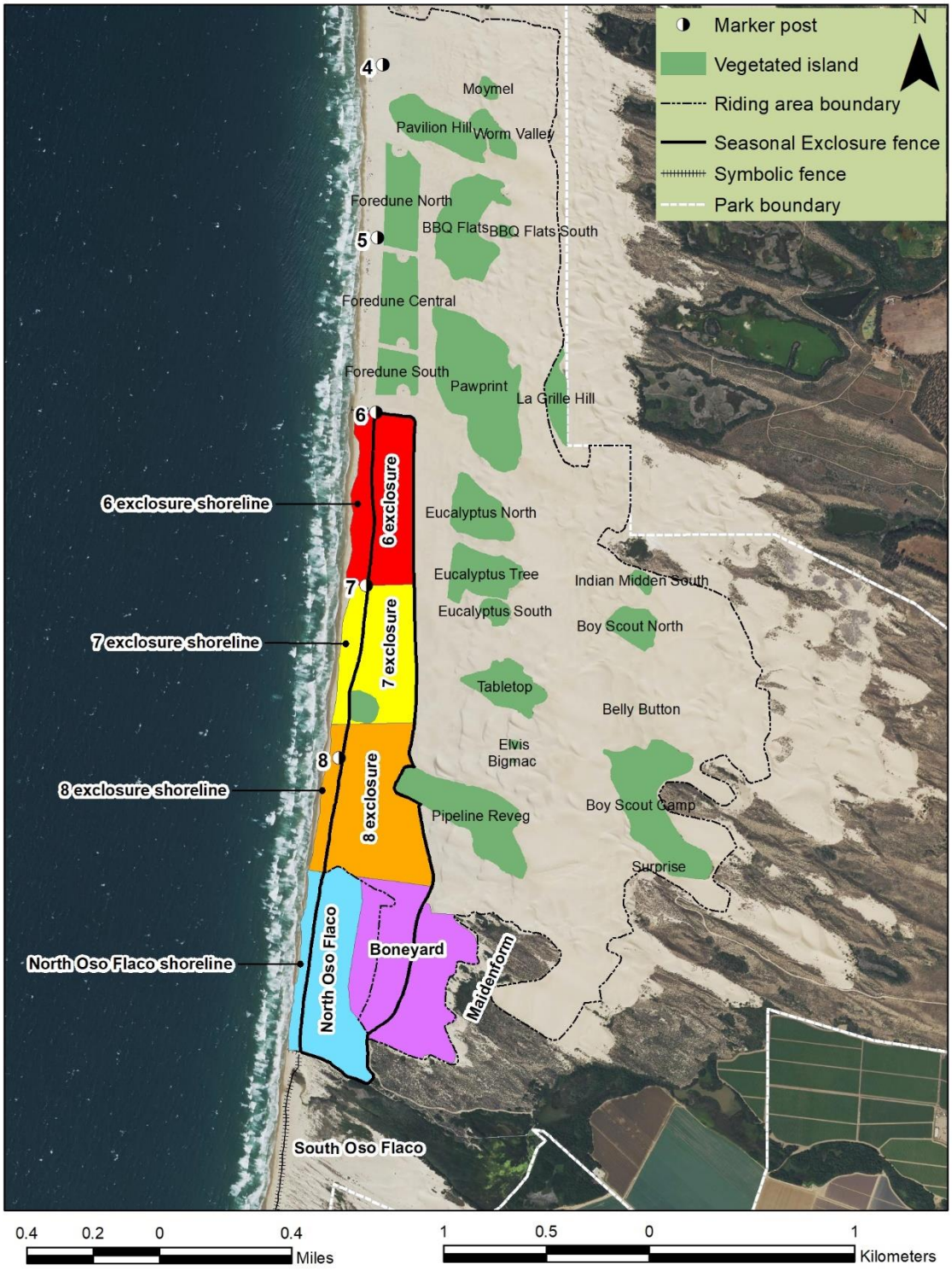
WS recommends continued monitoring for feral swine. If feral swine are located, contact WS as soon as possible so removal efforts can begin. If deceased feral swine are located with no obvious signs of death, do not approach or touch the carcass and contact WS as soon as possible at 1-866-4-USDA-WS.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

Table 1: Predator Removal Summary

Date	Species	Age/Sex	Location
2/23/2021	Common Raven	Adult/NA	Brown Road
4/23/2021	Coyote	Adult/NA	South Oso Flaco
4/30/2021	Common Raven	Adult/NA	ARC Site
5/12/2021	Coyote	Adult/NA	Maidenform Re-vegetation Area
6/3/2021	Northern Harrier	Adult/Male	Tabletop Re-vegetation Area
6/8/2021	Common Raven	Adult/NA	North Oso Flaco
6/8/2021	Common Raven	Adult/NA	North Oso Flaco
6/26/2021	Coyote	Adult/Female	Boy Scout
6/30/2021	Coyote	Adult/Male	South Oso Flaco Creek
8/4/2021	Feral Swine	Adult/Male	North of Oso Flaco Parking Lot
8/19/2021	Coyote	Adult/Female	North Oso Flaco/Maidenform Revegetation Area

Eric Covington, District Supervisor
Barry Lowry, Assistant District Supervisor
San Luis District
CA Wildlife Services

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



Appendix 2: DRC-1339 EPA Label

RESTRICTED USE PESTICIDE

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

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

COMPOUND DRC-1339 CONCENTRATE – LIVESTOCK, NEST & FODDER DEPREDATIONS

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

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

KEEP OUT OF REACH OF CHILDREN

DANGER-PELIGRO

POISON

FIRST AID

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

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

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

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

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

Hazard Avoidance: Do not get in eyes, on skin, or on clothing. Do not breathe dust. Wear protective clothing, eyewear, and respiratory protection as listed under "**PERSONAL PROTECTIVE EQUIPMENT**." Wash thoroughly with soap and water after handling and before eating or smoking. Remove contaminated clothing and wash before reuse.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

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

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

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

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

ENVIRONMENTAL HAZARDS:

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

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

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

Registration No. 56228-29, Page 1 of 3

ENDANGERED SPECIES CONSIDERATIONS:

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

DIRECTIONS FOR USE

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

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

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

PRODUCT INFORMATION:

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

USE RESTRICTIONS:

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

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

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

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

- Refuges or other areas where ravens or crows prey upon the eggs and/or young of Federally-designated Threatened or Endangered Species, or upon the eggs and young of other species which Federal or State wildlife agencies have determined to be in need of protection from nest predators due to documented declines in numbers and/or in nesting success; or

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

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

Before baits made from this product are applied, sites that are to be treated **must be observed** for evidence of nontarget activity **and must be prebaited** (see specific instructions for these activities). **DO NOT** apply treated baits where there is a danger that Threatened or Endangered Species will consume baits unless special precautions are taken to limit such exposures. Such precautions shall include observation of baited sites and use of hazing tactics to frighten away Threatened or Endangered Species that otherwise might feed upon baits.

DIRECTIONS FOR USE, continued

USE RESTRICTIONS, continued:

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

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

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

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

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

DO NOT use treated baits as food or feed.

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

ENTRY RESTRICTIONS:

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

PRETREATMENT OBSERVATIONS:

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

PREBAITING:

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

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

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

DIRECTIONS FOR USE, continued

BAIT PREPARATION:

MEAT BAITS:

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

MEAT BAIT APPLICATION:

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

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

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

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

EGG BAITS:

EGG BAIT PREPARATION:

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

Using an 18-gauge hypodermic needle or similarly-sized implement, make an entry hole in the end of each hard-boiled chicken, turkey, or duck egg to be used. Using a syringe and a 20-gauge hypodermic needle, slowly inject 0.002 pints (1 ml) of the 2% solution (or 0.001 pints or 0.5 ml of the 4% solution) into the yolk of each egg.

Make only enough solution to treat the desired number of eggs. Mark treated eggs with small skull and crossbones or the word POISON.

DIRECTIONS FOR USE, continued

EGG BAIT APPLICATION:

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

Control of crows, magpies, and ravens with egg baits prepared from this product is limited to the sites indicated above under "**USE RESTRICTIONS**". Place all egg baits to be used at one baited site within 25 ft (7.6 m) of the center of the site or within 25 ft (7.6 m) of any silage/fodder bags that are to be protected. Place 1-4 eggs in each bait set, and do not use more than a total of 18 eggs per baited site. If a draw station (fresh, unpoisoned animal carcass) is used, all bait sets must be located at least 10 ft (3 m) from the carcass. Wherever practical, bait sets should be made in "dummy" nests created by making small depressions in the ground. Dummy nests may be partially hidden by vegetation or other debris. In other situations, eggs may be placed on elevated wooden platforms 1 to 2 ft^2 (0.1 to 0.2 m^2) in area. Eggs placed on platforms must be restrained by wire to prevent them from falling off platforms or being removed by birds. Apply 2-3 eggs per platform.

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

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

Rebait with additional treated eggs when more than 50% of the treated eggs offered have been removed by ravens, magpies, or crows. When replacing baits, take care not to frighten target birds actively removing or feeding upon eggs. Retrieve unconsumed treated eggs within 7 days of exposure. Old treated eggs and treated eggs not eaten by the time control operations cease must be disposed of in accordance with applicable State and Federal laws.

POSTTREATMENT CLEAN-UP (Meat and Egg Baits):

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

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

STORAGE AND DISPOSAL

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

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

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

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

Revised: 05-06-2016

Appendix 3: Safety Data Sheet for DRC-1339

USDA APHIS

Safety Data Sheet

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

1. IDENTIFICATION

Product Identifier

Product Name

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

Other Means of Identification

SDS # USDA-0001

Synonyms

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

Registration Number(s)

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

Recommended Use of the Chemical and Restrictions on Use

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

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

Details of the Supplier of the Safety Data Sheet

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

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

Emergency Telephone Number

Company Phone Number 1-208-236-6920

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

2. HAZARDS IDENTIFICATION

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

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

Classification

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

Hazards Not Otherwise Classified (HNOC)

Signal Word
Danger

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

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

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

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

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

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms

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

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

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

4. FIRST-AID MEASURES

First Aid Measures

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

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

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

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

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

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

Most Important Symptoms and Effects

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

Indication of Any Immediate Medical Attention and Special Treatment Needed

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

5. FIRE-FIGHTING MEASURES

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

Unsuitable Extinguishing Media	Not determined.

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

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

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

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

Methods and Material for Containment and Cleaning Up

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

7. HANDLING AND STORAGE

Precautions for Safe Handling

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

Conditions for Safe Storage, Including Any Incompatibilities

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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

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

Appropriate Engineering Controls

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

Individual Protection Measures, Such as Personal Protective Equipment

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

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

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

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

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

10. STABILITY AND REACTIVITY

Reactivity
Not reactive under normal conditions.

Chemical Stability
Stable under recommended storage conditions.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous Polymerization Hazardous polymerization does not occur.

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

Incompatible Materials
Strong oxidizing agents.

Hazardous Decomposition Products
No data available.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

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

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

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

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

Ingestion Harmful if swallowed.

Component Information

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

Information on Physical, Chemical and Toxicological Effects

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

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

Sensitization May cause an allergic skin reaction.

Germ Cell Mutagenicity Negative test results in three mutagenicity studies.

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

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

Numerical Measures of Toxicity
Not determined.

12. ECOLOGICAL INFORMATION

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

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

Persistence/Degradability
No data available.

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

Mobility
No data available.

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

13. DISPOSAL CONSIDERATIONS

Waste Treatment Methods

Disposal of Wastes	Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinse is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency or Hazardous Waste representative at the nearest EPA regional office. Never place any unused product down an indoor or outdoor drain. Do not contaminate water, food or feed by disposal.
Contaminated Packaging	Completely empty bag in application equipment. Then dispose of empty bag in a sanitary landfill or by incineration or if allowed by state and local authorities, by burning. If burned, stay out of smoke. Do not reuse or refill this container.

14. TRANSPORT INFORMATION

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

DOT

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

IATA

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

IMDG

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

TDG

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

15. REGULATORY INFORMATION

International Inventories

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

TSCA	Exempt
DSL	Excluded

Legend:

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

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

U.S. Federal Regulations

SARA 311/312 Hazard Categories

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

SARA 313

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

U.S. State Regulations

U.S. State Right-to-Know Regulations

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

EPA Pesticide Registration Numbers

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

EPA Statement

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

EPA Pesticide Label

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

16. OTHER INFORMATION

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

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

Disclaimer

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

End of Safety Data Sheet

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

TECH NOTE

Wildlife Services

APHIS

United States Department of Agriculture

Animal and Plant Health Inspection Service

Date 1 April 2001

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 within the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California

Annual Report – 2021

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Agreement No. C2053010

Recommended Citation: S.J. Manley and D. S. Biteman. 2021. 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 - 2021. Unpublished report prepared by Wildlife Innovations for the California Department of Parks and Recreation, Oceano Dunes District. 48 pp.

October 2021

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") within the Oceano Dunes State Vehicular Recreation Area (ODSVRA), and populations throughout the **w**est coast. Previous studies have shown that predator control programs, including trap and translocation of raptors and owls documented to depredate sensitive species, have contributed to increasing the reproductive success of these sensitive shorebird species. Wildlife Innovations was hired to provide raptor and owl management within ODSVRA during 2021, and developed a program focused on the targeted management of raptors and owls, in an effort to reduce predation pressure upon terns and plovers. During the 2021 nesting season, a total of 177 individuals, comprising nine species of avian predator were recorded within or near protected tern and plover nesting sites on ODSVRA. Of those, more predator observations were recorded within 6 Exclosure (n=36; 20.3%) than within other sites, and more NOHA (n=70; 39.5%) were observed than other species of avian predator. May attributed the highest number of avian predator observations (n=49; 27.7%), when compared to other months. A greater proportion of Northern Harriers (*Circus cyaneus*; NOHA; 40.0%) and Peregrine Falcon (*Falco peregrinus*; PEFA; 36.7%) observations indicated disturbance to terns or plovers than observations of other avian predator species. A total of five avian predators were removed from within or near tern and plover nesting sites on ODSVRA, including one PEFA that was trapped twice after returning to the site after being translocated, and one NOHA was lethally removed by Wildlife Services. Four different trap types were used for the capture of these individuals, with a bownet comprising 50% of these captures. Approximately 60% of all trap hours were attributed to targeting NOHA, with the most trap hours invested into the adult male NOHA (38.7%) that was responsible for depredating plover nests during April and May. Additionally, WI trapped and removed a single Common Raven (*Corvus corax*) suspected of depredating plover nests.

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INTRODUCTION

California Least Terns (*Sternula antillarum browni;* hereafter "tern") nest along the coastlines of Western North America, from Baja California, Mexico, north to the San Francisco Bay area (USFWS 1980), foraging in bays, lagoons, estuaries, tidal marshes, river mouths, ponds, lakes, and offshore. The California Least Tern is one of three subspecies of Least Tern, and due to population decline resulting primarily from loss of habitat (Craig 1971, Cogswell 1977), it was listed as endangered by the U.S. Secretary of the Interior in 1970 (USFWS 1973) and the California Department of Fish and Game in 1971 (CDFG 1976). The listing under the Endangered Species Act mandated protection of tern nesting sites in California (USFWS 1985). Multiple factors threaten the survival of terns, including 1) overall habitat limitation, 2) predation by a variety of native and non-native predators, 3) a reduction in the quality of nesting and foraging habitat, 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).

Nesting terns are susceptible to a plethora of avian and mammalian predators (Burr 1988, Massey 1988, USFWS 1988). Based on the California Department of Fish and Wildlife (CDFW) Tern Breeding Surveys conducted during 2014–2017, the predators known to be responsible for the greatest number of depredated terns were Peregrine Falcon (*Falco peregrinus;* PEFA), rats (*Rattus spp*.), Common Ravens (*Corvus corax;* CORA), Northern Harriers (*Circus cyaneus;* NOHA), American Crows (*Corvus brachyrhynchos;* AMCR), and coyotes (*Canis latrans*; Frost 2015, 2017, Sin 2021). During 2017, coyotes were responsible for the highest number of tern nest predations across California (62%). Both CORA and AMCR were the next most prolific predators of nests with eggs, respectively (17%, 7%, 7% unidentified corvid). During that same season, PEFA were responsible for 62% of fledgling and 39% of adult predations (Sin 2021). During 2017, chicks were predated heavily by American Kestrels (*Falco sparverius;* AMKE), and Great Blue Herons (*Ardea Herodias;* GBHE), and other impactful predators included rats, Gull-billed Terns (*Gelochelidon nilotica;* GBTE), NOHA, Great Horned Owls (*Bubo virginianus;* GHOW), Western Gull (*Larus occidentalis*; WEGU), and Burrowing Owl (*Athene cunicularia;* BUOW; Sin 2021). During the 2014 nesting season, the highest number of nest predations were from AMCR, ravens, and gulls (*Larus spp.*), while PEFA, domestic cats (*Felis catus*), Red-tailed Hawks (*Buteo jamaicensis;* RTHA), AMKE, NOHA, GHOW, and Cooper's Hawks (*Accipiter cooperii;* COHA), predated the largest number of chicks, fledglings, and adults. Heavy predation can be a direct threat and detrimental to the perseverance of the colony but can also lead to abandonment and affect site fidelity (Frost 2015, Velasco 2015).

The breeding range of the Pacific Coastal population of Western Snowy Plovers (*Charadrius nivosus nivosus;* hereafter "plover") extends from Midway Beach, Washington, to Bahia Magdalena, Baja California Sur, Mexico (USFWS 2019). The Pacific Coast population of plovers was listed as a federally threatened species in 1993 (USFWS 2012). Threats have not changed significantly since the last 5-year review, as evidence of habitat loss and degradation remain widespread; although, the degree of this threat varies by geographic location, habitat loss and degradation attributed to human disturbance, urban development, introduced beachgrass, and expanding predator populations, remain the management focus in all recovery units (USFWS 2019, Riensche et al. 2015, USFWS 2007). 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).

Documented avian predators of terns and plovers include gulls (*Larus spp*.), PEFA, AMKE, NOHA, COHA, RTHA, GHOW, Barn Owls (*Tyto alba;* BANO), BUOW, Loggerhead Shrikes (*Lanius ludovicianus*), CORA, AMCR, European Starlings (*Sturna vulgaris;* EUST), GBHE, GBTE, and Black-crowned Night Herons (*Nycticorax nycticorax*) (CDPR 2019, 2020, USFWS 2006, Zimmerman 2008, Marschalek 2012, Jake Manley pers. comm.).

The reduction in the number of nesting terns and plovers on the Pacific Coast, and their federal listing under the Endangered Species Act, prompted wildlife agencies to intensify monitoring and management efforts. Currently, Oceano Dunes State Vehicular Recreation Area (ODSVRA) provides important habitat for nesting plovers, and during 2017, was estimated to house between 1.96–2.44% of the California breeding population of terns (Sin 2021).

Monitoring of terns and plovers on ODSVRA began in 1991 and 1992 respectively (CDPR 2017). The number of breeding adult plovers present on ODSVRA ranged from 32–226 between 2002–2020, with an average of 149 adults, and the average fledging rate was 38.6% (CDPR 2021). The average number of tern pairs on ODSVRA was 40–43 between 2005–2020, and the average fledging rate was 73.1% between 2006–2020 (CDPR 2021). During 2021, more adult plovers (minimum 195 breeding adults) and tern pairs (52–52), laid more nests than during 2020 (n=239, n=53, respectively), with more plovers (n=119) and terns (n=48) reaching fledging age (CDPR 2021).

Wildlife Innovations (WI) initiated avian predator surveillance and raptor and owl management efforts for the protection of terns and plovers within the ODSVRA on 22 March 2021, with the goal of effectively mitigating predation pressure on terns and plovers and increasing their nesting success. An adaptive and highly targeted approach was used for managing raptors and owls to reduce negative impacts to the native predator community while providing sufficient protection for nesting terns and plovers. Wildlife Innovations attempted to investigate reported tern and plover predations, when feasible, during the 2021 nesting season to determine the species responsible but relied on evidence collected by ODSVRA personnel for the predations that WI was unable to investigate. That information, combined with surveillance of predators present and active within ODSVRA, was used to inform adaptive management efforts and to help examine the impacts of predatory species on tern and plover nesting success and survival.

STUDY AREA

Oceano Dunes State Vehicular Recreation Area is located within southern coastal San Luis Obispo County, California. The Park is part of the 18-mile-long Guadalupe-Nipomo Dunes complex, where California Department of Parks and Recreation manages 4,900 acres, 9.1 acres of which is ocean shoreline (CDPR 2020). Both street-legal and off-highway vehicle use, and overnight camping are authorized on the beach and within the dunes, which extend approximately 0.6–1.3 miles inland from the shoreline (CDPR 2020). During 2019, an estimated 315,022 street-legal vehicles and 63,988 off-highway vehicles visited and recreated within ODSVRA. The open riding area is approximately 1,360 acres but is restricted to approximately 1,015 acres during tern and plover nesting season. Terns are only present during the breeding season (April–September), but some plovers are present onsite year-round (CDPR 2020). The Park is broken into smaller units, with some areas fenced to prevent vehicle and/or pedestrian access, to protect nesting terns and plovers, and other habitats (i.e. vegetation restoration; Fig. 1). During 2020, an area known as the "Foredune Closure (approximately 0.8 miles of shoreline, and 48 total acres)" was established to improve air quality conditions, and was broken into Foredune North, Foredune Central, and

Foredune South (CDPR 2020). The Southern Exclosure is a single contiguous area comprising approximately 307 acres (during 2020) and is broken into four designated areas: 6 Exclosure (61.2 acres), 7 Exclosure (61.4 acres), 8 Exclosure (86.8 acres), and Boneyard Exclosure (97.8 acres). Oso Flaco includes approximately 1.7 miles of narrowed shoreline and heavily vegetated dunes. Oso Flaco is broken into North Oso Flaco (0.5 miles of shoreline and approximately 68 acres; closed to both pedestrian access and vehicles) and South Oso Flaco (approximately 1.2 miles of shoreline; open to pedestrian access but closed to vehicles). The Seasonal Exclosure includes areas of both the Southern Exclosure and North Oso Flaco and are enclosed with predator fencing (269 acres) to exclude coyotes, humans, and vehicles (CDPR 2020). Revegetation areas are fenced to prevent access by vehicles, and are referred to as the following: Pipeline, Maidenform, Eucalyptus North, Eucalyptus Tree, Pawprint, Tabletop, Boyscout Camp, Moymel, Worm Valley, Pavilion Hill, and BBQ Flats (Fig. 1).

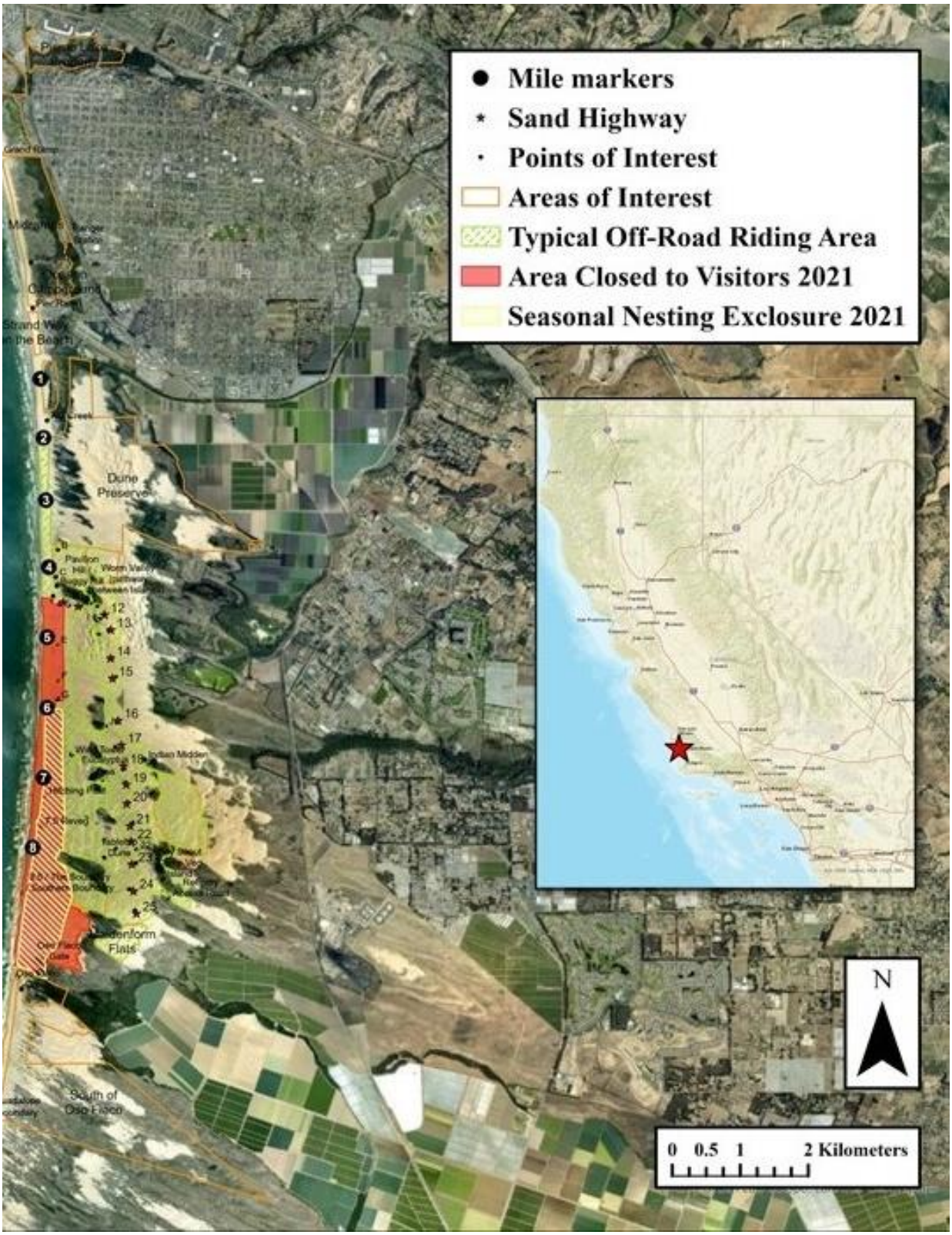

Figure 1. Map of ODSVRA, including exclosures, open riding areas, and other points of interest, where raptor and owl management were conducted for terns and plovers during the 2021 nesting season.

METHODS

Raptor Management efforts during the 2021 tern and plover nesting season were conducted within and near previously identified beach nesting areas within the ODSVRA, between 22 March and 23 August of 2021. Those efforts included conducting predator surveillance, targeted trapping for raptors or owls documented depredating or threatening to depredate terns and/or plovers or their nests, and investigation of tern and plover predations.

General

All WI vehicles and personnel conducting raptor 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 within each nesting site varied throughout the season, with more patrols and fixed-position surveillance conducted within areas with more avian predator observations, discovery of predator sign, and documented or suspected predations of terns or plovers. Additionally, when not required to remain in one location while trapping for targeted raptors, more time was spent monitoring high-density tern and plover nesting sites, such as Foredune, and 6 and 7 exclosures, than monitoring lower-density sites. Variation in surveillance effort across sites made it difficult to accurately quantify avian predator activity and to make comparisons between sites and time periods using only observational data collected while conducting various forms of raptor management work. Within other projects, to support comparisons between sites and time periods, WI has standardized survey efforts by establishing and conducting protocol-level point count and transect surveys for the duration of the nesting season. As the amount of time necessary to transit between areas within ODSVRA was extensive and access to some locations was restricted due to presence of terns or plovers, for the majority of the summer, point count or transect surveys were not able to be conducted as a part of the raptor management project within ODSVRA during the 2021 nesting season.

Observations of predators were recorded during both daytime and nighttime hours while conducting routine patrols of Exclosure fence lines and shoreline areas, surveillance from fixed and topographically advantageous positions, while trapping for targeted individuals, and while doing predation investigations within beach nesting areas. Observations were mapped at the location that the predator(s) were first detected unless the individual focused its activity in a specific and noteworthy location during the observation event: Example 1) if a NOHA entered Exclosure 8 from North Oso Flaco and hunted in only 8 Exclosure before exiting back through North Oso Flaco, the observation point would be placed where the bird was first observed in North Oso Flaco; Example 2) if a PEFA entered Exclosure 8 from North Oso Flaco and perched on a single dune, for the majority of the time it was observed, then its observation point would be placed on the dune. Observations of an individual belonging to the same species within 20 minutes of the first observation, in most cases were assumed to be the same individual and therefore were not entered as a second observation. If the presence or activity by a predator elicited a behavioral response from a tern or plover (i.e. alarm calls, distraction display, predator mobbing, etc.) during the observation event, it was recorded as a ‘disturbing terns or plovers.’ Nighttime surveillance was conducted using thermal imaging optics and occasionally a spotlight to allow the surveyor to determine more detail than possible using thermal optics alone, such as when attempting to identify a predator to the individual level. As RTHA were commonly observed within and near the veg

islands, and typically only select individuals become problematic for nesting terns and plovers, only those observed inside tern and plover exclosures were recorded, to better utilize personnel time while conducting field work.

In addition to direct observations, motion-sensor infrared-capable trail cameras with cellular-transmission capability were placed on upright wood or rebar stakes, to monitor some active traps. Cameras were serviced as needed, which consisted of changing rechargeable batteries, replacing the memory card, and adjusting settings to optimize detection of predators and camera function. Track-stations were also established around cameras and traps as an extra layer of surveillance, to monitor for predator and human presence that was not otherwise able to be detected by cameras.

Avian Predator Trapping

Traps were used to capture and remove raptors or owls documented or strongly suspected of being a high threat to terns or plovers or their nests, and one CORA suspected of depredating nests. The trap-type and method of deployment were tailored to the species, behavior of the targeted individuals (i.e. method and area observed hunting within, and the prey being targeted), and the characteristics and constraints present within the trap site. A variety of standard traps, described by Hull and Bloom (2001) were used to capture raptors, and a padded-foothold trap was used to capture the CORA. Most traps were anchored by attaching them to weights (2-5lbs) using a bungee cord, which acted as a shock-absorber, to further reduce the likelihood of injury to captured individuals, and to maintain tension on traps utilizing fishing-line nooses to ensnare the feet of targeted individuals. The CORA was euthanized upon removal from trap, whereas all captured raptors were translocated during the 2021 season.

Raptor Trapping.—Raptors documented depredating terns or plovers or that were observed exhibiting threatening predatory behavior (including activities that elicited alarm calls from terns or plovers), by ODSVRA monitoring personnel or by WI personnel, were targeted for removal via trap and translocation. Justification to begin trapping followed guidelines developed by California Department of Fish and Wildlife (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 captured were banded with an aluminum service band (USGS Bird Banding Laboratory) and a colored auxiliary marker (Acraft Sign and Name Place Co. Ltd., Edmonton, AB, Canada) that contained an alpha-numeric code which was intended to be readable from a distance using optics. Translocations not conducted by WI, were translocated by members of CDFW's Natural Resources Volunteer Network. Translocated individuals were released within locations previously vetted and approved by CDFW and USFWS personnel.

CORA Trapping.—The CORA was targeted using padded foothold traps that had been modified to capture and prevent injury to avian species. Pre-baiting was conducted by placing Japanese Quail (*Coturnix japonica*) eggs within the bowl of plover nests that were previously depredated by CORA, and within additional artificial bowls created in the sand. Trap locations were selected based on visitation of targeted individual(s) to bait, and trap placement was customized to the size of the targeted individual, so the trap would be triggered by the CORA while attempting to obtain the bait. The CORA captured was euthanized using cervical dislocation, a method recommended within the American Veterinary Medical Associations Guidelines for Euthanasia (2020).

Predation Investigations

Wildlife Innovations attempted to investigate tern and plover predations that were reported by ODSVRA monitors in 2021. Predations that retained enough evidence to accurately assign the predator, to species, were recorded to the species level. For predations that did not retain enough evidence to for WI personnel to confidently assign a species of predator, they were recorded to the nearest level of identification possible (i.e. "Avian," or "Unknown"). This information was used to continuously inform and adapt the management strategy being utilized within each site, and across sites, to help ensure that the most effective, efficient, and appropriate management methods were utilized to mitigate predation of nesting terns and plovers. However, WI personnel were not allowed to enter many nesting areas without the presence of monitors, and some predations were reported while traps were active and could not be left unattended. Additionally, with extremely high winds being a common occurrence onsite, traces of predator sign remaining at depredation sites were quickly distorted and/or lost if investigations were not conducted soon after their discovery. As such, many of the predations were unable to be investigated by WI personnel.

Data Management and Analysis

Smart phones and tablets, containing the Collector for ArcGIS Application (ESRI, Redlands CA), were customized with input pages and data management tables, designed by WI, and used to record all predator control data while in the field. 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 (i.e. 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 (Figures 5–6). These data were later downloaded as spreadsheets (Microsoft Office Excel 2016, Microsoft Corp., Redmond, WA) and within ArcGIS Pro (ESRI, Redlands, CA) for summary, analysis, and mapping. Observation data were summed by time period, geographic area (i.e. Site or Exclosure), and species, and are 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.

RESULTS

Predator Surveillance

Between 6 April and 22 August of 2021, a total of 177 avian predators, comprising nine species were recorded within or near protected tern and plover nesting sites on ODSVRA (Table 1). Of those, more predator observations were recorded within 6 Exclosure (n=36; 20.3%) than within other sites, and more observations of NOHA (n=70; 39.5%) were recorded than of other species of avian predator (Table 1, Figures 2–5). More avian predators were observed during May (n=49; 27.7%), than during other months. A greater proportion of NOHA (40.0%) and PEFA (36.7%) observations resulted in reactions from terns or plovers that indicated they were disturbed (i.e. alarm calls, mobbing, or distraction displays) than observations of other avian predator species.

Table 1. Avian predator observations recorded, by site and species, during the 2021 tern and plover nesting season on ODSVRA.

Site	American Crow	American Kestrel	Barn Owl	Common Raven	Cooper's Hawk	Great Horned Owl	Northern Harrier	Peregrine Falcon	Red-tailed Hawk	Total
Dune Preserve	0	0	0	1	0	0	0	2	0	**3**
Foredune Closure	0	0	1	0	0	0	1	7	0	**9**
Exclosure 6	0	7	8	0	0	7	11	3	0	**36**
Exclosure 7	0	0	3	0	0	0	6	1	0	**10**
Exclosure 8	0	1	0	0	0	0	5	3	0	**9**
BBQ Flats	0	2	1	0	0	0	1	1	0	**5**
Bigfoot	0	1	1	0	2	2	3	0	0	**9**
East Boneyard	0	1	0	2	0	0	1	3	0	**7**
Eucalyptus North	0	0	1	0	0	3	3	0	0	**7**
Eucalyptus South	0	0	0	0	0	2	2	0	0	**4**
Eucalyptus Tree	1	2	0	0	1	0	3	0	0	**7**
Interior Boneyard	0	2	0	0	2	0	0	1	2	**7**
Maidenform	0	0	0	0	1	1	2	0	0	**4**
North Oso Flaco	0	0	0	1	0	0	14	3	1	**19**
Oso Flaco Flats	0	1	0	0	0	2	1	0	0	**4**
Pavilion Hill	0	0	0	0	0	1	0	0	0	**1**
Pipeline Reveg	0	1	0	0	2	0	8	0	0	**11**
South Oso Flaco	0	4	0	0	0	0	1	1	0	**6**
7.5 Reveg	0	1	0	0	0	0	2	3	0	**6**
Tabletop	0	0	0	0	0	0	1	0	0	**1**
Undefined Area	0	0	0	0	0	1	1	0	0	**2**
West Boneyard	0	4	0	0	0	0	4	2	0	**10**
Total	**1**	**27**	**15**	**4**	**8**	**19**	**70**	**30**	**3**	**177**

Figure 2. Locations of avian predators observed, north of tern and plover nesting sites within ODSVRA, during the 2021 nesting season.

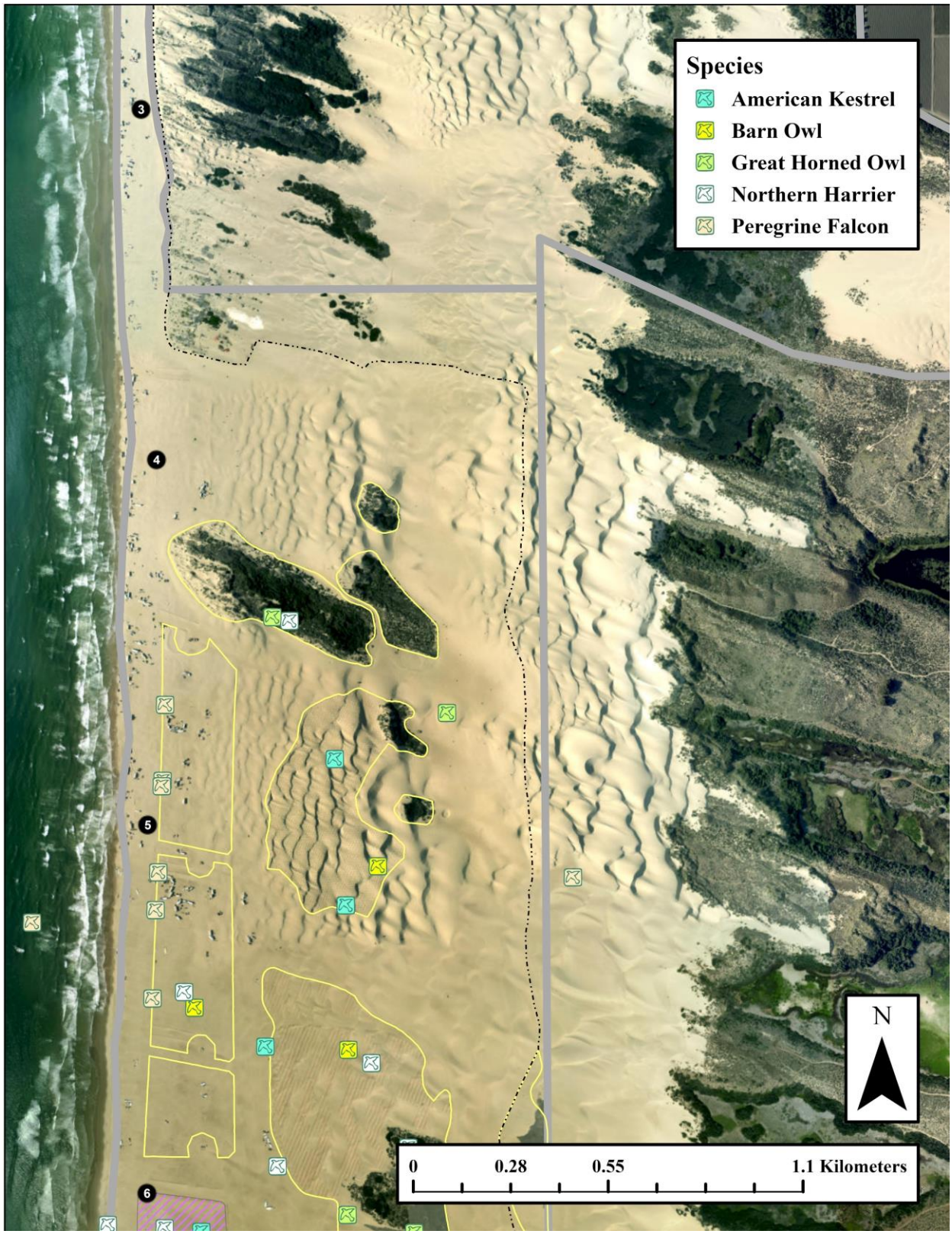

Figure 3. Locations of avian predators observed within or near north-central tern and plover nesting sites, at ODSVRA, during the 2021 nesting season.

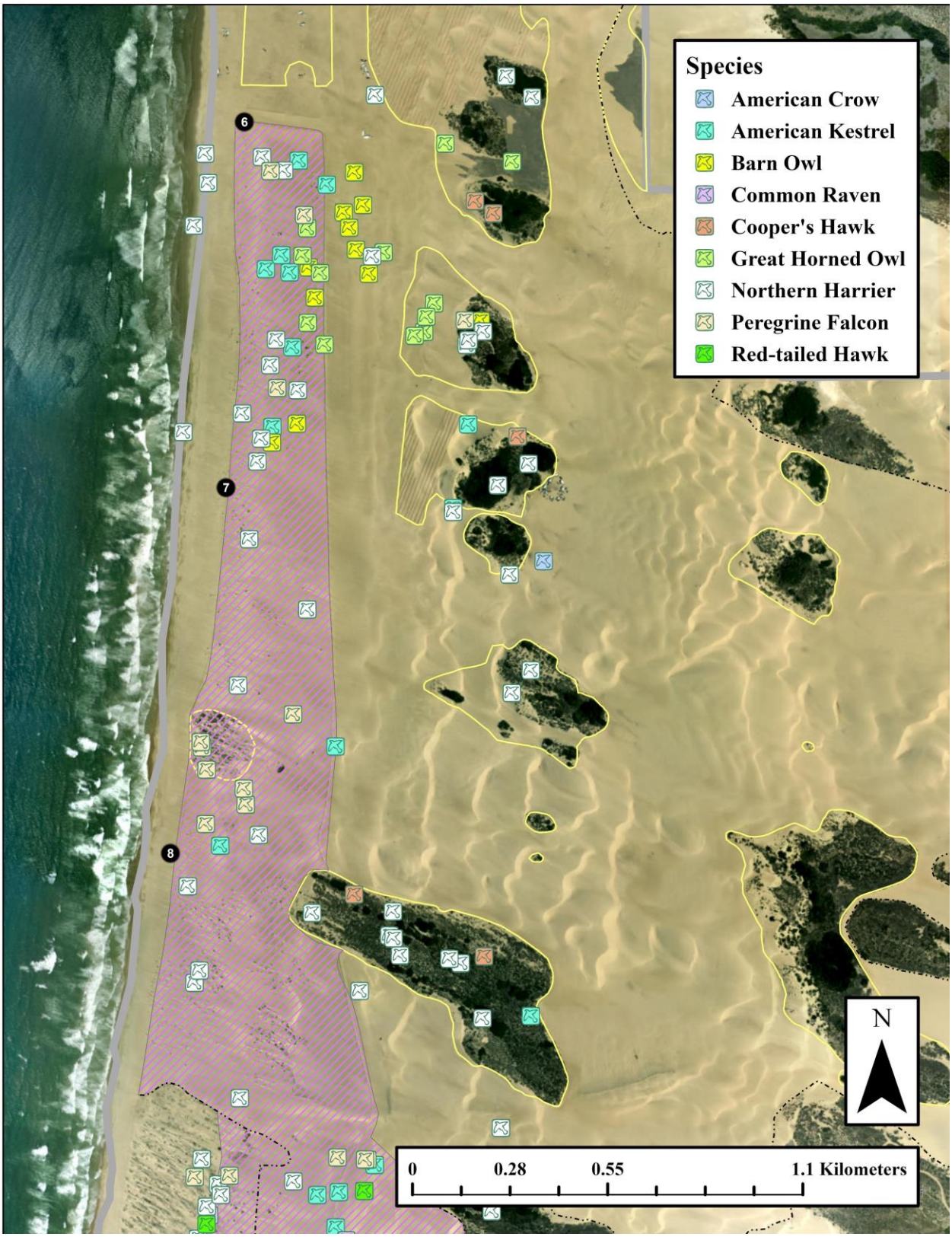

Figure 4. Locations of avian predators observed within or near south-central tern and plover nesting sites within ODSVRA, during the 2021 nesting season.

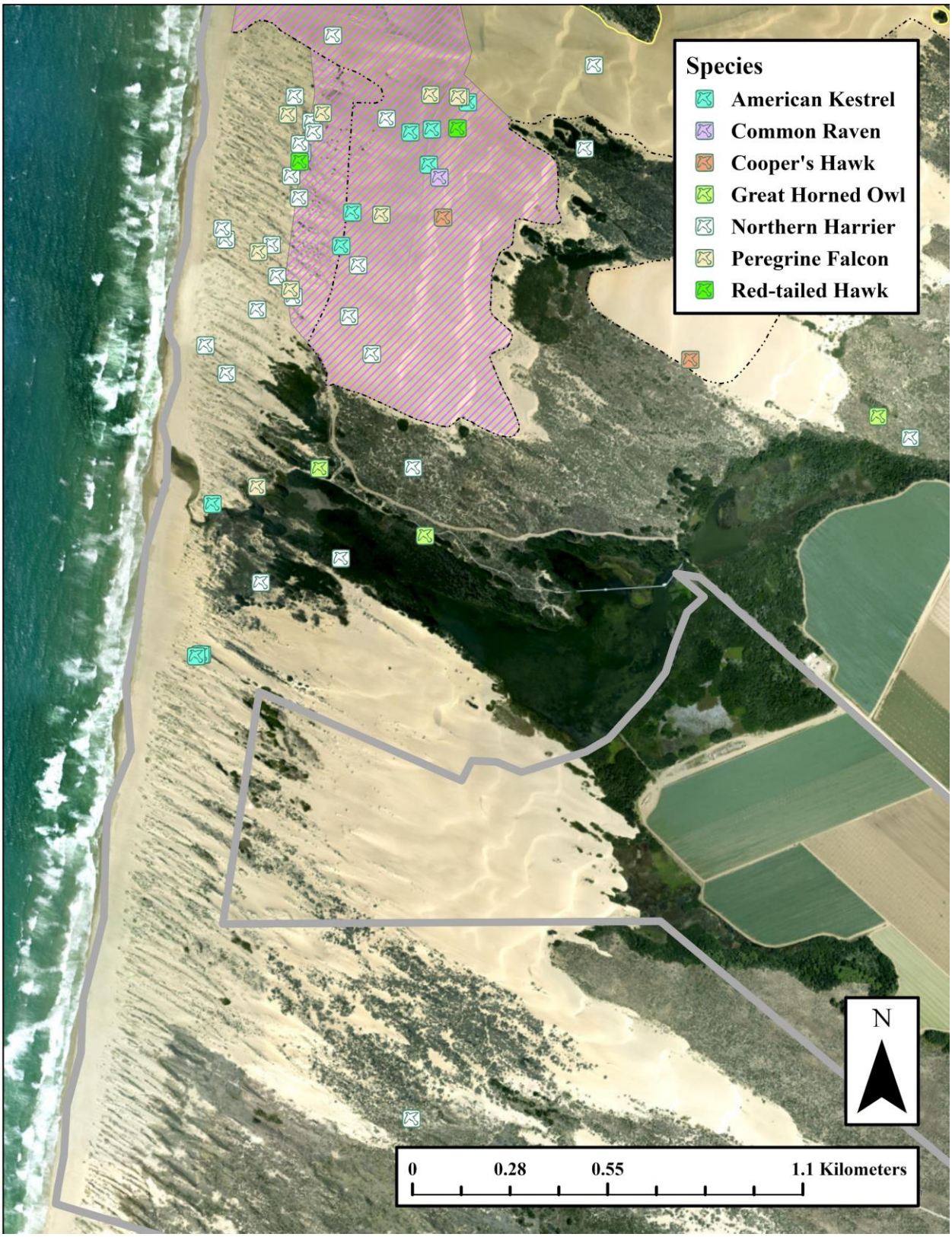

Figure 5. Locations of avian predators observed within or near southern tern and plover nesting sites within ODSVRA, during the 2021 nesting season.

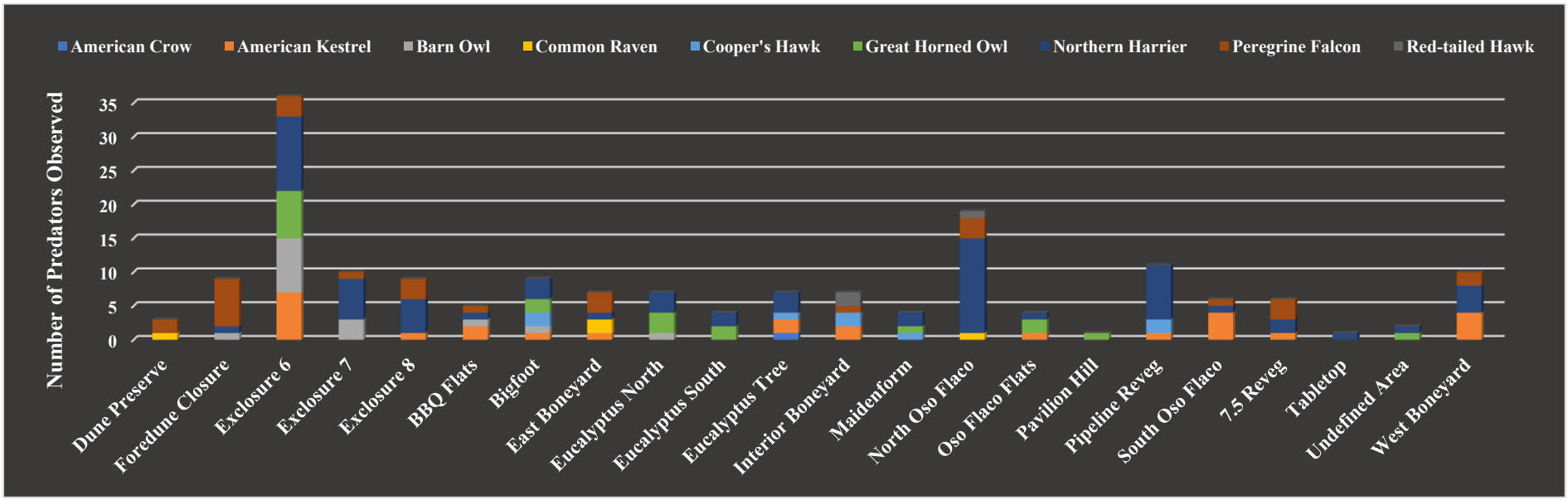

Figure 6. Avian predators observed, by species and site, within ODSVRA during the 2021 tern and plover nesting season.

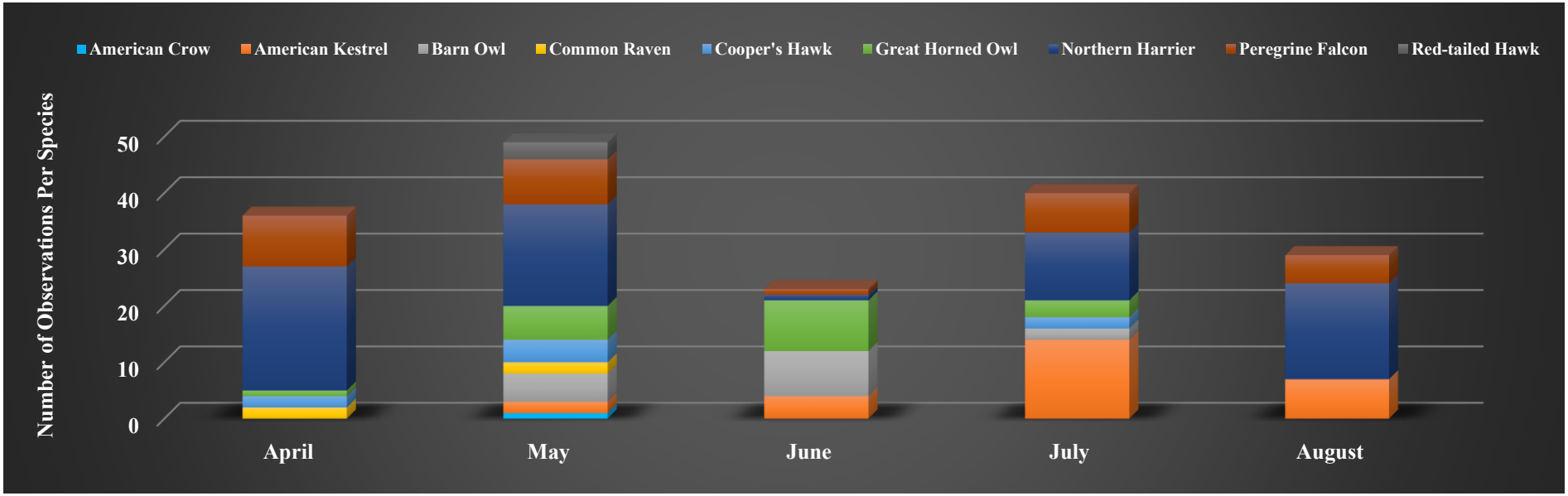

Figure 7. Number of avian predators observed per month and species, within ODSVRA during the 2021 tern and plover nesting season.

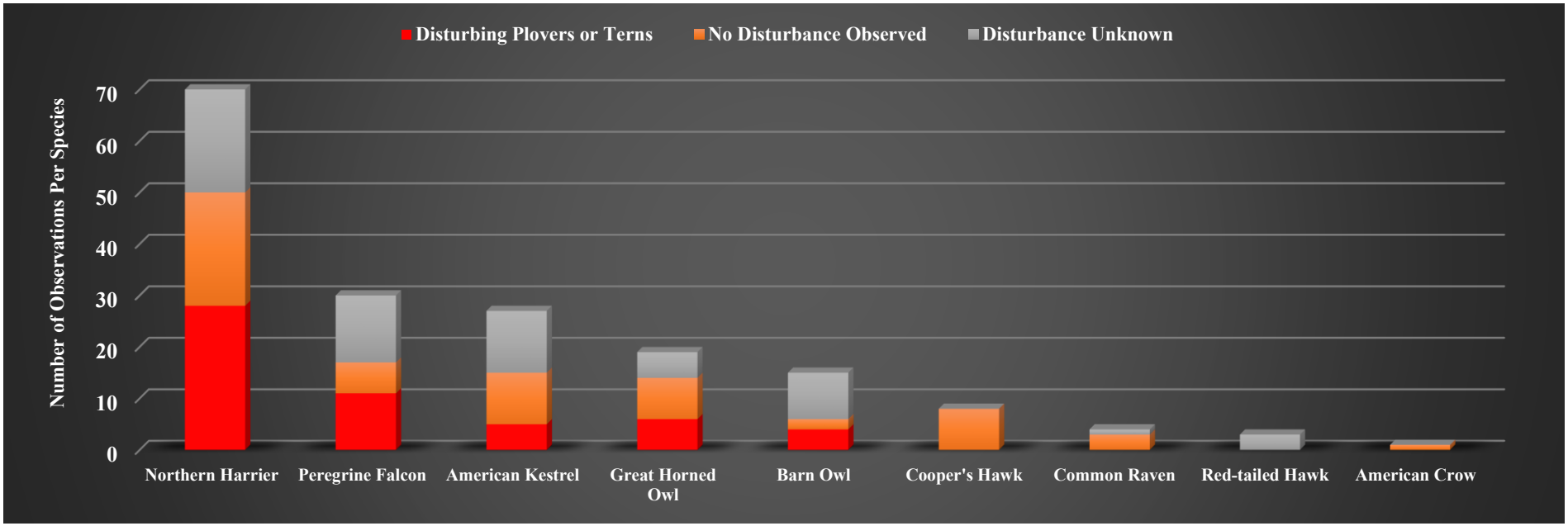

Figure 8. Number of avian predators observed by species, and the level of associated disturbance for terns and plovers within ODSVRA, during the 2021 nesting season.

Avian Predator Removal

During the 2021 nesting season, five individual avian predators were removed from within or near tern and plover nesting sites on ODSVRA during six removal events (Table 2). Four different trap types were used for the capture of these individuals, although a bownet comprised 50% of these captures. Four additional raptors were targeted for capture, but unsuccessfully, including an adult male NOHA, subadult male NOHA, adult male AMKE, and previously captured adult female PEFA [(VID) white on black 'W/49' (RL); USFWS 1947-18002 silver (LL)]. Approximately 60% of all trap hours were exhausted targeting multiple NOHA, with the most trap hours invested into the adult male NOHA (38.7%). Additionally, upon request by ODSVRA project staff, WI provided support to USDA/APHIS/Wildlife Services predator control personnel, to capture a single CORA suspected of depredating plover nests. A padded foothold trap was placed on the morning of 29 April within Boneyard, operated for a total of 14.5 hours, and the CORA was captured on 30 April. (Fig. 13).

A total of eight avian predators were targeted for trapping during the 2021 season. Of those, four individuals, including a second year male PEFA, adult female GHOW, adult male AMKE, and hatch year female NOHA, were able to be captured and translocated (Table 2). Although all individuals were observed hunting within tern and plover exclosures and/or within protected shoreline areas, all except the NOHA were captured outside of those areas. All translocated raptors were banded and measured prior to release, and all were released by WI personnel, excluding the AMKE, and the female PEFA after the second capture. The AMKE was translocated by the California Department of Fish and Wildlife's (CDFW) Volunteer Network (NRVP) after WI transferred it to them in Kettleman City, CA. Additionally, the PEFA was captured twice and translocated once by WI once during the 2021 season. Following the second capture, WI personnel moved the bird to the Bird and Pet Clinic of Roseville, CA, per instructions from CDFW. Per email conversations with representatives from CDFW, that individual was still being held in captivity as of 30 August, with the intent to release it again after the fires and associated smoke in the air within potential release locations in northern CA, subsided.

Table 2. Avian predators removed, by species and trap type, during the 2021 tern and plover nesting season at ODSVRA.

Species	Bal-chatri	Bownet	Padded Foothold	Harnessed Dove	Captures Per Species
Great Horned Owl	0	1	0	0	1
Common Raven	0	0	1	0	1
American Kestrel	1	0	0	0	1
Peregrine Falcon*	0	1	0	1	2
Northern Harrier	0	1	0	0	1
Total	**1**	**3**	**1**	**1**	**6**

* Individual captured twice within the 2021 season on ODSVRA

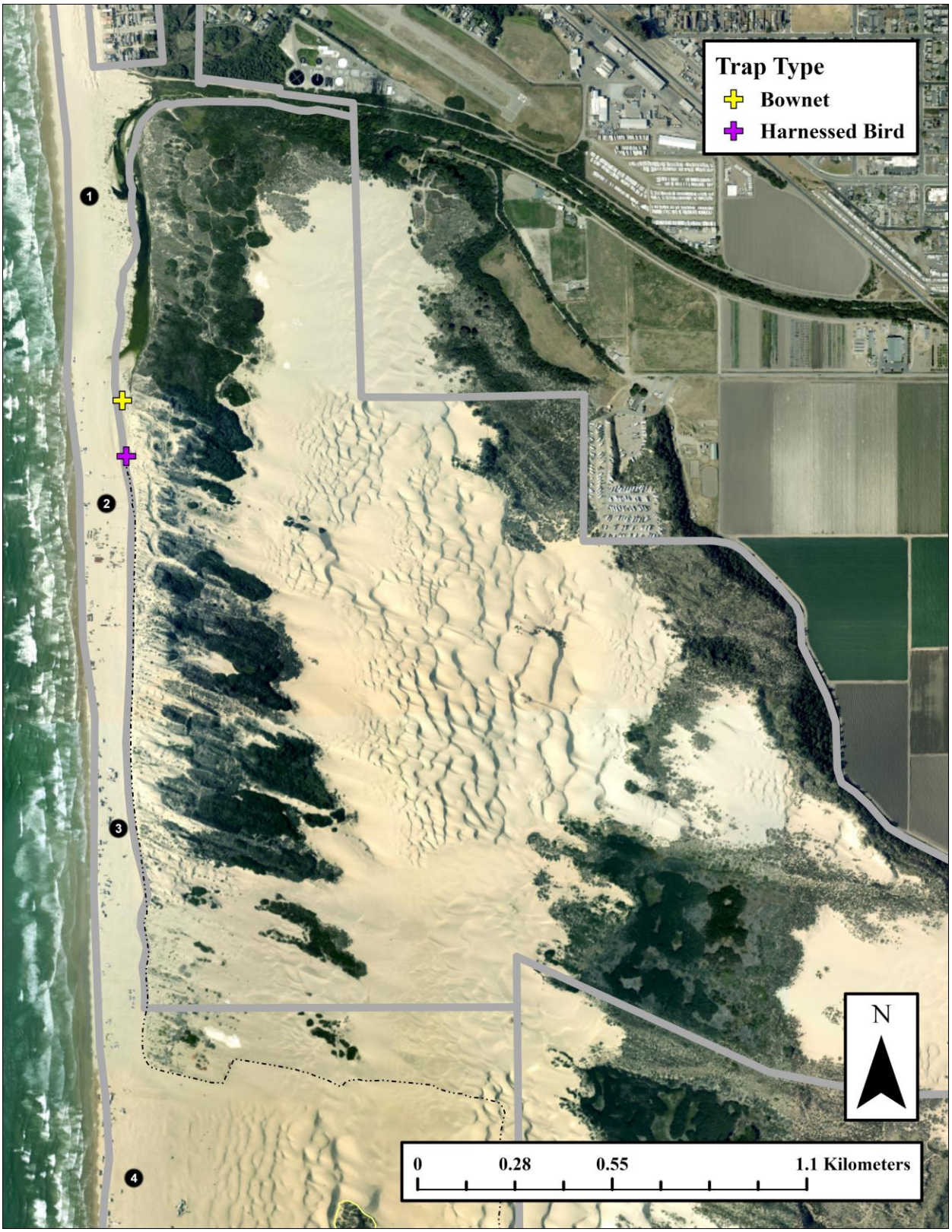

Figure 9. Locations of traps placed, by trap type, to capture raptors and owls within and near northern beach nesting areas of ODSVRA used by plovers and terns, during the 2021 nesting season.

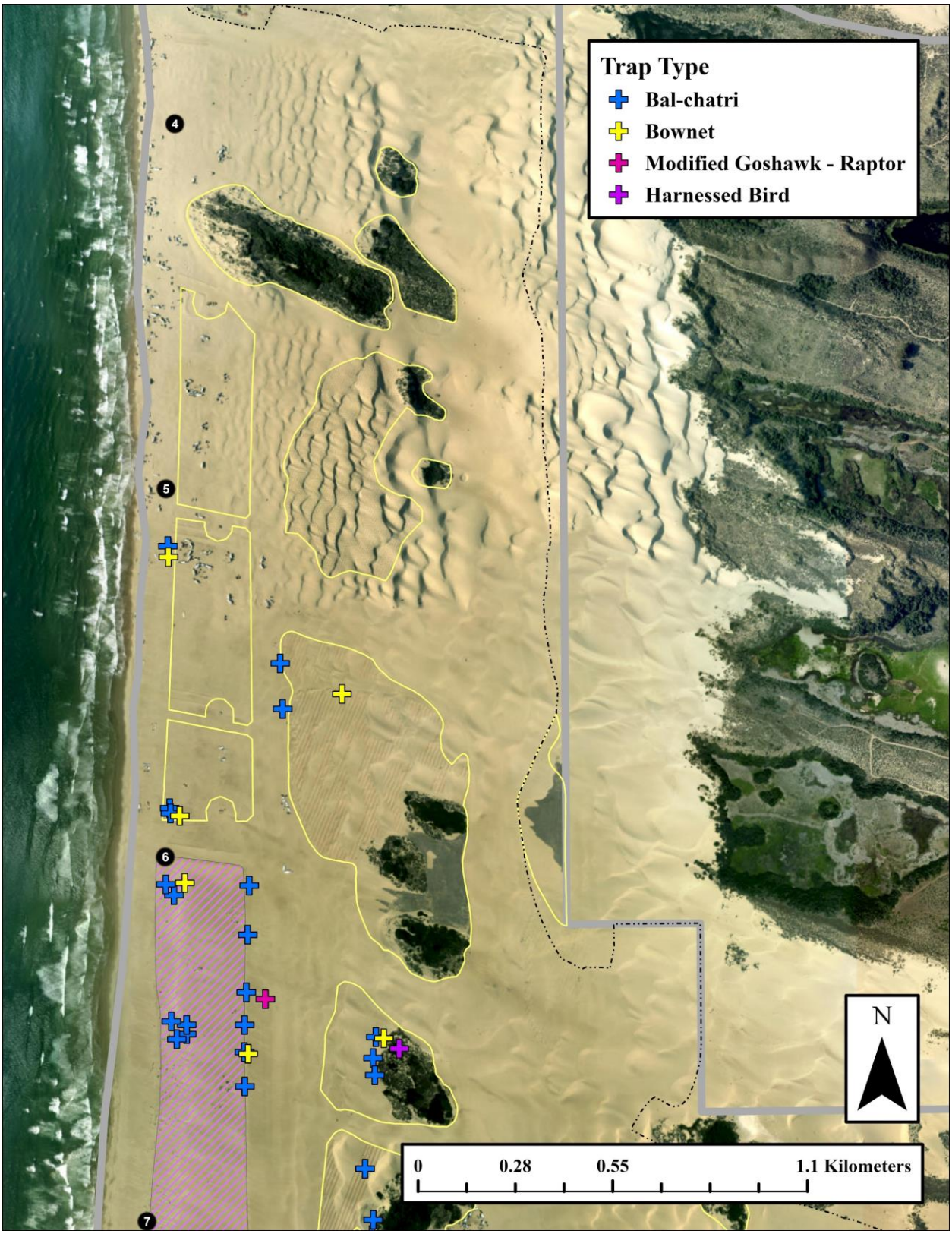

Figure 10. Locations of traps placed, by trap type, to capture raptors and owls within and near central beach nesting areas of ODSVRA used by plovers and terns, during the 2021 nesting season.

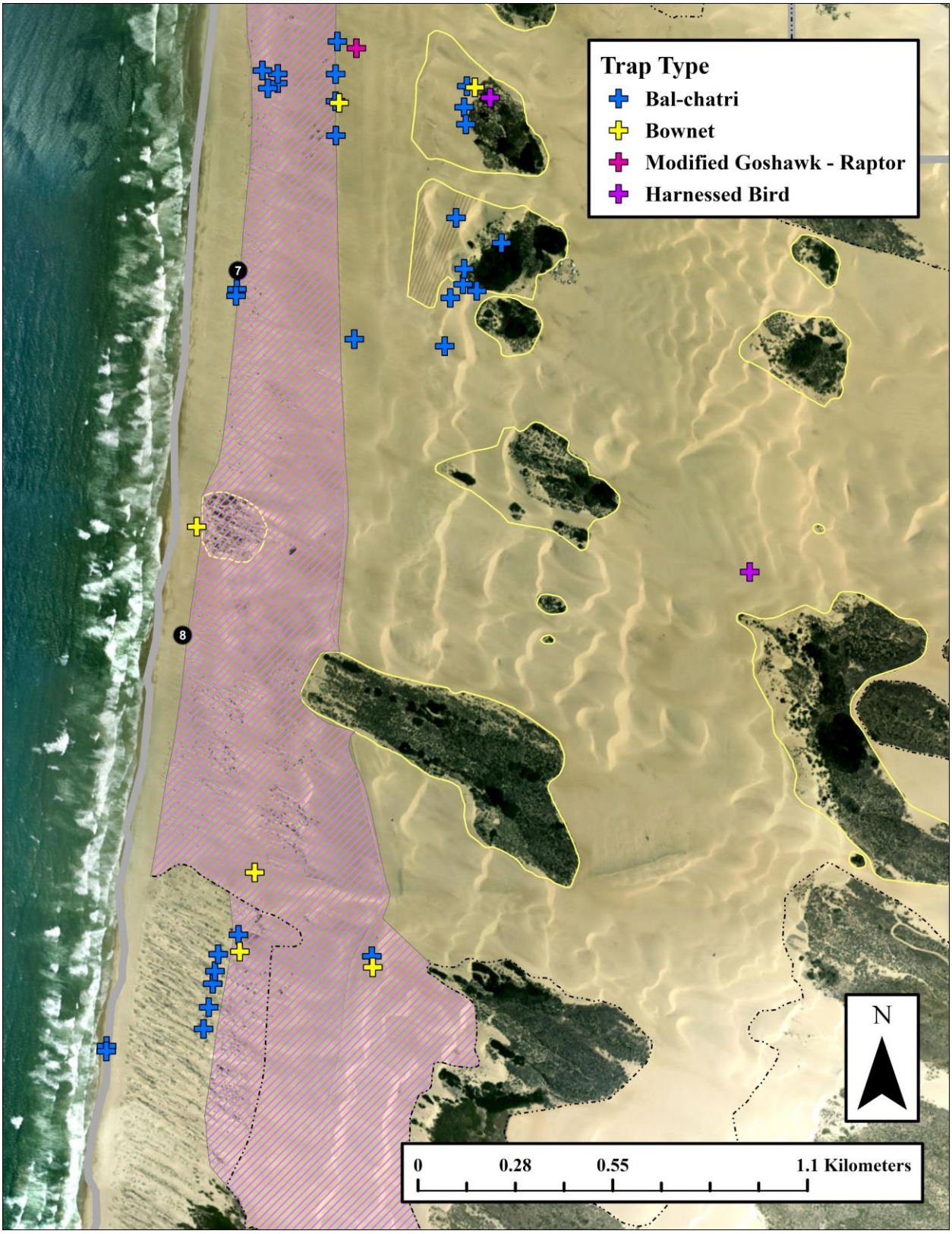

Figure 11. Locations of traps set, per trap type, to capture avian predators, within and near southern beach nesting areas of ODSVRA, during the 2021 nesting season.

Table 3. Avian predators targeted for removal, trap effort per individual, trap type used, and trap locations during the 2021 tern and plover nesting season at ODSVRA.

Targeted Individual	Age	Sex	Areas Trapped	Trap Types Used	Days Trapped	Hours Traps Deployed	Total Trap Hours	Targeted Individual Captured	Date Captured
Adult Male NOHA	Adult	Male	Arc Site, 8 Exclosure, Bigfoot, Eucalyptus North	Bal-chatri, Bownet, Harness Trap	20	235	330.5	No	NA
Subadult NOHA	Second Year	Unknown	Eucalyptus Tree, 6 Exclosure, Foredune Closure	Bal-chatri, Bownet	15	128.5	184.5	No	NA
GHOW	Adult	Female	6 Exclosure Fence, Eucalyptus North	Bal-chatri, Bownet	14	124	176.5	Yes	6/22/2021
PEFA 91AK	Second Year	Male	IBY Fence, Boyscout, AG Creek	Bal-chatri, Bownet, Harness Trap	6	39	45	Yes (Twice)	5/14/2021 & 8/9/2021
PEFA W49	Adult	Female	5 Shore, 7.5 Reveg	Bal-chatri, Bownet, Harness Trap	9	30.5	34.5	No	NA
GHOW/BANO	Unknown	Unknown	East of 6 Exclosure	Modified Swedish Goshawk Trap	7	63	63	No	NA
First Male AMKE	Adult	Male	East 6 Exclosure Fence line	Bal-chatri	3	9.3	32	Yes	8/4/2021
Second Male AMKE	Adult	Male	West Bigfoot Fence	Bal-chatri	1	2	4	No	NA
Total					**93**	**590.3**	**853.25**		

Table 4. Raptors and Owls captured and translocated from within ODSVRA during the 2021 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	Release Date	Released By
5/14/2021	Boyscout	PEFA	AHY	F	1947-43863	VID	Black, 91 over AK	Harness Trap	Pigeon	Horse Creek, CA	16-May	Wildlife Innovations
6/22/2021	Eucalyptus N.	GHOW	AHY	F	1218-01287	ACRAFT	C over 6	Bownet	Starling	Winton Park, CA	24-Jun	Wildlife Innovations
8/4/2021	Eucalyptus Tree	AMKE	AHY	M	1893-30005	ACRAFT	2 over 0	Bal-Chatri	Zebra Finch	Los Banos, Wildlife Area	6-Aug	CDFW NRVP
8/12/2021	6 Exclosure	NOHA	HY	F	1235-01608	ACRAFT	4 over A	Bownet	Starling	Olancha, CA	12-Aug	Wildlife Innovations
8/9/2021	AG Creek	PEFA	AHY	F	1947-43863	VID	Black, 91 over AK	Bownet	Pigeon	Still in CDFW custody	NA	NA

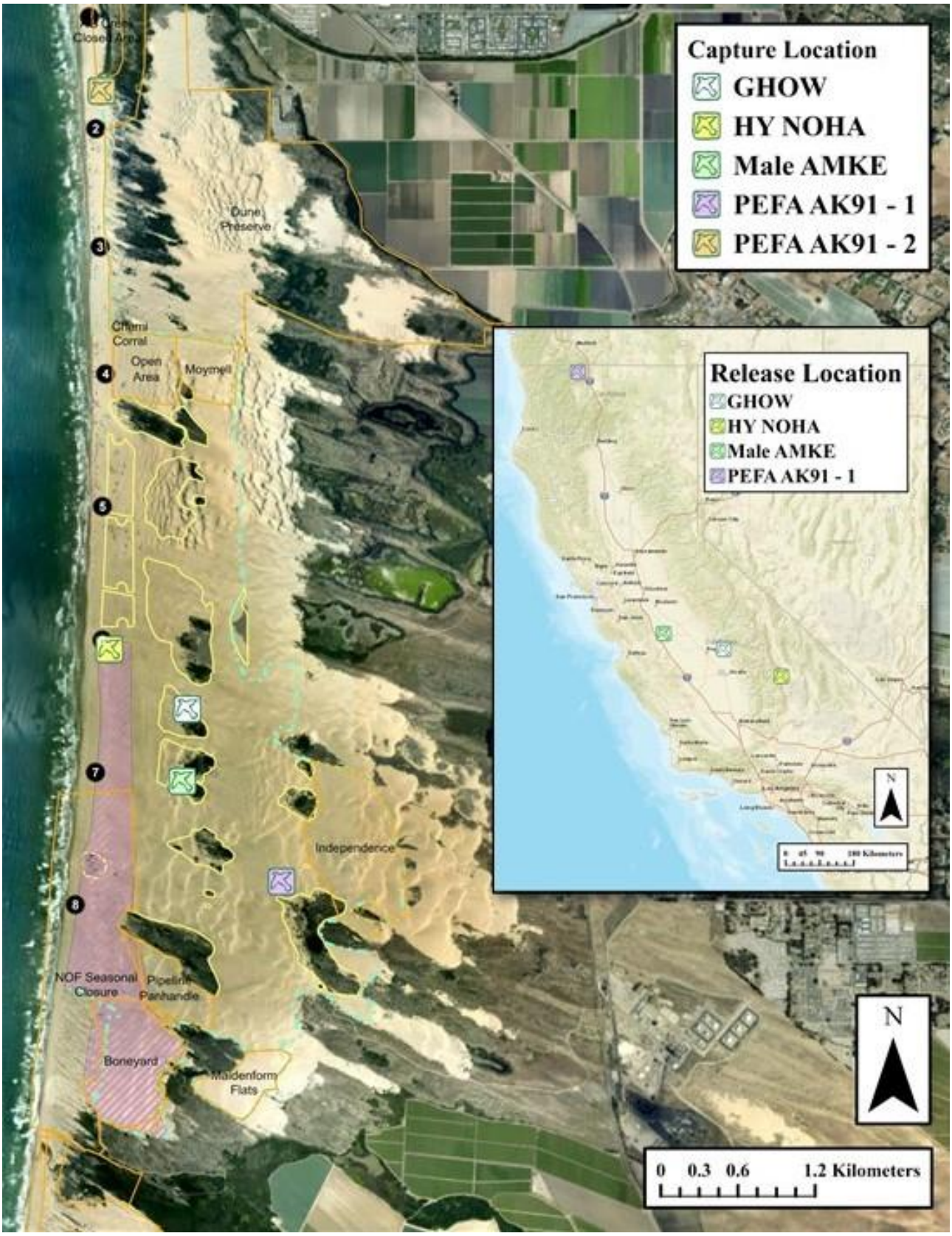

Figure 12. Capture and release locations of raptors and owls removed from within and near tern and plover nesting areas of ODSVRA, during the 2021 nesting season.

Figure 13. Location of trap placed to capture CORA within the Boneyard of ODSVRA, during the 2021 tern and plover nesting season.

Predation Investigations

Due restrictions imposed upon WI personnel to access tern and plover nesting areas, the amount of time required to transit between sites, and because some traps could not be left unattended, many of the predations discovered by ODSVRA during the 2021 season, were unable to be investigated by WI personnel. As a result, summary of predations reported within this report are a compilation of findings from investigations conducted by both WI and ODSVRA personnel. For a comprehensive summary of predations, please see the ODSVRA monitoring report (CDPR 2021).

DISCUSSION

This was the first year of a 3-year agreement between ODSVRA and WI, to provide raptor and owl management to benefit nesting terns and plovers. As the contract was not fully executed until 19 March 2021, WI personnel were unable to begin acquiring necessary equipment, learning the site and associated logistics, or evaluate predator presence and activity ahead of nesting efforts. During the 2022 and 2023 seasons, WI expects to be able to get an earlier start on field work, which should help increase the success of the ODSVRA raptor and owl management program. Field work was conducted by senior level WI personnel during 2021, with supplemental assistance provided by other experienced WI biologists. This allowed senior WI personnel to gather site-specific information about the ODSVRA tern and plover program, including access limitations and logistics, and project expectations prior to training future project personnel. However, this also eliminated the time associated with training to new personnel, to ensure they were familiar and able to independently operate effectively within tern and plover nesting areas. That time was instead invested in getting the project up and running in an expedited manner.

Due to a variety of factors, not all predations discovered were able to be investigated by WI. The following data summary is a compilation of depredations discovered and investigated by both ODSVRA and WI personnel. A more comprehensive summary of nesting efforts and results can be found within CDPR 2021. During 2021, plovers laid 239 nests, 54 (22.6%) of which were determined to have been predated. Of those predated, 44 (81.5%) are strongly suspected to have been by avian predators, with CORA (n=10, 18.5%) and NOHA (n=11, 20.4%) being the most prominent predators of plover nests. Seven additional plover nests with hatched or abandoned pre-term fates, were partially depredated including five eggs by NOHA and four eggs by either unidentified or suspected predators (CDPR 2021). Terns laid a total of 53 nests, 49 (92.5%) of which hatched, and none were determined to have been predated. In addition to nest predation, a total of 28 individuals were determined to have been predated, 64.3% (n=18) of which were plovers, and 35.7% (n=10) were terns. Of the individuals predated, 53.6% (n=15) and 25.0% (n=7) were plover and tern chicks or juveniles, respectively, three were adult terns (10.7%) and one (3.6%) was an adult plover. Of the predated individuals for which the predator was able to be determined, 35.7% (n=10) were NOHA, 28.6% (n=8) were PEFA, 14.3% (n=4) were AMKE, 14.3% (n=4), 7.1% (n=2) were GHOW, 7.1% (n=2) were owls that were unable to be identified to species, 3.6% (n=1) were suspected to be from PEFA, and 3.6% (n=1) were from an unidentified predator.

Raptors as Predators of Terns and Plovers by Species

Northern Harrier

The NOHA is a cryptic marsh hawk, sometimes affectionately called “the grey ghost” by bird watchers. They specialize in hunting birds and small rodents and are well known to depredate eggs,

nestlings, and chicks of listed species within many nesting sites in California, including terns and plovers on ODSVRA (CDPR 2019, 2020, Wooten et al. 2017, 2018, 2019). An adult male NOHA was responsible for many plover nest predations within ODSVRA during April and May and may have been responsible for more that were unable to be documented, during the 2021 nesting season. Significant depredation by one individual hunting one nesting site, can result in reduced productivity within that site, but also can indirectly affect productivity within other sites by requiring predator management resources to focus on preventing predation from one individual, limiting the ability to adequately protect other sites. Harriers are notorious for being difficult to capture, often avoiding trap-types that are effectively used to capture similar species. Lethal removal of raptors is complicated, and most often not endorsed by state and federal regulatory agency representatives and others. The legality of lethal removal is further problematic for NOHA on state managed and regulated properties, as they are a Bird Species of Special Concern in California. This is further complicated by assertions from one prominent researcher to regulators, that over management of NOHA associated with listed species recovery programs, may be negatively affecting the coastal NOHA population in southern California (P. Bloom, Bloom Biological Inc., personal communication).

Despite these claims, many unique NOHA were observed within and near ODSVRA during the 2021 nesting season, possibly indicating that the local NOHA population is not as affected by management practices as asserted. A minimum of five individuals were observed on ODSVRA during the breeding season. Additionally, two visually distinct adult female NOHA were observed within a ten-minute period alone, from the road while entering the Rancho Guadalupe Preserve, a property that neighbors ODSVRA, on one morning in late April. During early season surveys, NOHA were primarily observed hunting within the southeastern areas of ODSVRA, within Oso Flaco Flats, NOF, Boneyard, PLR, Tabletop, and Maidenform. However, as the season progressed, they were observed hunting in nearly all of the veg islands, nesting exclosures, and shorelines. Although WI was only able to identify presence of five visually distinct individuals active within ODSVRA, many more observations of NOHA were unable to be identified to the individual level, at least some of which were suspected to be additional birds. For the purposes of this report, we will discuss the five distinct NOHA that were identified.

Subadult Female.—A subadult female was first recorded on 25 March, after which she was frequently observed hunting North Oso Flaco, Oso Flaco Flats, Maidenform, and AG field close to Little Oso Flaco Lake during the end of March and throughout April. She was also occasionally observed hunting in the veg islands east of the tern and plover nesting exclosures but was not identified as a significant threat to nesting terns or plovers; therefore, no management actions were initiated. Surveillance of this individual suggested that she roosted near Little Oso Flaco Lake.

Adult Male.—An adult male NOHA, first observed on 2 April at Eucalyptus North, was responsible for the largest number of documented plover nest depredations during the 2021 season. During subsequent observations, this individual was most often recorded hunting Boneyard, SOF, NOF, 7.5 Reveg, 8 shore, and Reveg Islands, and believed to have a nest located within the Rancho Guadalupe Dunes Preserve, southeast of the SOF shoreline. After obtaining permission from preserve managers, WI spent two days (19 and 20 April) trying to locate the nest, so that capturing the adult male near the nest could be considered as an option. During the afternoon of 20 April, an adult female was observed briefly, hunting the surrounding area; however, WI was forced to abandon the survey position due to approaching high tide and

was unable to wait until the male returned to feed or otherwise interact with the female on or near their possible nest. While walking back to the shoreline to exit ahead of the approaching tide, the male NOHA was observed transiting to the area where the female was last observed, possibly supporting that they were a pair and could have had a nest nearby. WI planned to return on 22 April to conduct more observations of this area and to try to locate a nest, but the high tides prevented a return trip. Also, during subsequent discussions with the preserve and ODSVRA managers, it was determined that WI was not authorized to employ raptor management within Rancho Guadalupe. Therefore, no further nest searching was conducted within that property, and instead, target trapping for this individual was initiated within ODSVRA to mitigate the predation threat to nesting terns and plovers.

The adult male NOHA was initially documented entering ODSVRA between 09:00 and 12:30 and casually hunting various habitats within. Eventually, he began arriving onsite later in the afternoon and moving in a more determined directional manner, flying fast and low straight to the nesting exclosures. It is likely that this shift in behavior was the result of success taking plover nests from within exclosures; unfortunately, the shift in behavior reduced the potential to capture him outside of the nesting exclosures substantially, as he did not appear to begin hunting until he reached 8 Exclosure from the south. Since he was most often observed transiting through the eastern section of the NOF foredunes, the Arc Site, and Boneyard to reach the nesting exclosures, WI conducted most of trapping within that travel route in an effort to prevent him from reaching nesting areas with higher concentrations of plover nests. Although he flew within view of traps and lure animals on multiple occasions, he only briefly displayed interest in a trap on one occasion during the first few days of trapping. Despite the amount of trapping effort, utilizing multiple trap types and lure animals (i.e. mammals, birds, quail eggs), the male NOHA was not able to be captured and continued to depredate nests within tern and plover nesting areas.

Nest predations from this harrier were not only discovered and observed directly by WI and ODSVRA personnel but were also captured on nest cameras. Camera footage documented the male NOHA consuming a single egg from plover nests, leaving the area, and then returning the next day to consume another or the remaining eggs. On some of these occasions, adult plovers returned to incubate the remaining egg(s), information that would not have been gained without the camera footage. This information was a valuable discovery that may help better identify and document NOHA predation of tern and plover nests and ultimately help to improve NOHA management during future seasons. Typical NOHA hunting behavior includes flying low to the ground and attempting to capture animals that are flushed from or active within vegetation, supporting that NOHA may rely heavily on movement to locate and capture prey. Therefore, project cooperators initially hypothesized that the male NOHA was locating plover nests due to the movement of the incubating adult.

To help test this theory and explore the use of artificial nests as a potential bait to capture him, WI placed Japanese Quail eggs into recently depredated plover nests that had a camera on them and were no longer being attended by the adult plover. On 25 April, the male NOHA visited the nest (former SP23) and attempted to eat the quail eggs but seemed unable to break them open. He made multiple attempts to crack open the quail eggs, including picking them up, biting down on them, dropping them, and eventually leaving, with the eggs scattered around the area. The quail eggs were left intact despite the NOHA's efforts to break them open and consume them. The quail eggshells were thicker and larger in diameter than plover and tern eggs,

possibly requiring more bite pressure than the NOHA was able to provide to puncture them. As the male NOHA returned to a previously depredated nest that did not have an adult plover attending it, rather than relying on the movement of an adult to locate nests, he may have instead recognized the size and shape of plover eggs or remembered where nests that he had already visited were located.

Since the NOHA returned and tried to consume the artificial nest, WI attempted capture him using artificial nests as a lure in conjunction with a bownet. Unfortunately, these efforts were unsuccessful, as the NOHA did not appear to visit artificial nest sets after the initial visit. This could have been because he did not receive a reward from the quail eggs during the first attempted depredation, and he may have been able to recognize the difference between plover and quail eggs following that event. If eggs, which are closer to the size of plover and tern eggs, are identified and found to be commercially available, they may provide an additional bait option for problem raptors targeting eggs in future years. Another option could be to reduce the thickness of the quail eggshells, chemically or mechanically, enough to allow the NOHA to puncture and consume them. If this is determined to be possible, pre-baiting a problem individual ahead of trapping may increase capture success.

By 7 May, 40% (29 of 73) of plover nests on ODSVRA were suspected to have been depredated by the adult male harrier. Despite extensive efforts by WI, he was unable to be captured. Based on behavior, morphological similarities, and suspected origin (within the Rancho Guadalupe Dunes Preserve), it is likely that this was the same individual documented taking eggs from within ODSVRA during the 2020 nesting season. Raptor Biologists from Bloom Biological Inc. spent more than 500 hours attempting to trap an adult male NOHA during 2020, due to it depredating plover nests, but were ultimately unsuccessful. As this individual likely caused significant impacts during the 2020 and 2021 nesting seasons, the decision was made to lethally remove it to prevent further loss of nesting terns and plovers. Even after permission was obtained from state and federal regulatory agencies to lethally remove it, it took USDA/APHIS/Wildlife Services nearly a month to complete the action (removed on 3 June), due to various logistics. Following lethal removal of that individual, nest predations by NOHA stopped. As approval for lethal removal of raptors can be a lengthy process, and removal action itself can take a substantial amount of time to complete even after permission is granted, it is important that potential threats are identified quickly and then closely monitored to help ensure that management decisions are made and enacted promptly, to help prevent significant impacts to threatened and endangered species.

Adult Female.— While trapping for the adult male NOHA, an adult female harrier was observed hunting within NOF and the Arc Site, on two occasions. She entered the area from the south during both observations, and within 13 and six minutes, respectively, of the adult male NOHA. During the first observation of her, she hovered over the top of one of the Bal-chatri traps, placed to capture the adult male NOHA, and then perched on a nearby dune and watched the trap for more than five minutes before flying south. As no visually distinct physical features or bands were present on either individual, WI was not able to determine whether this was the same adult female observed within the Rancho Guadalupe Dunes Preserve while nest searching, but it is strongly suspected that she was a different female considering the distance between the trap and suspected nest location. Although male harriers can support multiple nesting females at a time during the nesting season, no evidence, other than these two observations of the female

in proximity to the male, support that they were a pair. No adult female NOHA were observed again in this area after 13 May.

Subadult Male.—A subadult male NOHA, individually identifiable due to one missing tail feather and one missing left primary feather, was observed hunting onsite frequently within 6 and 7 Exclosures and protected Shorelines, between 19 July and mid-August. On 21 July, it was observed hunting the veg islands (Bigfoot, BBQ Flats, Eucalyptus North) then entered 7 Exclosure and depredated an unknown animal in dunes, while getting mobbed by terns. Trapping for this individual was initiated in Eucalyptus North on 23 and 24 July, after it was observed consuming one tern chick and additional unidentified prey items from within tern and plover nesting areas, during five consecutive days. On one afternoon, 11 attempts were made to haze this individual (ten via pyrotechnic bird whistlers and one with a green laser) before it left the nesting area; however, the deterrence was brief, and the subadult male harrier returned to hunt the nesting areas later that same day. The bird whistler pyrotechnics deployed to attempt to haze it from the tern and plover nesting areas were relatively ineffective on this individual. This may be due to indirect and frequent exposure to them when deployed to haze other species or individuals within proximity to this individual. This NOHA also displayed little reaction to the laser, although it seemed to acknowledge that it saw the laser beam briefly.

As WI personnel were also working nights to survey for and trap for a GHOW at that time, and the owl was considered a threat to adult terns, further trapping for the NOHA had to be postponed until 8 August. Trapping for the subadult NOHA was ultimately unsuccessful, but initial trapping limitations may have contributed to the lack of success. Based on observations of this individuals' hunting behavior, the optimum location to place traps for successful capture was within the northern section of 6 Exclosure. Due to presence of tern and plover chicks within the northern portion of this Exclosure, WI was prevented from placing traps during the first two days, which prevented trapping during a critical period, reducing the potential for capture while disturbance and depredations from the NOHA continued to occur. The longer a predator such as a NOHA spends successfully exploiting a food source, the less likely it may be to pursue alternate food items such as lure animals used for trapping, which is necessary for capture. For these reasons it is important to optimize placement and timing of all trap sets, especially when dealing with trap-shy species or individuals.

Hatch-year Female.—A hatch-year (HY) NOHA was first recorded hunting the Veg Islands on 23 July. Subsequent observations indicated that this individual progressed to hunting more frequently within the 6 and 7 Exclosures but was not documented taking terns or plovers. During the second week of August, while hunting within 6 Exclosure, the HY NOHA was inadvertently captured while trying to capture the subadult male NOHA. Since this bird had been observed hunting inside the Exclosures on multiple occasions and because NOHA are notoriously difficult to capture, if released onsite, the probability of being able to recapture it should it start depredating terns and/or plovers (during the 2021 nesting season or future seasons), would be significantly reduced, limiting future management options. Therefore, in coordination with USFWS and CDFW permitting representatives, the decision was made to translocate it instead of releasing it onsite. Factors, such as the species, age, perceived threat to tens and/or plovers, and time of year, should be carefully considered before releasing individuals captured within a management area, regardless of whether the individual has been previously documented depredating terns, plovers, or their nests.

American Kestrel

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, with one individual observed taking up to six plover chicks in less than two hours (J. Manley, Wildlife Innovations, personal communication). Kestrel sightings within ODSVRA were infrequent until July and August of the 2021 nesting season, and most observations were of adult males. Initial observations indicated that they were primarily targeting insects; however, on 2 August, an adult male was observed depredating two plover chicks, and therefore was targeted and captured to prevent further predations. On 3 August, another male was observed catching prey from the southern 6 exclosure shoreline and carried it to Eucalyptus Tree revegetation are (wing and feather remains confirm the prey was a plover chick). On 4 August, a male was again observed perched on the western Bigfoot fence eating a prey item that appeared to be a plover chick or juvenile. The second male was also targeted for capture and translocation but left the area soon after traps were deployed and was not seen again.

Kestrels present within ODSVRA during the early and middle portion of 2021 tern and plover nesting season were assessed as a low threat until 2 August. This trend is common on other nesting sites, where AMKE also do not threaten terns or plovers until later in the season. This may be because adult AMKE are leaving nesting territories during that time, juveniles are dispersing from natal territories, and migrants are passing through within some sites. Despite their size, they can depredate many chicks within relatively short time periods if not managed and must be monitored closely when hunting within or in proximity to tern and plover nesting sites. Due to their aggressive nature, AMKE are typically more trappable than some other species of raptor. During future seasons, predator control personnel should continue to monitor AMKE onsite vigilantly during the early and middle of the season, as tern and plover nesting season progresses and chicks begin being more mobile, in order to identify when new and high-threat individuals arrive onsite or locals shift from targeting other prey to chicks; should this occur, it will be important to implement trapping quickly and minimize predations incurred by terns and plovers.

Peregrine Falcon

Peregrine Falcons are well-known to depredate tern and plover chicks, fledglings, and adults, and have been documented doing so at numerous sites along the California coast, including ODSVRA (CDPR 2019, CDPR 2020, Biteman and Manley 2021, Wooten et al. 2016, 2017, 2018, 2019, Marschalek 2009). Peregrine Falcons again presented one of the most prominent avian predatory threats to terns and plovers nesting within ODSVRA during 2021. Effective management of PEFA was challenging during 2021 for several reasons. Although a minimum of four individuals were identified and recorded hunting terns and plovers within and near nesting Exclosures, two were recorded most frequently. Of those two individuals, one was an adult female that was captured and translocated from ODSVRA initially during 2019 and the other was a subadult male that was captured and translocated twice during the 2021 season.

W49.—An adult female PEFA, was initially documented depredating terns and plovers within ODSVRA as a subadult during the 2019 season, captured on 24 June of that year, banded (Auxiliary VID band ‘W49’), and released the following day near Lone Pine, California (36°33’35.88” N, 118°03’28.15” W). Less than 200 miles *as the crow flies*, that translocation effort was far shorter than PEFA are typically translocated when documented depredating terns or plovers within other programs and far shorter than PEFA have been documented to return to the site of capture from. She was initially documented to have returned to ODSVRA on 9 April

2020, when she was again observed depredating plover adults and chicks. Despite efforts to do so, she was unable to be recaptured during the 2020 season. During the 2021 season she was first suspected onsite on 5 March, when a banded PEFA with similar plumage to W49 was observed eating what appeared to be a gull; however, the bands were unable to be confirmed. Observations made by both ODSVRA, and WI indicated that W49 continued to actively hunt terns and plovers for the duration of the season, documented doing so for periods of consecutive days multiple times, confirmed to have depredated a minimum of four plovers between 11 July and the end of August, and suspected of depredating more. She was most active along the shorelines from foredunes to SOF, and typically observed beginning hunting efforts within the north and working her way south.

As W49 was previously captured during 2019 and was likely exposed to additional trap types, sets, and lures, due to attempts to capture her again during 2020, WI expected her to be wise to most trap sets and lure presentations, making her very difficult if not impossible to capture. Considering these factors, optimal placement and operation of traps would have been critical to maximize the potential to recapture her. Based on her hunting activity, the optimal location to place traps was within the northern shoreline area, close to post 5, as this bird was observed for consecutive days perched here during early morning hours. Typically, traps would have been placed well before daylight in this area to prevent W49 from arriving and observing traps being set or a vehicle in the area. Additionally, lure animal placement in a location where the PEFA was likely to initiate its hunt and prior to human activity would have increased chances for success. Wildlife Innovations requested and was initially denied permission by ODSVRA to trap within that area and to deploy traps prior to daylight to avoid disturbing snowy plover broods. Permission to enter the shoreline by vehicle prior to daylight was later allowed, but the most favorable trapping window during which a targetable behavioral pattern had been identified, was missed while awaiting permission to access that area, and contributed to the lack of capture success. Trapping efforts consisted of multiple locations and types of traps and sets, but ultimately, she was unable to be recaptured during 2021. As W49 is likely to return to hunt terns and plovers again during future nesting seasons, WI suggests pursuing permission from state and federal permit representatives to begin trapping for this individual as soon as it arrives on site, so trapping limitations can be reduced and chances for success increased.

91AK.—This individual was observed hunting, taking, and consuming small birds within the highest density tern and plover nesting areas frequently (9 of 12 days) during the first part of May. ODSVRA monitoring personnel attempted to haze the SY PEFA from within nesting areas using pyrotechnic whistlers on multiple occasions, although, the effect was only temporary and the PEFA typically just moved between exclosures before resuming hunting. Although no depredations were able to be confirmed initially, the SY PEFA was documented disturbing terns and plovers, eliciting alarm calls from both species, and distraction displays from plovers, during May, satisfying guidelines provided by the USFWS for capture and translocation of raptors (2013). Due to persistent disturbance to terns and plovers, WI targeted the SY PEFA for trap and translocation. The SY PEFA was trapped and banded with a service band (1947-43863; RL) and auxiliary VID marker (91 over AK; LL) on 14 May, translocated and released near Horse Creek within far Northern California (41.882222, 122.837469), on 16 May.

On 1 August, 91AK was confirmed to have returned to ODSVRA and was observed eating a juvenile tern, while being aggressively mobbed by other terns. This PEFA was observed

hunting within and near nesting exclosures for the next nine consecutive days by both ODSVRA monitoring personnel and WI, with two predations confirmed from him during the same period. Due to the renewed threat to terns and plovers from 91AK, WI began trapping for it again. During the early morning hours of 6 and 7 August, ODSVRA monitoring personnel observed 91AK perched on a post by AG Creek. On 8 August, WI deployed a bownet in this area prior to daylight. 91AK arrived soon after sunrise flying fast, grabbed the lure bird (European Starling) mid-flight disconnecting it from its tether, and carried it away from the trap location. As this occurred quickly, and without 91AK landing within the capture area for the bownet, it was not able to be captured. The bownet was deployed again the following morning with a pigeon as a lure, and 91AK was recaptured. The ability of WI to optimize a trap set for this bird immediately following the identification of an opportunity, likely contributed to its capture success.

As 91AK had already been captured, translocated, and returned to depredate plovers within ODSVRA during 2021, there is a strong possibility that it will not be able to be captured again, should it return. If not able to be recaptured, and it continues to disturb and depredate terns and plovers, lethal removal will likely be the only remaining option to adequately protect nesting terns and plovers. In an effort to prevent the need for lethal removal of 91AK in the future, WI made a request to state and federal permit representatives that it not be released again. Although the USFWS representative agreed to place 91AK within captivity as an educational bird, CDFW ultimately decided that it would be released again. During the writing of this report, 91AK was still in captivity, due to forest fires in Northern California and the health risk associated with poor air quality.

A growing amount of observations support that some PEFA learn to target terns and/or plovers, while others do not, and adults with established territories are far more likely to return to their area of capture than young birds. This supports that if adult PEFA are confirmed to target terns or plovers, especially those that have returned after being translocated, preemptive trapping or lethal removal should be considered more quickly to prevent additional predation of listed and sensitive species. Additionally, previously trapped individuals tend to be trap shy at a minimum, but may ultimately be uncapturable, exhausting time that could be spent within other important aspects of the avian predator management program.

Young PEFA have been described as very transient, and if they have not yet become established within an area, they may be coerced to move on and away from depredation sites using harassment. Based on extensive experience attempting to harass a variety of raptor and owl species away from areas containing established food resources, WI believes that this would be very difficult to accomplish and are not aware of anyone who has successfully prevented harassed individuals from returning using only harassment. However, because trap and translocation are time consuming, expensive, and because PEFA may be more prone to return to capture locations despite long-distance translocations, WI is determined to pursue the development of new techniques to attempt to harass young PEFA from tern and plover nesting sites.

Great Horned Owl

Tracks, signs of depredation, and pellets, discovered by both ODSVRA and WI personnel, indicated presence and activity by GHOW within the Veg Islands and especially within the Oso Flaco Flats area. In response to those discoveries, WI began conducting nighttime surveys using thermal optics, to observe activity and behavior of individuals present and better evaluate their threat to nesting terns and plovers. Thermal optic surveys were conducted almost every night,

between 20 May and 22 June, within and near Foredunes and 6 and 7 Exclosures, which contained the highest density of terns and plovers at the time. Although thick fog inhibited the ability to detect GHOW during many of those surveys, a few GHOW were observed. Most of those observations occurred earlier in the night, and most individuals entered from the east, from the direction of Eucalyptus North. With confirmation of tern depredation, from GHOW, documented, and nighttime observations documenting GHOW hunting within the tern and plover nesting exclosures, trapping was initiated just east of 6 Exclosure to target GHOW. As initial trap efforts along the east fence of 6 Exclosure were unsuccessful, traps were moved to Eucalyptus North, where the owl was previously observed entering the area from on multiple occasions. The adult female GHOW was captured on 22 June, within approximately 90 minutes of trap deployment, and translocated to Winton Park, in Fresno County, on 24 June.

The time spent focusing on nighttime surveillance for GHOW left less time to conduct daytime surveys for diurnal species and resulted in fewer avian predator observations made by WI during the end of May and most of June. With WI personnel focusing on nighttime surveillance, ODSVRA monitoring personnel supported raptor management by monitoring for and conveying activity observed from avian predators during the daytime to the raptor biologist. Should this level of support again be available during future seasons, it is recommended that nighttime surveys continue to be conducted with some frequency by WI personnel, and especially when owl activity is suspected. As ODSVRA personnel do the majority of monitoring remotely, via optics, and do not enter the Exclosures on a regular basis, it is unlikely that all depredations are detected and that presence and activity by owls may otherwise go undetected without at least occasional nighttime monitoring.

Barn Owl

All BANO observations were recorded during nighttime surveillance efforts initiated to monitor for GHOW activity. While conducting those surveys, BANO were heard and observed flying high, either directly over, or just east of the 6 Exclosure. On two occasions, BANO were observed targeting adult terns at the night roost just east of the 6 Exclosure, which was an unexpected observation and would have otherwise gone undetected. Although no tern depredations by BANO were confirmed, the disturbance from BANO attempting to depredate terns prompted WI to conduct more, and targeted surveillance efforts, to deploy one Modified Swedish Goshawk trap, and to prepare to deploy Bal-chatri traps if additional observations of threatening activity were made. However, additional surveillance indicated that BANO presence was sporadic, rather than predictable, which prevented patterning their activity enough to allow effective trap deployment. Unlike GHOW, BANO spend little time on the ground and likely only land on the ground when making attempts to capture prey, which makes their presence and activity within tern and plover nesting areas more difficult to detect if only relying on presence of tracks in the sand to do so. Nighttime surveillance should be continued during future breeding seasons, and in areas with high plover and tern nesting or roosting to better evaluate BANO presence and predation threat.

Cooper's Hawk

Cooper's Hawks were observed infrequently within ODSVRA during the 2021 season but were most often seen within the vegetation islands. Although COHA have been documented as a significant threat to nesting terns and plovers, and especially their chicks on other sites, observations of COHA, active within ODSVRA, didn't support that those individuals presented a significant threat to nesting terns and plovers; therefore, predator surveillance and management efforts were focused on other species.

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). On ODSVRA during 2021, RTHA were observed nearly every day, with activity occurring throughout the daylight hours (morning, noon, afternoon hours) and most often within or near the veg islands. As no RTHA were observed threatening nesting terns and plovers during the season, no management actions were required. Due to RTHA prevalence within ODSVRA, WI shifted from recording every individual observed, to only recording those observed within the nesting exclosures. Despite this reduction in recorded observations, WI remained vigilant for monitoring RTHA activity near the exclosure areas once chicks were moving around on the ground. This is an important aspect of surveillance to maintain during subsequent years (typically July–September), as that is the time of the season when RTHA have been most problematic on other tern and plover sites.

Non-Raptor or Owl Predators

American Crows

Crows are known to be a primary 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). Crows are synanthropic predators that thrive around human development (Johnston 2001, Marzluff et al. 2001) and whose populations in urban areas of southern California may be growing. Despite the presence of large numbers of crows on the northern and northeastern areas of the ODSVRA, crows were seldom observed inside nesting exclosures or shorelines and were, therefore, considered a low threat to nesting terns and plovers. Monitoring of crows should be continued during subsequent years and the threat to nesting terns and plovers reevaluated as needed. If determined to present a threat to nesting terns and plovers during future years, an important facet of crow management to be used in conjunction with removal, will be to identify attractants within and near ODSVRA, to remove those attractants or to exclude crows from accessing them and evaluate whether additional management efforts are warranted.

Common Ravens

Ravens can have large territories, are extremely intelligent, and have been documented to have significant negative impacts on listed species in 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, ravens are known to be predators of the eggs and young of threatened and endangered species, including tern, California Condor, San Clemente Island Loggerhead Shrike, Greater Sandhill Crane, Marbled Murrelet, and desert tortoise (Liebezeit and George 2002). 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, raven 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 raven populations within and near ODSVRA will also follow these growth trends, the threat of predation to terns and plovers by ravens will also likely increase in subsequent years.

Because ravens are intelligent, it is important that predator control personnel prevent ravens from witnessing management methods. Should a raven experience or observe a negative interaction with predator control personnel or equipment, the likelihood of removing that individual using the same

methods, substantially decreases. Therefore, care should be taken to remove ravens only when all individuals in proximity or view could be removed.

Because raven populations are growing in California, additional steps should be taken to improve the efficiency of corvid management on ODSVRA during subsequent years. Hunting is far more time consuming than trapping, and WI typically only uses hunting to remove individuals opportunistically, or to target individuals that are wary of traps. Extensive time spent hunting can considerably limit the ability of predator control personnel to implement effective management for multiple species concurrently.

General Management

Remove Access Restrictions to Support Trapping

During raptor trapping efforts during the 2021 season, WI was sometimes prevented by ODSVRA staff from accessing exclosures or other areas occupied by nesting terns and plovers, and in some cases from accessing areas prior to daylight hours. Removal of such restrictions by adding WI personnel as authorized individuals on the ODSVRA recovery permit for these activities, would increase the success of raptor and owl management efforts on ODSVRA during subsequent years of the program. In many cases, the most effective way to capture a targeted raptor or owls is to place traps within travel routes used to access tern and plover nesting areas. However, this is not always the case, and for some individuals, optimal trap locations are located within nesting areas occupied by terns or plovers. On such occasions, more care is needed to reduce potential negative impacts to the protected species. Wildlife Innovations personnel have spent more than 15,000 hours over nine years, conducting predator management work within occupied tern and plover nesting habitats, including placement and operation of raptor traps. During that time, no incidents of take or nest abandonment, as a result of predator control actions or presence, have been confirmed or suspected. Additionally, if access restrictions reduce removal success for the targeted predator, and predation continues or increases as a result, the impacts to nesting terns and plovers are likely to be far greater than any temporary disturbance incurred during trap placement and operation. Optimal placement and operation of traps will be especially important when attempting to capture trap-shy raptor species or individuals, such as NOHA or previously captured raptors or owls.

The recapture of PEFA 91AK during the 2021 season was likely a result of optimal timing and placement of the trap immediately after an opportunity was identified. Since there were no terns or plovers near AG Creek, WI was able to access that area unescorted and before sunrise to place an optimal trap set. Restrictions associated with placing traps for PEFA W49 likely inhibited and may have prevented recapture of that individual during the 2021 season. It is important for land managers and regulatory personnel to evaluate potential costs and benefits of allowing unrestricted access for the placement, operation, and removal of raptor, owl, and other predator traps, on both short and long-term time scales. By limiting access for predator management, the potential for trap exposure to the targeted individual can be substantially reduced, and sometimes during a crucial time (i.e. beginning of hunt and prior to hunting success). The exact location that traps should be placed to optimize capture success should be chosen by the trapper and be based on typical hunting behavior of the species and direct observations of the target predator. Although trap locations can sometimes be flexible, allowing the trapper to avoid immediate areas with active tern or plover nests, small adjustments of trap locations of even 50 meters from the ideal location, can sometimes negatively affect success.

Reducing the disturbance from tern and plover monitors while raptor or owl traps are active will also benefit trapping success. As much of the hazing was conducted by ODSVRA monitors in 2021, and the surveillance of terns and plovers close to active trap sets increases potential for disturbance of targeted raptors, the presence of monitors within several hundred meters of active traps reduces potential for capture success and should therefore be avoided. Hazing of any animal within proximity to an active trapping area should also be avoided, as this can promote an elevated sense of alert from the target predator, reducing hunting focus and potential for capture success.

Hazing to Deter Avian Predators

Many non-lethal techniques which are utilized within other areas of wildlife management (i.e. wildlife hazard mitigation programs on airports) rely on the use of loud noises produced by hand-fired pyrotechnics or stationary propane cannons. Some techniques utilize motion sensitive or handheld lights, predator decoys and effigies, and even scents. Unfortunately, many of those techniques should not be used within proximity of sensitive nesting avian species due to the potential to cause nest and even nesting-site abandonment. The development of new and effective non-lethal techniques is a priority for WI, in support of our mission to minimize the impact of predator control on native predator species. However, the development of new, and effective non-lethal techniques takes time.

Currently, ODSVRA monitoring personnel utilize pyrotechnic bird whistlers for avian predator deterrence. These devices may be a valuable tool for mitigating impending threats to terns and plovers but should be used sparingly, in order to help prevent the acclimation of predators (directly or secondarily) to the deterrent. Typically, the more exposure an animal has from a particular deterrent, the more habituated it will become. The use of this deterrent on avian species, such as ospreys (*Pandion haliaetus*; OSPR), which pose no threat of depredation to terns and plovers, is strongly recommended against. Although their presence may temporarily elicit alarm behaviors from nesting terns or plovers, these species have evolved together and any disturbance from them will likely be minimal. The amount of time spent attempting to deter OSPR from tern and plover nesting areas during 2021 was substantial and reduced the possible detection of actual predators.

Additionally, the use of deterrence should be focused within areas with higher densities of terns and plovers. When conducting wildlife management, it is important to manage for the overall population and not individuals, as within most programs, resources do not exist to effectively manage for both. A substantial amount of time was spent attempting to deter avian predators from areas in the veg islands, which contained few nesting plovers. Hazing efforts within those areas have the potential to reduce the effectiveness of those devices when used within areas that are more important for productivity of terns and plovers. Hazing should be reserved to mitigate imminent threats within the exclosures, in an attempt to establish concentrated zones of negative stimuli vs large areas, promoting greater avoidance of more productive areas. Also, as trapping for high threat individuals within the exclosures and shorelines is currently discouraged within the program, it is important to utilize areas outside these to trap such individuals. Recognition of patterns exhibited by raptors, such as frequency of visits by an individual to a perch or preening post, is valuable to effectively patterning and trapping an individual; therefore, those areas should be left free of disturbance.

The 2021 nesting season was the first year of WI conducting predator control within the ODSVRA. Despite many challenges and a steep, but anticipated, learning curve, a significant amount of time this year was spent gathering vital site-specific information that will support more efficient predator management during subsequent years. The heavy site-presence of skilled ODSVRA tern

and plover monitoring personnel and their continuous support for and coordination with predator management personnel played a valuable role in the success of the raptor and owl management program for ODSVRA this year and will be critical for the enhancement and growth of the program in subsequent years.

MANAGEMENT RECOMMENDATIONS

1) Develop a site-specific decision tree or management protocol, especially for NOHA and PEFA due to their state protected status, that identifies thresholds to begin and end harassment (i.e. pyrotechnic whistlers), trapping for translocation, and when lethal removal may be employed. To the extent possible, the protocol should specify the number of predated nests/individuals, possibly by species (i.e. tern or plover), time periods, and areas, for each progressive step. The management protocol should be developed cooperatively between ODSVRA and WI personnel, and once a draft has been developed, state and federal permit personnel may be allowed to comment, and ideally approve the protocol.
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 management to benefit terns and plovers be conducted with population level implications in mind, rather than weighting and attempting to protect smaller outlier groups or individuals equally. With the current personnel resources it is not possible to provide a high level of protection within all areas. Continuing to attempt to manage predators within all areas will continue to compromise the effectiveness of management provided for the high-density areas, by exhausting resources within low density or outlying areas where few nests are present. 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) Hazing of predators using pyrotechnics and/or vehicles should be conducted sparingly, and only individuals perceived to be an immediate threat for terns and/or plovers, within areas that contain higher densities of active nests or broods (i.e. Exclosures and on shorelines), should be targeted via hazing. Overuse of any type hazing can reduce its effectiveness by desensitizing (directly or indirectly) target individuals to the method being used. Hazing efforts should not be wasted on avian species such as ospreys, which do not pose a predatory threat to terns and plovers. Hazing of avian predators should be conducted on foot or from within a vehicle, when possible, so that predators hazed begin to associate the type of vehicle or individuals with the negative experience, which can prolong the hazing effect when the person or vehicle are in the vicinity, even without requiring redeployment of the actual hazing method (i.e. pyrotechnic whistler).
4) We recommend that ODSVRA reassess and evaluate the potential for disturbance caused by predator management personnel entering active tern and plover nesting areas, including the time of day/night, placement and operation of traps, or to conduct investigation of depredated nests or individuals. Based on a minimum of nine years and more than 15,000 hours conducting trapping 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 capturing a high-threat predator that has been actively hunting within high-density nesting areas and preventing depredation of nests or individuals, significantly outweighs the potential for temporary disturbance and even the unlikely event of take.

5) Develop and implement procedures to further reduce or prevent disturbance from ODSVRA monitoring personnel and vehicles in areas where raptor traps are active. It is recommended that Monitoring vehicles maintain a minimum distance of 400m from active traps unless only transiting through to another location or are otherwise approved to conduct specific activities within the area after coordinating with the avian predator biologist.
6) Identify, develop, and test innovative and new, nonlethal options to help mitigate raptor predation of terns and plovers. Intelligent species or individuals may quickly become desensitized to nonlethal methods used repeatedly; therefore, it is important to continue to develop new techniques so that a larger selection can be rotated through during the nesting season. This should be conducted cooperatively between ODSVRA and WI. Current ideas WI has been developing, include the continued evaluation of lasers and the use of quadcopters.
7) Develop innovative and new trapping techniques and trap sets to increase the effectiveness and efficiency of capture for wary individuals or species, such as NOHA and previously captured PEFA. New equipment is currently under construction by WI and will be deployed during the 2022 season.
8) Single nest exclosures, such as 7-foot diameter Circular- or Mini-Exlosures, with net or wire tops, should be placed on all plover nests as soon as possible (ideally upon the discovery of the first egg), especially in areas with high-risk of predation (i.e. corvids, coyotes, or when egg-eating raptors are documented), if determined to be possible without causing nest abandonment or detrimental effects to the adult plovers.
9) ODSVRA monitoring personnel should continue to notify predator control personnel as soon as significant changes in the number of nesting terns or plovers, and especially active nests, within a site are realized. This will ensure that predator control has the most current information to be able to accurately assess and prioritize predator control efforts and maximize effectiveness.

ACKNOWLEDGEMENTS

We thank Ronnie Glick, with California State Parks, for his trust and support throughout the course of this contract year. We thank the ODSVRA monitoring leads, Joanna Iwanicha, Amber Clark, Ryan Slack, Sarah Robinson, and Mattie Bishop, and other staff for their on-site assistance and collaboration throughout the breeding season, including timely reporting of predator observations and predations, troubleshooting, training, guidance, and for their help compiling predation data after the breeding season. We would like to thank Paul Young for his assistance with raptor management and other site-specific training. We thank Jennifer Brown, of the USFWS Migratory Bird permitting office, Carie Battistone, a raptor specialist with California Fish and Wildlife (CDFW), and members of the CDFW Volunteer Network for their support and coordination with raptor translocation logistics and permitting. We would also like to acknowledge that this work was funded by the CA State Parks Division, Sacramento, California.

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CDFW SEABIRD MORTALITY EVENT NECROPSY REPORT

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

MWVCRC#: 21-0242
Species: LETE
Intake#: None
Band # l:w/o

EVENT PROFILE

COMMON NAME: California Least Tern
SCIENTIFIC NAME: *Sterna antillarum browni*

DATE FOUND: 7/6/2021
COLLECTION AREA: Oceano Dunes SVRA

COUNTY: San Luis Obispo
STATE: California

CARCASS CONDITION: Frozen
OILED/FOULED: No

AGE: Chick
SEX: Unknown

DEATH DATE: 7/6/2021
EUTHANASIA: No

NECROPSY DATE: 8/17/2021
NECROPSY BY: Corinne Gibble

REPORT DATE: 10/8/2021
REPORT BY: Corinne Gibble

HISTOPATHOLOGY TAKEN (Y/N?): N
REVIEWING PATHOLOGIST: Melissa Miller

EVENT BACKGROUND

This chick was from known nest LT6 at Oceano Dunes State Vehicular Recreation Area (ODSVRA). The bird hatched on 7/1/21 was banded at the nest on 7/2/21, and was not seen again until it was found dead on 7/6/21 in the general area of the nest within the exclosed nesting area. The bird was collected by ODSVRA staff, saved frozen and sent to the Marine Wildlife Veterinary Care and Research Center (MWVCRC) in Santa Cruz for examination via gross necropsy.

CASE SUMMARY

At gross examination the body was dorsoventrally compressed, with subcutaneous bruising of both legs at the femur and tibiotarsus. The left portion of the bill was fractured and missing, and the lower right portion of the bill was fractured. There was bruising and hemorrhage in the mouth and at the skin surrounding the bill on both sides. There was subcutaneous congestion of the occipital region of the skull. The lower abdomen was perforated, and the keel was laterally displaced. The bird was in good to thin body condition based on pectoral muscle and adipose. The internal organs were intact, although there was advanced autolysis. Scant urates were found in the cloaca. Due to the nature of the injuries, acute crush trauma of unknown cause is the presumptive cause of death; this trauma was accompanied by potential predation injuries to the lower abdomen. No other pathology was found on gross necropsy.

COMPLETED TESTS/PROCEDURES

1.) Gross photographs
2.) Radiographs
3.) Gross necropsy (including morphometric measurements)
4.) Archived frozen carcass

GROSS FINDINGS

Acute severe crush trauma characterized by:
-Multifocal bill fractures
-Lateral displacement of the keel
-Bruising and bleeding at the tibiotarsus and femur
-Multifocal acute hemorrhage and bruising
-Dorsoventral compression of body

-Focal occipital hemorrhage

INCIDENTAL FINDINGS

Scant urates in cloaca.

FINAL DIAGNOSES

Cause of death: Acute severe crush trauma

SAMPLES SAVED

Frozen carcass

PHOTOS

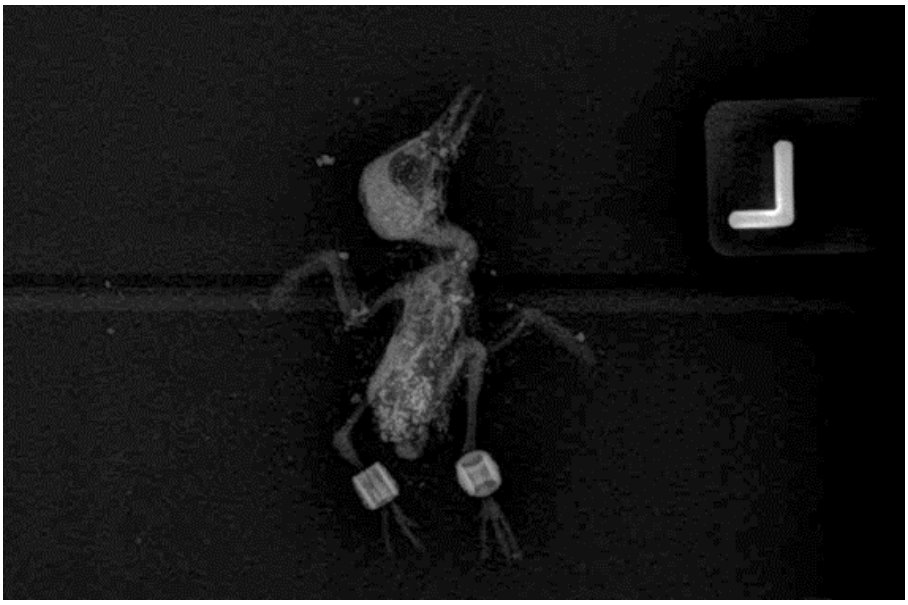

Figure 1. Radiographs showing displacement of keel, fractures at the bill

Figure 2. Bruising at tibiotarsus and femur, abdominal perforation

Figure 3. Multiple bill fractures with hemorrhage

Figure 4. Lateral displacement of keel and autolysis

Figure 5. Focal occipital hemorrhage

CDFW SEABIRD MORTALITY EVENT NECROPSY REPORT

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

MWVCRC#: 21-0241
Species: LETE
Intake#: None
Band # None

EVENT PROFILE

COMMON NAME: California Least Tern
SCIENTIFIC NAME: *Sterna antillarum browni*

DATE FOUND: 7/14/2021
COLLECTION AREA: Oceano Dunes SVRA

COUNTY: San Luis Obispo
STATE: California

CARCASS CONDITION: Frozen
OILED/FOULED: No

AGE: Chick
SEX: Unknown

DEATH DATE: 7/14/2021
EUTHANASIA: No

NECROPSY DATE: 8/17/2021
NECROPSY BY: Corinne Gibble

REPORT DATE: 10/8/2021
REPORT BY: Corinne Gibble

HISTOPATHOLOGY TAKEN (Y/N?): N
REVIEWING PATHOLOGIST: Melissa Miller

EVENT BACKGROUND

This chick was from known nest LT42 at Oceano Dunes State Vehicular Recreation Area (ODSVRA). The bird was found dead approximately 60 feet from the next and was collected by ODSVRA staff. The bird was saved frozen and sent to the Marine Wildlife Veterinary Care and Research Center (MWVCRC) in Santa Cruz for examination via systematic necropsy.

CASE SUMMARY

Upon examination the body was dorsoventrally compressed. the right and left orbit were swollen, and both eyes were proptosed (pushed out of the socket). The left portion of the bill was fractured and missing, and the right portion was fractured and partially missing. Hemorrhage surrounded the bill and eye area. There was a degloving injury to the bottom left tarsometatarsus with all digits missing. Bruising and bleeding surrounded the injury. The right foot was missing one digit with associated bruising and hemorrhage. The bird's keel and skull were not yet fully ossified; however, the keel was laterally displaced. The bird was in good to thin body condition based on pectoral muscle and adipose. Examined organs were intact, although there was mild decomposition and autolysis. Scant urates were found in the cloaca. Scant congestion was found in the occipital region of the skull. Due to the nature of the injuries, acute crush trauma of unknown cause is the presumptive cause of death; this trauma was accompanied by potential degloving or predation injuries to both feet. No other pathology was found on gross necropsy.

COMPLETED TESTS/PROCEDURES

1.) Gross photographs
2.) Radiographs
3.) Gross necropsy (including morphometric measurements)
4.) Archived frozen carcass

GROSS FINDINGS

Acute severe crush trauma characterized by:
-Multifocal acute subcutaneous and fascial hemorrhage and bruising
-Dorsoventral compression of entire body
-Possible focal occipital hemorrhage

-Multifocal bill fractures and hemorrhage
-Both eyes proptosed (pushed out of the socket due to skull compression)
-Lateral displacement of the keel
-Bruising and bleeding at the distal left tarsometatarsus with all digits missing (potential degloving or predation injury)
-Digit missing on right foot with associated bruising (potential degloving or predation injury)

INCIDENTAL FINDINGS

Scant urates in cloaca.

FINAL DIAGNOSES

Cause of death: Acute severe crush trauma

SAMPLES SAVED

Frozen carcass

PHOTOS

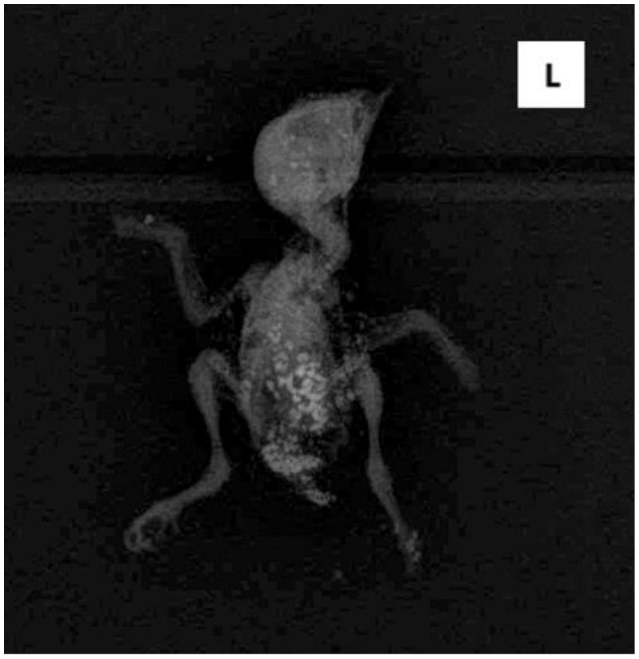

Figure 1. Radiographs showing lateral displacement of keel, possible degloving injuries to feet, bill fractures

Figure 2. Degloving injury to left foot, with all digits missing

Figure 3. Degloving injury to right foot with one digit missing

Figure 4. Proptosis of right eye, hemorrhage, and bill fracture

Figure 5. Lateral displacement of keel and dorsoventral compression of body

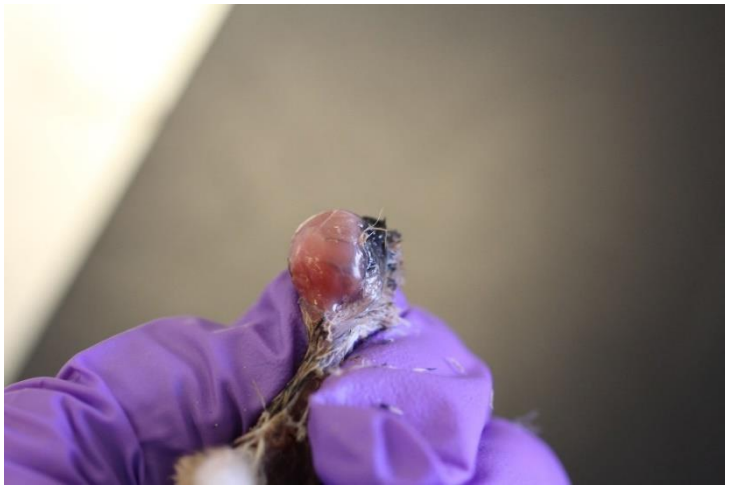

Figure 6. Possible focal occipital hemorrhage

CDFW SEABIRD MORTALITY EVENT NECROPSY REPORT

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

MWVCRC#: 21-0240
Species: SNPL
PWC#: 21-1202
Band # None

EVENT PROFILE

COMMON NAME: Western Snowy Plover
SCIENTIFIC NAME: *Charadrius nivosus*

DATE FOUND: 6/15/2021
COLLECTION AREA: Oceano Dunes SVRA

COUNTY: San Luis Obispo
STATE: California

CARCASS CONDITION: Frozen
OILED/FOULED: No

AGE: Chick
SEX: Unknown

DEATH DATE: 6/21/2021
EUTHANASIA: No

NECROPSY DATE: 8/17/2021
NECROPSY BY: Corinne Gibble and Katherine Greenwald

REPORT DATE: 10/1/2021
REPORT BY: Corinne Gibble

HISTOPATHOLOGY TAKEN (Y/N?): N
REVIEWING PATHOLOGIST: Melissa Miller

EVENT BACKGROUND

This chick was from known nest SP95 at Oceano Dunes State Vehicular Recreation Area (ODSVRA). It hatched on 6/15/2021 and was noted to be unable to stand on the right leg at the nest. The bird was collected by ODSVRA staff and taken to Pacific Wildlife Care (PWC) on the same day that it hatched. Upon intake at PWC, the bird was noted to have mild dehydration, and a noticeable instability due to either injury or deformity in the right leg, at the stifle. The bird was placed in hobbles in an effort to keep the right leg in position, and give the ligaments a chance to tighten up. The bird was bright, alert, and responsive in care, and accepted hand feedings. Alignment of the right leg showed some signs of improvement in care, but the leg was unable to rotate medially or protrude behind the body. The bird was unable to bear weight on the leg, and later died in care. The bird was saved frozen and sent to the Marine Wildlife Veterinary Care and Research Center (MWVCRC) in Santa Cruz for examination via systematic necropsy.

CASE SUMMARY

At gross necropsy, the carcass was intact and in fresh-frozen condition. The right leg was noticeably stiffer than the left on flexion and extension. The skin on the right leg was dehydrated, and the musculature was diffusely atrophied. No grossly apparent bone deformations or fractures were not observed grossly or on postmortem radiographs. The bird's keel and skull were not yet fully ossified. The bird was in good to thin body condition based on pectoral muscle and adipose. Examined organs were intact, and diffusely pale. Digesta was found in the gastrointestinal tract and scant urates were found in the cloaca, confirming that the bird had recently eaten. The difference in size and musculature between the left and right legs was likely caused by a congenital defect or injury to the right leg. The immediate cause of death is not determined. No other pathology was found on gross necropsy.

COMPLETED TESTS/PROCEDURES

1.) Gross photographs
2.) Radiographs
3.) Gross necropsy (including morphometric measurements)
4.) Archived frozen carcasses

GROSS FINDINGS

Diffuse atrophy of musculature on right leg, possible congenital deformity.

INCIDENTAL FINDINGS

Digesta in gastrointestinal tract and scant urates in cloaca.

FINAL DIAGNOSES

Cause of death: Unknown

SAMPLES SAVED

Frozen carcass

PHOTOS

Figure 1. Radiographs showing no visible fractures.

Figure 2. Dorsal view of bird with right leg having diffusely atrophied musculature, skin is dehydrated.

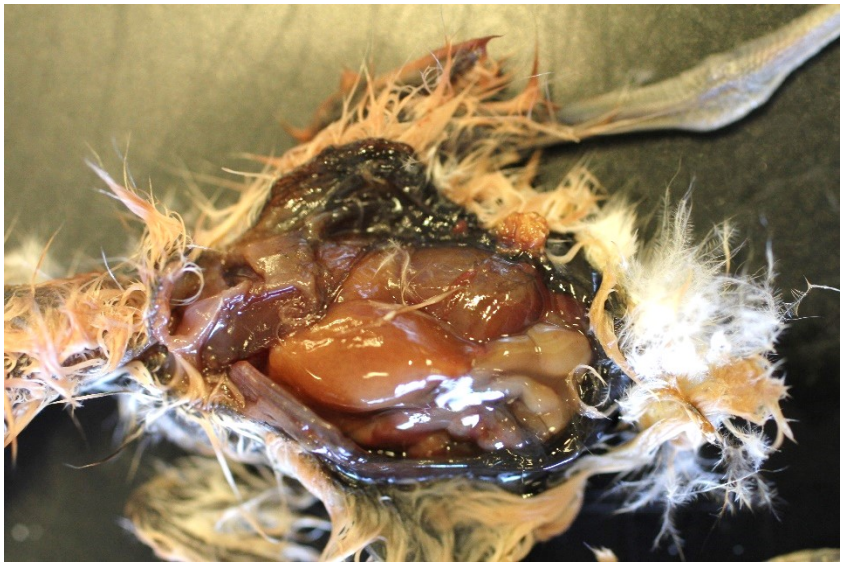

Figure 3. Ventral view of coelomic cavity: Internal organs are diffusely pale

CASE#: 21-636 SPECIES: SNOWY PLOVER

Date Admitted 5/3/2021 12:50 pm

Band

Name

Reference Number

Microchip Number

Intake

Admitted By: vm
Address Found: 928 Pacific Blvd. Oceano, CA United States
Date Found: 5/3/2021
Reasons for Admission: immobile, weak
Care by Rescuer:
Notes About Rescue:

Diagnosis

orphaned hatchling

Treatment Log

Date:	Type:	Comments:
May 5, 2021 5:46 pm	Treatment Log	Weight: 6.40g. BAR, ambulating normally, eating small mealworms and bloodworms mostly. Weight at 6 PM= 7.3g. Plan for reunite attempt tomorrow. VM
May 4, 2021	Treatment Log	Weight: 6.30g
May 3, 2021 2:28 pm	Patient Location	Moved to TXR, incubator
May 3, 2021	Exam	**Intake Exam:** Weight: 6.30g Age: 0.00Days Sex: Unknown BCS: Good Dehydration: Mild Mucous Membrane Color: Pink Mucous Membrane Texture: Moist Attitude: Quiet Comments: BAR, walking after warm. Prognosis guarded due to age and history of hypothermia Treatment: placed into 104F incubator, .3 ml LRS SQ at 5 PM Examiner: VM

Disposition

Disposition: Released
Disposition Date: 5/6/2021
Disposition Location: Oceano CA
Criminal Activity?:
Carcass Saved?:
Transfer Type:
Release Type: Reunite with family

CASE#: 21-1202 SPECIES: SNOWY PLOVER

Date Admitted 6/15/2021 1:15 pm

Band

Name

Reference Number

Microchip Number

Intake

Admitted By: Aloha Windsor
Address Found: State Park ODSVRA, CA United States **Date Found:** 6/15/2021
Reasons for Admission: Injured
Care by Rescuer:
Notes About Rescue:

Intake Exam

Dehydration: Mild **Weight:** 4.40g **Sex:** Unknown
Age: Hatchling / Chick **Attitude:** Alert **BCS:** Reasonable
Mucous Membrane Color: **Temperature**

Body Area:	Comments:
Eyes / Ears / Mouth / Nares	No significant findings
Neurologic	No significant findings
Heart / Lungs	No significant findings
GI / Vent	No significant findings
Musculoskeletal	No significant findings
Feathers / Fur / Skin	No significant findings
Body	No significant findings
Wings / Arms	No significant findings
Legs / Feet / Hocks	Abnormal : R stifle instability/deformity (?). Leg distal to stifle tends to rotate medially. Bird unable to stand/walk

Comments: Very concerned that stifle is injured/deformed to a degree where the bird will not be able to walk. Placed hobbles in effort to keep R leg in normal position. Plan to leave in place for few days to give ligaments chance to possibly tighten up. Guarded prognosis
Treatments: 0.5ml LRS SQ w/B complex, applied hobbles
Examiner: SR/Jenna

Diagnosis

R stifle abnormality

Treatment Log

Date:	Type:	Comments:
Jun 21, 2021	Treatment Log	Looking much worse. Still not standing, but also less alert. Think time to stop treatment. Contacted ODSVRA. SR
Jun 18, 2021 10:08 pm	Patient Location	Moved to Small Space Pod – Estimated date/time of move. JLA

Jun 18, 2021 7:25 pm	Treatment Log	Weight: 4.70g. BAR. Vocal. Taking 2 MW/feeding well. Removed hobbles. Alignment of R leg improved. Leg doesn't rotate medially or protrude behind body. Still unable to bear weight on leg, however. Left hobbles off. Hoping will be able to gain some strength if R leg aligned properly. Recheck Monday. SR
Jun 17, 2021 7:06 pm	Treatment Log	Weight: 4.50g. BAR. Increased amt of feedings since hasn't gained weight. Hobbles in place. Plan to remove tomorrow and assess progress. SR
Jun 16, 2021 7:22 pm	Treatment Log	Weight: 4.60g. BAR. Taking hand feedings well. Hobbles in place. Plan to leave in place until Friday. If no significant improvement by then, may have to consider euthanasia. SR
Jun 15, 2021 1:23 pm	Patient Location	Moved to TXR
Jun 15, 2021	Exam	**Intake Exam:** Weight: 4.40g Age: Hatchling / Chick Sex: Unknown BCS: Reasonable Dehydration: Mild Attitude: Alert Legs / Feet / Hocks: R stifle instability/deformity (?). Leg distal to stifle tends to rotate medially. Bird unable to stand/walk Comments: Very concerned that stifle is injured/deformed to a degree where the bird will not be able to walk. Placed hobbles in effort to keep R leg in normal position. Plan to leave in place for few days to give ligaments chance to possibly tighten up. Guarded prognosis Treatment: 0.5ml LRS SQ w/B complex, applied hobbles Examiner: SR/Jenna

Disposition

Disposition: Died +24hr
Disposition Date: 6/22/2021
Disposition Location: PWC CA

Criminal Activity?:
Carcass Saved?:

Transfer Type:
Release Type:

CASE#: 21-2047 SPECIES: SNOWY PLOVER

Date Admitted 9/12/2021 11:29 am

Band 2 purple L, Red+ blue R

Name

Reference Number

Microchip Number

Rescuer Contact

Rescuer: ODSVRA Oceano Dunes
Email:
Address: 928 Pacific Blvd. Oceano, CA 93445 United States
Notes About Rescuer:

Phone: (805) 473-7220
Alt Phone:

Intake

Admitted By: vm
Address Found: 928 Pacific Blvd. Oceano, CA United States
Reasons for Admission: caught by clam
Care by Rescuer:
Notes About Rescue:

Date Found: 9/12/2021

Location History

Date Moved:	Holding At:	Location:
Sep 29, 2021 9:19 am	Clinic	AV1 entry
Sep 12, 2021 12:17 pm	Clinic	SBR

Intake Exam

Dehydration: Mild
Age: Adult
Mucous Membrane Color: Pink
Weight: 31.40g
Attitude: Alert
Temperature
Sex: Unknown
BCS: Reasonable

Body Area:	Comments:
Eyes / Ears / Mouth / Nares	No significant findings
Neurologic	No significant findings
Heart / Lungs	No significant findings
GI / Vent	No significant findings
Musculoskeletal	No significant findings
Feathers / Fur / Skin	Abnormal : moderate load of feather lice
Body	No significant findings
Wings / Arms	No significant findings
Legs / Feet / Hocks	Abnormal : ~3 cm Pismo Clam closed onto middle L hallux, attached by thin filament of tissue. Digit distal to clam not viable

Comments: clam returned to ODSVRA with ODSVRA staff person
Treatments: bupivicaine to affected digit, cut tissue affixing clam to bird; sq fluids/meds, covered injured toe w/tegaderm+hydrogel
Examiner: VM

Diagnosis

clam bitten toe, partial digit amputation

Treatment Log

Date:	Type:	Comments:
Sep 29, 2021 4:07 pm	Treatment Log	BAR. Good body condition. Running fast and not favoring R foot. Thickening of R D2 persists, but unchanged. Rest of bird looks very good. OK for release anytime. SR
Sep 29, 2021 9:19 am	Patient Location	Moved to AV1 entry – Estimated date/time moved. JLA
Sep 28, 2021 11:52 am	Treatment Log	Weight: 38.70g. BAR. Decent body condition. Using legs evenly. Remaining R D2 still thickened, but much less pink. Doesn't appear painful when manipulated. D/C meds. Recheck Thurs-hope to release soon after. SR
Sep 27, 2021 10:45 am	Treatment Log	Amber from Oceano called requesting an update. Gave her SR's notes from the 24th. Amber is planning to call back around 3 pm on the 28th for another update since hopefully release is in sight. She just wants notice before the bird is ready to go so that te appropriate staff can pick up and release the plover. HB
Sep 24, 2021 12:54 pm	Treatment Log	BAR. Decent body condition. Swelling and redness at amputation site improved, but not completely resolved. Starting to develop some wear on plantar surfaces both feet, so should change substrate in basket. Recheck Tues. Hope will be ready for release next week. SR
Sep 22, 2021 12:26 pm	Treatment Log	BAR. Decent body condition. Continuing to use R foot normally, but swelling of D2 persists. No more than at last check, but no better either. Change to enrofloxacin. Recheck Friday. SR
Sep 22, 2021	Prescription	RX: 0.03ml of 22.7mg/ml Enrofloxacin 15mg/kg po bid. from 9/22/2021 until open
Sep 21, 2021	Prescription	RX: 0.02ml of 1mg/ml Ivermectin 0.4mg/kg po sd. from 9/21/2021 until 9/21/2021
Sep 20, 2021 3:42 pm	Treatment Log	Weight: 38.90g. Very BAR. Decent body condition. Using legs evenly. Swelling of remaining D2 increased. Cleaned w/saline and debrided dry piece of debris at end of digit. Small amt bleeding. Applied pressure and covered w/tegaderm. Restart meloxicam. Recheck Wed. SR
Sep 20, 2021	Prescription	RX: 0.03ml of 1.6mg/ml Meloxicam 1mg/kg po bid. from 9/20/2021 until 9/24/2021
Sep 16, 2021 12:16 pm	Treatment Log	Weight: 37.40g. BAR. Decent body condition. Using both feet normally. Swelling of L foot resolved. Injured D2 still moderately swollen and hyperemic. Crust at end of digit. Bone not obviously exposed. Continue antibiotics and extend meloxicam for couple more days. Recheck Monday. SR
Sep 14, 2021 11:47 am	Treatment Log	Weight: 34.70g. BAR. Fair body condition. Bearing weight evenly on both feet. Mid-digit amputation, L D2. Mild swelling of remaining portion of digit and of foot. No other abnormalities found on PE. Continue meds. Recheck Thurs. SR
Sep 12, 2021 12:17 pm	Patient Location	Moved to SBR
Sep 12, 2021	Lab Values	FECAL: Float=Negative, Direct=Negative. Technician: vm
Sep 12, 2021	Prescription	RX: 0.06ml of 62.5mg/ml Clavamox 125mg/kg po bid. from 9/12/2021 until 9/22/2021
Sep 12, 2021	Prescription	RX: 0.02ml of 1.6mg/ml Meloxicam 1mg/kg po bid. (Loading Dose: 0.04) from 9/12/2021 until 9/16/2021
Sep 12, 2021	Prescription	RX: 0.04ml of 25mg/ml Tramadol 30mg/kg po bid. from 9/12/2021 until 9/16/2021
Sep 12, 2021	Prescription	RX: 0.01ml of 50mg/ml Vitamin E/selenium 15mg/kg po sd. from 9/12/2021 until 9/12/2021
Sep 12, 2021	Prescription	RX: 0.01ml of 1mg/ml Ivermectin 0.4mg/kg po sd. from 9/12/2021 until 9/12/2021
Sep 12, 2021	Exam	**Intake Exam:** Weight: 31.40g Age: Adult Sex: Unknown BCS: Reasonable Dehydration: Mild Mucous Membrane Color: Pink Mucous Membrane Texture: Moist Attitude: Alert Feathers / Fur / Skin: moderate load of feather lice Legs / Feet / Hocks: ~3 cm Pismo Clam closed onto middle L hallux, attached by thin filament of tissue.

Digit distal to clam not viable Comments: clam returned to ODSVRA with ODSVRA staff person Treatment: bupivicaine to affected digit, cut tissue affixing clam to bird; sq fluids/meds, covered injured toe w/tegaderm+hydrogel Examiner: VM

Disposition

Disposition: Released
Disposition Date: 10/4/2021
Disposition Location: Oceano CA

Criminal Activity?:
Carcass Saved?:

Transfer Type:
Release Type: