NESTING OF THE CALIFORNIA LEAST TERN AND WESTERN SNOWY PLOVER AT OCEANO DUNES STATE VEHICULAR RECREATION AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA 2018 SEASON

Prepared for
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Prepared by
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Cover photo of adult California least terns at Oso Flaco Lake, Oceano Dunes SVRA, taken by Jeanette Stone on 13 June 2018 and used by permission.

TABLE OF CONTENTS

SUMMARY **1**
INTRODUCTION **2**
SITE DESCRIPTION **3**
MONITORING AND MANAGEMENT ACTIONS **8**
MONITORING 8
MANAGEMENT ACTIONS 14
RESULTS AND DISCUSSION **17**
CALIFORNIA LEAST TERN 17
WESTERN SNOWY PLOVER 26
FACTORS INFLUENCING LEAST TERN AND SNOWY PLOVER REPRODUCTIVE SUCCESS 39
RECOMMENDATIONS **47**
NOTES **53**
LITERATURE CITED **61**
APPENDICES **63**
APPENDIX A. CALIFORNIA LEAST TERN NESTS AT ODSVRA IN 2018. 63
APPENDIX B. SNOWY PLOVER NESTS AT ODSVRA IN 2018. 68
APPENDIX C. MAPS OF ALL CALIFORNIA LEAST TERN AND SNOWY PLOVER NEST LOCATIONS AT ODSVRA IN 2018. 84
APPENDIX D. BANDED LEAST TERNS AND SNOWY PLOVERS 93
APPENDIX E. CALIFORNIA LEAST TERN REPRODUCTIVE SUCCESS FOR SAN LUIS OBISPO AND SANTA BARBARA COUNTIES FROM 2004-18. 117
APPENDIX F. ADDENDUMS TO SNOWY PLOVER NESTING SUCCESS. 119
APPENDIX G. PREDATOR SUMMARY TABLES AND FIGURES. 125
APPENDIX H. DOCUMENTED MORTALITY OF CALIFORNIA LEAST TERN AND SNOWY PLOVER CHICKS, JUVENILES, AND ADULTS AT ODSVRA. 133

List of Tables

Table 1. Nesting success of California least terns at ODSVRA from 1991-2018. 18
Table 2. Causes of California least tern nest loss at ODSVRA from 2002-18. 20
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 13-year period, 2006-18. 21
Table 4. Number of reported breeding least tern pairs and juveniles produced at ODSVRA and the combined sites of Rancho Guadalupe Dunes County Park (RGDCP), Vandenberg Air Force Base (VAFB), and Coal Oil Point Reserve (COPR) from 2004-18. 25
Table 5. Number of snowy plover breeding adults, breeding males, fledglings, and chicks fledging per breeding male for the 17-year period 2002-18. 26
Table 6. Number of adult snowy plovers counted on USFWS breeding season window surveys versus calculated minimum number of breeding adults at ODSVRA from 2005-18. 27
Table 7. Snowy plover nest distribution and success at ODSVRA in 2018. 28
Table 8. Nesting success of snowy plovers at ODSVRA from 2001-18. 29
Table 9. Attributed causes of snowy plover nest loss at specific locations at ODSVRA in 2018. 30
Table 10. Coyote occurrence in the Southern Exclosure and Oso Flaco at ODSVRA from 2009-18. 42

Table 11. Sightings of merlin, American kestrel, large owl spp., red-tailed hawk, northern harrier, and peregrine falcon in specific areas of the Southern Exclosure and Oso Flaco at ODSVRA in 2018. 43
Table 12. Sightings of peregrine falcon in specific areas of the Southern Exclosure and Oso Flaco at ODSVRA from 2008-18. 45

Table D.1. Banded least terns recorded at ODSVRA in 2018. 93
Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2017 to 28 February 2018. 95
Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018. 101
Table D.4. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2017 to 28 February 2018. 108
Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2018. 111

Table F.1. Nesting success of snowy plovers in identifiable areas at ODSVRA, 2001-18. 119
Table F.2. Attributed causes of snowy plover nest loss in Southern Exclosure and Oso Flaco at ODSVRA from 2002-18. 121
Table F.3. Nest protection used at ODSVRA in 2018. 123

Table G.1. Summary of predators detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2018. 125
Table G.2. Mammalian and avian predators removed under predator management actions for least terns and snowy plovers at ODSVRA in 2018. 127

Table H.1. Documented predation of least terns from 1 March to 30 September 2018. 133
Table H.2. Documented predation of snowy plovers from 1 March to 30 September 2018. 133
Table H.3. Mortality, other than documented predation, of snowy plovers from 1 February 2018 to 12 October 2018. 134

List of Figures

Figure 1. ODSVRA site map. 6
Figure 2. ODSVRA Southern Exclosure, Seasonal Exclosure, and Oso Flaco seasonally protected areas for breeding California least terns and snowy plovers in 2018. 7
Figure 3. Number of California least tern nests, pairs, and fledglings at ODSVRA from 1991-2018. 19
Figure 4. Distribution of least tern nests as a percent of total nests at ODSVRA from 2006-18. 19
Figure 5. Number of days California least tern juveniles that hatched at ODSVRA in 2018 continued to be seen on-site after reaching fledge age (21 days old). 22
Figure 6. Number of California least terns counted at the ODSVRA night roost in 2018. 24
Figure 7. Number of snowy plover breeding males, nests, nests hatched, chicks, and chicks fledged at ODSVRA from 2001-18. 27
Figure 8. Number of snowy plover nests at ODSVRA from 1994-2018. 28
Figure 9. Distribution of snowy plover nests as a percent of total nests at ODSVRA from 2006-18. 29
Figure 10. Number of known location and known fate snowy plover nests with known initiation date (n=177) initiated per 10-day period and number known to hatch at ODSVRA in 2018. 30
Figure 11. Fledging rate of chicks hatching in early season (prior to 20 June) and late season (20 June or later) at ODSVRA from 2003-18. 31
Figure 12. Number of snowy plover chicks hatching per 10-day period and number subsequently fledging at ODSVRA in 2018. 32
Figure 13. Chick survival and fledge rate from 23 April to 10 September at ODSVRA in 2018. 33

Figure 14. Loss of snowy plover chicks by age and location last seen in the Southern Exclosure and Oso Flaco at ODSVRA in 2018. 34
Figure 15. 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 2005-18. 36
Figure 16. Monthly average number of snowy plovers observed during nonbreeding season surveys at ODSVRA from October 2017 to February 2018. 37
Figure 17. Number of snowy plovers counted on USFWS winter window surveys from 2004-18. 38
Figure 18. Number of days coyote, opossum, skunk, and raccoon were detected in the Southern Exclosure and Oso Flaco at ODSVRA from 2007-18. 41
Figure 19. Number of days large owl spp., northern harrier, peregrine falcon, and red-tailed hawk were detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2007-18. 44

Figure C.1. California least tern and snowy plover nest locations at ODSVRA in 2018. 84
Figure C.2. California least tern nest locations at ODSVRA 6 exclosure in 2018. 85
Figure C.3. California least tern nest locations at ODSVRA 7 exclosure in 2018. 86
Figure C.4. Snowy plover nest locations at ODSVRA 6 exclosure in 2018. 87
Figure C.5. Snowy plover nest locations at ODSVRA 7 exclosure in 2018. 88
Figure C.6. Snowy plover nest locations at ODSVRA 8 exclosure in 2018. 89
Figure C.7. Snowy plover nest locations at ODSVRA Boneyard exclosure in 2018. 90
Figure C.8. Snowy plover nest locations at ODSVRA North Oso Flaco in 2018. 91
Figure C.9. Snowy plover nest locations at ODSVRA South Oso Flaco in 2018. 92

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 30 March to 26 August 2018. 124

Figure G.1. Coyote occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018. 128
Figure G.2. Raccoon occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018. 129
Figure G.3. Skunk occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018. 130
Figure G.4. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018. 131

Attachments

U.S. Department of Agriculture Wildlife Services. Oceano Dunes State Vehicular Recreation Area 2018 Predator Management Report
Bloom Biological, Inc. Summary of results of avian predator management activities during the 2018 season at Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California
Least tern necropsy examination report: one juvenile
Snowy plover necropsy examination report: one juvenile
Snowy plover medical examination records: one adult and 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 2018.

Least tern

There were an estimated 30-33 least tern breeding pairs, lower than both 2017 (42-47 pairs) and the 13-year average (41-44 pairs) for the period 2005-17. There were 35 known nesting attempts, all from known locations and within the large seasonally fenced exclosure in the southern portion of the vehicle riding area. Twenty-eight of the 35 nests hatched for a nest hatching rate of 80%, similar to the average of 83% during the previous 13 years. Seven nests failed due to the following causes: abandoned pre-term (4); abandoned post-term (2); and cause unknown (1). There was a minimum of 47 banded adults documented; 45 of these birds were identified as banded at this site as chicks.

Forty-two chicks hatched and of these 38 were color-banded to individual. Thirty-five chicks (33 banded, two unbanded) are known to have fledged (seen when 21 days old or older), for a fledging rate of 83.3% and an estimated 1.06-1.17 chicks fledged per pair. This compares with the previous 12-year period that averaged a 70% chick fledging rate, 1.12-1.19 chicks fledged per pair, and 48 juveniles produced per year.

Snowy plover

There was a minimum of 201 breeding snowy plovers (115 males and 86 females), compared to 183 in 2017, an increase of 9.8%. One hundred and one banded birds were documented as breeding, and the banding history was known for 98 of these birds. Of the known origin birds 89.8% (88/98) were banded as chicks and fledged from ODSVRA. There were 221 known nesting attempts, including 15 identified only by detection of brood (unknown nest location). Of the 206 nests from known locations, 145 (70.4%) were in the southern riding area seasonal exclosure and 61 (29.6%) in North and South Oso Flaco. Of the 200 nests with known location and fate, 144 hatched for a nest hatching rate of 72.0%, compared to the previous 17-year average of 75.8%. Fifty-six nests failed, attributed to the following causes: abandoned pre-term (11); abandoned post-term (3); abandoned unknown pre- or post-term (7); abandoned, suspected due to wind (3); overwashed by tide (1); cause unknown (2); unidentified predator (2); unidentified avian (13); coyote (*Canis latrans*) (4); common raven (*Corvus corax*) (5); and gull (5).

Of the 412 hatching chicks, 207 were color-banded to brood with 51.7% (107/207) fledging, and the fate of the 205 unbanded chicks is believed known with 45.4% (93/205) fledging. A total of 200 chicks fledged (seen when 28 days old or older) for a fledging rate of 48.5%. 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 2018, an estimated 1.74 chicks fledged per breeding male at ODSVRA. For the 17-year period 2002-18, average productivity was 1.50 chicks fledged per breeding male.

INTRODUCTION

Oceano Dunes SVRA, located in southern coastal San Luis Obispo County, California, is a popular park with high attendance and was visited by nearly 1.4 million people in 2017 for a variety of recreational opportunities, including driving vehicles on the beach and dunes.[1] In 2017, an estimated 348,899 street-legal vehicles and 75,170 off-highway vehicles were driven on the shoreline and dunes in the designated riding area of the park.[2]

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

This report summarizes the results of the 2018 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 conform to current analysis practices. Maps in figures and appendices use aerial imagery taken in 2016 by the National Agriculture Imagery Program, unless otherwise noted.

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

[1] ODSVRA 2017 Annual Attendance figures (source ODSVRA)
[2] ODSVRA 2017 Monthly Carrying Capacity Summaries (source ODSVRA)

SITE DESCRIPTION

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

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

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

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

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

<u>Southern Exclosure</u>: 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 2018 was approximately 302 acres, compared to a range of 271-301 acres (and an average of 291 acres) between 2004 and 2017. 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 60.6 acres), first incorporated into the Southern Exclosure for a full season in 2004. Vegetation within the exclosure is overall sparse with limited areas of vegetated hummocks.

7 exclosure: The area from marker post 7 to the south side of 7.5 revegetation area (approximately 0.4 miles of shoreline and approximately 60.5 acres). Habitat includes extensive areas of bare sand, limited areas of vegetated hummocks, limited areas of organic surface debris (shells, driftwood, dried algal wrack), and moderate to heavy vegetation in the 7.5 revegetation area (4.8 acres, included in the 60.5 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 85.4 acres). Habitat includes extensive areas of bare sand in the eastern portion, areas of small to moderately tall vegetated foredune hummocks, and limited areas of organic surface debris (shells, driftwood, and algal wrack).

Boneyard exclosure: The area east of the North Oso Flaco dunes. Habitat is primarily bare sand and active sand dunes. This inland area does not have a shoreline component and is approximately 95.0 acres. A portion of the west side (approximately 15.5 acres) has been closed year-round since 2005 due to the presence of a cultural resource area. Portions of this area have developed small vegetated hummocks. Straw bales, placed within the protected cultural area in 2004, to build up sand to cover and protect cultural resources, persist. The east fence of the Boneyard exclosure is not maintained as predator fencing due to the rapidly shifting open sand dunes in the area. Instead, beginning in 2003, a two-inch by four-inch mesh interior fence (six-foot-tall predator fencing) has bisected Boneyard exclosure during the nesting season, resulting in 48 acres in the western portion (contiguous with 6, 7, and 8 exclosures and North Oso Flaco) and 47 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. Beginning in 2006, an additional 0.4 miles of shoreline at the southern end of the park were included in the ODSVRA (a survey conducted by the Guadalupe-Nipomo Dunes NWR in 2005 determined this area was part of ODSVRA and not the Guadalupe-Nipomo Dunes NWR, as was previously thought). For purposes of discussion in this report, Oso Flaco is divided into North Oso Flaco and South Oso Flaco (Figure 2).

North Oso Flaco: The area extending south 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 has been part of the Seasonal Exclosure and managed in a similar manner with symbolic fencing replaced by predator fencing. Additionally, the shoreline has been closed to the public during the nesting season.

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

Seasonal Exclosure: The contiguous area enclosed by the predator fencing of Southern Exclosure and North Oso Flaco (does not include the shoreline or the eastern Boneyard area). ODSVRA fences this approximately 263-acre area during the nesting season to exclude coyotes, vehicles, and human trespass from the protected nesting habitat (see section titled Seasonal closure and fencing on page 14, Figure 2, and Figure C.1 in Appendix C). A portion of the North Oso Flaco fence along the boardwalk is left in place

year-round, however it is only maintained for predators during the nesting season (labeled as Permanent predator fence in Figure C.8 in Appendix C).

Pipeline revegetation area: Located adjacent to the east side of 8 exclosure. The area is heavily vegetated. Fencing designates the perimeter of revegetation area adjacent to the open riding area, however this fence is not maintained as predator fencing (Figure C.6 in Appendix C).

Other revegetation areas mentioned in this report: Maidenform revegetation area is located adjacent to the east side of Boneyard exclosure and the open riding area. Several named revegetation areas are 800 to 1,200 feet east of 6 exclosure including North Eucalyptus and three areas that make up Pawprint (Heather, Acacia, and Cottonwood). The areas are heavily vegetated. Fencing designates the perimeter of revegetation areas in the open riding area, however this fence is not maintained as predator fencing.

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

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

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

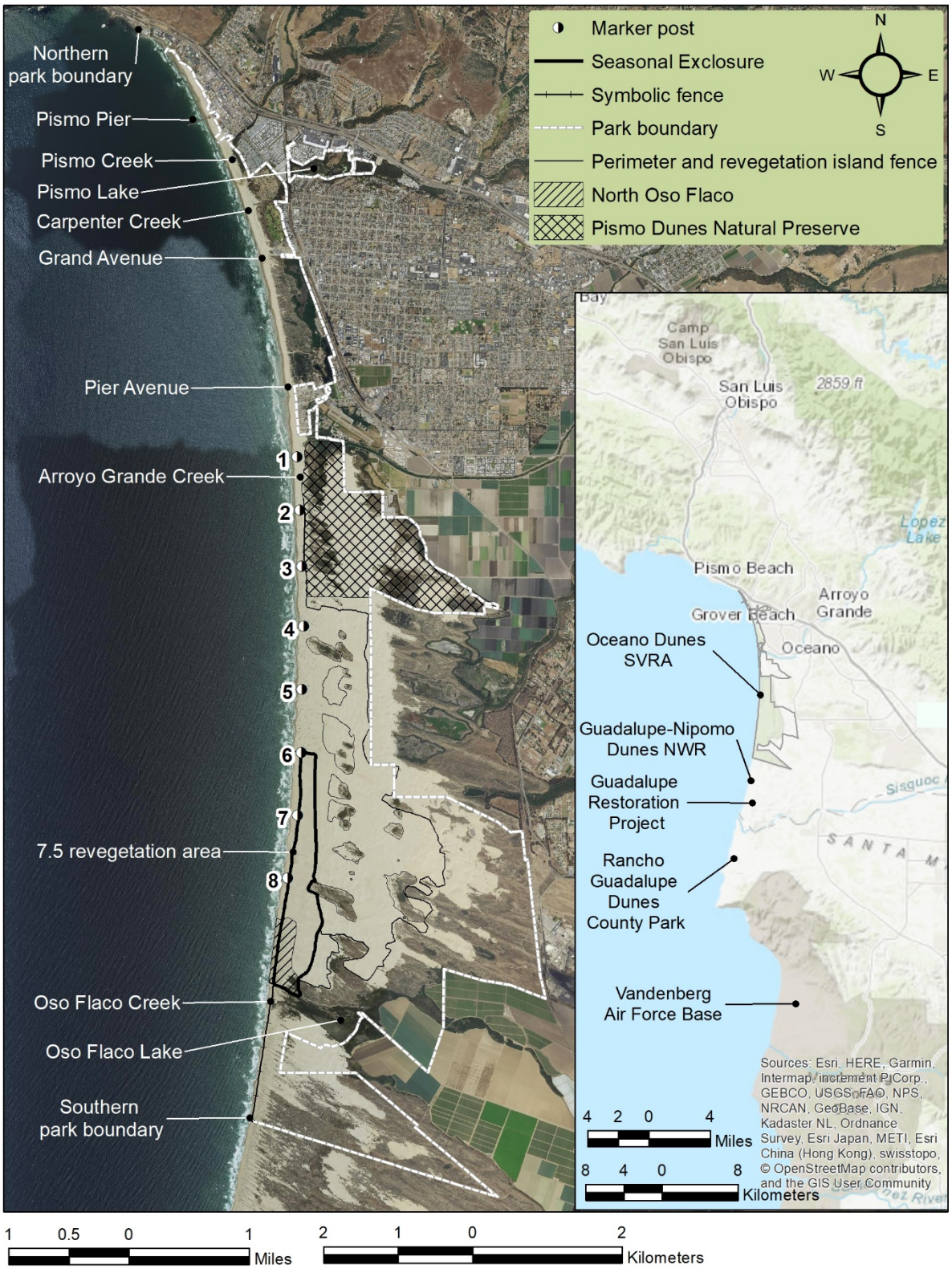

Figure 1. ODSVRA site map.

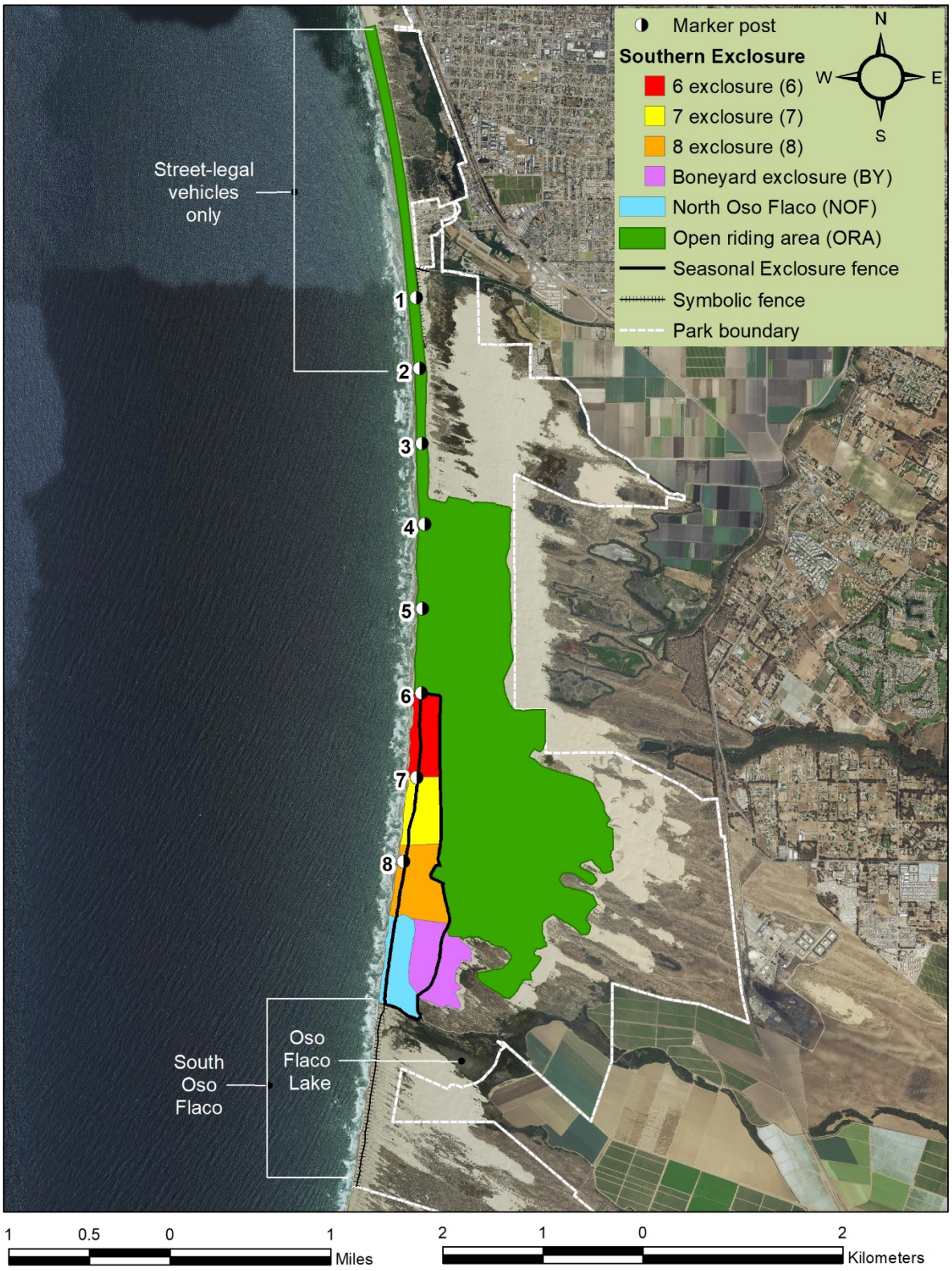

Figure 2. ODSVRA Southern Exclosure, Seasonal Exclosure, and Oso Flaco seasonally protected areas for breeding California least terns and snowy plovers in 2018.

MONITORING AND MANAGEMENT ACTIONS

MONITORING

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

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

Open riding area

Monitoring of the open riding area by vehicle occurs daily along defined transects, as any nests initiated or chicks in this area require immediate protection from recreational activities. Staff looks for signs of nesting birds, predator presence or signs, nonpermitted visitor activities (such as off-leash dogs or kites near the exclosure), rescues sick or injured wildlife, and collects deceased wildlife. Areas along transects with plover activity indicating potential nesting interest (scraping or copulating) receive more thorough checks on foot and with increased frequency using binoculars or spotting scope. Monitors pay particular attention to the boundary of the Southern Exclosure, looking each morning for tracks or others signs of tern or plover movement into the open riding area. Close brood monitoring occurs when staff walk within the exclosure, including preventing chick movement toward the open riding area, if necessary, with staff slowly stepping out of the vehicle or walking toward the exclosure. When staff finds chicks in the open riding area, they slowly direct them back into the protected Southern Exclosure using various appropriate measures to allow the brood's safe movement, including: diverting or regulating vehicle traffic flow, flushing threats such as gulls or other predators within the travel corridor, obtaining assistance as necessary from ODSVRA patrol staff, and placing signs and/or symbolic fencing to provide a safe passage until the brood reaches the protected exclosure. Staff continues to monitor chicks to confirm they do not move back into the open riding area.

Breeding least terns and snowy plovers

Finding and monitoring nests: The least tern and snowy plover management program documents size of breeding populations and attempts to find, monitor, and determine all tern and plover nest and chick fates. Staff checks most nests daily and conducts regular nest searches using binoculars and spotting scopes from parked vehicles outside of the seasonal fencing to minimize disturbance to nesting birds and broods. Additional nest searches conducted on foot confirm egg number and document activity at the nest bowl. Staff maps nest locations using a Global Positioning System (GPS).

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

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

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

Abandoned pre-term: Nest abandoned prior to the expected hatch date; causes may include, but are not limited to, disturbance or adult mortality.

Abandoned, suspected due to wind: Nest abandoned pre-term during periods of high wind, with eggs typically found almost or completely buried.

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

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

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

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

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

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

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

Banding chicks: In 2018, least tern chicks received a single size 1A blank aluminum band (covered with green over yellow vinyl tape) on the left leg, and a size 1A numbered aluminum federal band on the right leg. Color tape placed on the federal band creates color band combinations unique to each individual chick for the season. Weighing chicks occurs immediately prior to banding, typically at one to three days old.

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

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

Assignment of broods to nests: Point Blue bands most chicks at the nest. Unbanded broods found outside of the immediate nest area receive assignment to one of three categories: 1) a hatched preexisting known location nest, 2) a hatched new nest with unknown location and known only from brood, or 3) a hatched unassigned nest (listed as UNA1-UNA10 in Appendix B). Staff assigns unbanded broods to either a preexisting known location nest or a new nest with unknown location based on parent bands, or when adults are unbanded, based on the brood location and age of chicks. However, staff cannot assign broods to a specific nest in circumstances where several nearby nests hatch at the same time (hatching chicks confirmed from a distance with a spotting scope), banding at the nest is impossible, and unbanded broods with chicks of similar age appear on the same section of shoreline. Such broods fall within a category of hatched unassigned (UNA) nests.

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

Fledging success: At ODSVRA, juvenile terns can be widely dispersed over a large area. Specifically monitoring terns allows estimation of number of juveniles produced as well as identifies 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 on park property: in the Southern Exclosure, at Oso Flaco Lake, Pismo Creek lagoon, and any temporary daytime roosting areas that may become established. The fledgling tern counting method varied among years as follows: single day high counts for 1991-97, and 2000-01; a single day high count at Oso Flaco Lake for 1998; count method for 1999 unknown; and three-week interval day count conducted from 2002-04 (chicks banded to site 2003-04). In 2005, chicks were color-banded to brood and since 2006 most chicks were color-banded to individual, resulting in more accurate documentation of fledge rate than previous methods. Earlier estimates prior to banding to individual may represent substantial undercounts or overcounts.

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

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

> *Hatch rate:* Total number of hatching known location and fate nests divided by total number of nests with known location and fate.
>
> *Percentage chicks fledging*: Total number of chicks fledging divided by total number of chicks (includes chicks fledged from unknown location nests).
>
> *Number of chicks fledging per nest*: Total number of chicks fledging divided by total number of nests.

Productivity: Number of least tern fledglings per breeding pair (consistent with the annual statewide California least tern report produced by CDFW). Number of snowy plover fledglings per breeding male (consistent with USFWS Pacific coast western snowy plover recovery plan).

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

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

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

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

Individually banded snowy plover adults provide the most accurate means to identify breeding population size but currently at ODSVRA too few adults are banded to rely solely on this method. A minimum number of breeding females derives from the maximum number of nests active on the same day plus any additional nests hatching one day before or initiated one day after this date. The minimum estimated number of breeding males equals the highest same day count of active nests and broods (males typically raise the chicks; males with broods three weeks of age or older are not included if they could be associated with a new nest) and number of nests initiated the day after the high count. Beginning in 2009, 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. 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. A set of night vision goggles are available, but have limited value for this task. On occasions when monitors cannot see terns due to darkness after dusk, terns are heard vocalizing as they arrive to roost. ODSVRA considers counts a minimum due to the inherent limited visibility of the night roost. It is typically too dark to distinguish between adults and juveniles.

Least tern use of freshwater lakes: Freshwater lakes can provide a source of prey fish in addition to the near-shore ocean. Surveying nearby small freshwater lakes documents tern use and gives a better understanding of local food resources. An important component of this monitoring is to determine if lakes provide additional appropriately-sized fish to feed chicks (chicks require fish small enough to be swallowed

whole). Monitors conduct periodic surveys at Oso Flaco Lake (located on park property approximately 1.8 miles south of the middle of tern colony) during the season, do not monitor Dune Lakes (approximately 1.5 miles to east) on private property with no access, and no longer monitor Cypress Ridge Lake (approximately 3.2 miles to east) because of terns' absence since 2013. However, staff monitors the tern colony in the Southern Exclosure daily and observations of adults in flight provide information about the direction of foraging sources and, occasionally, fish size.

Wind speed monitoring

Since 2011, ODSVRA monitors wind speed from a tower (S1 tower) located approximately 375 feet east of 6 exclosure, with anemometers at two, seven and 10 meters high. In 2010-11, ODSVRA placed a portable anemometer with data logger (from WindLog Rainwise, Inc.) in the breeding habitat. Before 2010, monitors periodically measured wind speeds by handheld weather gauges (Kestrel 2000 Weather Meter by Kestrel Meters).

Predator activity

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

Measures describing predator activity:

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

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

For both sightings and occurrences, this report separates single day detections for the different areas of the Southern Exclosure (6, 7, 8, and Boneyard exclosures) and Oso Flaco (North and South). Note that the number of recorded sightings or occurrences for the first two weeks of March may be biased lower, with less time during this period spent on predator surveys and more time spent on habitat enhancement and fencing projects.

Gull monitoring: Gulls may depredate snowy plover and least tern eggs and chicks, as well as young plover juveniles. Human activity, with its associated food resources, attracts gulls, making them a subsidized predator. Monitors count gull numbers at the trash dumpster area near marker post 2 one to two times per week in addition to general gull monitoring around the Southern Exclosure and Oso Flaco.

Nonbreeding season monitoring of snowy plovers

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

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

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

Investigation of least tern and snowy plover carcasses

As directed by CDFW, ODSVRA sends fresh carcasses of least terns to an approved facility for necropsy. This is primarily the CDFW Office of Spill Prevention and Response, Marine Wildlife Veterinary Care and Research Center, Santa Cruz, California (CDFW OSPR). If CDFW OSPR is unavailable, ODSVRA sends carcasses to UC Davis California Animal Health and Food Safety Laboratory System, Davis, California. Fresh carcasses require immediate refrigeration and then ODSVRA sends them by overnight delivery service within one day to preserve the tissue integrity for testing to determine cause of death. Since 2017, under direction from USFWS, ODSVRA places all snowy plover carcasses in a freezer for deferred necropsy, if USFWS determines it necessary.

MANAGEMENT ACTIONS

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

Informational signage and enforcement of regulations

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

Seasonal closure and fencing

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

ODSVRA uses the following exclosure types:

<u>Seasonal Exclosure protected area (within Southern Exclosure and North Oso Flaco)</u>: ODSVRA encloses with wire mesh fencing this 263-acre area during the nesting season to limit vehicle and human trespass into protected nesting and brood-rearing habitat. Wire fencing five feet high (bottom eight inches buried) with two-inch by four-inch mesh discourages coyote entry. Beginning in 2006, an additional layer of fence material attached to overlap the top of the fence increased fence height above the surface to approximately six feet as a further deterrent to coyotes. Staff attaches bird barrier spikes to the wood posts in an effort to discourage perching by avian predators.

<u>Symbolic fencing (Southern exclosure shoreline, North Oso Flaco shoreline, and South Oso Flaco)</u>: Symbolic rope fencing, with the addition of tall posts with large stop signs extending into the intertidal area at marker post 6 and the south end of North Oso Flaco, clearly designate a closed shoreline to visitors. Symbolically fencing approximately 1.2 miles of nesting and brood-rearing habitat in South Oso Flaco identifies the closure area (lower shore remains open to public). Staff moves the fencing in this area westward for nests found west of or very near the symbolic fence to provide more of a buffer between nests and pedestrians. Nests in this area may also receive some type of single nest wire exclosure.

<u>Large single nest exclosure</u>: Staff installs a large circular single nest exclosure with height of five feet (bottom eight inches buried) around any least tern or snowy plover nest found in the open riding area. The minimum nest exclosure diameter size is 656 feet (200 meters) for tern nests and 200 feet for plover nests. (Prior to 2016, the minimum size for tern single nests exclosures was 200 feet in diameter.) ODSVRA may use single nest exclosures of differing sizes to protect snowy plover nests in areas closed to vehicles (Oso Flaco, Southern Exclosure shoreline, Arroyo Grande Creek area, and areas north of Grand Avenue).

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

inside or outside of seasonal fencing for protection from predators, including roosting gull flocks. 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 builds the 10-foot by 10-foot exclosure (available for use since 2003) and seven-foot-diameter circular exclosure (available for use since 2012) with five-foot-high sides with the bottom eight inches buried when located outside of the Seasonal Exclosure. Plastic netting, 1/2-inch by 1/2-inch mesh, added to the top, protects against avian and climbing mammalian predators.

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

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

Habitat enhancement

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

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

Wrack and talitrids: Results from studies conducted by Drs. Jenny Dugan and Mark Page, researchers from the Marine Science Institute at the University of California Santa Barbara, showed that invertebrate populations on the Southern Exclosure shoreline are greatly depressed during the five months when open to recreational vehicle use (October through February). The studies also showed that invertebrates cannot effectively recover species diversity and abundance on the Southern Exclosure shoreline in the following seven-month seasonal closure (March through September).

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

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

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

Predator management

In addition to preventative measures such as fencing, single nest wire exclosures, and cover provided by habitat enhancement, park staff removes animal carcasses (which attract scavengers) in or adjacent to nesting and brood-rearing habitat and harass predators to flush them from sensitive areas. Hazing techniques used include approaching an avian predator on foot or by vehicle, waving arms and making noise, or firing a bird whistler. A bird whistler is a handheld launcher that fires a projectile up to 300 feet that makes a loud whistling sound, hazing predatory birds without harming them. In some situations, firing the bird whistler may cause less disruption to plovers and terns compared to approaching an avian predator on foot in the breeding habitat. When ODSVRA requires additional options for managing predators, Bloom Biological, Inc. performs selective live-trapping and relocation of avian predators and USDA Wildlife Services conducts lethal removal of mammalian and avian predators (see section titled Predators and predator management on page 39 for additional information).

RESULTS AND DISCUSSION

CALIFORNIA LEAST TERN

Number of breeding pairs

In 2018, least terns were first heard at ODSVRA on 2 May flying over the exclosure, with nine seen over the exclosure on 3 May, and from this date onward terns were seen or heard daily. Terns were last seen on 27 August with two banded juveniles on the exclosure shoreline. During the previous 16 years, first sightings occurred between 8 April and 15 May (median=6 May) and last sightings occurred between 10 August and 28 September (median=30 August). To determine the minimum number of breeding pairs ODSVRA uses the single day high count of concurrent nests and broods (see Monitoring and Management Actions section for additional information on determining number of breeding adults). In 2018, there was a known minimum of 30 breeding pairs and an estimated maximum of 33 pairs. This is noticeably lower than both the 42-47 pairs in 2017 and an average of 41-44 pairs (range=23-60) for the 13-year period 2005-17 (Table 1, Figure 3). The record low productivity of the 2017 season, with many eggs and chicks in nests suspected lost to predators (including striped skunks [*Mephitis mephitis*]), may have resulted in some pairs relocating to nearby sites in 2018. This season, there was a substantial increase in breeding pairs at Vandenberg Air Force Base (VAFB), and Rancho Guadalupe Dunes County Park (RGDCP) had nesting terns for the first time in eight years.

Number, clutch size, and distribution of nests

There was a total of 35 nests, with the first nest initiated approximately 26 May and the last 18 July (Appendix A). During the 16-year period 2002-17, there was an average of 48 nests per year (range=22-79) with initiation dates for first nests ranging from 16 May to 8 June (median=30 May). In 2018, the number of nests and broods active at the same time was 30 on 12-13 July. Of the 33 nests with known complete clutch size, 14 had one egg, 19 had two eggs, and none had three eggs, with an average clutch size of 1.58 eggs. This compares to an average of 1.89 for 2005-17 (range=1.57-2.05), and a reported statewide average of 1.67 from 2007–16 (range=1.60-1.82) (Marschalek 2008-12; Frost 2013-17). Of the 35 nests, 20 were located in 6 exclosure (57%), and 15 in 7 exclosure (43%) (Figure 4).

Clutch hatching rate

Of the 35 nests, 28 hatched, four were abandoned pre-term, two were abandoned post-term, and one failed (unknown cause) for a clutch hatching rate of 80.0% (28/35) (Table 2). This compares to an average hatching rate of 83% (range=65-98%) for known fate nests during the period 2005-17 (Table 1). The hatching rate was 70.0% (14/20) in 6 exclosure and 93.3% (14/15) in 7 exclosure. Twenty-two chicks hatched from a minimum of 31 eggs in 6 exclosure, and 20 chicks hatched from a minimum of 23 eggs in 7 exclosure.

Table 1. Nesting success of California least terns at ODSVRA from 1991-2018.
Percent nests hatched calculated using number of nests with known fate. Percent chicks fledged and juveniles fledged per nest may include fledglings from unknown nest locations detected only by brood presence, but these are few. Chicks were banded to site in 2003 and 2004. In 2005, chicks were first banded to brood and from 2006-18, chicks were banded to individual.

Year	Estimated no. breeding pairs	No. nests (no. known fate)	No. hatched nests	Percent known fate nests hatched	No. chicks	Percent chicks fledged	No. juveniles	Juveniles fledged per nest	Estimated no. juveniles fledged per pair
1991	4-5	6 (6)	2	33	4	100	4	0.67	0.80-1.00
1992	3-4	4 (4)	1	25	2	50	1	0.25	0.25-0.33
1993	0	0	0	0	0	0	0	0	0
1994	2	2 (2)	0	0	0	0	0	0	0
1995	1	1 (1)	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0
1997	16-19	21 (16)	3	19	6	0	0	0.00	0.00-0.00
1998	33-37	40 (32)	26	81	40	60	24	0.60	0.65-0.73
1999	28-31	34 (31)	22	71	42	40	17	0.50	0.55-0.61
2000	4-5	5 (5)	4	80	8	50	4	0.80	0.80-1.00
2001	12-15	18 (18)	13	72	22	55	12	0.67	0.80-1.00
2002	20-21	22 (19)	15	79	27	37	10	0.45	0.48-0.50
2003	53-66	79 (77)	60	78	101	37	37	0.47	0.56-0.70
2004	47-55	63 (60)	44	73	69	36	25	0.40	0.45-0.53
2005	47-53	59 (59)	39	66	66	30	20	0.34	0.38-0.43
2006	31-35	38 (38)	28	74	45	78	35	0.92	1.00-1.13
2007	54-60	66 (66)	51	77	90	79	71	1.08	1.18-1.31
2008	55-56	56 (56)	50	89	99	72	71	1.27	1.27-1.29
2009	25-26	26 (26)	23	88	43	77	33	1.27	1.27-1.32
2010	23	23 (23)	20	87	35	83	29	1.26	1.26
2011	33-34	35 (35)	31	89	55	91	50	1.43	1.47-1.52
2012	41-44	46 (39)	32	82	51	82	42	0.91	0.95-1.02
2013	48-53	57 (52)	45	87	85	66	56	0.98	1.06-1.17
2014	47-48	49 (46)	42	91	76	76	58	1.18	1.21-1.23
2015	44-49	54 (54)	48	89	84	82	69	1.28	1.41-1.57
2016	47-48	49 (47)	46	98	78	76	59	1.20	1.23-1.26
2017	42-47	52 (34)	22	65	39	18	7	0.13	0.15-0.17
2018	30-33	35 (35)	28	80	42	83	35	1.00	1.06-1.17

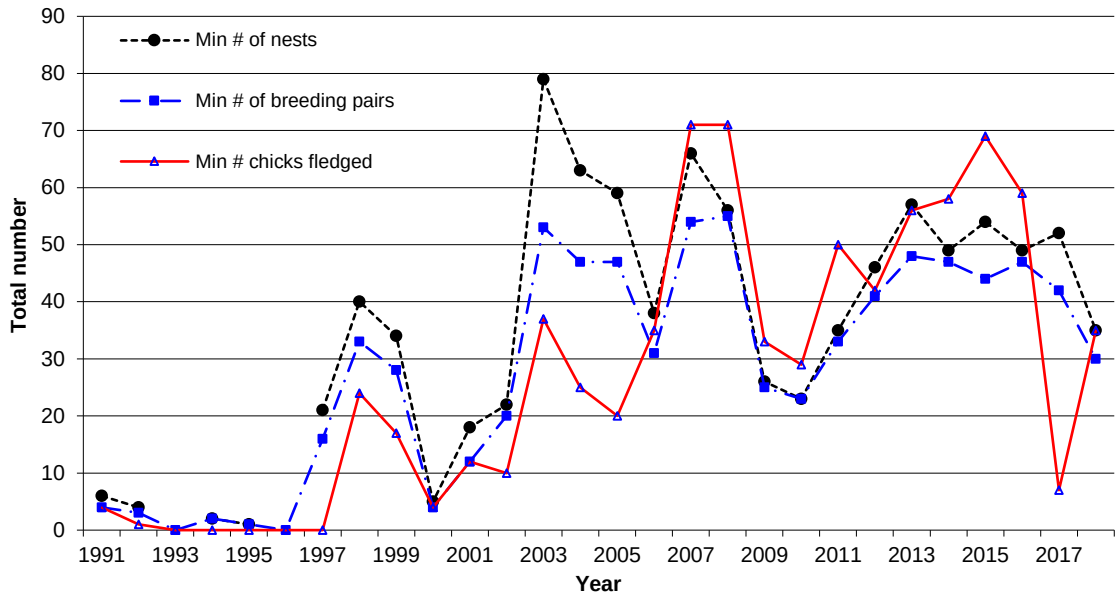

Figure 3. Number of California least tern nests, pairs, and fledglings at ODSVRA from 1991-2018.

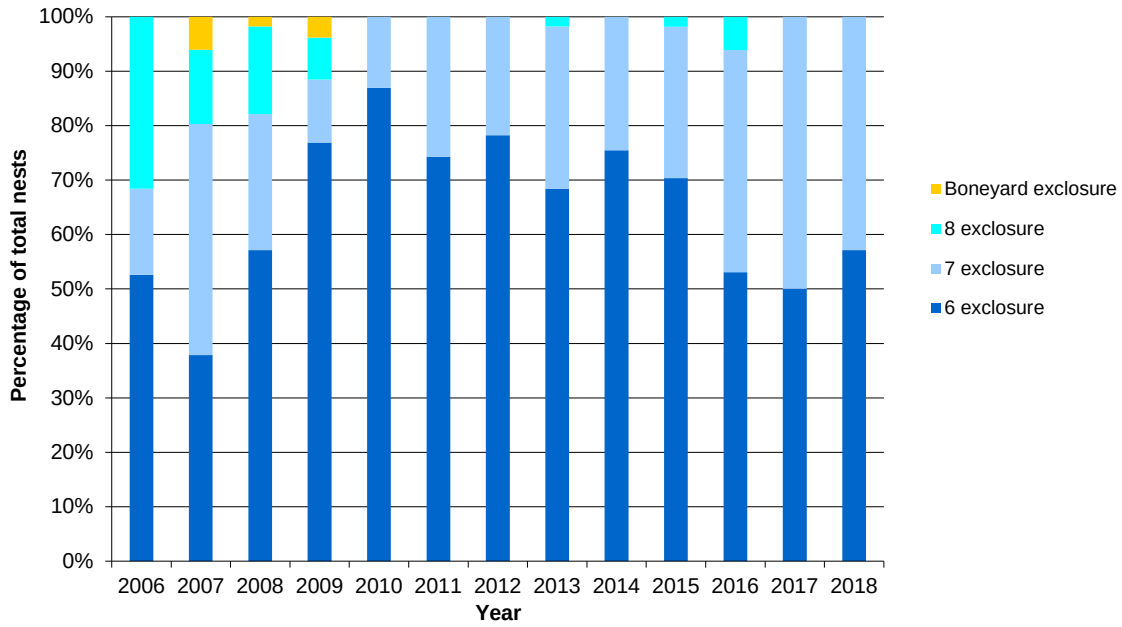

Figure 4. Distribution of least tern nests as a percent of total nests at ODSVRA from 2006-18.

Table 2. Causes of California least tern nest loss at ODSVRA from 2002-18.
Ab. = Abandoned.

Year	Ab. pre-term	Ab. post-term	Ab., suspected wind	Ab., unknown if pre- or post-term	Failed, cause unknown	Skunk	Coyote	Gull	Opossum	Raccoon	Unknown predator	Chick dies in egg at hatch	Total no. failed nests
2002	1	1					2						**4**
2003	6				5		1				2		**14**
2004	9	1			3		2				1		**16**
2005	7	3		4	4						1	1	**20**
2006	4	3		2							1		**10**
2007	2	4	4		5								**15**
2008	3	2						1					**6**
2009	1	1		1									**3**
2010		1			1				1				**3**
2011	2	2											**4**
2012	1	2		3	1								**7**
2013	2			2	1		1		1				**7**
2014	1	1		1	1								**4**
2015	1	1		1	2					1			**6**
2016				1									**1**
2017	5			1	1	5							**12**
2018	4	2			1								**7**
Total 2002-18	**49** **35.3%**	**24** **17.3%**	**4** **2.9%**	**16** **11.5%**	**25** **18.0%**	**5** **3.6%**	**6** **4.3%**	**1** **0.7%**	**2** **1.4%**	**1** **0.7%**	**5** **3.6%**	**1** **0.7%**	**139**

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

Thirty-eight of the 42 known hatching chicks were banded with a unique color combination. Thirty-five of the 42 chicks were seen when 21 days old or older for a fledgling rate of 83.3%. The fledging rate for banded chicks was 86.8% (33/38) and 50.0% (2/4) for unbanded chicks (Appendix A). This fledging rate compares to an average of 70% (range=18-91%) during the previous 12-year period 2006-17 when most chicks were banded to individual. In 2018, 57.1% (8/14) of the two-chick broods fledged both chicks. This compares to an average of 56% (range=0-86%) of 179 two-chick broods fledging both chicks during the previous 12 years. In 2018, the estimated number of fledglings produced per pair ranged from 1.06-1.17 and averaged 1.12-1.19 for the previous 12 years (range=0.15-1.57). This is above recent averages for all of California (Table 1). Estimated statewide fledging rates for each year are reported as a range and averaged 0.27-0.39 fledglings per pair for the 12-year period 2005-16 (highest estimate in 2014 with range=0.37-0.68) (Marschalek 2006-12; Frost 2013-17).

From 2010-15, there were six known occurrences of a least tern chick moving east of the exclosure into the open riding area (two in 2010, by the same chick on the same day; one in 2011; two in 2013; and one in 2015). These chicks were monitored and directed back into the exclosure. From 2016-18, there were no known such occurrences.

Of the current or recent breeding sites in San Luis Obispo and Santa Barbara counties, banding tern chicks occurs at ODSVRA (since 2003) and VAFB (beginning 2018 with banding to site and year). Banding least tern chicks at ODSVRA, especially with individual color band combinations, has increased the ability to detect juveniles at ODSVRA and provides greater accuracy in documenting fledging rate than the three-week count method[3]. For the six-year period 2006-11, the three-week count method at ODSVRA consistently underestimated the minimum known number of juveniles produced each year, identifying an average of 49.0% (range=38.0-66.7%) of the known minimum number (see CDPR 2011 for greater details).

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

ODSVRA relies on color band resighting data to derive a more accurate fledging rate and did not conduct three-week counts in 2012-18.

Color banding chicks to brood in 2005 and to individual since 2006 has also provided information on juvenile length of stay at ODSVRA. In 2018, 36.4% (12/33) of the color-banded juveniles were documented remaining at ODSVRA for 21 days or longer post-fledging. Over the 13-year period 2006-18, 552 color-banded fledglings were tracked at ODSVRA with 30.8% (170/552) remaining 21 days or longer (Table 3).

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 13-year period, 2006-18.

During this period, 552 color-banded fledglings (21 days old or older) were tracked at ODSVRA (sightings outside the park are not included). Numbers in parentheses are percentages of all banded fledglings for the year.

Year	0 - 6 days post-fledge	7 - 13 days post-fledge	14 - 20 days post-fledge	21 - 27 days post-fledge	28 - 34 days post-fledge	>35 days post-fledge
2006	4 (12%)	5 (15%)	9 (26%)	14 (41%)	2 (6%)	0 (0%)
2007	9 (14%)	14 (22%)	15 (23%)	18 (28%)	9 (14%)	1 (2%)
2008	12 (18%)	28 (41%)	16 (24%)	11 (16%)	0 (0%)	0 (0%)
2009	3 (10%)	14 (48%)	8 (28%)	3 (10%)	1 (3%)	0 (0%)
2010	3 (10%)	4 (14%)	15 (52%)	7 (24%)	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 (24%)	24 (47%)	10 (20%)	0 (0%)	0 (0%)
2014	2 (5%)	7 (17%)	18 (43%)	14 (33%)	1 (2%)	0 (0%)
2015	12 (21%)	10 (18%)	21 (38%)	10 (18%)	1 (2%)	2 (4%)
2016	22 (39%)	9 (16%)	19 (34%)	5 (9%)	1 (2%)	0 (0%)
2017	0 (0%)	3 (60%)	1 (20%)	1 (20%)	0 (0%)	0 (0%)
2018	3 (9%)	5 (15%)	13 (39%)	4 (12%)	8 (24%)	0 (0%)
Total 2006-18	80 (15%)	123 (22%)	179 (32%)	140 (25%)	27 (5%)	3 (1%)

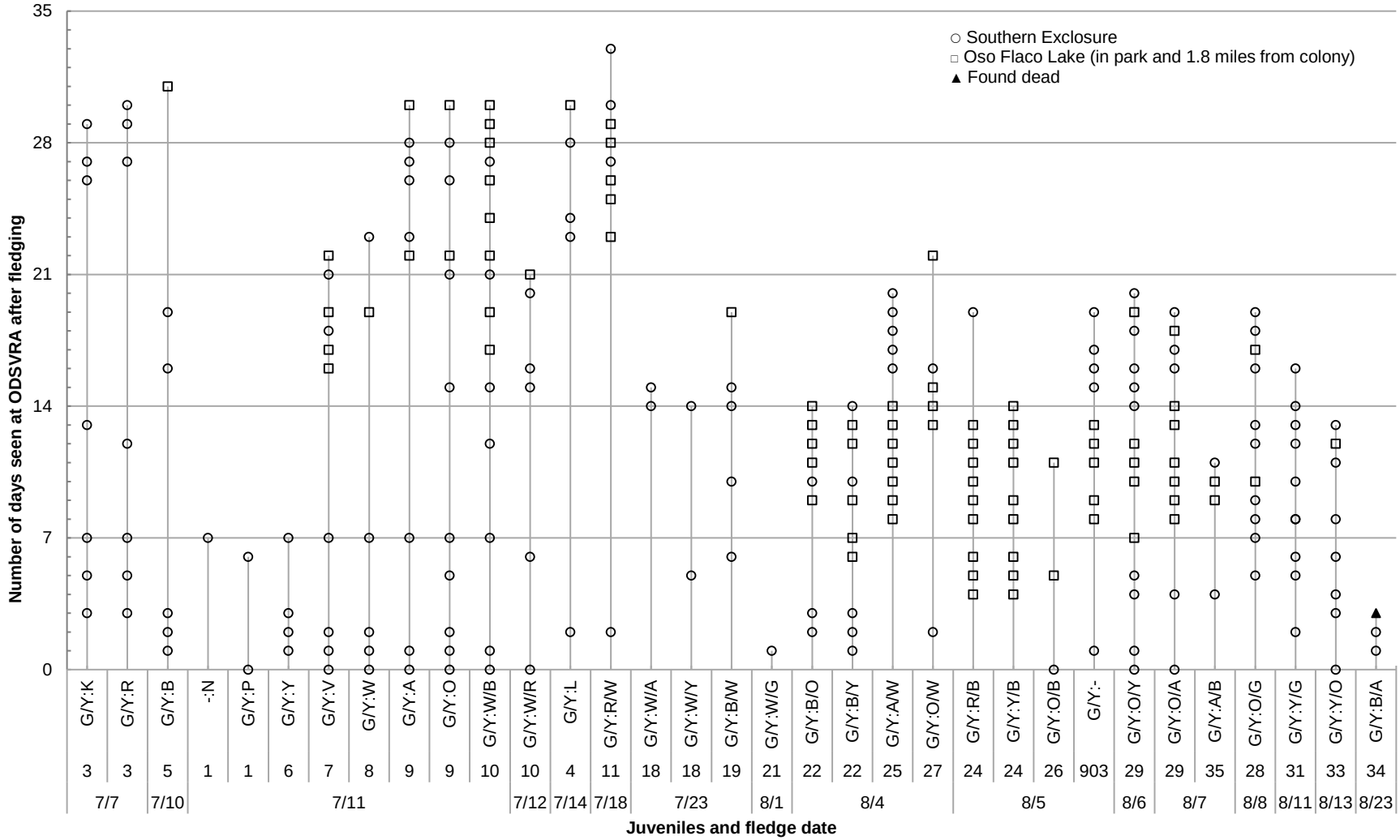

Figure 5. Number of days California least tern juveniles that hatched at ODSVRA in 2018 continued to be seen on-site after reaching fledge age (21 days old).

The horizontal axis provides the nest number from which each fledgling hatched and the date it fledged. All juveniles included in graph were color-banded to individual.

Mortality (other than eggs)
There was one documented tern mortality (other than eggs) at ODSVRA during the 2018 breeding season; the carcass of a fledgling found on 7 exclosure shoreline on 26 August. It had last been seen alive on 25 August at 23 days old (see Notes section, 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. In 2018, 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 12 years, nearby small freshwater lakes observed with more than incidental tern activity in one or more years include Oso Flaco Lake, Dune Lakes, and Cypress Ridge Lake. Of these lakes, only Oso Flaco Lake was surveyed in 2018 (see paragraph titled Least tern use of freshwater lakes in the Monitoring and Management Actions section).

In 2018, 30 surveys at Oso Flaco Lake, averaging 85 minutes in length, were conducted by park resource staff between 27 June and 29 August; number of terns seen averaged 9.2 birds (range=0-29, high count 1 August). This compares to 2017 with an average of 4.5 birds over 12 surveys between 10 June and 19 August (range=0-12, high count 22 July). In 2018, adult terns were observed foraging, roosting, feeding juveniles, and flying with fish in the direction of the tern colony. To collect additional information on least tern presence at Oso Flaco Lake, accounts of birder visits from March through September posted to the eBird and iNaturalist websites were reviewed (eBird.org 2018, iNaturalist.org 2018). Least terns were reported on these websites on 15 days between 23 June–17 August (average number=6.6, range=1-21, high count on 2 August). Banded terns seen by resource staff or confirmed with photographs by birders included 22 juveniles and 20 adults. With the exception of one 2018 VAFB juvenile, all banded birds were confirmed to have been banded at ODSVRA as chicks.

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 2018, there was a minimum of 47 banded adults documented at ODSVRA, based on observations with a spotting scope. Forty-five of these birds were identified as banded at this site as chicks (banding began in 2003). Origins of two banded birds could not be determined as they only had a single federal aluminum band without color tape. Breeding was documented for a minimum of 21 banded adults and this is likely a substantial underestimate (Appendix A). At least 16 of the 21 adults were banded as chicks at ODSVRA; the complete color combinations of the other five breeding adults could not be confirmed (Table D.1 in Appendix D).

Least terns typically first breed at three years old, with some breeding documented by two-year-old birds (Massey and Atwood 1981). A total of nine two-year-old banded terns have been documented as breeding at ODSVRA in 2012-18 (two in 2012, three in 2013, two in 2014, one in 2016, and one in 2018). In 2005, a two-year-old tern banded as a chick at ODSVRA was documented breeding at VAFB, approximately 22 miles south of the park. The oldest confirmed breeding adult at ODSVRA in 2018 was a banded 10-year-old tern (-:W/A/W, banded G/W:W/A/W as a chick at ODSVRA in 2008).

Least terns banded at other sites and seen at ODSVRA
Over the last eight years there has been only one confirmed sighting of an adult banded tern from another site. This was an adult (S:A/O) seen 28 July–11 August 2011 that was banded at the U.S. Navy North Island Maintenance and Training Facility in San Diego Bay, San Diego County, California. In 2018, VAFB first began banding least tern chicks. One of those banded juveniles (S:B) was confirmed this year at ODSVRA from 16-18 August (Table D.1 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 112 days between 10 May and 31 August in 2018. The night roost was initially located in the same area of northern 6 exclosure used since 2004, the year when 6 exclosure first became available as protected habitat for a complete season. However, as in 2016 and 2017, the night roost later appeared to shift to areas in southern 6 exclosure and mid-7 exclosure, and was sometimes not located during surveys. Also, part of the roost location shifted eastward and closer to the Southern Exclosure fence. A bumpout was installed 4 August to maintain a 328-foot (100-meter) buffer between the night roost and the open riding area. Counts at the night roost are minimums, as some or all birds would often arrive after it was too dark to count individuals. In 2018, there was a high count of 64 birds at the night roost on 27 July (Figure 6). This compares to an average night roost high count of 60 (range=35-95) from 2007-17. Both adults and juveniles were seen but it typically was too dark to distinguish plumage and age class.

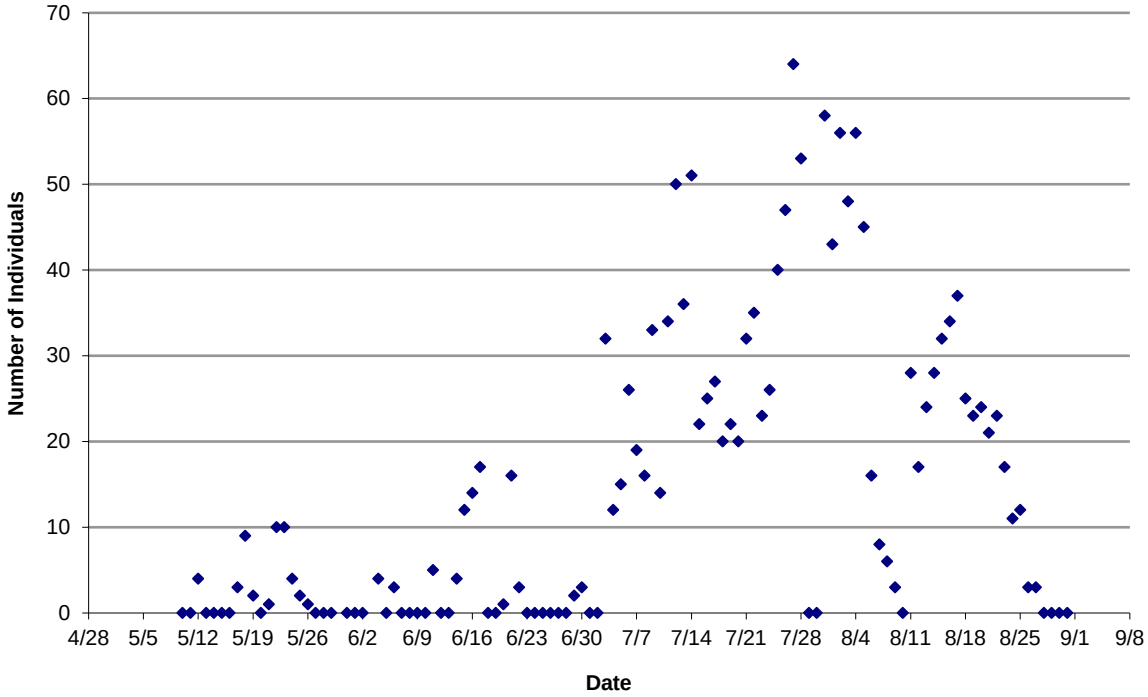

Figure 6. Number of California least terns counted at the ODSVRA night roost in 2018.
First survey on 10 May and roost first detected on 12 May.

Importance of ODSVRA least tern breeding colony

The ODSVRA least tern breeding colony has benefited from the increased level of protection and management actions provided since 2002. The colony is important in meeting statewide recovery goals as loss of breeding habitat has resulted in a fragmented population distribution and a limited number of remaining breeding sites (USFWS 1985, 2006). On a regional level, there are very few active breeding sites along the central coast of California and none remain between ODSVRA and San Francisco Bay. Within San Luis Obispo and Santa Barbara counties, there are four least tern colony sites with annual or intermittent use, all sites have management providing protective measures and monitoring. ODSVRA is the only site in

San Luis Obispo County. The RGDCP site, VAFB, and Coal Oil Point Reserve (COPR) are in Santa Barbara County and approximately seven, 22, and 85 miles south of the ODSVRA colony, respectively. For this regional population, ODSVRA has become an important source of productivity. During the period 2004-18, ODSVRA produced a minimum of 659 juvenile terns while RGDCP, VAFB, and COPR combined produced an estimated 262 juveniles (Appendix E, Table 4).

Table 4. Number of reported breeding least tern pairs and juveniles produced at ODSVRA and the combined sites of Rancho Guadalupe Dunes County Park (RGDCP), Vandenberg Air Force Base (VAFB), and Coal Oil Point Reserve (COPR) from 2004-18.

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.

Year	ODSVRA		RGDCP, VAFB, and COPR combined	
	Est. no. breeding pairs	No. juveniles	Est. no. breeding pairs	No. juveniles
2004	47-55	25	15	0
2005	47-53	20	48	1
2006	31-35	36	7	7
2007	54-60	70	23	17
2008	55-56	70	19	19
2009	25-26	33	32-33	40
2010	23	29	34	31
2011	33-34	50	33	4
2012	41-44	42	18	10
2013	48-53	56	15	19
2014	47-48	58	17	20
2015	44-49	69	22	29
2016	47-48	59	25	18
2017	42-47	7	27	8
2018	30-33	35	70-71	39
Total juveniles produced		**659**		**262**

WESTERN SNOWY PLOVER

Number of breeding adults

In 2018, there was a minimum of 201 breeding adults (115 males and 86 females). This is an increase of 9.8% from a minimum number of 183 breeding adults in 2017 and compares to an average of 205 adults for the last five years and 142 for the 17-year period 2002-18 (Table 5, Figure 7).

Beginning in 2005, the USFWS has coordinated a rangewide window survey count of the U.S. Pacific coast breeding population of the snowy plover between the last week of May and first week of June. In 2018, the survey at ODSVRA counted 154 adult plovers (69 males, 72 females, and 13 of unknown sex), 77% of the minimum number documented for the entire season by known breeding activity. In 13 of the 14 years from 2005-18, 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 14-year period the window survey count averaged 79% 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 17-year period 2002-18.

Year	Min. no. breeding adults	Min. no. breeding males	No. fledglings	No. fledglings per breeding male[1]
2002	32	18	35	1.94
2003	84	52	107	2.06
2004	121	67	66	0.99
2005	116	65	82	1.26
2006	107	58	17	0.29
2007	79	47	66	1.40
2008	95	54	72	1.33
2009	114	66	81	1.23
2010	137	78	103	1.32
2011	160	94	152	1.62
2012	190	105	96	0.91
2013	163	92	187	2.03
2014	226	120	196	1.63
2015	205	113	277	2.45
2016	209	110	157	1.43
2017	183	93	174	1.87
2018	201	115	200	1.74
Average for 17-year period 2002-18	142	79	122	1.50
Average for 5-year period 2014-18	205	110	201	1.82
Average for 3-year period 2016-18	198	106	177	1.68

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

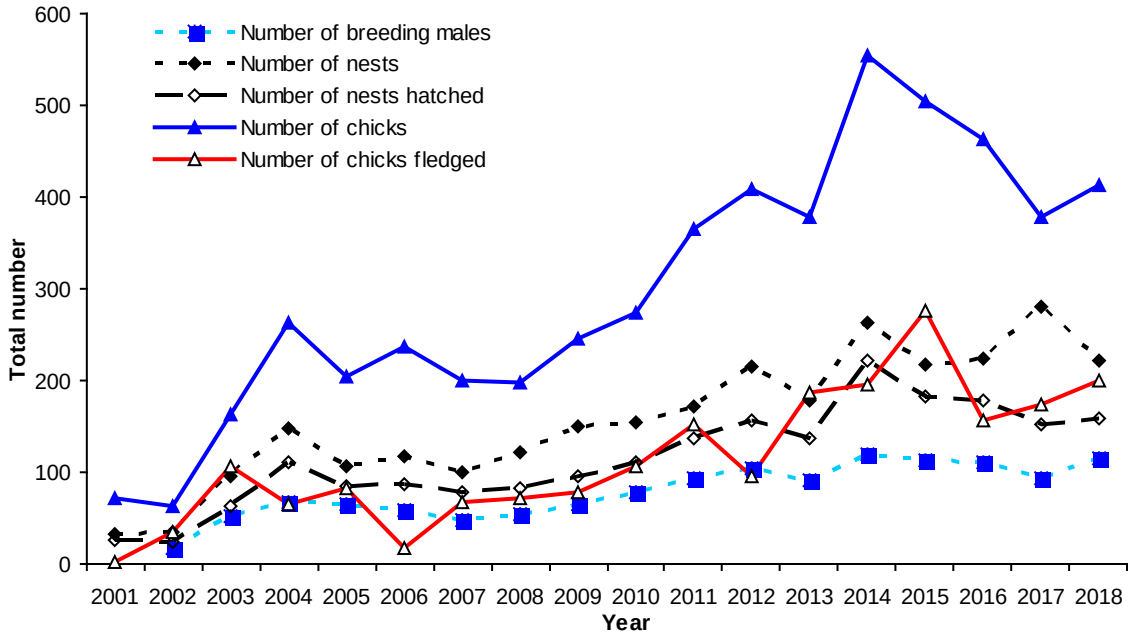

Figure 7. Number of snowy plover breeding males, nests, nests hatched, chicks, and chicks fledged at ODSVRA from 2001-18.

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 2005-18.

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	154	77%

Number and distribution of nests

There were 221 known nesting attempts, including 15 with unknown nest location, initiated between 30 March–10 July (see section titled Assignment of broods to nests in the Monitoring and Management Action section for unknown nest location description). Of the 206 nests from known locations, 145 (70.4%) were in the Southern Exclosure, 21 (10.2%) in North Oso Flaco, and 40 (19.4%) in South Oso Flaco. More specifically for the Southern Exclosure, there were 63 nests in 6 exclosure, 37 in 7 exclosure, 39 in 8 exclosure, and 6 in Boneyard exclosure (Appendix C). The maximum number of known location nests active at one time was 66 on 22 June, with the highest number in 6 exclosure (23 nests) (Table 7, Table 8, Figure 9, Table F.1 in Appendix F).

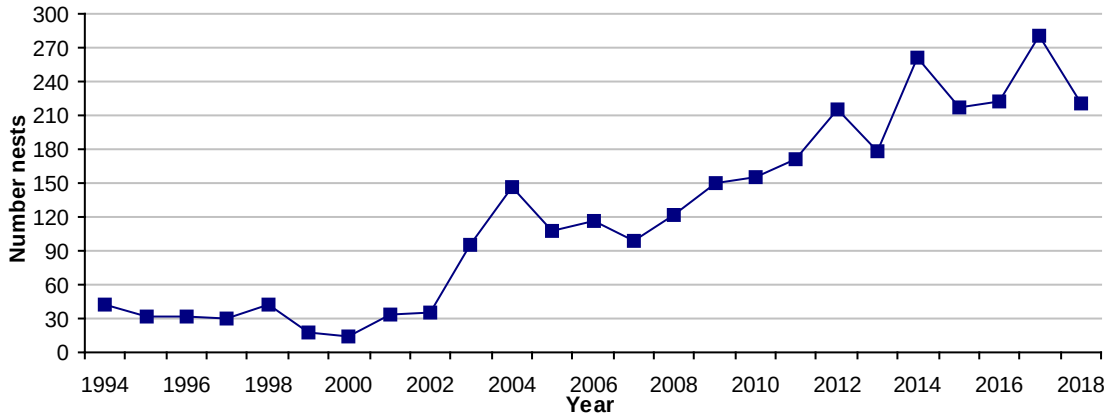

Figure 8. Number of snowy plover nests at ODSVRA from 1994-2018.

Table 7. Snowy plover nest distribution and success at ODSVRA in 2018.

Excludes 15 nests known only from detection of broods.

Location	No. nests (no. known location and fate)	Min. No. eggs laid	No. nests hatching	Percent known location and fate nests hatching
6 exclosure	63 (63)	181	51	81.0
7 exclosure	37 (34)	106	30	88.2
8 exclosure	39 (36)	103	25	69.4
BY exclosure	6 (6)	16	5	83.3
TOTAL SOUTHERN EXCLOSURE	**145 (139)**	**406**	**111**	**79.9**
North Oso Flaco	21 (21)	58	11	52.4
South Oso Flaco	40 (40)	115	22	55.0
TOTAL OSO FLACO	**61 (61)**	**173**	**33**	**54.1**

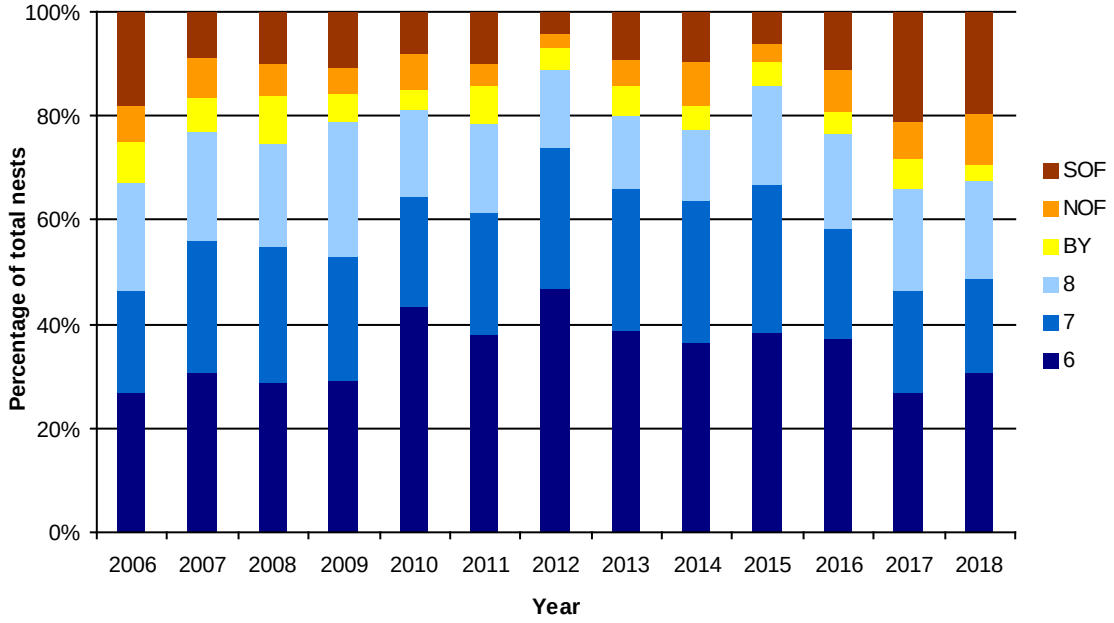

Figure 9. Distribution of snowy plover nests as a percent of total nests at ODSVRA from 2006-18.

Table 8. Nesting success of snowy plovers at ODSVRA from 2001-18.

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 2001-18 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)	No. known fate chicks fledged (percent fledged)	No. fledglings per nest
2001	33 (30)	na	na	26 (26)	86.7	71 (71)	3 (4.2)	0.09
2002	35 (35)	99	na	25 (25)	71.4	62 (62)	35 (56.5)	1.00
2003	95 (93)	254	na	63 (62)	66.7	162 (159)	107 (67.3)	1.13
2004	147 (140)	415	2.87 (141)	110 (105)	75.0	263 (263)	66 (25.1)	0.45
2005	107 (103)	290	2.86 (96)	84 (80)	77.7	204 (204)	82 (40.2)	0.77
2006	117 (114)	336	2.89 (115)	87 (87)	76.3	230 (230)	17 (7.4)	0.15
2007	99 (91)	290	2.93 (89)	78 (70)	76.9	200 (198)	66 (33.3)	0.67
2008	121 (119)	341	2.85 (116)	83 (81)	68.1	197 (197)	72 (36.5)	0.60
2009	150 (147)	418	2.85 (144)	95 (94)	63.9	245 (245)	81 (33.1)	0.54
2010	155 (150)	431	2.88 (146)	111 (109)	72.7	275 (275)	103 (37.5)	0.66
2011	172 (160)	487	2.88 (159)	138 (131)	81.9	365 (365)	152 (41.6)	0.88
2012	216 (203)	603	2.94 (200)	157 (152)	74.9	386 (386)	96 (24.9)	0.44
2013	178 (167)	502	2.93 (162)	138 (130)	77.8	343 (343)	187 (54.5)	1.05
2014	262 (239)	725	2.86 (243)	222 (206)	86.2	547 (547)	196 (35.8)	0.75
2015	217 (195)	612	2.92 (192)	182 (167)	85.6	494 (494)	277 (56.1)	1.28
2016	223 (193)	613	2.89 (188)	179 (165)	85.5	462 (462)	157 (34.0)	0.70
2017	281 (238)	738	2.88 (228)	153 (145)	60.9	378 (378)	174 (46.0)	0.62
2018	221 (200)	615	2.95 (184)	159 (144)	72.0	412 (412)	200 (48.5)	1.00

Average clutch size, clutch loss, and nest hatching rate

There were 221 identified nesting attempts, including 15 known only by brood, and of these 159 hatched (Table 8, Figure 8, Figure 10). For 184 nests with known complete clutch size (and excluding nesting attempts known only by brood) the average number of eggs was 2.95. This compares to the average of 2.89 eggs per clutch (range=2.85-2.94) for the 14-year period 2004-17. Excluding 21 nests (6 with unknown fate and 15 detected by brood only), the clutch hatching rate was 72.0% (144/200). This compares to an average of 75.2% (range=60.9-86.2%) from 2002-17 (Table 8). The nest hatching rate in 2018 was higher in the Southern Exclosure (79.9%) than in Oso Flaco (54.1%), as has been the case in 15 of the previous 17 years (Table F.1 and Figure F.1 in Appendix F). Fifty-six nests were known to fail, with losses attributed to abandoned pre-term (11); abandoned post-term (3); abandoned unknown pre- or post-term (7); abandoned, suspected wind (3); overwashed by tide (1); cause unknown (2); unidentified predator (2); avian (13); coyote (4); raven (5); and gull (5) (Table 9).

Table 9. Attributed causes of snowy plover nest loss at specific locations at ODSVRA in 2018.

Area	Abandoned pre-term	Abandoned post-term	Abandoned unknown pre- or post-term	Abandoned, suspected wind	Overwashed by tide	Failed, cause unknown	Unidentified predator	Avian predator	Coyote	Raven	Gull
Southern Exclosure											
6 exclosure	2	3	1	0	0	1	0	1	0	4	0
7 exclosure	0	0	2	0	0	0	0	1	0	1	0
8 exclosure	6	0	2	0	1	1	0	1	0	0	0
Boneyard exclosure	1	0	0	0	0	0	0	0	0	0	0
TOTAL SOUTHERN EXCLOSURE	9	3	5	0	1	2	0	3	0	5	0
Oso Flaco											
North Oso Flaco	0	0	2	0	0	0	0	7	1	0	0
South Oso Flaco	2	0	0	3	0	0	2	3	3	0	5
TOTAL OSO FLACO	2	0	2	3	0	0	2	10	4	0	5
TOTAL ODSVRA	11	3	7	3	1	2	2	13	4	5	5

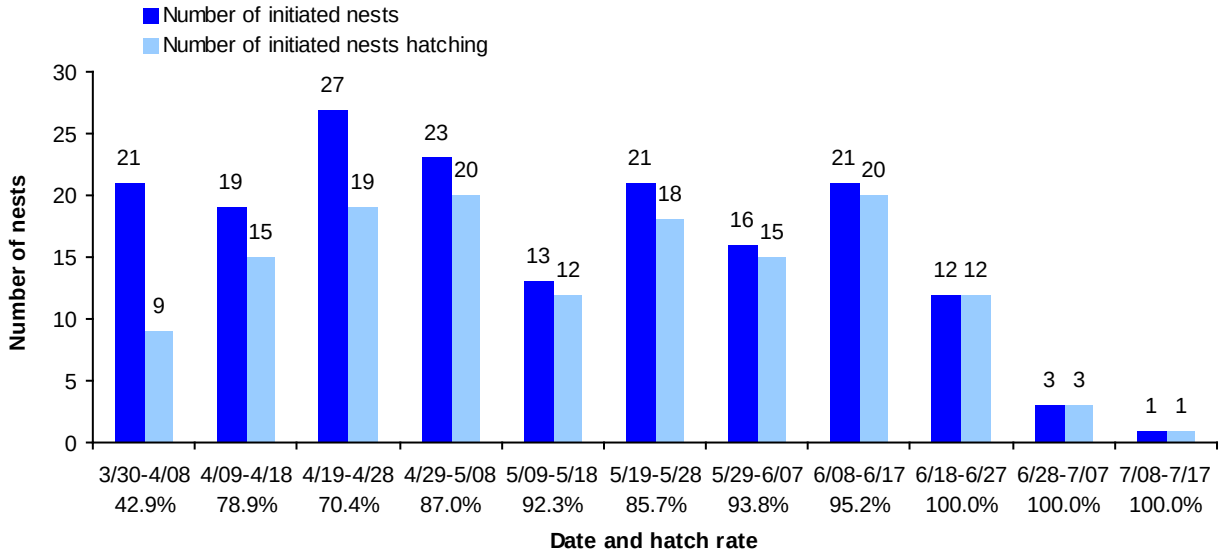

Figure 10. Number of known location and known fate snowy plover nests with known initiation date (n=177) initiated per 10-day period and number known to hatch at ODSVRA in 2018.

Thirty-seven nests with unknown initiation date are excluded and 22 of these nests failed. Excluding these nests has caused the hatch rates in the figure to inflate.

Chick fledging rate

Of the 412 snowy plover chicks hatched, 207 were banded and the fate of 205 unbanded chicks is believed known (Appendix B). In the absence of a high percentage of chicks being banded at ODSVRA, it would not be possible to obtain accurate chick survival and fledging rates. Between 13 June and 14 August, 10 unbanded broods (18 chicks) were observed on the exclosure shoreline and could not be assigned to a particular nest (listed as UNA1-10 in Appendix B). Although these broods could not be assigned to a specific nest and exclosure, all chicks were tracked and fledglings are included in totals. Additionally, there were 15 unbanded broods (36 chicks) observed on the shore from hatched nests of unknown location. Three of the 15 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 51.7% (107/207) and 45.4% (93/205) for unbanded chicks. The fledging rate for all chicks combined was 48.5% (200/412). This compares to 46.0% in 2017 and an average rate of 39.4% (range=7.4-67.3%) for the 16-year period 2002-17 (Table 8, Table F.1 in Appendix F) (CDPR 2007-17).

In 12 of 16 years during the period 2003-18, the fledging rate of chicks hatching in the early season (prior to 20 June) has been higher, by an average of 20 percentage points, than chicks hatching in the late season (20 June or later). (See 2012 report for how early versus late season was determined.) In 2018, the early season had a higher chick fledging rate (57%) compared to the late season (39%). Low survival was particularly apparent for chicks hatching after 10 July, representing 25.7% of all chicks produced, with only 24.5% (26 of 106 chicks) fledging (Figure 11, Figure 12, Figure 13).

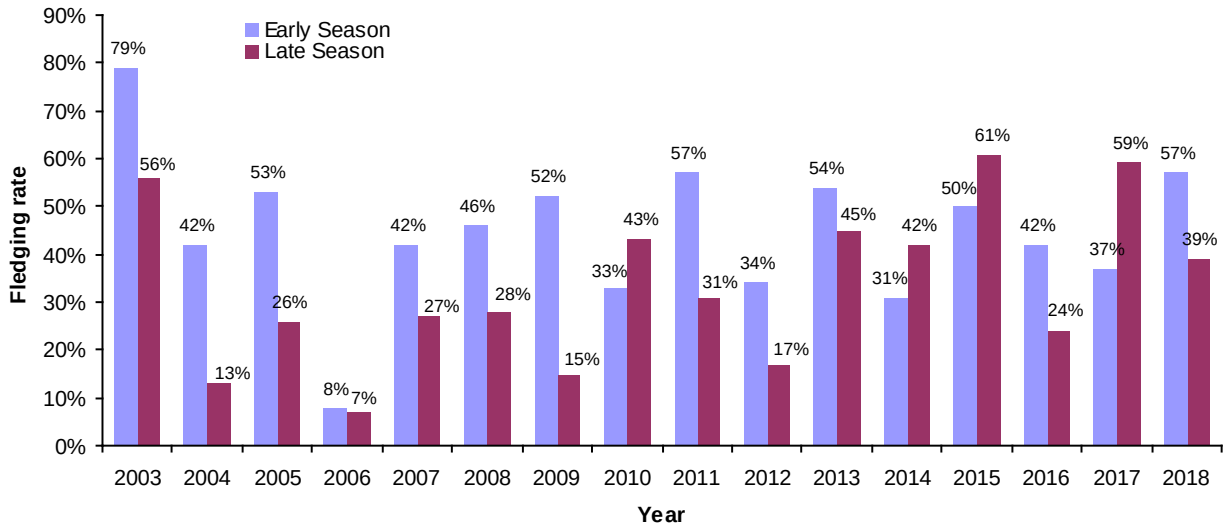

Figure 11. Fledging rate of chicks hatching in early season (prior to 20 June) and late season (20 June or later) at ODSVRA from 2003-18.

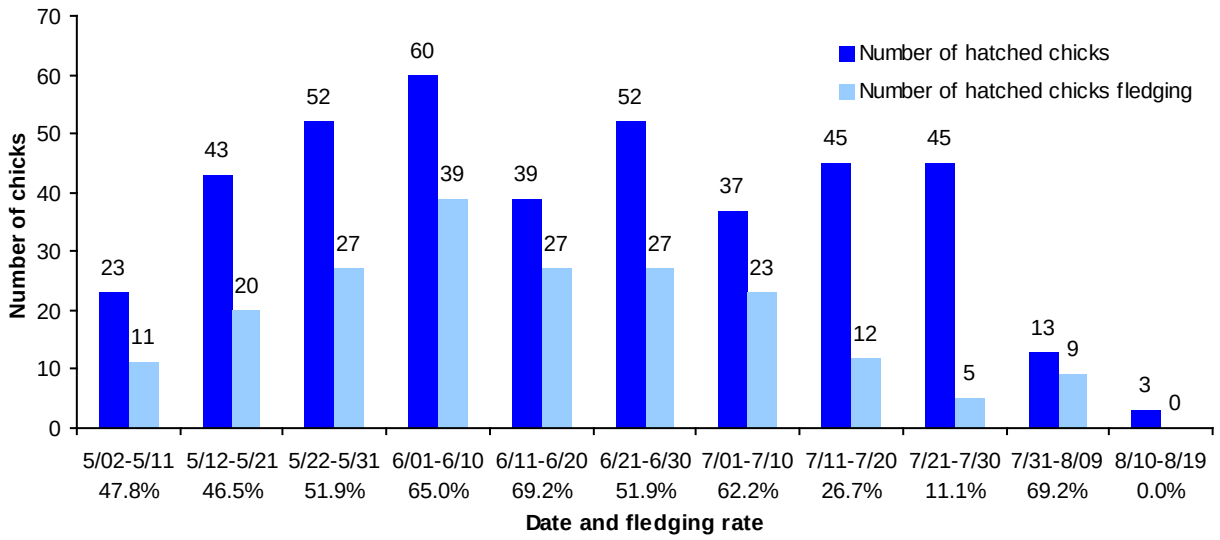

Figure 12. Number of snowy plover chicks hatching per 10-day period and number subsequently fledging at ODSVRA in 2018.

Includes all chicks with known fate (412). For broods that either originated from unknown location (36 chicks from 15 broods) or were not assigned to a specific nest (18 chicks from 10 broods) a hatch date was estimated based on chick size.

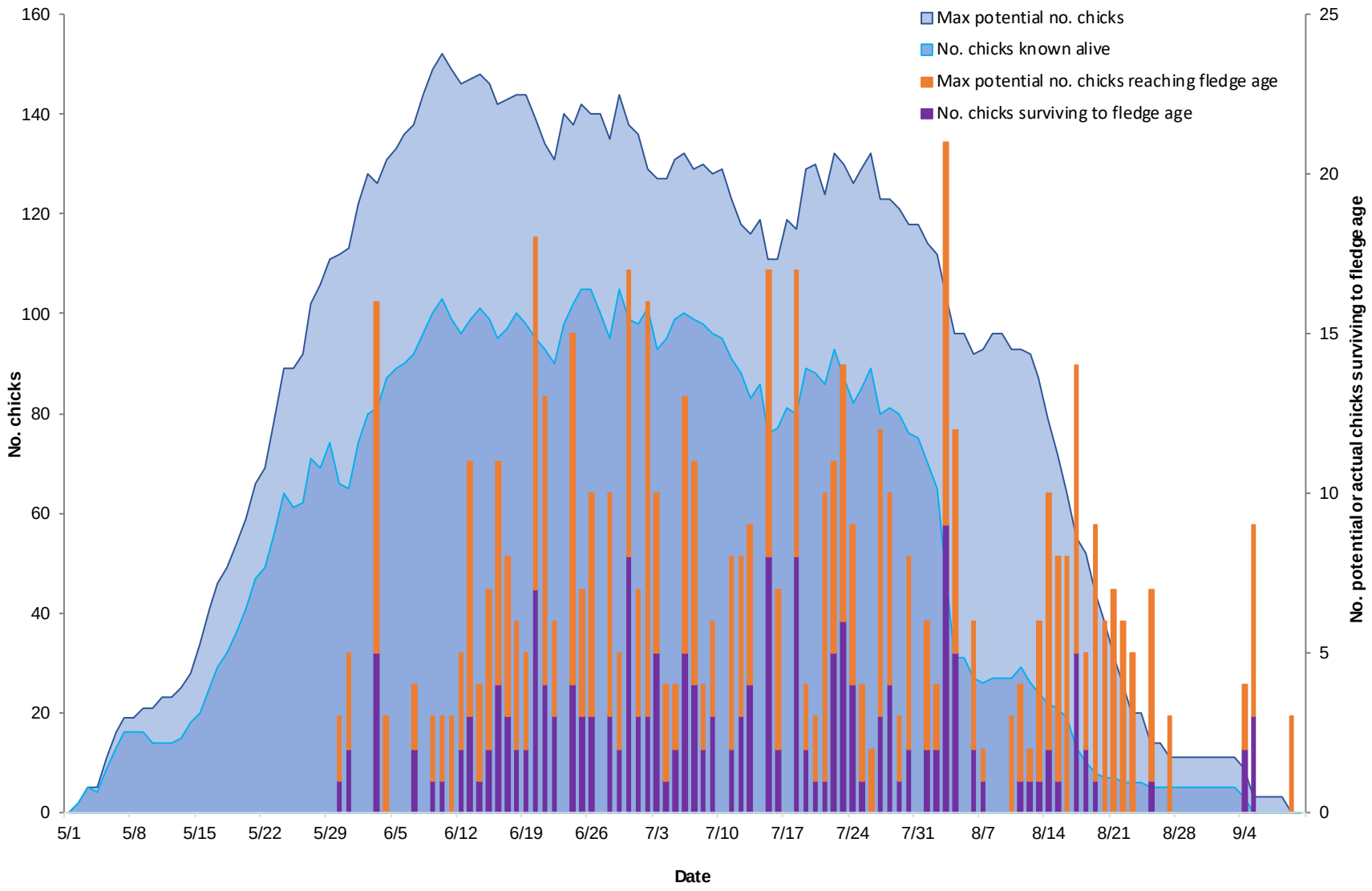

Figure 13. Chick survival and fledge rate from 23 April to 10 September at ODSVRA in 2018.
Of the total of 412 chicks hatching, 405 chicks (excludes seven chicks that were found when approximately three days old or older) are represented in this figure. Number chicks known alive calculated using date of last sighting during regular surveys of all chicks. No. = number

Age of chick loss

Of 225 carefully tracked chicks (207 banded and 18 unbanded chicks with banded siblings) from known location nests, 110 were believed lost. As has consistently been the case in previous years, chick loss in 2018 was highest for very young chicks (0-4 days of age), accounting for 44.5% of total loss (Figure 14). This compares to an average of 49% loss (range=38%-64%) from 2009-17 (CDPR 2017). For 123 chicks reaching 16 days of age in 2018, the fledge rate was 93% (115/123). This is greater than the average of 80% (range=71-93%) for the previous nine-year period 2009-17 and is equivalent to 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).

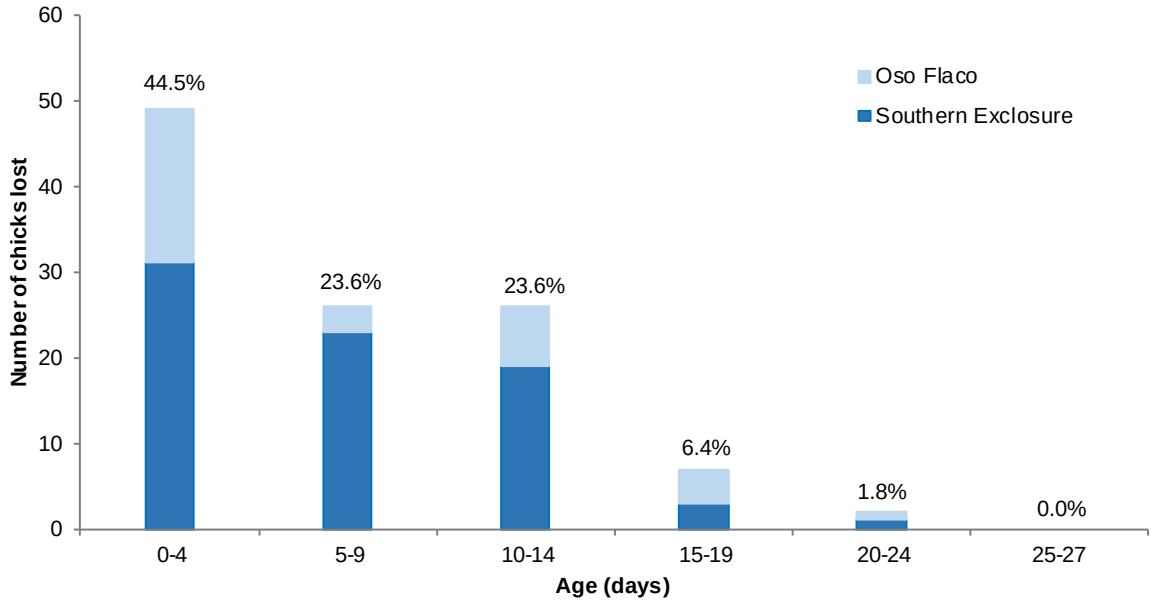

Figure 14. Loss of snowy plover chicks by age and location last seen in the Southern Exclosure and Oso Flaco at ODSVRA in 2018.

Number and percentage of total chicks lost shown for each age group. There were 225 chicks included in the analysis; 110 of these were lost. Data excludes broods that could not clearly be identified and tracked individually.

Productivity measured by number of fledglings produced per adult male

Based on a population viability analysis in the 2007 USFWS Pacific coast western snowy plover recovery plan, a rate of 1.0 fledglings produced per male is believed necessary to prevent population decline with 1.2 fledglings per male allowing for moderate population growth (assuming approximately 75% annual adult survival and 50% juvenile survival) (USFWS 2007). In 2018, the number of chicks fledging per male was 1.74, and allows for population growth. This rate is a decrease from 2017 (1.87) and below the average of 1.92 (range=1.43-2.45) for the three-year period 2015-17. During the 2002-18 period, average productivity was 1.50 fledglings per male and exceeded 1.2 fledglings per male in 14 of the 17 years (Table 5). (Note that if the number of breeding males is underestimated, the number of chicks fledged per male is an overestimate.)

Mortality (other than eggs)

There was a minimum of 36 documented snowy plover mortalities (other than eggs) at ODSVRA from November of 2017 (subsequent to last year's report) to November of 2018. Predators involved were two peregrine falcons (*Falco peregrinus*) (three plover chicks, one adult plover and one unknown juvenile or adult plover), one California gull (*Larus californicus*) (two plover chicks), and one western gull (*Larus*

occidentalis) (nine plover chicks). Documented mortality other than predation included 11 adults, two juveniles, and seven chicks. This includes: two plovers observed in distress prior to death; one adult with a left leg injury that died at Pacific Wildlife Care; and one chick collected in the field with limited mobility and unattended by its nearby associated adult, that died while being warmed in a brooder (For additional information see Predators and predator management section on page 39, Notes section, and Appendix H).

Protection of known location and fate nests with exclosures and symbolic fencing

Of the 200 nests from known location and with known fate, 94 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 78.7% (74/94) hatch rate.

For the 6, 7, and 8 exclosures and North Oso Flaco, there were an additional 66 nests with known location and fate established on the shoreline outside of the Seasonal Exclosure. This shoreline is closed to public use during the nesting season. One nest in North Oso Flaco was protected by an individual circular exclosure and hatched. Sixty-five nests were protected only by symbolic rope fencing and signage that provides no predator protection but is designed to discourage vehicle and pedestrian trespass. These nests did not receive single wire fence protection due to a combination of the following factors: avoiding disturbance of nearby broods, nest abandonment concerns due to adult mortality, and a continuing high hatch rate without the use of single nest wire exclosures. Of these nests 72.3% (47/65) hatched.

In South Oso Flaco there were 40 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. Fifteen 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 15 nests, six hatched (40.0% hatch rate). An additional five nests failed before a planned circular exclosure could be installed. Twenty nests received circular exclosures and 80.0% hatched (16/20) (see Table F.3 in Appendix F for additional details of protective fencing measures for nest).

Banded snowy plovers breeding at ODSVRA in 2018

Banding of snowy plovers occurs at multiple breeding sites along the Pacific coast. The closest sites to ODSVRA where banding occurs are Monterey Bay in Monterey County, California, to the north and VAFB in Santa Barbara County, California, to the south. In 2018, the minimum number of breeding adults at ODSVRA was 201 birds, and of these 97 (48.3%) were banded and with known origins (Figure 15). The great majority (89.7%, 87/97) represent recruitment from chicks banded and fledged from ODSVRA. Nine breeding birds were banded as chicks from 2013 to 2017 at VAFB and one was banded as a chick in 2014 at Moss Landing Salt Ponds in Monterey County. An additional three breeding birds were missing one or more bands and were from unknown locations (Table D.3 in Appendix D).

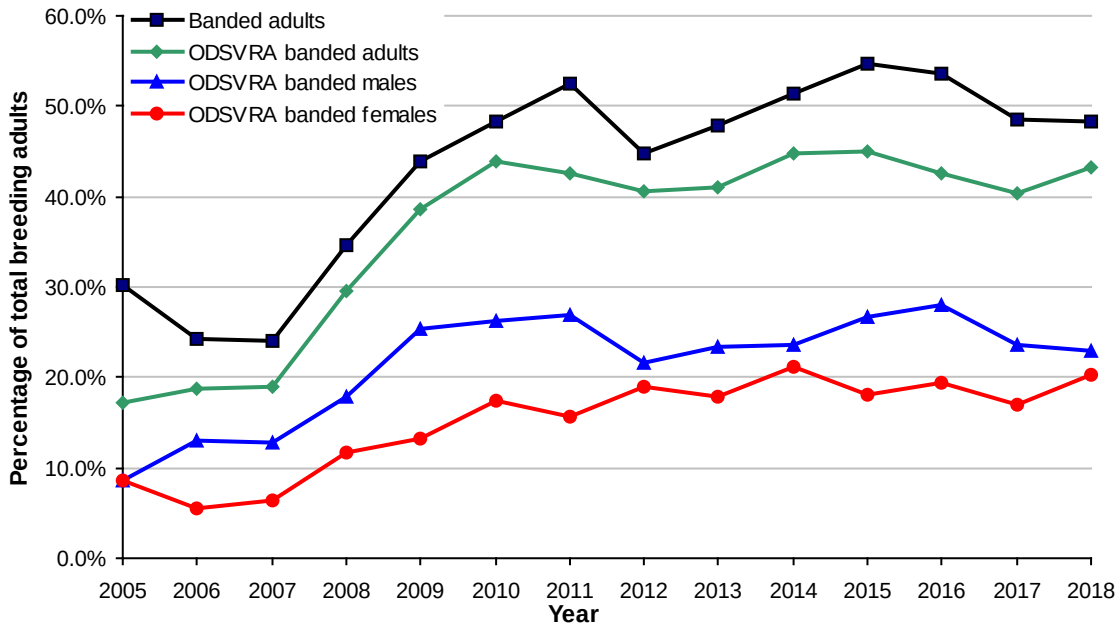

Figure 15. Percentages over the total calculated breeding population at ODSVRA of all known origin banded adults and the sum of males and females originally banded at ODSVRA breeding from 2005-18.

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

Snowy plovers banded at ODSVRA breeding elsewhere in 2018

Throughout the snowy plover range, reports of banded plovers are collected by a coordinated effort of managers and monitors. There was a minimum of 117 banded snowy plovers fledging from ODSVRA seen at other sites during the months of March through September 2018, and 15 were confirmed breeding in five different general locations in California (two in Monterey Bay area in Monterey County, four in Morro Bay area in San Luis Obispo County, seven at VAFB in Santa Barbara County, one at Bolsa Chica in Orange County, and one at Camp Pendleton in San Diego County) (Appendix D).

Snowy plover surveys at ODSVRA during the nonbreeding season

Surveys for wintering plovers (populations of both Pacific coast breeding birds joined by interior breeding birds) were conducted four to six times a month during the five-month period October through February (see Monitoring and Management Actions for survey details). Between 4 October 2017 and 28 February 2018, single day wintering plover counts at ODSVRA ranged from 56-178 birds (single day high count on 3 January 2018). The shore was divided into five beach sections and the monthly average number of plovers (from four to six surveys) was obtained for each section. An average number of plovers for each beach section for the five-month winter period was obtained by averaging each month's average count. Of the five sections, the beach north of Grand Avenue had an average of zero plovers during the winter period (range=0-1); Grand Avenue to marker post 2 had an average of 31 (range=4-49); marker post 2 to marker post 6 had an average of 33 (range=5-75); marker post 6 to the southern boundary of the riding area, closed to public entry during the breeding season, had an average of 41 (range=18-58); and Oso Flaco had an average of 26 (range=23-28) (Figure 16).

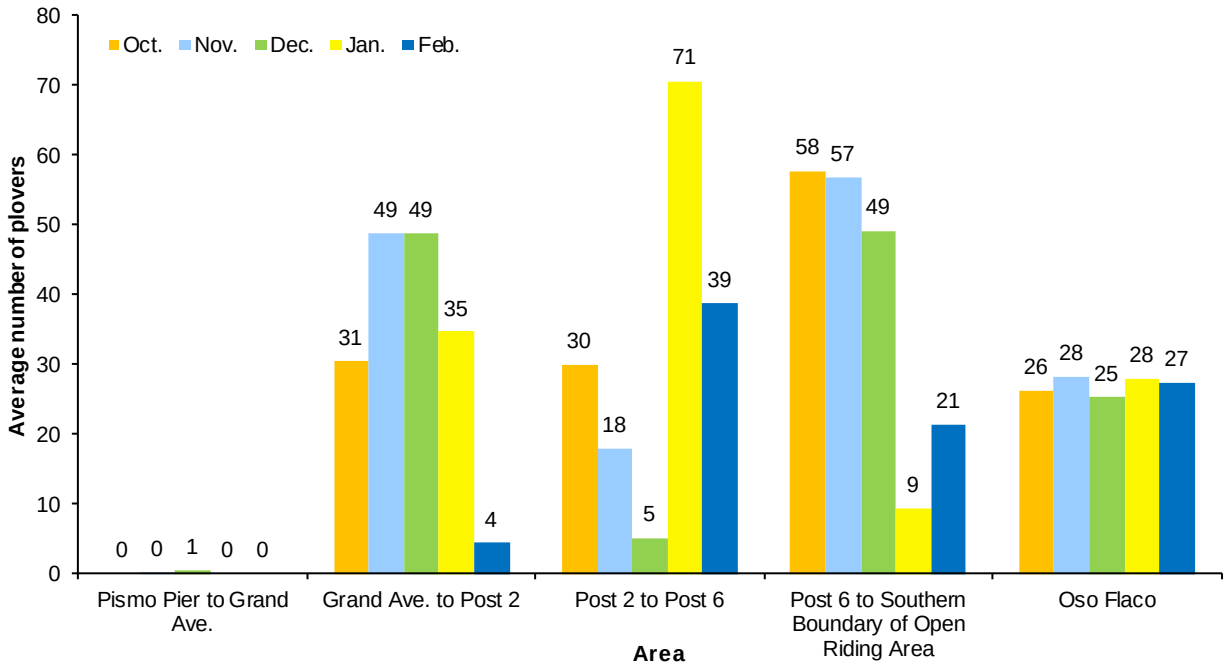

Figure 16. Monthly average number of snowy plovers observed during nonbreeding season surveys at ODSVRA from October 2017 to February 2018.
Surveys conducted four to six times a month.

Beginning in 2004, ODSVRA has participated in a snowy plover winter season window survey organized by USFWS and conducted in January throughout the U.S. Pacific coast. Plovers present during this time include birds from both the Pacific coast breeding population and interior breeding birds wintering on the coast. In 2018, the survey at ODSVRA counted 134 adult plovers, a 2.9% decrease from 138 in 2017. The 134 plovers in 2018 compares to an average winter window count of 207 (range 138-246) during the previous 3-year period 2015-2017 and 158 (range=62-261) during the 15-year period 2004-18 (Figure 17).

One hundred and thirteen banded snowy plovers were recorded during surveys from 1 October 2017 to 28 February 2018 at ODSVRA. These birds were banded at the following locations: 83 from ODSVRA, 20 from VAFB in Santa Barbara County, California, eight from the Monterey Bay area in Monterey County, California, one from Coos Bay in Coos County, Oregon and one was missing two bands and was from an unknown location (Table D.2 in Appendix D).

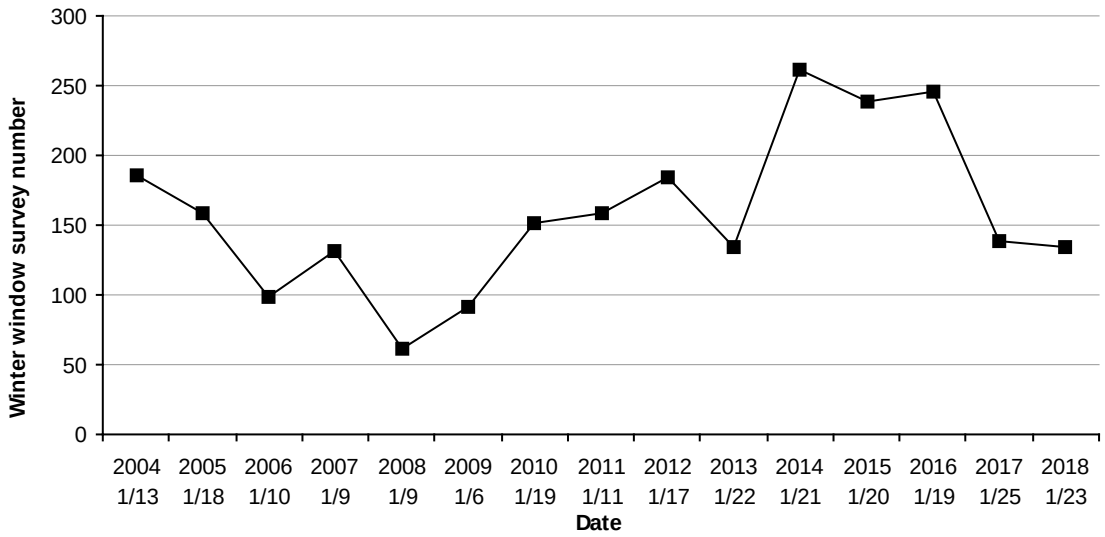

Figure 17. Number of snowy plovers counted on USFWS winter window surveys from 2004-18.

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 large areas of flattened terrain and barren sand with very limited scattered natural debris and vegetation. Areas of patchy cover can benefit plovers and terns during the nesting and chick-rearing periods and to make available more such areas park staff places material, including surf-cast kelp (wrack), branches, driftwood, and woodchips, in the 6, 7, and 8 exclosures. On the shoreline of 6, 7, and 8 exclosures talitrids may be added to help restore populations of this important invertebrate prey of snowy plover chicks, juveniles, and adults. Nearshore ocean waters provide the primary source of prey fish for the tern colony and nearby small freshwater lakes 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). Of these lakes, Oso Flaco Lake has the most documented use by terns and water quality issues continue to be addressed by the park.

Predators and predator management

Predators and predation can be an important factor limiting least tern and snowy plover reproductive success (Page et al. 1995; Thompson et al. 1997). Predators may impact terns and plovers directly by depredating eggs, chicks, juveniles, or adults. Indirect predator impacts, such as disturbance, can increase time spent by adults in vigilance or avoidance behavior, and may limit incubating and brooding behavior. Presence of predators may result in a brood becoming scattered and the loss of any chick failing to reunite with the adult. Depredation of an adult tern or plover may result in egg abandonment or loss of dependent chicks. Species known to be predators of terns and plovers were documented by both number of days detected, as well as number of sightings (avian) and occurrences (mammalian) (see Monitoring and Management Actions section for more detail).

Selective live-trapping and relocation of raptors was conducted by Bloom Biological, Inc. and lethal removal of mammalian and avian predators was conducted by USDA Wildlife Services. Predator monitoring effort by Bloom Biological, Inc. was conducted from mid-February until mid-September and USDA Wildlife Services monitoring effort was conducted from early-May until mid-September. Five striped skunks, two raccoons (*Procyon lotor*), seven coyotes, one red fox (*Vulpes vulpes*), one Virginia opossum (*Didelphis virginiana*), three common ravens, three California gulls, and one western gull were removed lethally. Two peregrine falcons, one American kestrel (*Falco sparverius*) and two great horned owls (*Bubo virginianus*) were live-trapped and relocated (Table F.2 in Appendix F).

Documented Predation

Predation can occur quickly, leaving little or no evidence, and it is likely that only a small percentage of events are documented during a season. There are many hours each day (including almost all night hours)

when monitoring staff and/or predator management specialists are not present to observe predation. Even when monitors are present, there are limitations in the ability to detect predators, such as diurnal avian predators, that can travel quickly over large distances. Despite limited documentation of predation events and detection bias, predators of particular concern identified during the 2018 season included peregrine falcon, great horned owl, gull spp., common raven, American kestrel, coyote, and skunk.

In 2018, no tern nests were documented lost to predation. Twenty-nine plover nests were identified lost to the following predators: unidentified predator (2), coyote (4), common raven (5), unidentified avian (13), and unidentified gull species (5). From 2002-18, 2.6% (20/766) of all tern nests with known fate were documented lost to predators (14 mammalian, one gull, and five unidentified predator). During this same 17-year period, 8.3% (216/2587) of plover nests with known location and fate were documented lost to predation (41 mammalian, 130 avian, and 45 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.

Documented predation events, other than eggs, in 2018 included: 14 plover chicks (nine by immature western gull, two by immature California gull, and three by peregrine falcon), one juvenile or adult plover (peregrine falcon), one adult plover (peregrine falcon), and one juvenile tern (unidentified avian predator) (Appendix H). This compares to three documented losses in 2017: one plover chick (juvenile red-tailed hawk), one juvenile plover (peregrine falcon), and one adult plover (peregrine falcon).

Mammalian Predators

Opossum

Opossum tracks were documented on 23 days in the Southern Exclosure and Oso Flaco in 2018 and averaged 10 days per season (range=3-25) from 2007-17 (Figure 18). From 2002-18, known nest loss to opossum was limited to two tern nests, occurring in 2010 and 2013.

Skunk

In 2018, skunk tracks were documented on 49 days in the Southern Exclosure and Oso Flaco compared to an average of 32 days per season (range=2-87) from 2007-17 (Figure 18). There were no known tern or plover nests lost to skunk in 2018 compared to 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 (Table G.2 in Appendix G). In response to continued presence of tracks within sensitive habitat in 2018, and to prevent the continuation of high nest lost experienced in 2017, five skunks were removed in 2018.

Raccoon

Two non-targeted raccoons were caught in traps intended for skunks and euthanized. Raccoon tracks were documented on 55 days in the Southern Exclosure and Oso Flaco. This compares to an average of 95 days (range=39-145) for 2007-17 (Figure 18). Tracks and scat indicated that raccoons commonly traveled across the exclosure to forage in the intertidal zone on prey that included mole crabs (*Emerita analoga*). From 2002-18, known nest loss to raccoons was limited to one tern nest in 6 exclosure in 2015 and two plover nests in Oso Flaco, occurring in 2010 and 2011.

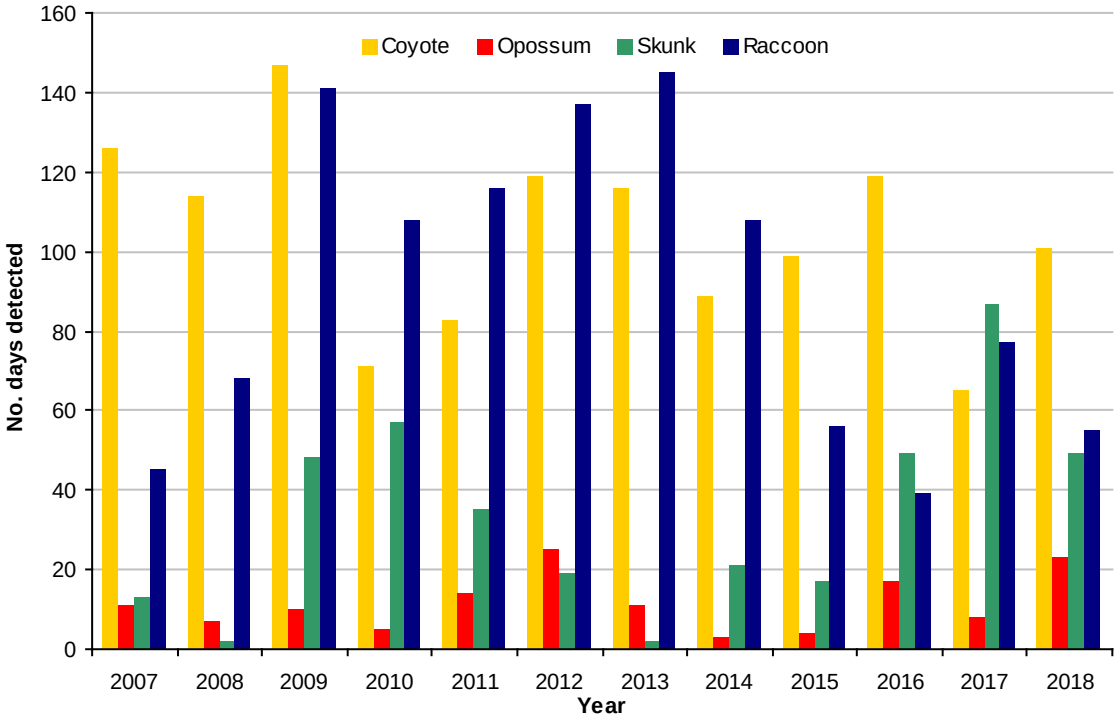

Figure 18. Number of days coyote, opossum, skunk, and raccoon were detected in the Southern Exclosure and Oso Flaco at ODSVRA from 2007-18.

Coyote

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

Seven coyotes were removed in an effort to reduce the threat of predation and disturbance due to coyote presence documented within sensitive nesting habitat. This compares to an average of six removed per year from 2007-17 (range=4-11). As part of monitoring at ODSVRA, coyote scat encountered by monitoring staff and contractors was checked in the field for plastic or aluminum bands used for banding least terns and snowy plovers. Bands were found in coyote scat for the first time in 2012, with four scats having a total of 11 bands (representing a minimum of one plover chick, two unknown age plovers, and one unknown age tern) (CDPR 2012). No bands were found in coyote scat in 2013-18 (CDPR 2013, 2014, 2015, 2016, 2017).

In the combined Southern Exclosure and Oso Flaco areas, coyote presence was recorded on 101 days, which includes 11 days inside the Seasonal Exclosure and is equal to the average of 101 days (range=65-147) during the previous nine-year period 2009-17 (Table 10). There were 198 recorded coyote occurrences in distinct areas in 2018. This compares to an average of 189 (range=73-307) for the previous nine years. One hundred and seven occurrences were recorded on the Southern Exclosure and North Oso Flaco shoreline this season, compared to an average of 102 (range =5-193) for the last nine years (Figure G.1 in Appendix G). It should be noted that predator tracks are documented opportunistically and counts represent a minimum level of activity. In addition, shoreline accessibility for monitoring staff may vary between years making direct comparison difficult.

From 2002-18, documented coyote depredation of nests has been limited to fifteen plover nests and six tern nests (Table G.2 in Appendix G).

Table 10. Coyote occurrence in the Southern Exclosure and Oso Flaco at ODSVRA from 2009-18.
Date range is from 1 March to 10 September (a 194-day period).

Year	Inside Southern Exclosure and North Oso Flaco predator fencing	6, 7, 8 exclosure shoreline	North Oso Flaco shoreline	South Oso Flaco	Total no. occurrences (Total no. days detected)
2009	19	99	94	95	307 (147)
2010	5	24	23	47	99 (71)
2011	10	17	20	55	102 (83)
2012	92	100	47	35	274 (119)
2013	49	55	38	60	202 (116)
2014	28	115	38	42	223 (89)
2015	48	104	32	29	213 (99)
2016	36	61	49	63	209 (119)
2017	25	1	4	43	73 (65)
2018	22	55	52	69	198 (101)

Avian Predators

In 2018, one adult female American kestrel, one adult male peregrine falcon, one juvenile male peregrine falcon, and two adult great horned owls were live-trapped and relocated. In addition, three California gulls, one western gull, and three common ravens were lethally removed. Unsuccessful efforts were made to trap one juvenile male merlin (*Falco columbarius*). Avian predators perched in sensitive areas within the Southern Exclosure and Oso Flaco were hazed when possible.

Loggerhead shrike

From 8 July–8 September a minimum of one loggerhead shrike (*Lanius ludovicianus*) was documented on five days in 2018 in the Southern Exclosure and Oso Flaco. Shrike observations included perch-hunting and flying over Boneyard and North Oso Flaco.

Merlin

From 4 April–9 May, a minimum of two merlins were documented on 20 days (72 sightings) in 2018 actively hunting shorebirds in the Southern Exclosure and Oso Flaco (Table 11). In the 11-year period 2007-17, merlin activity averaged seven days (range=2-16) a year. From 2004-2018, merlins were documented taking four adult plovers (one in each of the years 2004-06 and one in 2015) at ODSVRA. In addition, an adult female merlin was observed eating a small shorebird that may have been a plover in 2011. In 2014, their presence coincided with several plover nests being abandoned pre-term with adult mortality suspected as the cause.

American kestrel

There were 126 documented sightings on 34 days of American kestrels in specific areas of the Southern Exclosure and Oso Flaco (Table 11). Kestrels were primarily observed in August and September perch-hunting and flying over all sensitive areas. Kestrels were hazed out of sensitive areas on 20 different occasions when perched. For the 11-year period 2007-17, kestrels were seen an average of 15 days per season (range=6-28) (CDPR 2007-17).

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

In 2018, owl tracks were periodically documented in sensitive nesting and chick-rearing habitat, with owl presence detected on 32 days with 38 separate sightings (Table 11, Figure 19). In the 11-year period 2007-17, owl activity was documented on an average of 27 days (range=5-53). Two adult great horned owls were live-trapped in Pipeline revegetation area on 16 May and 24 May and relocated.

Red-tailed hawk
Red-tailed hawks were primarily observed perching and flying in the North and South Oso Flaco foredunes. In 2018, based on concurrent sightings and age, there was a minimum of four individuals (two adults, one sub-adult, and one juvenile) observed in or adjacent to the nesting area. Red-tailed hawk presence was documented on 30 days (47 sightings) (Table 11, Figure 19). From 2007-17, activity was recorded on an average of 45 days (range=7-74). In 2017, a juvenile red-tailed hawk was observed eating a plover chick. This was the first known predation by a red-tailed hawk at ODSVRA, but they have been a documented predator of plovers and terns at other sites.

Northern harrier
Northern harrier (*Circus hudsonius*) has been documented as a predator of nests, chicks, and juveniles of plovers and/or terns at ODSVRA in past years. In 2018, there were 59 sightings of northern harriers on 25 days. In the 11-year period 2007-17, activity was recorded on an average of 42 days (range=25-68) (Table 11, Figure 19). Based on age and sex, there was a minimum of three individuals (one adult female, one sub-adult male, and one juvenile) observed during this season.

Table 11. Sightings of merlin, American kestrel, large owl spp., red-tailed hawk, northern harrier, and peregrine falcon in specific areas of the Southern Exclosure and Oso Flaco at ODSVRA in 2018.
Date range is from 1 March to 10 September (194-day period). Note most owl "detection" based on tracks.

Location	Merlin	American kestrel	Large owl spp.	Red-tailed hawk	Northern harrier	Peregrine falcon	Total
6 exclosure	8	18	1	0	3	60	**90**
7 exclosure	6	22	2	5	7	55	**97**
8 exclosure	10	28	9	3	16	52	**118**
Boneyard exclosure	18	11	18	2	4	17	**70**
North Oso Flaco	25	26	6	17	13	55	**142**
South Oso Flaco	5	21	2	20	16	56	**120**
TOTAL	**72**	**126**	**38**	**47**	**59**	**295**	**637**

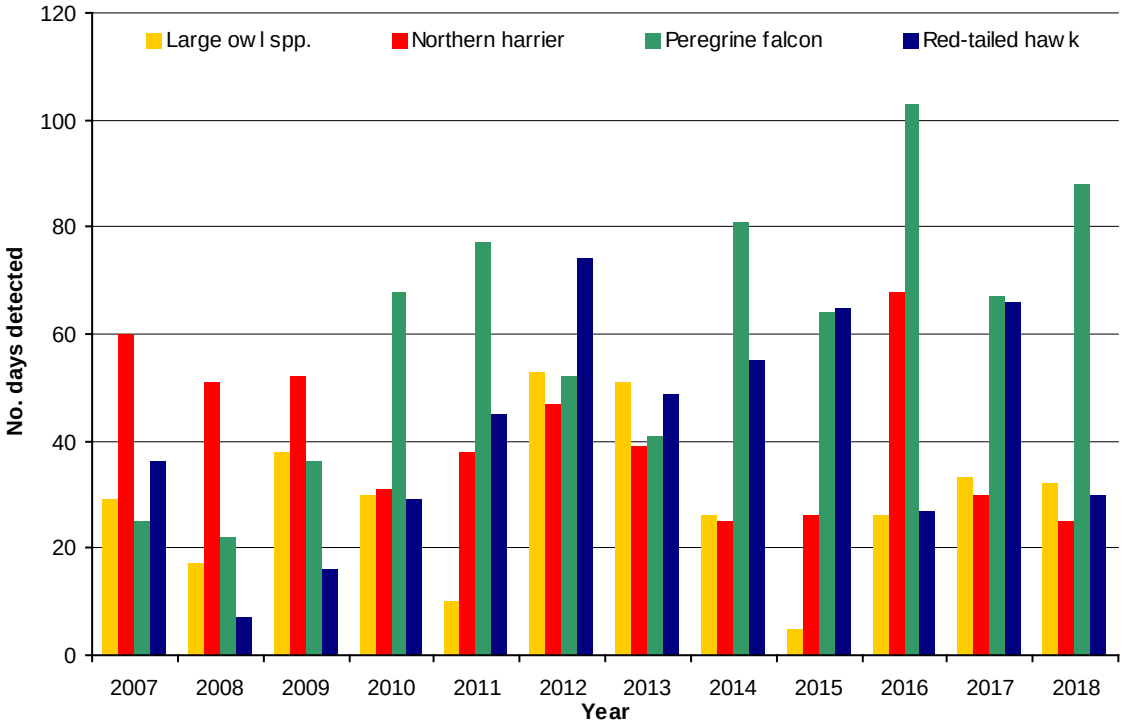

Figure 19. Number of days large owl spp., northern harrier, peregrine falcon, and red-tailed hawk were detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2007-18.
Date range is from 1 March to 10 September (194-day period).

Peregrine falcon

Peregrines were commonly observed actively hunting, perching, and consuming prey in the Southern Exclosure and Oso Flaco. Peregrines hunting on the exclosure shoreline, even when not focused on plovers and terns, can cause disturbance that limits foraging time for plover chicks while increasing the risk of broods being separated or moved. Peregrines perched in the nesting area for an extended period of time were hazed on 38 days in 2018 (sometimes requiring repeated efforts before the bird left the nesting area). Hazing peregrines out of sensitive areas provided a temporary solution but did not deter individual falcons from returning to ODSVRA.

On 26 June, a banded adult male peregrine (unread white characters on black VID band on left leg, federal band on right leg) was observed eating an adult plover on the 7 exclosure shoreline. On the following day, an adult peregrine with the same combination (black VID band on the left leg and federal band on the right leg), was documented landing, running after, and eating what are believed to be three plover chicks from inside 7 exclosure, 7 exclosure shoreline, and North Oso Flaco shoreline (Appendix H). A banded adult male peregrine falcon ("74D" white characters on black VID band on left leg and federal band on right leg) with similar plumage was trapped in South Oso Flaco on 10 July. This bird is known to be an adult male associated with the "Lion's head" nest site on VAFB property. On 13 July, a VAFB avian predator specialist affixed a GPS transmitter using a backpack harness and the bird was released at the Butte Valley Wildlife Area, Siskiyou County, California, 475 miles north of ODSVRA. On 10 August, this bird was observed back on-site. In addition, this same banded peregrine was observed eating a plover chick, tern juvenile, and suspected adult plover in 2016.

On 19 August, an unbanded juvenile peregrine was observed catching and eating an older juvenile or adult plover on 8 exclosure shore. On 31 August, an unbanded juvenile peregrine with similar plumage was trapped in South Oso Flaco, and on 3 September was released in Inyo National Forest, Inyo County, California, 179 miles northeast of ODSVRA. The bird was banded with a federal band (2206-85657) on the right leg and VID band (W03, white characters on black band) on the left leg.

In 2018, there were 295 sightings of peregrine falcons on 88 days, a 54% increase in sightings from the previous year (192 sightings on 67 days). This also represents a 75% increase from the average of 169 (range=38-362) sightings from 2008-17 (Table 12). The average number of days peregrine falcons were recorded during the period 2008-17 was 61 (range=22-103) (Table 11, Table 12).

A minimum of five individual peregrine falcons were identified at ODSVRA this season: one banded adult female (VID band "17D"), one banded adult male (VID band "74D"), one unbanded sub-adult, one unbanded adult, and one unbanded juvenile live-trapped and banded (VID band "W03"). The adult female with VID band "17D" was banded as a nestling in 2013 in southern California and was seen at ODSVRA the previous two years.

Table 12. Sightings of peregrine falcon in specific areas of the Southern Exclosure and Oso Flaco at ODSVRA from 2008-18.

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

Location	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
6 exclosure	11	13	37	39	41	28	75	41	54	31	60
7 exclosure	11	13	29	45	37	23	85	31	50	35	55
8 exclosure	5	13	25	40	31	19	67	28	45	40	52
Boneyard exclosure	6	6	11	32	9	2	11	15	16	8	17
North Oso Flaco	4	9	24	37	27	14	69	19	32	37	55
South Oso Flaco	1	20	18	12	11	14	55	29	57	41	56
Total no. sightings	**38**	**74**	**144**	**205**	**156**	**100**	**362**	**163**	**254**	**192**	**295**
No. days detected	**22**	**36**	**68**	**77**	**52**	**41**	**81**	**64**	**103**	**67**	**88**
No. peregrines trapped	**0**	**1**	**3**	**0**	**1**	**0**	**1**	**1**	**0**	**1**	**2**

Corvids (American crow and common raven)

American crows (*Corvus brachyrhynchos*) and common ravens are efficient predators at many tern and plover nesting sites and can have pronounced impacts over a short period of time. American crow sightings were limited to 15 sightings over seven days, including two events of two crows flying over North Oso Flaco. There were 12 sightings of common raven on six days. During the 11-year period 2007-17, American crows were seen annually an average of five days (range=1-10) and common ravens on six days (range=1-14) (CDPR 2007-17). In 2018, documented nest loss to raven were five plover nests during a 13-day period from 5-17 April and additional plover nest loss is suspected. On 25 April, an adult common raven was lethally removed approximately 0.25 mile east of Oso Flaco Lake. On 27 April, two additional adult common ravens were lethally removed from the same area.

Gulls

On 30 May, an immature western gull was observed eating two plover chicks on 6 exclosure shoreline and then quickly lost from view. Four hours later, what is believed to be the same gull (and for the purposes of this report will be considered the same gull) was observed eating a plover chick on 6 exclosure shoreline and was lethally removed. The gull's stomach contents contained nine (five banded and four unbanded) plover chick carcasses. On two separate occasions (17 June and 27 July), an immature California gull exhibiting suspicious behavior on the Southern Exclosure shoreline was lethally removed. On 7 August, an

immature California gull observed eating two plover chicks on the Southern Exclosure shoreline was lethally removed. These events represent a minimum of 11 plover chicks lost to gulls this season (Table G.2 in Appendix G).

Gulls can pose a significant threat to snowy plover breeding success at ODSVRA, especially individual gulls that key in on adults with broods. Such gulls can become “specialists” searching for and preying on chicks over a wide area, and depredation events can happen quickly and easily go undetected. In 11 of the 15 years from 2004-18, gulls have been documented taking plover chicks. Between 2011-18, gulls took a minimum of 42 plover chicks, juveniles, and unknown age birds. In 2011, three gulls took a minimum of six chicks, three juveniles, one juvenile or adult, and five plovers of unknown age over a four-day period from 28-31 July. In 2012, a regurgitated gull pellet found on 6 exclosure shoreline contained nine bands, representing a minimum of three unknown-age plovers; none of these predation events were observed. In 2013, no plovers were known depredated by gulls. In 2014, two gulls took a minimum of two plover chicks and one juvenile or adult. In 2015, one gull took a minimum of one plover chick. In 2016, two gulls took a minimum of five plover chicks and four juveniles.

RECOMMENDATIONS

Continue monitoring

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

Continue banding least tern and snowy plover chicks

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

Continue banding least tern chicks to individual

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

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

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

Continue option to band adult snowy plovers

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

Provide adequate-sized bumpouts and single nest exclosures to protect least tern nests and chicks in or close to the open riding area

Least tern nests inside the Southern Exclosure and located close to the north or east fence receive temporary additional fencing to create a buffer from recreational activities in the open riding area. These bumpouts connect to the fence adjacent to the nests and extend into the open riding area. Earlier practice has been to provide a 100-foot buffer between a nest and the open riding area, using bumpout fencing for nests inside the Southern Exclosure and a 100-foot-radius circular single nest exclosure for nests in the open riding area. In 2016-18, as recommended by CDFW, the minimum distance between least tern nests and the open riding area was increased, and where needed bumpouts were used to provide a buffer of 300 feet in 2016 and 328 feet (100 meters) in 2017-18. Sixty percent (21/35) of nests were within 328 feet of the exclosure fence in 2018 and bumpouts were installed to increase the buffer from the open riding area. This is slightly higher

than in 2017 and 2016 when 54% (28/52) and 50% (24/48) of known location nests, respectively, were within 328 feet of the exclosure fence. In 2016-18, all nests receiving bumpouts were in close proximity and near the eastern side of 6 and 7 exclosures, and therefore the bumpout fencing was moved and connected several times over the course of the nesting season as additional nests were initiated. In 2018, a bumpout was also installed to maintain a 328 foot buffer between the night roost and the open riding area. By the end of the season, the night roost bumpout and several nest bumpouts had coalesced into one large bumpout with multiple layers of fencing (Appendix C). Of the nests with bumpouts 81% (17/21) were documented to hatch. This compares to 79% (11/14) for all other nests not within 328 feet of the exclosure fence and open riding area (Appendix A).

For 2019, it is recommended to continue to provide a bumpout for tern nests within 328 feet (100 meters) of the open riding area fencing, as approved by CDFW. Nests in the open riding area should receive a single nest exclosure with a minimum radius of 328 feet. Nests will be monitored closely to assess the adequacy of protective fencing in reducing disturbance. If necessary, bumpouts or single nest exclosures may increase in size if disturbance to incubating birds is observed as a result of recreational activity. Tern chicks and the night roost will also be monitored and the bumpout size may be adjusted if chicks or night roosting birds are observed to remain within 328 feet of the eastern bumpout fence. ODSVRA will continue to maintain a safe vehicle corridor adjacent to the north and east fence, any bumpouts, and single nest exclosures.

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

In 2018, snowy plover nests inside the Southern Exclosure and located within 100 feet of the north or east fence received temporary additional fencing to create a buffer from recreational activities in the open riding area. These bumpouts connect to the fence adjacent to the nests and extend into the open riding area. Nests inside the exclosure and more than 100 feet from the fence may also receive a bumpout if repeated disturbance from the open riding area is observed. For nests found in the open riding area, the protocol is to install a single nest exclosure with a minimum radius of 100 feet.

In 2018, two snowy plover nests (SP112 in 6 exclosure, SP103 in 8 exclosure) were given bumpouts to increase the distance from the nests to the open riding area fence to a minimum of 100 feet. The SP112 nest failed to unknown cause and SP103 hatched three chicks, two of which fledged (Appendix B).

For 2019, it is recommended to continue to install bumpouts for snowy plover nests close to the Southern Exclosure fence to create a buffer of at least 100 feet between the nest and the open riding area. Nests in the open riding area should receive a single nest exclosure with a minimum radius of 100 feet. Nests will be monitored closely to assess the adequacy of protective fencing in reducing disturbance. If necessary, bumpouts or single nest exclosures may increase in size if disturbance to incubating birds is observed as a result of recreational activity. ODSVRA will continue to maintain a safe vehicle corridor adjacent to the north and east fence, any bumpouts, and single nest exclosures.

Continue to 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 by hand and placed in the exclosure. Approximately 217 cubic yards of wrack were distributed on the exclosure shoreline during the 2018 season as habitat enhancement. Greater efficiencies may be possible for wrack distribution. Since 2008, ODSVRA monitoring staff has received assistance from available heavy equipment operators from park maintenance staff in loading woodchips to be distributed in the exclosure. However, a method using heavy equipment has not been found to collect and

distribute large amounts of wrack from the open riding to the seasonal shoreline exclosure. Attempts in the past resulted in more sand than wrack being collected with the equipment compared to hand collection. In 2019, it is recommended that methods to better use heavy equipment for wrack collection should be further explored. The goal would be to have heavy equipment available throughout the season to assist in loading large piles of wrack collected from the open riding area, to then be placed and distributed by permitted staff on the Southern Exclosure shore. This would increase staff efficiency and allow larger amounts of wrack to be dispersed, helping to maintain larger populations of invertebrate prey over a broader area for snowy plover chicks, fledglings, and adults. Broader distribution of wrack also provides shelter from wind and cover from predators. The use of heavy equipment needs to be balanced with other operational needs in the park.

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

Continue to study the benefits of wrack addition to the Southern Exclosure shoreline and inoculation with wrack-associated invertebrates as a possible means to restore invertebrate species and biomass (these invertebrates are part of the prey base for snowy plover chicks, juveniles, and adults)

In 2007, a study was initiated by Drs. Jenifer Dugan and Mark Page, researchers from the Marine Science Institute at the University of California Santa Barbara (UCSB), examining the responses of invertebrate numbers and diversity in areas where wrack was added to the Southern Exclosure shoreline throughout the breeding season. Preliminary findings from the five-year study (2007-11) indicated that the seven-month seasonal closure (March-September) is not a sufficient period of time for invertebrates to effectively and naturally recover species diversity and abundance on the Southern Exclosure shoreline following five months of recreational use. In 2012, invertebrate sampling (by Dr. Dugan) was more limited, with one series of transects at the beginning of the season and repeated once at the end of the season. In 2013-18, park staff, following the same methodology, performed one series of invertebrate sampling at the end of the season and a beginning season sampling survey was done in 2015-18. The survey was comprised of 10 transects in the Southern Exclosure and three transects in North Oso Flaco (as a control). Samples were sent to Dr. Dugan at UCSB for analysis and findings added to the data set. For 2019, it is recommended to continue the beginning and end of season sampling. From 2012-18, park staff has inoculated wrack added to the shoreline with invertebrates following protocols developed by UCSB and it is recommended to continue these protocols in 2019.

In 2018, drone equipment (Phantom 4 Pro with DJI Phantom camera) was used to experiment with photographing the shoreline habitat over three days on 5-7 March. The drone made seven flights at an altitude of 120 feet (covering approximately 1.5 miles of shoreline), one flight at 150 foot altitude, and one flight at 250 foot altitude (covering approximately 0.5 miles), and was found to be highly effective at assessing habitat enhancement material distributed by staff. The flight at 250 feet produced imagery of a broader area, while still providing useful information about the habitat; individual wood pieces, wrack piles, and even footprints were visible. Each flight lasted about 20 minutes and shorebirds were not observed to be disturbed by the drone. It is recommended for 2019 to perform additional experimental drone flights, in consultation with USFWS, to develop protocols to amend the USFWS permit guidelines to include drone activity if necessary. Beginning and end of season drone flights will occur, as well as during the season, if permitted by USFWS. The goal of the trial flights would be to examine wrack manipulations on the Southern Exclosure shore and identify potential means to enhance the diversity and abundance of invertebrate species that are natural prey for plovers. Prior to any drone flight, the area would be scanned for any roosting or nesting plovers or terns. The USFWS permit would be amended, as necessary, and current monitoring guidelines will be followed, including not allowing the activity during high winds, rain, high temperatures, or if predators were present. During all drone flights, the behavior of terns and plovers

would be monitored closely by park staff and, if disturbance was observed, drone activity would cease and flight height would be increased until safely away from the nesting area.

Continue weekly gull surveys at the trash dumpster area

Full park monthly gull surveys were done from 2008-15, daily gull surveys at the trash dumpster area at marker post 2 were done from 2014-17. In 2018, surveys were limited to at least weekly surveys at the trash dumpster area because of time constraints. For 2019 it is recommended to continue weekly gull surveys as was done in 2018.

Continue to look for an appropriate design to cover trash dumpsters

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

Surveys at the dumpster area during the 2018 nesting season resulted with the month of August having the highest daily average number of gulls (189) and the maximum number of gulls present at one time was 445 on 13 August. It is recommended for 2019 to cover all the trash dumpsters in the marker post 2 area with lids designed to exclude gulls and meet the needs of the ODSVRA staff and visitors.

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

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

Ongoing management actions that will continue in 2019

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. Goggle equipment has been used for monitoring since 2007 and a new thermal scope (Trijicon REAP-IR) was acquired and will be used in 2019.
- Continue monitoring least tern juveniles and the night roost. Continue monitoring foraging activity at nearby freshwater lakes, if time allows.
- Continue use of motion detector cameras for nest monitoring and train and permit additional monitoring staff as needed.
- Continue to use an anemometer with data logger from a wind tower to record daily wind speeds and direction.
- Continue option to use tern chick shelters.
- Continue option to use least tern chick fencing on the east side of the exclosure and a method to maintain the tern chick fencing will continue to be explored.
- Predator monitoring and management actions that have been in place since 2003 and 2004 will continue.
- The Seasonal Exclosure protected area will include the use of increased fence height as practiced since 2006 and use of aprons as used since 2007 to improve the effectiveness of the perimeter fence in protecting breeding terns and plovers.
- The Southern Exclosure and North Oso Flaco shoreline will continue to be protected; this includes maintaining the posts and rope at marker post 6 and Oso Flaco boardwalk intertidal zones to minimize trespass, which has been part of the management actions in these locations since 2008.
- Continue to position a large section of the 6 and 7 shoreline exclosure fence further east (inland by approximately 100 feet of the pre-2012 shoreline fence location) to provide a wider functional shoreline habitat. The shoreline fence should continue to be installed last (after all other fencing is installed) and as close to 1 March as possible to lessen the chance of storm-driven high surf damaging the fence.
- Continue use of 10-foot by 10-foot single nest exclosures with net tops, circular exclosures with net tops, and mini-exclosures as needed to protect nests from mammalian and avian predators. These small exclosures are not without risks to incubating adults and we will continue to closely monitor and evaluate their use.
- Surveys for plovers will continue during the nonbreeding season. These weekly surveys have been conducted since the winter of 2009-10.
- Continue to document impacts and, when possible, reduce disturbance caused by low-flying aircraft over the Southern Exclosure and Oso Flaco.

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

NOTES

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

Shoreline habitat provides a source of invertebrate prey for plovers and is an important area for raising chicks. At marker post 6 the boundary between the exclosure shore and the open riding area is signed and symbolically fenced to limit trespass of park visitors, but because of the changing tidal conditions it cannot be fenced to prevent chick movement into the open riding area. Each year there are snowy plover broods raised close to marker post 6 or found moving outside of the protected shoreline. In 2016 and 2017, there were seven broods (16 chicks, five fledged) and four broods (10 chicks, four fledged), respectively, observed in or very close to the open riding area. In 2018, there were five broods (12 chicks, three fledged) raised in this area. The broods were monitored closely, often during all daylight hours, and were directed away from the riding area when necessary. The gull flock that forms at the northern 6 exclosure shoreline, individual gulls, or other potential predators were also monitored. Several of these broods were raised in close proximity to each other and aggression between the associated adults or aggression towards chicks was observed. Possible reasons broods move from the north end of 6 exclosure into the open riding area may include the search for food; spacing out of broods to avoid territorial fighting of adults and attacks on chicks; and efforts to avoid predators, especially gulls forming a flock at the north end of 6 exclosure.

Two chicks from the SP28 nest were often foraging very close to the open riding area near marker post 6 and were monitored closely from 11 May, when one to two days old, until fledge age. Aggression between the adult of the SP28 brood and the associated adults of nearby broods was seen on multiple occasions. The SP28 brood was observed moving a short distance into the open riding area on seven occasions from 20 May to 6 June when 10 to 28 days old, and was directed back into the exclosure. Both chicks fledged but continued to be monitored closely while they were not yet flight confident. They were observed moving in the adjacent open riding area on multiple occasions and were directed back into the exclosure.

Three chicks from the SP33 brood were raised just south of marker post 6 at the border of the open riding area. They were monitored closely beginning on the 15 May hatch date and were seen very close to the open riding area on several occasions. Three chicks were last seen on 28 May at 12 to 13 days old and the brood was not seen subsequently.

The three chicks from the SP77 brood, two banded BB:WW and one unbanded, were raised on the northern 6 exclosure shoreline near the open riding area and the brood was monitored closely. Territorial aggression was observed on multiple occasions between the adult with the SP77 brood and adults associated with the nearby SP28 and SP78 broods. On 7 June, the three SP77 chicks (three to five days old) with an attending adult were seen in the open riding area approximately 125 feet north of marker post 6. Vehicle traffic was directed away from the area while the adult and chicks were directed back toward the exclosure. Aggression between the adult of the SP77 brood and another adult associated with a nearby brood prevented the SP77 brood from moving back into the exclosure until over an hour later. On the morning of 8 June, the three chicks and associated adult were seen moving slightly north of marker post 6 into the open riding area and the brood was directed back into the exclosure. Territorial aggression between the adults caused the unbanded chick to become slightly separated and the chick was aggressively attacked by the SP78 adult. The unbanded chick remained unattended through the evening and was not subsequently seen after 8 June. On 11 June, both banded chicks were seen but one was less active. Later the same day, the associated male was observed dragging a dead chick and no chicks were subsequently seen (see section titled Snowy plover carcasses collected or observed in this Notes section).

Three chicks from the SP78 nest were raised very close to the open riding area near marker post 6 and were monitored closely beginning 7 June. The brood was observed moving a short distance into the open riding area on two occasions, on 7 June when the three chicks were three and four days old, and on 12 June when

the remaining two chicks were eight to nine days old. On each occasion, the chicks were directed back into the exclosure. Aggression between the adult of the SP78 brood and the associated adult of nearby SP77 brood (and occasionally with the SP28 and SP38 adults) was observed on multiple occasions. A chick from this brood was observed attacked by an adult on five occasions between 12-15 June with observations including a chick being pecked at, picked up and dropped, or picked up and thrown. Three chicks were last seen on 10 June, two chicks last seen 14 June, and one chick fledged 2 July and continued to be seen near marker post 6 until 13 July.

One SP161 chick was raised just south of marker post 6 at the border of the open riding area and was monitored closely beginning on 19 July when one day old. Aggression between the associated male and nearby adults was seen on five occasions from 19 July to 31 July, but the chick was never observed to be attacked. Between 29 July to 6 August, the chick (11 to 19 days old) was observed moving a short distance into the open riding area multiple times, and on 7 August, the 20-day-old chick was depredated by a California gull at the north end of 6 exclosure.

Injured least tern, none sighted
No injured least terns were observed during the 2018 season.

Injured or sick snowy plover sightings
During the 2018 season, there were two to three adults, four juveniles, and three chicks observed sick or with injuries. If it was determined to be appropriate, an effort was made to capture the plover and take it to Pacific Wildlife Care in Morro Bay under the care of Dr. Shannon Riggs, DVM. In addition, two abandoned and immobile chicks were collected from the shoreline, both recovered after warmed in a brooder, and were taken to the Santa Barbara Zoo (see section titled Selective collection and transfer of abandoned chicks and potentially viable eggs in this Notes section).

Injured adult sightings
On 14 February, an unbanded plover was seen with an injured left leg or foot south of marker post 8 in the riding area. It was observed putting no weight on the left leg and the left foot appeared dark in color. On 26 April, an unbanded female was observed on the 8 exclosure shoreline with a left leg injury and was possibly the same individual seen on 14 February. It was also putting little weight on the left leg, which appeared swollen with fine hair attached. The bird was captured and transported to Pacific Wildlife Care the same day. The veterinarian surgically removed the fine hair-like material and one toe that was necrotic. It was treated with antibiotics and pain medication over the following days. On the morning of 30 April, the bird was found dead at Pacific Wildlife Care. USFWS was notified and the carcass was placed in a freezer at ODSVRA (medical record attached).

On 11 June, a male plover banded GA:WR was observed on the 6 exclosure shoreline with a left foot injury. It was putting no weight on the left leg and the middle toe on the left foot was swollen. The left leg was not swollen and the bands appeared to move freely. The bird was again seen 14 June at the southern boundary of Oso Flaco occasionally putting some weight on the left leg while walking.

Injured juvenile sightings
On 20 July, a 48- to 49-day-old juvenile banded GG:PG from the SP92 nest was seen on the northern 6 exclosure shoreline with a right leg injury. The bird was holding up the right leg and putting slight weight on the toes when walking. There were three GG:PG fledglings from the SP92 nest and one was last seen 11 August on the 8 exclosure shoreline without injury, but it is unknown if this was the bird previously seen injured.

From 4 to 9 August, a 40- to 45-day-old juvenile banded BB:WR from the SP141 nest was seen occasionally holding up its right leg and walking with a slight limp. The injured bird was seen actively foraging on the

shoreline in several locations from north of marker post 6 to South Oso Flaco. Two chicks hatched (both banded BB:WR) and fledged from the SP141 nest. One juvenile was last seen 25 August walking normally and without any noticeable injury, but it is unknown if this was the bird previously seen injured.

From 13 to 21 August, an unbanded juvenile plover was observed with a right wing injury on the shoreline of 7 and 8 exclosures. The wing was in an irregular position with the feathers extending across the back over the left side. On 20 August, capture was briefly attempted, and the plover was observed to fly low and out of sight. The juvenile was last seen 25 August on the 8 exclosure shoreline.

On 23 and 25 August, a 37- to 39-day-old juvenile banded VG:AR from the SP167 nest was seen on the 8 exclosure and North Oso Flaco shoreline with a left leg injury. The bird was occasionally lifting the left leg and putting slight weight on the leg. Only one chick was known to fledge from the SP167 nest. From 27 August to 9 September, the VG:AR juvenile was seen four additional times and no injury noted.

Injured or sick chick sightings

On 13 May, an unbanded seven-day-old chick from the SP29 nest was observed laying immobile on its side on the 8 exclosure shoreline. The associated adult attempted to brood the immobile chick briefly with the two banded siblings and the chick's legs moved slightly, indicating it was still alive. The adult and siblings moved away while the chick remained on the ground and immobile. The chick was placed in a warmed brooder with food and water, but the chick did not react to the talitrids and remained inactive. On the following morning, the chick was found dead in the brooder. USFWS was notified and the carcass was placed in a freezer. This chick was last seen actively foraging on 8 May at two days old. The two banded chicks from this brood were last seen 15 May and one chick fledged.

On 6 July, an unbanded 14- to 15-day-old chick from the SP120 nest was observed with missing neck feathers and the exposed skin appeared swollen. The chick was foraging and behaving normally with its unbanded sibling in South Oso Flaco. Two chicks hatched from this nest, only one chick was seen subsequent to 6 July, and one fledged.

On 6 July, an 11-day-old chick, banded PG:WY from the SP119 nest, was observed on the 6 exclosure shoreline with a right leg injury. The bird was foraging while the non-functioning right leg was limp and dragged on the ground. The bird was captured 8 July and transported to Pacific Wildlife Care where the right leg was treated for nerve injury, the free moving bands on right leg were removed, a splint placed on the curled under foot, and the bird was given antibiotics and anti-inflammatory medication. On 17 July, the veterinarian reported the bird was walking more normally and not limping but there was a small abrasion and swelling that developed on the right foot and it needed continued treatment. The leg and foot slowly improved and the bird was transferred to the Santa Barbara Zoo on 28 August at 64 days old (medical record attached). On 14 September, the plover was in a flight pen and reported to be moving well, keeping up with other plovers, and gaining weight. The fledgling continued to do well in the flight pen and was released (banded P W/G:- with white tape added to the top portion of green band and no bands on right leg) at McGrath State Beach, Ventura County, on 11 October at 108 days old.

Least tern carcass found

On 26 August, a dead least tern fledgling, banded G/Y:B/A from the LT34 nest, was found on the 8 exclosure shoreline near the waterline. The carcass was wet and intact, with a wound on the back of neck with fresh blood. CDFW was notified and the carcass was sent on 27 August to CDFW OSPR for necropsy. The report indicates the bird died from acute trauma with the wounds presumably caused by attempted predation by an avian predator (necropsy report attached). The fledgling was last seen alive 25 August on the 7 exclosure shoreline at 23 days old.

Snowy plover carcasses collected or observed

In 2018, a total of 15 carcasses (10 adults, two juveniles, and three chicks) were collected and three additional chick carcasses were observed but not collected. The proximity of young plover broods prevented the chick carcasses from being recovered. For carcasses found in the riding area, USFWS was notified and the carcasses were placed in a freezer at ODSVRA. For carcasses that received a necropsy, reports are attached. (There were also two plovers observed prior to death, one adult with a left leg injury that died at Pacific Wildlife Care and one unattended chick with limited mobility, both reported on in section titled Injured or sick snowy plover sightings in this Notes section.)

Carcasses of eight adult snowy plovers in the riding area

Details on eight adult snowy plover carcasses found to date in 2018 (1 January to 14 November) are provided below (no carcasses were found 7 November to 31 December 2017, subsequent to the 2017 annual report). No suggestion of predation was evident at any of the carcasses. USFWS was notified and, unless otherwise noted, the carcasses found in the riding area were placed in a freezer at ODSVRA. The eight carcasses in 2018, along with seven found in both 2017 and 2016 calendar years, is higher than the average of two carcasses (range=1-4) (all adults or juveniles) found per year in the riding area during the seven-year period 2009-15 (CDPR 2009-17).

On 1 February, a dead plover, banded VV:YB, was found in tire tracks north of marker post 6 in the riding area. The carcass was not flattened and appeared fresh. The bird fledged from ODSVRA in 2017.

On 9 February, a dead unbanded plover was found near the shoreline south of marker post 4 in the riding area. The bird was found in a fresh tire track and appeared flattened.

On 28 February, a dead female plover, banded GG:GG, was found at the base of the exclosure fence north of marker post 7 in the riding area. The carcass was partially buried but appeared fairly fresh. There were no vehicle tracks in the area of the carcass and it is likely that the bird died as a result of a fence strike. The bird fledged from ODSVRA in either 2011 or 2013 and was a known breeder at our site in 2014, 2016 and 2017. The bird was last seen in this general area on 19 February.

On 1 March, a dead unbanded plover was found east of marker post 7 in the riding area (area closed to riding later that morning) in an area with multiple vehicle tracks. One wing of the bird appeared twisted and no predator tracks were seen.

On 22 September, a dead unbanded adult plover was found east of the camping area north of marker post 5 in the riding area. The carcass appeared fresh and was found in an area with multiple vehicle tracks.

On 30 September, two dead unbanded adult plovers were found approximately 10 feet apart near the camping area north of marker post 5 in the riding area. The birds were found in an area with multiple vehicle tracks, appeared flattened, and were partially buried.

On 12 October, a dead unbanded adult plover was found east of the camping area between marker post 4 and 5 in the riding area. The carcass appeared fresh and was found in an area with multiple vehicle tracks.

Carcass of one snowy plover adult on the 8 exclosure shoreline

On 1 September, desiccated partial remains from an adult plover banded RR:BG were found on the 8 exclosure shoreline. Two chicks banded RR:BG fledged from ODSVRA in 2016. A male with this combination was known breeding at our site in 2017 and was last seen 19 November 2017.

Carcass remains of one snowy plover, suspected adult, in South Oso Flaco

On 6 September, the desiccated partial remains of a snowy plover, suspected adult, were found in South Oso Flaco. Parts found included a partial bill, leg, and feathers.

Carcasses of two snowy plover juveniles on the 8 exclosure shoreline

On 2 July, a dead juvenile snowy plover, banded BB:VG from the SP64 nest, was found on the immediate edge of the active SP174 nest bowl on the 8 exclosure shoreline. (The SP174 nest was a renest by the SP64 associated banded male and both nests were in similar locations.) The intact carcass was in rigor and appeared fresh. USFWS was notified and the carcass was placed in a freezer at ODSVRA. Two chicks banded BB:VG fledged from the SP64 nest and both were last seen alive on the 8 exclosure shoreline on 30 June when 38 to 39 days old. U.S. Geological Survey National Wildlife Health Center performed a necropsy and the report indicates it died from pulmonary hemorrhage, but the cause of the hemorrhage was not determined (see attached necropsy report). The SP174 nest hatched three chicks on 21 July.

On 9 August, a dead, unbanded juvenile plover was found on the 8 exclosure shoreline. The intact carcass was wet, possibly washed by the ocean, and some blood was seen on the underside of the bird. USFWS was notified and the carcass was sent to CDFW OSPR for necropsy. Radiographs of the carcass did not show any fractures and it was too desiccated for additional analysis. The remains were donated to the California Academy of Sciences in San Francisco.

Carcass of one snowy plover chick in 7 exclosure

On 14 August, the carcass of an unbanded, newly hatched sized chick was found five feet from the SP200 nest bowl in 7 exclosure. The nest bowl was empty and chick likely hatched from the nest. The carcass was extremely desiccated with large openings on the right side of the body and right side of the head. On 3 August, the SP200 nest hatched one chick (banded PV:PR) and the two remaining eggs had no cracks. On 6 August, the PV:PR chick was seen on the 8 exclosure shoreline with a SP200 adult banded PG:OW. The following day, the four-day-old chick was adopted by the SP220 brood on the North Oso Flaco shoreline and this chick fledged. A bird continued attending the original SP200 nest from 3-10 August. On 7 August, a second chick hatched (banded GG:RY) and the remaining egg was pipped and peeping (assumed to hatch and found as carcass on 14 August). The GG:RY chick was not subsequently seen.

Carcasses of two snowy plover chicks in South Oso Flaco

On 6 September, one small, desiccated chick carcass, banded VV:YB from the SP49 brood, was found on the South Oso Flaco shoreline in the general area of the nest and where the brood was raised. Three chicks were last seen 28 May, two last seen on 13 June, and the remaining chick was last seen on 15 June at 19 days old.

On 23 September, the desiccated partial remains of a small chick were found in South Oso Flaco. Remains were partially buried and the pink and violet bands found indicate it was likely a chick banded PV:AY from the nearby SP105 nest. Three chicks from this brood were raised in close proximity to the nest location and were last seen 28 June at 10 days old.

Carcasses of three snowy plover chicks on the shoreline of 6 and 7 exclosures not collected

On 11 June, one chick banded BB:WW from the SP77 brood, raised on the north end of the 6 exclosure shoreline, was observed to be alive but less mobile than the sibling. The brood was monitored closely and the associated adult male occasionally brooded both chicks but attendance to the less mobile chick was minimal throughout the day. In the afternoon of the same day, only the one immobile chick was seen with the adult periodically attempting to brood, and at 6:30 pm the adult was observed dragging a chick. The chick appeared dead and the carcass could not be recovered due to the proximity of young plover broods. The brood was not seen after this date and no chicks are known to have fledged (see section titled Snowy

plover chicks at north end of 6 exclosure shoreline and movement toward or into open riding area in this Notes section).

On 12 July, the carcass of one unbanded chick from the SP169 brood was observed on the 7 exclosure shoreline with the sibling and associated adults nearby. Two chicks hatched from this nest and both chicks were seen 11 July at four days old. The carcass could not be recovered due to the proximity of young plover broods.

On 24 July, an unbanded chick carcass (unknown nest number) was observed held in the bill of a whimbrel (*Numenius phaeopus*) on the 6 exclosure shoreline. The carcass was limp and may have been dead prior to the whimbrel picking it up. The whimbrel shook the carcass, attempted to eat the chick, and flew a short distance with it after it was briefly chased by a gull. The chick carcass was not relocated.

Selective collection and transfer of abandoned chicks and potentially viable eggs

Management strategies may include the collection of abandoned but potentially viable eggs or chicks under select circumstances. Such eggs or chicks may be considered for collection if disturbance factors from visitors or park management efforts may have been a factor in the abandonment. Examples of such factors include but are not limited to: abandoned eggs or chicks from a nest in the open riding area; abandoned eggs or chicks from a nest with a single wire nest exclosure such as a circular exclosure, with suspected adult mortality; or abandoned eggs or chicks from a nest near the park's two-inch by four-inch fencing that may have increased the amount of windblown sand on the nest. Collected potentially viable eggs are first assessed for transfer to nests which are being actively incubated but determined to have nonviable eggs (well past estimated hatch date). When no nest is available, and in consultation with USFWS, potentially viable eggs are transported to the Santa Barbara Zoo for captive-rearing. Collected abandoned chicks are first assessed for possible reuniting with their associated adults; if not possible, they are transported to the Santa Barbara Zoo for captive-rearing. In 2018, two abandoned chicks were collected in the field and transported to the Santa Barbara Zoo for captive-rearing (one was initially treated at Pacific Wildlife Care). Five nests abandoned pre-term had their eggs (n=14) collected in the field and were transported to the Santa Barbara Zoo for captive-rearing.

<u>One chick from an unknown nest transported to Pacific Wildlife Care and later to the Santa Barbara Zoo</u>

On the morning of 27 July, one small, unbanded chick of unknown age (less than a week old) from an unknown brood was observed on the 7 exclosure shoreline not moving and lying unnaturally on its back. The chick was unattended by an adult and a male plover was aggressively pecking and carrying the chick. The chick was collected and found to be alive but cold and not breathing normally. It was placed in a warmed brooder and immediately transported to Pacific Wildlife Care (medical record attached). The chick recovered and was transferred to the Santa Barbara Zoo on 3 August. It was banded PA:GY and was released as a fledgling at McGrath State Beach, Ventura County, on 11 October at approximately 80 days old.

<u>One chick from the SP201 nest transported to the Santa Barbara Zoo</u>

On 17 August, one nine-day-old chick banded PG:RG and from the SP201 nest was observed lying face down with wings out on the 8 exclosure shoreline and separated from the adult and two siblings. The brood was monitored from a distance and the chick had some slight movements indicating it was alive, but appeared weak and the chick remained unattended by the adult. The chick was collected, placed in a warmed brooder, and quickly became active and was fed talitrids. The chick could not be reunited the same day because of the close proximity of young snowy plover broods and was kept in the brooder overnight. The following morning, reuniting the chick with its brood was attempted but unsuccessful. The chick was rebanded PA:RG and transported to the Santa Barbara Zoo 18 August. The chick fledged and was released at McGrath State Beach, Ventura County, on 11 October at 64 days old.

Three eggs from the SP9 nest transported to the Santa Barbara Zoo

The SP9 nest in South Oso Flaco was found as a one-egg nest on 4 April. A circular exclosure and a camera were installed on 10 April when at three eggs, and the nest was incubated by an adult after the installations. The nest had inconsistent incubation by an unbanded female from 12-19 April. On 21 April, the nest was determined to be abandoned and the three eggs were collected, placed in a warmed brooder, and transported to the Santa Barbara Zoo the same day. Upon examination, one egg was determined to be nonviable and two eggs had active embryos. Of the two active eggs, one stopped development 7 May and the other egg hatched on 11 May. The chick reached fledge age, was banded PA:AG (pink band above joint), and was released at VAFB, Santa Barbara County, on 1 August at 82 days old.

Three eggs from the SP90 nest transported to the Santa Barbara Zoo

On 11 May, the three-egg SP90 nest was found in South Oso Flaco and a bird was seen incubating. The same day, a circular exclosure was installed and the symbolic fence was moved west to decrease possible pedestrian disturbance. The following day, no bird was seen on the nest, but the associated male banded NR:WB was nearby, and a nest camera was installed. Daily nest checks and the nest camera confirmed inconsistent incubation from 12-14 May and nest was abandoned 14 May. On 17 May, the three eggs (mostly buried) were collected and transported to the Santa Barbara Zoo. All three eggs were viable and two chicks hatched 9 June. The third chick died in the process of hatching. Both chicks reached fledging age, and were banded PA:AR and PA:AW (pink bands placed above the joint). The fledglings were released at VAFB on 1 August at 53 days old.

Three eggs from the SP80 nest transported to the Santa Barbara Zoo

The SP80 nest in South Oso Flaco was found as a two-egg nest on 7 May. A circular exclosure and a camera were installed on 9 May when at three eggs. On the morning of 18 May, no bird was present and no eggs were visible. Three eggs were found fully buried within the circular and they were placed on the sand surface. The following day, no bird was on the nest, and the three eggs were partially buried and unmoved. Camera information indicated there were high winds on 17 May beginning at 11:35 am, the adult was unable to keep the eggs from being buried while inside the circular exclosure, and abandoned the nest that afternoon at 3:30 pm. The three eggs were collected 19 May, placed in a warmed brooder, and transported to the Santa Barbara Zoo the same day. Upon examination, two eggs showed no development and fertility could not be confirmed. The remaining egg hatched on 8 June. The chick reached fledge age, was banded PA:AY (pink band above the joint), and was released at VAFB on 1 August at 54 days old.

Two eggs from the SP59 nest transported to the Santa Barbara Zoo

The SP59 nest in eastern 8 exclosure was found as a one-egg nest on 24 April. The nest progressed to three eggs but one egg was lost after 13 May. The nest had consistent incubation but on two occasions a bird was observed moving off the nest when monitors moved on foot east of the exclosure to access a nest viewing blind. On 26 May, both eggs were tapping and expected to hatch. On 27-29 May, no bird was on the nest or nearby. On 29 May, the two abandoned eggs with hatching cracks were mostly buried, the eggs were collected, placed in a warmed brooder, and transported to the Santa Barbara Zoo. Both chicks in the eggs were alive on arrival and the eggs were opened a bit to assist the hatching process. The two chicks hatched 30 May, but one chick was quite weak and did not survive. The other chick reached fledge age, was banded PA:BR (pink band above the joint), and was released at VAFB on 1 August at 63 days old.

Three eggs from the SP118 nest transported to the Santa Barbara Zoo

The SP118 nest in South Oso Flaco was found as a three-egg nest on 28 May and a circular exclosure was installed the same day. The nest had an incubating adult from the date found to 9 June. On 12 June, no bird was present, the three eggs were found completely buried within the circular exclosure, and the eggs were placed on the sand surface. The following day, the nest was determined to be abandoned and the three eggs were collected, placed in a warmed brooder, and transported to the Santa Barbara Zoo the same day. One

egg had no development and one died in late embryonic stage. The remaining egg hatched 26 June, but the chick had a malformed beak, was weak, and was euthanized the same day.

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APPENDICES

APPENDIX A. CALIFORNIA LEAST TERN NESTS AT ODSVRA IN 2018.

Least tern chicks were banded with green over yellow vinyl tape on a size 1A blank aluminum band on the left leg and a size 1A numbered aluminum federal band on the right. Color tape was placed on the federal band to create combinations unique to individual. Chicks were weighed immediately prior to banding, typically at one to three days old. Four chicks from four hatching nests were not banded. Two unbanded young fledglings were confirmed separately in 7 exclosure on 29 July and 11 August (with obvious age and plumage differences) but unknown from which nests. Evidence supports these two unbanded fledglings originated at ODSVRA. One additional G/Y:- banded fledgling was documented after it lost the right band and could not be associated with a nest number, but is known to have originated at ODSVRA. Information on adult pair is provided where known. Sex of adults is typically not known. Contents of several nonhatching eggs were examined for fertilization post-season at the Santa Barbara Museum of Natural History.

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

U = unbanded

unk = unknown

na = estimated date not available due to insufficient information

? = unconfirmed band combinations or colors

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

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
1	6	banded	27-May	Hatch	20-Jun	2	2 (2)	G/Y:P (7.3) -:N (6.6)	G/Y:P -:N	Bumpout Seasonal Exclosure	One chick originally banded G/Y:N on 22 June lost band from left leg and first seen as -:N at 28 days old.
2	6	U	na	Abandoned pre-term	17-Jun	2	0 (0)			Bumpout Seasonal Exclosure	Nest seen incubated on 18 days from 29 April-16 June. Two eggs collected 21 August. One egg had approximately 2.5-week-old dead embryo when contents examined.
3	6	W/B:W U	26-May	Hatch	16-Jun	2	2 (2)	G/Y:K (6.0) G/Y:R (6.0)	G/Y:K G/Y:R	Bumpout Seasonal Exclosure	
4	7	W/B:W/Y	30-May	Hatch	22-Jun	2	2 (1)	U G/Y:L (6.2)	G/Y:L	Bumpout Seasonal Exclosure	One unbanded chick last seen on 24 June at 2 days old.
5	7	banded	29-May	Hatch	19-Jun	1	1 (1)	G/Y:B (5.9)	G/Y:B	Seasonal Exclosure	

Appendix A. California least tern nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
6	7	B/R:(W/B)?	30-May	Hatch	20-Jun	2	1 (1)	G/Y:Y (8.5)	G/Y:Y	Seasonal Exclosure	One egg had inward dent and nonhatching cracks when nest walked to on 20 and 22 June. No egg was found when nest walked to 27 August.
7	7	Y/O:W/B U	26-May	Hatch	20-Jun	1	1 (1)	G/Y:V (9.0)	G/Y:V	Bumpout Seasonal Exclosure	
8	7	(W:B/W)?	30-May	Hatch	20-Jun	2	2 (1)	G/Y:W (10.2) G/Y:G (4.6)	G/Y:W	Seasonal Exclosure	G/Y:G chick last seen 10 July at 19 days old.
9	7	U	30-May	Hatch	20-Jun	2	2 (2)	G/Y:A (5.5) G/Y:O (6.2)	G/Y:A G/Y:O	Seasonal Exclosure	
10	6	Y/G:B/W U	30-May	Hatch	20-Jun	2	2 (2)	G/Y:W/R (7.3) G/Y:W/B (9.2)	G/Y:W/R G/Y:W/B	Bumpout Seasonal Exclosure	
11	7	U	4-Jun	Hatch	27-Jun	2	1 (1)	G/Y:R/W (10.6)	G/Y:R/W	Seasonal Exclosure	On 30 June, 1 chick was banded and 1 egg with large crack and dead chick inside. No egg found when nest walked to 27 August.
12	6		na	Failed, unknown cause	(10-Jun)	1	0 (0)			Bumpout Seasonal Exclosure	On 5 June, 1 egg seen at nest. Nest seen incubated on 6 days from 4-9 June. Unable to confirm incubation 10-11 June. No eggs found when nest walked to 12 June. Fate occurred during period of high winds.
13	6		na	Abandoned pre-term	10-Jun	2	0 (0)			Bumpout Seasonal Exclosure	On 5 June, 2 eggs seen at nest. Nest seen incubated on 5 of 7 days from 3-9 June. Nest was not seen incubated 11-12 June. Two eggs were found 25% buried at nest bowl when walked to on 11 June and were collected on 22 August. Fate occurred during period of high winds. No sign of fertilization when egg contents examined.

Appendix A. California least tern nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
14	6		na	Abandoned pre-term	(7-Jun)	≥1	0 (0)			Seasonal Exclosure	Nest location known by multiple observations of incubating adult from 4-6 June. Unable to confirm incubation 7-9 June. No eggs found when nest walked to 25 August. Fate occurred during period of high winds.
15	7		na	Abandoned pre-term	(9-Jun)	1	0 (0)			Seasonal Exclosure	Nest found at 1 egg on 6 June. Nest seen incubated on 2 of 3 days from 6-8 June. One egg found 50% buried at nest bowl when walked to on 12 June and was collected on 27 August. Fate occurred during period of high winds. No sign of fertilization when egg contents examined.
16	6		3-Jun	Hatch	29-Jun	1	1 (unk)	U		Bumpout Seasonal Exclosure	One unbanded chick seen 4 times from 10-18 July, and based on size and location is believed to be from this nest. Chick last seen on 18 July at 19 days old.
17	6	banded	na	Abandoned post-term	16-Jul	2	0 (0)			Bumpout Seasonal Exclosure	On 10 June, nest found at 2 eggs. One egg had dried yolk material around small indented hole and on 11 June was 6 inches outside nest bowl. Nest seen incubated on 36 days from 10 June to 15 July. On 13, 17, and 31 July only 1 egg (not cracked) in nest bowl and was collected 22 August. No sign of fertilization when egg contents examined.
18	6		10-Jun	Hatch	2-Jul	2	2 (2)	G/Y:W/Y (10.3) G/Y:W/A (9.3)	G/Y:W/Y G/Y:W/A	Bumpout Seasonal Exclosure	

Appendix A. California least tern nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
19	6	U ?:G/Y	11-Jun	Hatch	2-Jul	1	1 (1)	G/Y:B/W (9.1)	G/Y:B/W	Bumpout Seasonal Exclosure	
20	6	U	13-Jun	Hatch	4-Jul	1	1 (unk)	U		Bumpout Seasonal Exclosure	One unbanded chick seen 6 times from 4-12 July, and based on size and location is believed to be from this nest. Chick last seen on 12 July at 8 days old.
21	6	U	20-Jun	Hatch	11-Jul	2	2 (1)	G/Y:W/O (6.7) G/Y:W/G (7.3)	G/Y:W/G	Bumpout Seasonal Exclosure	G/Y:W/O chick last seen 1 August at 20 days old.
22	7	-:W/A/W Y/G:W/R/W	22-Jun	Hatch	13-Jul	2	2 (2)	G/Y:B/O G/Y:B/Y	G/Y:B/O G/Y:B/Y	Bumpout Seasonal Exclosure	
23	7	U	23-Jun	Hatch	15-Jul	1	1 (0)	G/Y:G/W (4.5)		Seasonal Exclosure	G/Y:G/W chick last seen 30 July at 15 days old.
24	6	U W/B:R/Y	22-Jun	Hatch	15-Jul	2	2 (2)	G/Y:R/B (11.1) G/Y:Y/B (9.2)	G/Y:R/B G/Y:Y/B	Bumpout Seasonal Exclosure	
25	6	-:A/B U	23-Jun	Hatch	14-Jul	1	1 (1)	G/Y:A/W (6.7)	G/Y:A/W	Bumpout Seasonal Exclosure	
26	6	Y/R:W/B	23-Jun	Hatch	14-Jul	2	2 (1)	G/Y:Y/W (6.3) G/Y:O/B (8.0)	G/Y:O/B	Bumpout Seasonal Exclosure	On 15 July, 1 chick banded G/Y:Y/W, lost the band from the left leg by 16 July, and band replaced 17 July (chick weighed 9.0 grams). G/Y:Y/W chick last seen 17 July at 3 days old.
27	7		23-Jun	Hatch	14-Jul	1	1 (1)	G/Y:O/W (8.6)	G/Y:O/W	Seasonal Exclosure	
28	6	U B/W:(A/W)?	24-Jun	Hatch	17-Jul	2	2 (1)	G/Y:O/G (7.2) G/Y:G/O (9.5)	G/Y:O/G	Bumpout Seasonal Exclosure	G/Y:G/O chick last seen 5 August at 19 days old.
29	7	Y/G:(R/B)? U	25-Jun	Hatch	16-Jul	2	2 (2)	G/Y:O/A (8.2) G/Y:O/Y (10.3)	G/Y:O/A G/Y:O/Y	Bumpout Seasonal Exclosure	
30	6	(R or B)?:W/B U	28-Jun	Hatch	22-Jul	1	1 (1)	U	U	Symbolic fence	Nest located on 6 exclosure shoreline outside of Seasonal Exclosure fencing.
31	6	banded	29-Jun	Hatch	21-Jul	1	1 (1)	G/Y:Y/G (8.9)	G/Y:Y/G	Seasonal Exclosure	

Appendix A. California least tern nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
32	6	U	na	Abandoned post-term	29-Jul	1	0 (0)			Seasonal Exclosure	On 29 June, nest found at 1 egg and seen incubated on 30 days from 29 June to 28 July. One egg collected 8 August. Egg had approximately 2.5-week-old dead embryo when contents examined.
33	7	U banded	30-Jun	Hatch	23-Jul	1	1 (1)	G/Y:Y/O (9.1)	G/Y:Y/O	Seasonal Exclosure	
34	7	U	12-Jul	Hatch	2-Aug	1	1 (1)	G/Y:B/A (5.6)	G/Y:B/A	Bumpout Seasonal Exclosure	On 26 August, G/Y:B/A fledgling found dead on 7 exclosure shoreline, last seen alive 25 August at 23 days old (see report Notes section).
35	7	R/W:W/B	21-Jun	Hatch	12-Jul	2	2 (1)	G/Y:B/R (15.8) G/Y:A/B (22.3)	G/Y:A/B	Seasonal Exclosure	On 17 July, two chicks found with two adults in 7 exclosure, banded same day. Nest assumed to have been in 7 exclosure based on earlier sightings of adult behavior suggesting a nest and then location of brood.

APPENDIX B. SNOWY PLOVER NESTS AT ODSVRA IN 2018.

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

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

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

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

Nest protection type: see Management Actions for description of Seasonal Exclosure, circular exclosure, 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	BY	F= M=U	1-Apr	Hatch	6-May	3	3 (2)	3 VV:AG	Seasonal Exclosure	
2	7	F=U M=PV:WY	3-Apr	Hatch	6-May	3	2 (2)	2 VG:YG	Seasonal Exclosure	One egg (with hatching-like cracks) abandoned post-term. Band combination also used on 3 chicks hatching from SP25 on 4 May and 2 known to fledge.
3	6	F= M=	na	Depredated, avian	8-Apr	2	0 (0)		Seasonal Exclosure	Lost during period of known nest loss to gull and raven.
4	7	F=U M=U	30-Mar	Hatch	2-May	3	2 (1)	2 VG:GB	Seasonal Exclosure	One egg (with hatching-like cracks) abandoned post-term.
5	6	F= M=	na	Depredated, raven	5-Apr	3	0 (0)		Seasonal Exclosure	
6	6	F=U M=	31-Mar	Depredated, raven	5-Apr	3	0 (0)		Seasonal Exclosure	
7	6	F= M=	30-Mar	Depredated, raven	5-Apr	3	0 (0)		Seasonal Exclosure	
8	8	F=U M=U	3-Apr	Abandoned pre-term	20-Apr	3	0 (0)		Seasonal Exclosure	Nest camera confirmed inconsistent incubation with nest ultimately abandoned.
9	SOF	F=U M=U	4-Apr	Abandoned pre-term	20-Apr	3	0 (0)		Circular excl. with top Symbolic fence	Nest camera confirmed inconsistent incubation prior to abandonment. On 21 April, 3 eggs taken to Santa Barbara Zoo. One egg hatched, chick fledged and banded PA:AG (see report Notes section).
10	SOF	F=U M=GA:WW	4-Apr	Depredated	12-Apr	3	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
11	SOF	F=VV:GW M=	4-Apr	Depredated, gull	13-Apr	3	0 (0)		Symbolic fence	
12	SOF	F=U M=-:YG	4-Apr	Hatch	7-May	3	3 (0)	3 PG:RW	Circular excl. with top Symbolic fence	
13	SOF	F=U M=	2-Apr	Depredated, gull	13-Apr	3	0 (0)		Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2018 (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
14	8	F=U M=U	2-Apr	Depredated, avian	19-Apr	3	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
15	SOF	F=U M=U	2-Apr	Hatch (Split)	5-May	3	3 (0)	3 VG:WG	Circular excl. with top Symbolic fence	Last chick sighting on 11 May and not known to fledge. Band combination reused on 3 chicks hatching from SP198 on 11 August.
16	8	F= M=	4-Apr	Abandoned pre-term	7-Apr	2	0 (0)		Symbolic fence	
17	NOF	F= M=	na	Depredated, avian	7-Apr	3	0 (0)		Seasonal Exclosure	Lost during period of known nest loss to gull and raven.
18	NOF	F= M=	4-Apr	Depredated, avian	8-Apr	2	0 (0)		Seasonal Exclosure	Lost during period of known nest loss to gull and raven.
19	NOF	F=U M=	4-Apr	Depredated, avian	10-Apr	3	0 (0)		Seasonal Exclosure	Lost during period of known nest loss to gull and raven.
20	7	F= M=	na	Depredated, avian	13-Apr	2	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
21	8	F= M=	9-Apr	Overwashed by tide	12-Apr	1	0 (0)		Symbolic fence	On 9 April, found as 1 egg in defined nest bowl with tracks.
22	NOF	F=U M=GG:OR	9-Apr	Depredated, avian	16-Apr	2	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
23	7	F=U M=U	7-Apr	Hatch (Split)	11-May	3	2 (1)	2 VG:PG	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
24	7	F=U M=U	9-Apr	Hatch	15-May	3	3 (2)	3 BB:GW	Seasonal Exclosure	
25	7	F=U M=U	1-Apr	Hatch	3-May	3	3 (2)	3 VG:YG	Seasonal Exclosure	Band combination also used on 2 chicks from SP2, both fledged.
26	6	F=?:YG M=U	10-Apr	Hatch	14-May	3	3 (0)	3 VG:PW	Seasonal Exclosure	Last sighting of brood on 19 May when an unbanded adult male observed picking up, dropping, and pecking at chick. Immediately afterward chick continued to forage, with no attending adult or sibling in area (see report Notes section).
27	SOF	F= M=	8-Apr	Depredated, avian	13-Apr	3	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
28	6	F=U M=U	7-Apr	Hatch (Split)	9-May	2	2 (2)	2 GG:OY	Seasonal Exclosure	Band combination also used on 3 chicks hatching from SP215 on 19 June and 2 were known to fledge. Brood raised on northern 6 exclosure shoreline near the open riding area. On 7 occasions between 20 May-1 June the brood was observed to enter the open riding area (see report Notes section).
29	8	F=VV:GR M=U	3-Apr	Hatch (Split)	5-May	3	3 (1)	2 BB:RG 1 unbanded	Seasonal Exclosure	On 13 May, unbanded 7-day-old chick observed immobile, placed in brooder, and was dead the following morning (see report Notes section).
30	8	F=U M=PV:YB	11-Apr	Hatch	16-May	2	2 (2)	2 VV:OW	Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2018 (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
31	NOF	F= M=	na	Depredated, avian	13-Apr	2	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
32	6	F=U M=BB:BG	11-Apr	Hatch	20-May	3	3 (3)	3 VV:AB	Seasonal Exclosure	
33	6	F= M=U	11-Apr	Hatch (Split)	15-May	3	3 (0)	3 VG:WY	Symbolic fence	Brood raised on northern 6 exclosure shoreline near the open riding area (see report Notes section).
34	6	F=U? M=(GG)?:PW	na	Depredated, raven	17-Apr	1	0 (0)		Symbolic fence	
35	6	F=RR:BW M=U	13-Apr	Hatch	20-May	3	2 (0)	2 unbanded	Symbolic fence	One egg (without cracks) abandoned post-term. On 30 May, both 10-day-old chicks observed depredated by western gull (see Appendix H).
36	SOF	F= M=	13-Apr	Depredated, avian	17-Apr	2	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
37	SOF	F=PG:- M=PG:OW	11-Apr	Hatch	13-May	3	2 (1)	2 RR:WY	Circular excl. with top Symbolic fence	One egg unknown fate. On 25 May, one 12- to13-day-old chick observed south of southern park boundary with associated male and fledged in same area.
38	6	F=BB:YW M=U	16-Apr	Hatch	19-May	3	3 (2)	3 GA:BB	Seasonal Exclosure	On 22 May, SP38 male adopted a banded chick from SP44. This chick was last seen on 26 May at 9 days old. On 27 May, the male adopted a 3-day-old chick from SP72 and this chick fledged.
39	7	F=U M=	na	Depredated, raven	17-Apr	3	0 (0)		Seasonal Exclosure	
40	6	F= M=	na	Failed, unknown cause	18-Apr	1	0 (0)		Seasonal Exclosure	Lost during period of known nest loss to gull and raven.
41	8	F=U M=GA:OW	13-Apr	Hatch	16-May	3	3 (1)	3 VV:VY	Symbolic fence	
42	8	F=U M=U	17-Apr	Hatch	21-May	3	1 (1)	1 PV:VB	Seasonal Exclosure	Two eggs unknown fate.
43	6	F=(GG:GR)? M=	9-Apr	Abandoned pre-term	3-May	3	0 (0)		Seasonal Exclosure	Nest last seen incubated on 30 April. On 1 May, 3 eggs 1 inch apart with no nest bowl. Eggs marked and placed in shallow bowl. Eggs found slightly rotated on 2 May. Three eggs had approximately 1-week-old embryos when contents examined.
44	6	F=VV:RY M=AG:GA	17-Apr	Hatch	17-May	3	3 (1)	3 BB:BW	Seasonal Exclosure	One 5-day-old chick adopted by SP38 brood beginning 22 May, chick last seen 26 May and not known to fledge.
45	6	F=VV:BG M=U	21-Apr	Hatch	24-May	3	2 (0)	2 unbanded	Symbolic fence	One egg unknown fate.

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
46	7	F=U M=Y-:GO	21-Apr	Hatch (Split)	21-May	3	3 (2)	3 unbanded	Seasonal Exclosure	
47	BY	F= M=RR:OR	14-Apr	Hatch (Split)	16-May	3	2 (2)	1 BB:BR 1 unbanded	Seasonal Exclosure	On 29 April, 1 egg 6 inches from nest bowl and mostly buried, egg marked and reset with other 2 eggs. This egg hatches. One egg (without cracks) abandoned post-term.
48	8	F=U M=	21-Apr	Abandoned pre-term	29-Apr	3	0 (0)		Seasonal Exclosure	On 28 April, 1 egg 2 feet away from nest bowl with tracks at all 3 eggs. Egg reset with other 2 eggs. No sign of fertilization when egg contents examined.
49	SOF	F=U M=GA:WW	23-Apr	Hatch	27-May	3	3 (0)	3 VV:YB	Circular excl. with top Symbolic fence	On 20 May, 3 eggs recentered in circular. On 6 September, 1 small, dead and desiccated VV:YB chick found in area of nest and where brood was seen (see report Notes section).
50	SOF	F=VV:GW M=U	21-Apr	Hatch (Split)	23-May	3	2 (2)	2 GG:GB	Circular excl. with top Symbolic fence	On 14 May, 3 eggs recentered in circular. One egg (without cracks) abandoned post-term.
51	SOF	F= M=	23-Apr	Depredated, gull	29-Apr	3	0 (0)		Symbolic fence	
52	SOF	F=U M=	21-Apr	Depredated, gull	28-Apr	3	0 (0)		Symbolic fence	
53	SOF	F= M=	23-Apr	Depredated, avian	29-Apr	3	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
54	NOF	F= M=	24-Apr	Depredated, avian	29-Apr	2	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
55	NOF	F=U M=	13-Apr	Depredated, avian	28-Apr	3	0 (0)		Seasonal Exclosure	Lost during period of known nest loss to gull and raven.
56	8	F= M=PG:VG	22-Apr	Hatch (Split)	24-May	3	3 (3)	2 BB:VW 1 unbanded	Seasonal Exclosure	
57	6	F=U M=U	15-Apr	Hatch (Split)	17-May	3	2 (0)	1 GA:VB 1 unbanded	Seasonal Exclosure	On 1 May, 1 egg found fully buried at nest. Egg marked and reset in nest. One egg unknown fate.
58	6	F=U M=BB:WB	22-Apr	Hatch (Split)	27-May	3	2 (2)	1 GA:YB 1 unbanded	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
59	8	F=U M=	24-Apr	Abandoned pre-term	27-May	3	0 (0)		Seasonal Exclosure	On 26 May, 1 egg missing pre-term and bird not seen on nest afterwards. On 29 May, 2 eggs found abandoned and mostly buried. Both eggs had cracks and taps and were collected and transported to Santa Barbara Zoo. Both eggs hatched and 1 chick (banded PA:BR) fledged (see report Notes section).

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
60	6	F=NO:AB? M=	20-Apr	Abandoned pre-term	30-Apr	3	0 (0)		Seasonal Exclosure	On 29 April, 2 eggs missing pre-term and 1 remaining egg in nest bowl marked. Egg found buried 1 May.
61	6	F=PV:- M=GA:AR	21-Apr	Hatch	23-May	3	3 (2)	3 unbanded	Symbolic fence	
62	7	F=U M=U	25-Apr	Hatch (Split)	26-May	3	3 (3)	3 VG:AG	Symbolic fence	
63	8	F=GA:YY M=VG:VY	19-Apr	Hatch	21-May	3	3 (1)	3 BB:BB	Symbolic fence	From 2-4 July, a 42-day-old BB:BB fledgling brooded at SP180 nest while female incubated eggs. Adult bands were not confirmed at SP180.
64	8	F=U M=GG:OR	20-Apr	Hatch (Split)	22-May	3	3 (2)	3 BB:VG	Seasonal Exclosure	On 2 July, 1 BB:VG juvenile found dead at SP174 nest site, a subsequent nest by the SP64 banded male. Two fledges were last seen on 30 June at 38 to 39 days old (see report Notes section and Appendix H).
65	6	F=U M=U	16-Apr	Hatch	18-May	3	3 (0)	3 BB:PB	Seasonal Exclosure	On 30 May, one 12-day-old chick eaten by western gull (see Appendix H).
66	6	F=(RR)?:AA M=VG:AG	21-Apr	Hatch	23-May	3	3 (1)	3 GG:BB	Seasonal Exclosure	On 26 June, GG:BB fledgling brooding with an unbanded female at SP166 while female incubated eggs. SP166 is a subsequent nest of the banded male with SP66.
67	NOF	F=RR:PW M=BB:VR	28-Apr	Hatch	31-May	3	2 (0)	1 unbanded	Seasonal Exclosure	One egg unknown fate. On 31 May, camera identifies 2 chicks. One remaining chick last seen 4 June at 4 days old and not known to fledge. On 12 June, male with SP67 adopted a 6-day-old banded chick from SP87. This chick fledged.
68	6	F=PG:YB M=BB:VY	27-Apr	Hatch	4-Jun	3	1 (0)	1 VG:WW	Seasonal Exclosure	One egg unknown fate and 1 egg (without cracks) abandoned post-term.
69	8	F=U M=VV:WR	17-Apr	Hatch	19-May	2	2 (2)	2 GG:AW	Seasonal Exclosure	
70	NOF	F=U M=U	1-May	Hatch	4-Jun	2	2 (1)	2 GA:GB	Seasonal Exclosure	
71	SOF	F=U M=VV:VB	1-May	Hatch (Split)	4-Jun	3	3 (3)	3 VG:YW	Circular excl. with top Symbolic fence	On 11 May, symbolic fence moved west to decrease possible pedestrian disturbance.
72	6	F=U M=BB:RB	22-Apr	Hatch	24-May	3	3 (2)	3 GG:WW	Seasonal Exclosure	One 3-day-old chick adopted by SP38 brood beginning 27 May and fledged. On 30 May, one 6-day-old chick eaten by western gull (see Appendix H).

Appendix B. Snowy plover nests at ODSVRA in 2018 (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
73	7	F=U M=GG:OR	26-Apr	Hatch	28-May	3	2 (1)	2 GA:GW	Seasonal Exclosure	On 22 May, 1 egg with pale colored shell around cracks. This egg abandoned post-term. On 30 May, one 2-day-old chick eaten by western gull (see Appendix H).
74	6	F=GG:AB M=	2-May	Abandoned post-term	23-Jul	2	0 (0)		Seasonal Exclosure	On 11 May, 1 egg with small hole on side of egg. On 2 June, egg with hole missing pre-term. One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
75	8	F=U M=BB:OB	27-Apr	Hatch	29-May	3	2 (0)	2 unbanded	Symbolic fence	One egg unknown fate.
76	6	F=GA:OR M=U	30-Apr	Hatch	31-May	3	2 (2)	2 PG:WB	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
77	6	F=U M=U	2-May	Hatch (Split)	2-Jun	3	3 (0)	2 BB:WW 1 unbanded	Seasonal Exclosure	Brood raised on northern 6 exclosure shoreline near the open riding area and territorial adult aggression seen on several occasions. On 7 and 8 June, the brood was observed to enter the open riding area. On 8 June, an adult chased and aggressively attacked the unbanded chick; the chick became separated from the associated male and was not seen again. On 11 June, the associated male was observed dragging a dead chick. Both banded chicks were last seen on this day (see report Notes section).
78	6	F=U M=U	2-May	Hatch (Split)	3-Jun	3	3 (1)	2 BB:PY 1 unbanded	Seasonal Exclosure	Brood raised on northern 6 exclosure shoreline near the open riding area and territorial adult aggression seen on several occasions. On 7 and 12 June the brood was observed to enter the open riding area (see report Notes section). Unbanded chick fledged.
79	6	F=VV:AA M=GG:WB	25-Apr	Hatch	27-May	3	3 (1)	3 VV:WW	Seasonal Exclosure	On 30 May, two 3-day-old chicks eaten by western gull (see Appendix H).
80	SOF	F=U M=	5-May	Abandoned, suspected wind	18-May	3	0 (0)		Circular excl. with top Symbolic fence	On 17 May, camera showed eggs were buried during high winds and nest abandoned. On 18 May, 3 eggs were unburied and placed on sand surface. Eggs were collected and taken to Santa Barbara Zoo on 19 May (See report Notes section).
81	8	F=U M=	24-Apr	Abandoned pre-term	28-May	3	0 (0)		Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2018 (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
82	6	F=GA:RY M=VV:YG	1-May	Hatch	2-Jun	3	1 (1)	1 unbanded	Symbolic fence	Two eggs unknown fate.
83	SOF	F= M=	1-May	Depredated	10-May	3	0 (0)		Symbolic fence	
84	6	F=U M=PG:PW	27-Apr	Hatch	29-May	3	3 (1)	3 unbanded	Symbolic fence	
85	SOF	F=GA:RY M=U	3-May	Hatch	4-Jun	3	2 (0)	2 BB:RY	Circular excl. with top Symbolic fence	On 25 May, 1 egg missing pre-term and found half-buried on 6 September.
86	SOF	F=U M=BB:PY	7-May	Hatch	9-Jun	3	2 (1)	2 PG:GY	Circular excl. with top Symbolic fence	On 9 June, 1 egg missing pre-term and found fully buried on 10 August. One 2-day-old chick adopted by SP93 brood beginning 11 June and chick fledged (only chick of SP86 to fledge).
87	6	F=U M=RR:AB	5-May	Hatch	6-Jun	3	3 (1)	3 VG:VR	Seasonal Exclosure	One 6-day-old VG:VR chick adopted by SP67 male beginning 12 June and chick fledged.
88	7	F=PV:YY M=U	30-Apr	Hatch	1-Jun	3	3 (2)	3 unbanded	Symbolic fence	
89	8	F=U? M=RR:AW?	na	Abandoned pre-term	(11-May)	≥1	0 (0)		Seasonal Exclosure	On 1 May, active scrape present. Egg found abandoned pre-term on 11 May.
90	SOF	F= M=NR:WB	na	Abandoned pre-term	15-May	3	0 (0)		Circular excl. with top Symbolic fence	On 11 May, symbolic fence moved west to decrease possible pedestrian disturbance. Camera confirmed inconsistent incubation from 12-14 May, and nest abandoned on 14 May. On 17 May, eggs collected and taken to Santa Barbara Zoo (see report Notes section).
91	SOF	F=U M=U	6-May	Hatch (Split)	7-Jun	3	2 (1)	2 unbanded	Circular excl. with top Symbolic fence	One egg abandoned post-term.
92	6	F=U M=O-:PB	30-Apr	Hatch (Split)	1-Jun	3	3 (3)	3 GG:PG	Seasonal Exclosure	On 20 July, juvenile (48 to 49 days old) seen with a right leg injury (see report Notes section).
93	SOF	F=PV:PR M=U	10-May	Hatch	10-Jun	3	2 (2)	2 unbanded	Circular excl. with top Symbolic fence	One egg abandoned post-term. On 11 June, male adopted a 2-day-old VG:VR chick from SP86. This chick fledged.
94	7	F=BB:OW M=RR:BW	7-May	Hatch	8-Jun	3	2 (2)	1 GA:AY 1 unbanded	Seasonal Exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
95	8	F= M=U	2-May	Hatch (Split)	3-Jun	3	2 (1)	2 BB:AR	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
96	7	F=U M=GG:AY	28-Apr	Hatch (Split)	30-May	3	3 (1)	3 unbanded	Symbolic fence	
97	7	F=U M=U	8-May	Hatch	9-Jun	3	2 (1)	2 GG:YY	Seasonal Exclosure	One egg (without cracks) abandoned post-term.

Appendix B. Snowy plover nests at ODSVRA in 2018 (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
98	6	F= M=GG:PW	7-May	Hatch	8-Jun	3	1 (1)	1 unbanded	Symbolic fence	Two eggs abandoned post-term.
99	SOF	F=U M=GA:PR	7-May	Hatch	8-Jun	3	3 (1)	3 PV:WG	Circular excl. with top Symbolic fence	On 4 June, 3 eggs recentered in circular.
100	6	F=VG:BW M=NB:OY	9-May	Hatch (Split)	10-Jun	3	3 (3)	3 GG:RB	Seasonal Exclosure	
101	6	F= M=U	30-Apr	Hatch (Split)	1-Jun	3	3 (2)	3 unbanded	Symbolic fence	
102	6	F=U M=U	13-May	Hatch (Split)	14-Jun	3	2 (2)	2 unbanded	Symbolic fence	One egg abandoned post-term.
103	8	F=U M=U	18-May	Failed, unknown cause	10-Jun	3	0 (0)		Bumpout Seasonal Exclosure	Both eggs had approximately 2.5-week-old embryos when contents examined.
104	7	F=PV:VY M=U	2-May	Hatch	3-Jun	3	2 (1)	2 VG:GG	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
105	SOF	F=U M=U	18-May	Hatch	18-Jun	3	3 (0)	3 PV:AY	Symbolic fence	All 3 chicks last seen alive on 28 June, at 10 days old. On 23 September, desiccated remains of 1 partially banded (PV:-) chick found near nest location (see report Notes section).
106	7	F=U M=U	12-May	Hatch	13-Jun	3	3 (0)	3 unbanded	Symbolic fence	
107	8	F=U M=U	16-May	Hatch	17-Jun	3	3 (2)	3 PG:BY	Seasonal Exclosure	
108	7	F=BB:GR M=NB:BW	20-May	Hatch (Split)	19-Jun	3	3 (3)	3 unbanded	Seasonal Exclosure	
109	7	F= M=GA:Y-	12-May	Hatch (Split)	13-Jun	3	3 (2)	2 VG:YY 1 unbanded	Seasonal Exclosure	One banded and one unbanded chick fledged.
110	6	F=PV:VW M=GA:WR	16-May	Hatch	17-Jun	3	3 (3)	3 GA:YG	Seasonal Exclosure	
111	BY	F=PV:PG M=U	21-May	Hatch	21-Jun	3	2 (2)	2 GA:AW	Seasonal Exclosure	On 3 June, 1 egg missing pre-term. On 13 June, 1 egg in nest and 1 egg found buried below nest bowl. Buried egg marked and reset in nest.
112	6	F=NR:BR M=BB:RR	12-May	Hatch	13-Jun	3	3 (2)	3 unbanded	Bumpout Seasonal Exclosure	
113	6	F=U M=U	15-May	Hatch (Split)	16-Jun	3	3 (3)	3 unbanded	Symbolic fence	
114	NOF	F=VG:GW M=U	4-May	Hatch	5-Jun	3	2 (2)	2 unbanded	Circular excl. with top Symbolic fence	One egg abandoned post-term.
115	SOF	F=PG:OW M=U	19-May	Hatch	20-Jun	3	3 (3)	3 unbanded	Symbolic fence	
116	SOF	F=U M=U	26-May	Abandoned, suspected wind	27-May	1	0 (0)		Symbolic fence	
117	NOF	F=VV:WY M=U	17-May	Hatch	18-Jun	3	2 (2)	2 unbanded	Symbolic fence	One egg unknown fate.

Appendix B. Snowy plover nests at ODSVRA in 2018 (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
118	SOF	F=U M=	21-May	Abandoned, suspected wind	10-Jun	3	0 (0)		Circular excl. with top Symbolic fence	On 12 June, 3 eggs unburied from center of circular and marked. On 13 June, the 3 eggs were confirmed abandoned and taken to Santa Barbara Zoo (see report Notes section).
119	6	F=GG:GR M=U	24-May	Hatch (Split)	25-Jun	3	3 (1)	2 PG:WY 1 unbanded	Seasonal Exclosure	On 6 July, one 11-day-old banded chick seen with serious right leg injury. Chick was taken to Pacific Wildlife Care 8 July and transferred to Santa Barbara Zoo 28 August (see report Notes section). One unbanded chick fledged.
120	SOF	F=PG:- M=U	20-May	Hatch (Split)	21-Jun	3	2 (1)	2 unbanded	Symbolic fence	One egg unknown fate. On 6 July, one 14- to 15-day-old chick seen with injury to neck (see report Notes section).
121	7	F=U M=RR:AW	25-May	Hatch	26-Jun	3	3 (2)	3 VG:AY	Seasonal Exclosure	
122	6	F=NR:YG M=U	23-May	Hatch (Split)	24-Jun	3	3 (1)	3 unbanded	Symbolic fence	From 26-29 June, SP122 and SP141 broods became mixed and the respective adults associated with each brood raised one chick from the other brood. Both adopted chicks fledged.
123	NOF	F=U M=BB:AR	22-May	Hatch	23-Jun	3	2 (1)	2 unbanded	Symbolic fence	One egg abandoned post-term.
124	7	F=U M=U	23-May	Hatch	24-Jun	3	2 (2)	2 PV:GY	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
125	NOF	F=U M=GN:RR	24-May	Hatch	25-Jun	3	3 (3)	3 unbanded	Symbolic fence	
126	8	F=U M=GA:YB	22-May	Hatch	24-Jun	2	2 (1)	2 GA:YY	Seasonal Exclosure	
127	8	F=B-:G- M=U	31-May	Hatch	1-Jul	3	2 (1)	2 unbanded	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
128	NOF	F=U M=GG:PR	20-May	Depredated, coyote	15-Jun	3	0 (0)		Symbolic fence	
129	6	F=U M=GA:WW	25-May	Hatch	26-Jun	3	2 (2)	2 PV:RB	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
130	8	F=U M=	na	Abandoned, unknown if pre- or post-term	9-Jun	3	0 (0)		Symbolic fence	No sign of fertilization when egg contents examined.
131	7	F=U M=GA:WG	3-Jun	Hatch	2-Jul	3	3 (0)	2 PG:AY 1 unbanded	Seasonal Exclosure	
132	6	F=banded M=U	22-May	Hatch	23-Jun	3	1 (0)	1 unbanded	Seasonal Exclosure	Two eggs (without cracks) abandoned post-term.
133	7	F= M=	27-May	Unknown	28-Jun	3	0 (0)		Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2018 (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
134	SOF	F=PV:BY M=NR:WB	28-May	Hatch	29-Jun	3	3 (3)	3 unbanded	Symbolic fence	
135	6	F=PV:- M=U	na	Abandoned post-term	27-Aug	3	0 (0)		Seasonal Exclosure	No sign of fertilization when egg contents examined.
136	NOF	F=VG:GR M=U	28-May	Hatch	29-Jun	3	3 (0)	3 unbanded	Symbolic fence	
137	7	F=RR:BB M=GA:RY	4-Jun	Hatch (Split)	6-Jul	3	3 (3)	3 GG:YR	Seasonal Exclosure	
138	SOF	F=U M=VV:OW	30-May	Depredated, coyote	18-Jun	3	0 (0)		Symbolic fence	
139	SOF	F=VV:GW M=U	29-May	Hatch	30-Jun	3	3 (2)	3 GA:WY	Circular excl. with top Symbolic fence	Brood raised north and south of southern park boundary.
140	SOF	F=U M=U	28-May	Hatch (Split)	29-Jun	3	3 (2)	3 unbanded	Symbolic fence	
141	6	F=U M=U	24-May	Hatch	25-Jun	3	2 (2)	2 BB:WR	Seasonal Exclosure	One egg (without cracks) abandoned post-term. Between 26-29 June, SP141 and SP122 broods became mixed and the respective adults associated with each brood raised one chick from the other brood. Both adopted chicks fledged. From 4-9 August, BB:WR juvenile (40 to 45 days old) seen with a right leg injury (see report Notes section).
142	8	F=U M=U	7-Jun	Hatch	9-Jul	3	1 (1)	1 GG:PY	Seasonal Exclosure	Two eggs (without cracks) abandoned post-term.
143	6	F=U M=U	6-Jun	Hatch (Split)	8-Jul	3	3 (1)	3 unbanded	Symbolic fence	
144	SOF	F=U M=U	1-Jun	Hatch (Split)	3-Jul	3	3 (2)	3 unbanded	Symbolic fence	
145	6	F=BB:VG M=U	13-May	Hatch	14-Jun	3	2 (1)	2 VV:AY	Seasonal Exclosure	One egg (with cracks and small hole with adhering sand) abandoned post-term.
146	6	F=U M=U	4-Jun	Hatch	6-Jul	3	3 (2)	3 PG:RB	Seasonal Exclosure	
147	6	F=banded M=U	5-Jun	Hatch	7-Jul	3	1 (0)	1 unbanded	Symbolic fence	Two eggs abandoned post-term.
148	7	F=VO:BW M=PV:WY	31-May	Hatch	2-Jul	3	3 (2)	3 PV:OG	Seasonal Exclosure	
149	7	F=U M=U	8-Jun	Hatch	10-Jul	3	1 (1)	1 unbanded	Symbolic fence	Two eggs abandoned post-term.
150	8	F=U M=VV:BW	19-May	Hatch	20-Jun	3	3 (2)	3 PG:VR	Symbolic fence	
151	8	F= M=PV:YB	15-Jun	Hatch	16-Jul	3	3 (1)	3 unbanded	Seasonal Exclosure	On 23 July, one of the three 7-day-old chicks lying immobile and not responding to adult. Brood subsequently seen with two chicks.
152	BY	F= M=	na	Abandoned pre-term	(16-Jun)	1	0 (0)		Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2018 (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
153	NOF	F=U M=U	4-Jun	Hatch	6-Jul	3	3 (2)	3 unbanded	Symbolic fence	
154	6	F=BB:YW M=U	1-Jun	Hatch (Split)	5-Jul	3	3 (3)	3 unbanded	Seasonal Exclosure	
155	NOF	F=U M=U	13-Jun	Hatch	15-Jul	3	1 (1)	1 unbanded	Symbolic fence	Two eggs abandoned post-term.
156	6	F=U M=U	3-Jun	Hatch (Split)	5-Jul	3	3 (2)	3 unbanded	Symbolic fence	
157	6	F=PG:YB M=BB:VY	11-Jun	Hatch	13-Jul	3	2 (0)	2 unbanded	Symbolic fence	One egg abandoned post-term.
158	SOF	F=U M=U	15-Jun	Hatch	17-Jul	3	2 (1)	2 VG:RW	Circular excl. with top Symbolic fence	On 18 June, symbolic fence moved west to decrease possible pedestrian disturbance. One egg (without cracks) abandoned post-term.
159	BY	F=PG:PB M=RR:OR	12-Jun	Hatch	14-Jul	3	1 (1)	1 unbanded	Seasonal Exclosure	Two eggs unknown fate.
160	8	F=U M=BB:OB	2-Jun	Hatch (Split)	4-Jul	3	2 (2)	2 VG:RB	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
161	6	F=U M=U	16-Jun	Hatch	18-Jul	3	1 (0)	1 VG:RY	Seasonal Exclosure	Two eggs (without cracks) abandoned post-term. Chick raised on northern 6 exclosure shoreline near the open riding area. On 5 occasions between 28 July - 6 August the chick was observed to enter the open riding area. On 7 August, chick depredated by California gull (see report Notes section).
162	6	F=banded M=	na	Abandoned, unknown if pre- or post-term	5-Jul	3	0 (0)		Symbolic fence	Nest not walked to while active to reduce disturbance to nearby plover broods. On 23 August, one intact egg and one partial egg with developed chick inside found near remnants of a third egg. All 3 eggs within 6 inches of each other. Two eggs had approximately 2.5-week-old embryos when contents examined.
163	8	F=U M=U	15-Jun	Hatch	17-Jul	3	3 (0)	3 unbanded	Symbolic fence	One 10-day-old chick adopted by GG:OR male with SP174 brood beginning 27 July, chick last seen 4 August and not known to fledge.
164	6	F=GA:RY M=	na	Abandoned post-term	12-Aug	2	0 (0)		Symbolic fence	Nest incubated for a minimum of 56 days from 17 June - 11 August. Nest not walked to while active to reduce disturbance to nearby plover broods. On 24 August, 2 eggs found abandoned post-term.

Appendix B. Snowy plover nests at ODSVRA in 2018 (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
165	8	F=GA:PR M=PV:YG	16-Jun	Hatch	18-Jul	3	3 (1)	3 unbanded	Symbolic fence	
166	6	F=U M=VG:AG	22-Jun	Hatch	25-Jul	3	3 (0)	3 VG:PR	Symbolic fence	On 23 June, incubating female observed brooding 32-day-old SP66 fledgling. SP166 is a subsequent nest of the banded male associated with SP66.
167	NOF	F=U M=U	15-Jun	Hatch	17-Jul	3	3 (1)	3 VG:AR	Seasonal Exclosure	On 23 and 25 August, fledgling (37 and 39 days old) seen with a left leg injury (see report Notes section).
168	7	F=GA:O- M=	na	Abandoned, unknown if pre- or post-term	26-Jul	3	0 (0)		Symbolic fence	Nest observed active from 21 June to 24 July. On 25 July, 3 eggs found in nest bowl with tracks to eggs. No bird seen on nest after 24 July. Three eggs had approximately 3.5-week-old embryos when contents examined.
169	7	F=U M=U	5-Jun	Hatch	7-Jul	3	2 (1)	2 unbanded	Symbolic fence	One egg unknown fate. On 12 July, one chick observed immobile for an extended period of time and assumed dead. Both chicks seen 11 July at 4 days old (see report Notes section).
170	NOF	F= M=	na	Abandoned, unknown if pre- or post-term	26-Jun	3	0 (0)		Symbolic fence	Nest observed incubating from 22-25 June. Nest not walked to while active to reduce disturbance to nearby plover broods. On 24 August, 3 eggs found partially buried at nest. No sign of fertilization when egg contents examined.
171	SOF	F=U M=U	na	Depredated, coyote	3-Jul	≥1	0 (0)		Symbolic fence	Nest observed incubating from 22 June - 2 July. Nest not walked to while active to reduce disturbance to nearby plover broods. On 3 July, nest bowl walked to and coyote tracks lead to nest and eggshell fragments present.
172	7	F=U M=U	16-Jun	Hatch	18-Jul	3	3 (0)	3 unbanded	Symbolic fence	
173	8	F=GA:OR M=	12-Jun	Hatch	14-Jul	3	2 (0)	2 unbanded	Seasonal Exclosure	One egg abandoned post-term.
174	8	F=RR:PW M=GG:OR	19-Jun	Hatch	21-Jul	3	3 (2)	1 VV:RR 2 unbanded	Symbolic fence	On 2 July, BB:VG fledgling from SP64 was found dead at edge of nest bowl. SP174 is a subsequent nest of the banded male with SP64 (see Notes section). On 27 July, the male adopted a 10-day-old unbanded chick from SP163. This chick was last seen on 4 August at 18 days old.

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
175	SOF	F=VG:GW M=GA:WW	17-Jun	Hatch (Split)	19-Jul	3	3 (3)	3 unbanded	Circular excl. with top Symbolic fence	
176	SOF	F=U M=	16-Jun	Depredated, gull	2-Jul	3	0 (0)		Symbolic fence	
177	6	F= M=U	5-Jun	Hatch	7-Jul	3	1 (1)	1 unbanded	Symbolic fence	Two eggs abandoned post-term.
178	6	F=U M=GG:OR	20-Jun	Hatch	22-Jul	3	3 (0)	3 unbanded	Symbolic fence	
179	8	F=U M=U	20-Jun	Hatch (Split)	22-Jul	3	3 (0)	3 unbanded	Symbolic fence	
180	8	F=banded M=U	17-Jun	Hatch	19-Jul	3	3 (0)	3 unbanded	Seasonal Exclosure	From 2-4 July, incubating female observed brooding SP63 BB:BB 42-day-old fledgling at nest.
181	NOF	F=U M=BB:VR	24-Jun	Hatch	26-Jul	3	3 (0)	3 unbanded	Symbolic fence	
182	7	F=GA:RG M=U	14-Jun	Hatch	16-Jul	≥2	2 (0)	2 unbanded	Seasonal Exclosure	Nest location known by multiple observations of incubating adult. To avoid disturbing young snowy plover and least tern broods, nest not walked to and total egg number unknown.
183	6	F=U M=U	17-Jun	Hatch	19-Jul	3	2 (0)	2 PG:OY	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
184	6	F=PG:PG M=U	23-Jun	Hatch	25-Jul	3	3 (0)	3 unbanded	Symbolic fence	
185	6	F=BB:VG M=AG:GA	20-Jun	Hatch (Split)	22-Jul	3	3 (0)	2 PV:YR 1 unbanded	Seasonal Exclosure	Three chicks last seen on 27 July and none known to fledge. Band combination reused on one chick from UNA6 on 29 July.
186	7	F=PV:YY M=U	na	Unknown	26-Jul	≥2	0 (0)		Symbolic fence	To avoid disturbing young snowy plover and least tern broods, nest not walked to while active and total egg number unknown. Two eggs abandoned post-term. No sign of fertilization when egg contents examined.
187	6	F= M=GA:AR	21-Jun	Hatch	23-Jul	3	3 (0)	3 unbanded	Symbolic fence	On 7 August, the single remaining 15-day-old chick observed depredated by California gull (see Appendix H).
188	SOF	F=U M=GA:OR	na	Depredated, coyote	19-Jul	3	0 (0)		Symbolic fence	
189	8	F=U M=	na	Unknown	22-Jul	≥1	0 (0)		Symbolic fence	To avoid disturbing young snowy plover and least tern broods, nest not walked to while active and total egg number unknown. One egg abandoned post-term. No sign of fertilization when egg contents examined.

Appendix B. Snowy plover nests at ODSVRA in 2018 (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
190	SOF	F=U M=-:YG	17-Jun	Hatch (Split)	19-Jul	3	3 (2)	3 VG:RG	Circular excl. with top Symbolic fence	
191	BY	F=U M=GG:PR	22-Jun	Hatch	24-Jul	3	1 (0)	1 PG:PY	Seasonal Exclosure	Two eggs (without cracks) abandoned post-term.
192	8	F= M=U	na	Abandoned, unknown if pre- or post-term	3-Jul	≥1	0 (0)		Symbolic fence	On 1 July, male observed on nest. Nest walked to 2 July and 1 egg present in nest bowl with tracks. Nest not incubated subsequently.
193	8	F= M=	na	Unknown	na	≥2	0 (0)		Seasonal Exclosure	On July 2, nest found as 2 eggs that were abandoned, unknown if pre- or post-term. No sign of fertilization when egg contents examined.
194	SOF	F=U M=U	30-Jun	Hatch	30-Jul	3	3 (0)	3 PV:GR	Circular excl. with top Symbolic fence	
195	7	F=U M=	26-Jun	Hatch	28-Jul	3	3 (0)	3 unbanded	Symbolic fence	
196	6	F=BB:PW M=U	17-Jun	Hatch	19-Jul	3	3 (0)	2 PV:RG 1 unbanded	Seasonal Exclosure	
197	8	F=U M=Y-:GO	18-Jun	Hatch	20-Jul	3	3 (0)	2 VG:OR 1 unbanded	Symbolic fence	
198	7	F=U M=U	10-Jul	Hatch (Split)	11-Aug	3	3 (0)	2 VG:WG 1 unbanded	Symbolic fence	
199	7	F=U M=U	11-Jun	Hatch	13-Jul	≥2	1 (0)	1 unbanded	Symbolic fence	To avoid disturbing young snowy plover and least tern broods, nest not walked to while active and total egg number unknown. One egg abandoned post-term.
200	7	F= M=PG:OW	2-Jul	Hatch (Split)	3-Aug	3	3 (1)	1 PV:PR 1 GG:RY 1 unbanded	Seasonal Exclosure	When 4 days old the PV:PR chick adopted by adult with SP220 brood beginning 7 August, and chick fledged. On 7 August, a second chick hatched and banded GG:RY at nest. Chick not known to fledge. On 14 August, the desiccated carcass of an unbanded chick (newly hatched size) found 5 feet from nest bowl (see report Notes section).
201	7	F= M=U	7-Jul	Hatch	8-Aug	3	3 (2)	2 PG:RG 1 PA:RG	Symbolic fence	On 17 August, one PG:RG chick observed immobile and unattended for an extended period of time. Chick placed in warmed brooder and transported to Santa Barbara Zoo on 18 August. Chick banded PA:RG (see report Notes section). The remaining 2 PG:RG chicks fledged.
202	8	F=U? M=VV:WR	20-Jun	Hatch	22-Jul	3	2 (0)	2 unbanded	Seasonal Exclosure	One egg abandoned post-term.
203	8	F= M=	na	Unknown	na	≥2	0 (0)		Seasonal Exclosure	On 22 August, nest found with 2 eggs abandoned, unknown if pre- or post-term.

Appendix B. Snowy plover nests at ODSVRA in 2018 (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
204	7	F= M=	na	Abandoned, unknown if pre- or post-term	na	3	0 (0)		Symbolic fence	On 30 August, nest found with 3 eggs abandoned, unknown if pre- or post-term. No sign of fertilization when egg contents examined.
205	NOF	F= M=	na	Abandoned, unknown if pre- or post-term	na	3	0 (0)		Symbolic fence	On 11 September, nest found with 3 eggs abandoned, unknown if pre- or post-term. No sign of fertilization when egg contents examined.
206	7	F= M=	na	Unknown	na	≥2	0 (0)		Seasonal Exclosure	On 10 September, nest found with 2 eggs abandoned, unknown if pre- or post-term. No sign of fertilization when egg contents examined.
207	Unknown	F= M=U	na	Hatch	(23-May)	≥2	2 (2)	2 VG:VG		On 25 May, found as brood of 2 small chicks on North Oso Flaco shoreline.
208	Unknown	F= M=PV:YG	na	Hatch	(24-May)	≥2	2 (0)	2 unbanded		On 29 May, found as brood of 2 small chicks on 8 exclosure shoreline.
209	Unknown	F=VG:AW M=U	na	Hatch	(27-May)	≥2	2 (0)	2 GG:YB		On 28 May, found as brood of 2 small chicks on South Oso Flaco shoreline.
210	Unknown	F=U M=U	na	Hatch	(28-May)	≥2	2 (2)	2 unbanded		On 29 May, found as brood of 2 small chicks on 8 exclosure shoreline.
211	Unknown	F= M=PG:VB	na	Hatch	(2-Jun)	≥2	2 (2)	2 unbanded		On 5 June, found as brood of 2 small chicks on 7 exclosure shoreline.
212	Unknown	F= M=U	na	Hatch	(3-Jun)	≥2	2 (2)	2 unbanded		On 4 June, found as brood of 2 small chicks on 8 exclosure shoreline.
213	Unknown	F= M=U	na	Hatch	(7-Jun)	≥2	2 (2)	2 unbanded		On 12 June, found as brood of 2 small chicks on North Oso Flaco shoreline.
214	Unknown	F= M=U	na	Hatch	(9-Jun)	3	3 (2)	3 unbanded		On 12 June, found as brood of 3 small chicks on South Oso Flaco shoreline.
215	Unknown	F= M=BB:OR	na	Hatch	(15-Jun)	3	3 (2)	3 GG:OY		On 16 June, found as brood of 3 small chicks on South Oso Flaco shoreline. Band combination also used on 2 chicks fledging from SP2.
216	Unknown	F=U M=U	na	Hatch	(23-Jun)	3	3 (0)	3 unbanded		On 27 June, found as brood of 3 small chicks on 7 exclosure shoreline.
217	Unknown	F=U M=NY:WG	na	Hatch	(23-Jun)	3	3 (0)	3 unbanded		On 24 June, found as brood of 3 small chicks on 7 exclosure shoreline.
218	Unknown	F=U M=U	na	Hatch	(28-Jun)	≥2	2 (0)	2 unbanded		On 29 June, found as brood of 2 small chicks on 6 exclosure shoreline.
219	Unknown	F=O-:AG M=	na	Hatch	(23-Jul)	3	3 (0)	3 unbanded		On 27 July, found as brood of 3 small chicks on 6 exclosure shoreline.

Appendix B. Snowy plover nests at ODSVRA in 2018 (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
220	Unknown	F= M=U	na	Hatch	(28-Jul)	3	3 (1)	3 unbanded		On 31 July, found as brood of 3 small chicks on North Oso Flaco shoreline. On 7 August, male adopted a 4-day-old PV:PR chick from SP200. This chick and one unbanded SP220 chick fledged.
221	Unknown	F= M=U	na	Hatch	(7-Aug)	≥2	2 (2)	2 unbanded		On 17 August, found as brood of 2 chicks on South Oso Flaco shoreline.

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

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
UNA1	Unknown	F= M=U	na	Hatch	(7-Jun)	-	1 (1)	1 unbanded	-	
UNA2	Unknown	F=PV:AW M=U	na	Hatch	(24-Jun)	-	2 (2)	2 unbanded	-	
UNA3	Unknown	F=U M=	na	Hatch	(29-Jun)	-	3 (0)	3 unbanded	-	
UNA4	Unknown	F=U M=U	na	Hatch	(4-Jul)	-	1 (0)	1 unbanded	-	
UNA5	Unknown	F= M=U	na	Hatch	(22-Jul)	-	3 (1)	3 unbanded	-	
UNA6	Unknown	F= M=PG:PW	na	Hatch	(24-Jul)	-	1 (1)	1 PV:YR	-	Chick band combination reused from SP185 (no chicks fledging).
UNA7	Unknown	F= M=U	na	Hatch	(26-Jul)	-	1 (0)	1 unbanded	-	On 27 July, an unbanded small chick not associated with an obvious brood found injured from an aggressive attack by an unbanded male. Chick collected and taken to Pacific Wildlife Care (see report Notes section).
UNA8	Unknown	F=U M=U	na	Hatch	(26-Jul)	-	1 (0)	1 PG:PR	-	
UNA9	Unknown	F= M=GA:OW	na	Hatch	(1-Aug)	-	2 (2)	2 unbanded	-	
UNA10	Unknown	F= M=U	na	Hatch	(9-Aug)	-	3 (2)	3 unbanded	-	On 14 August, found as brood of three chicks south of south boundary and moved north onto ODSVRA property on 16 August. Two chicks subsequently fledged from ODSVRA's southern shoreline.

APPENDIX C. MAPS OF ALL CALIFORNIA LEAST TERN AND SNOWY PLOVER NEST LOCATIONS AT ODSVRA IN 2018.

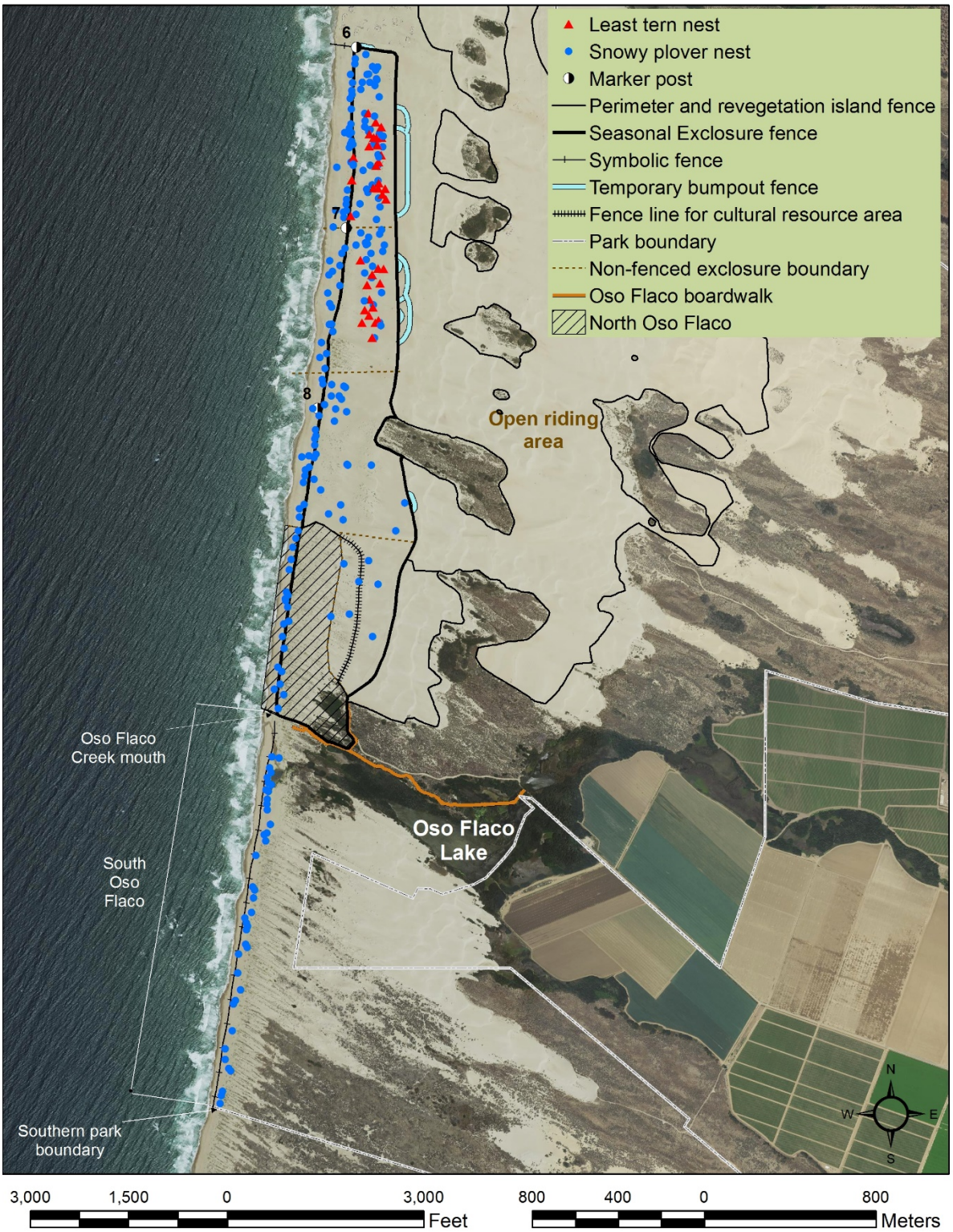


Figure C.1. California least tern and snowy plover nest locations at ODSVRA in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

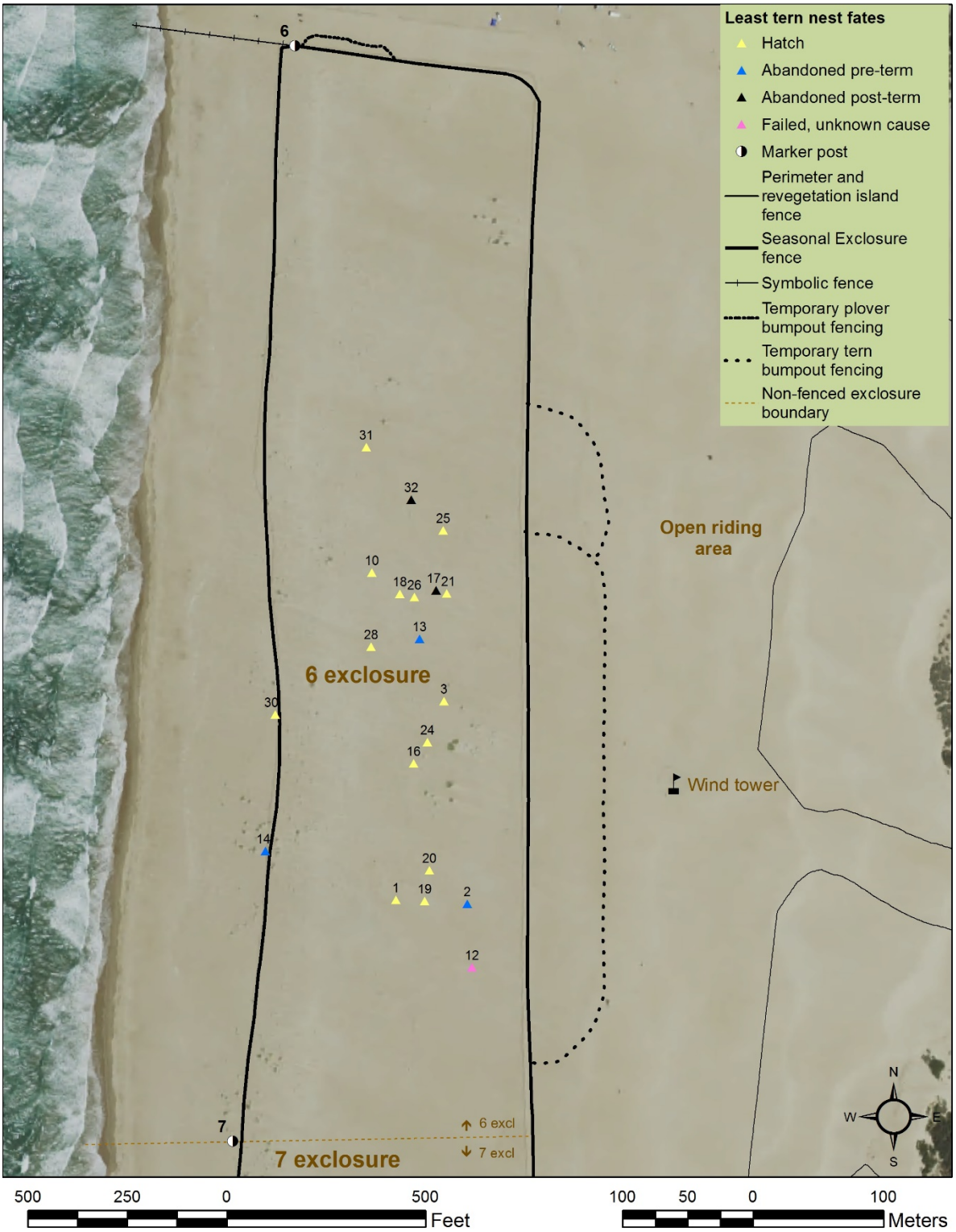


Figure C.2. California least tern nest locations at ODSVRA 6 exclosure in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

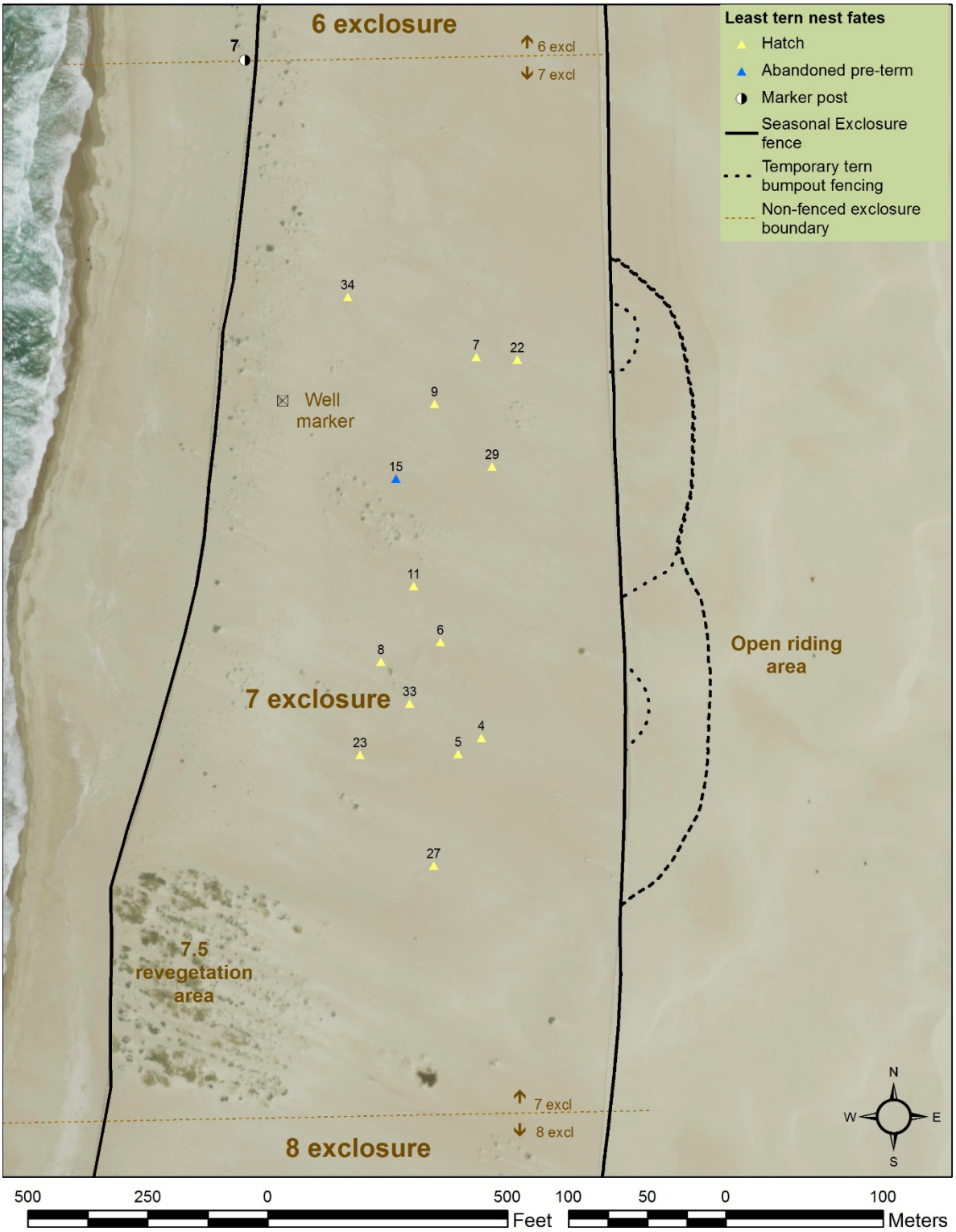


Figure C.3. California least tern nest locations at ODSVRA 7 exclosure in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

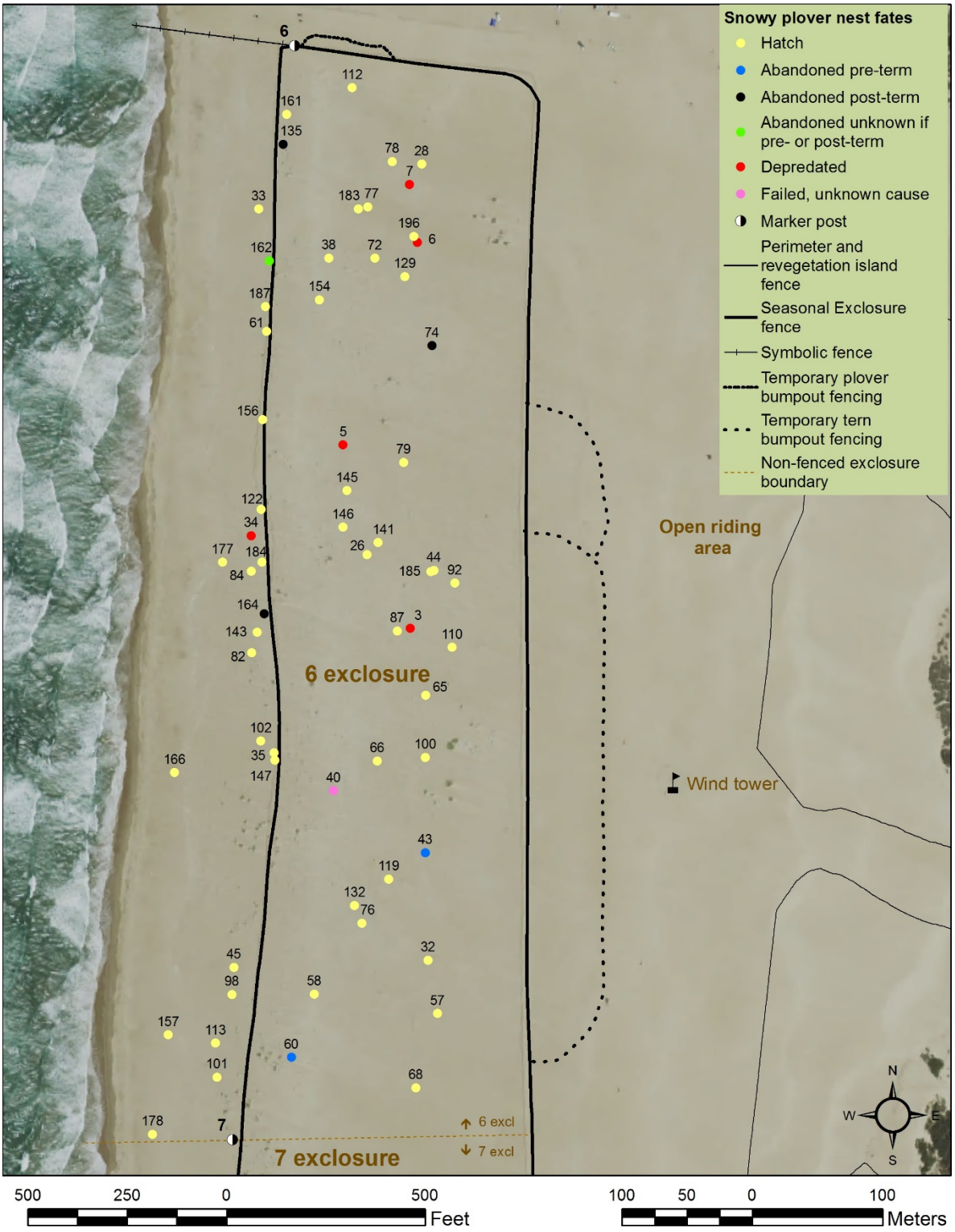


Figure C.4. Snowy plover nest locations at ODSVRA 6 exclosure in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

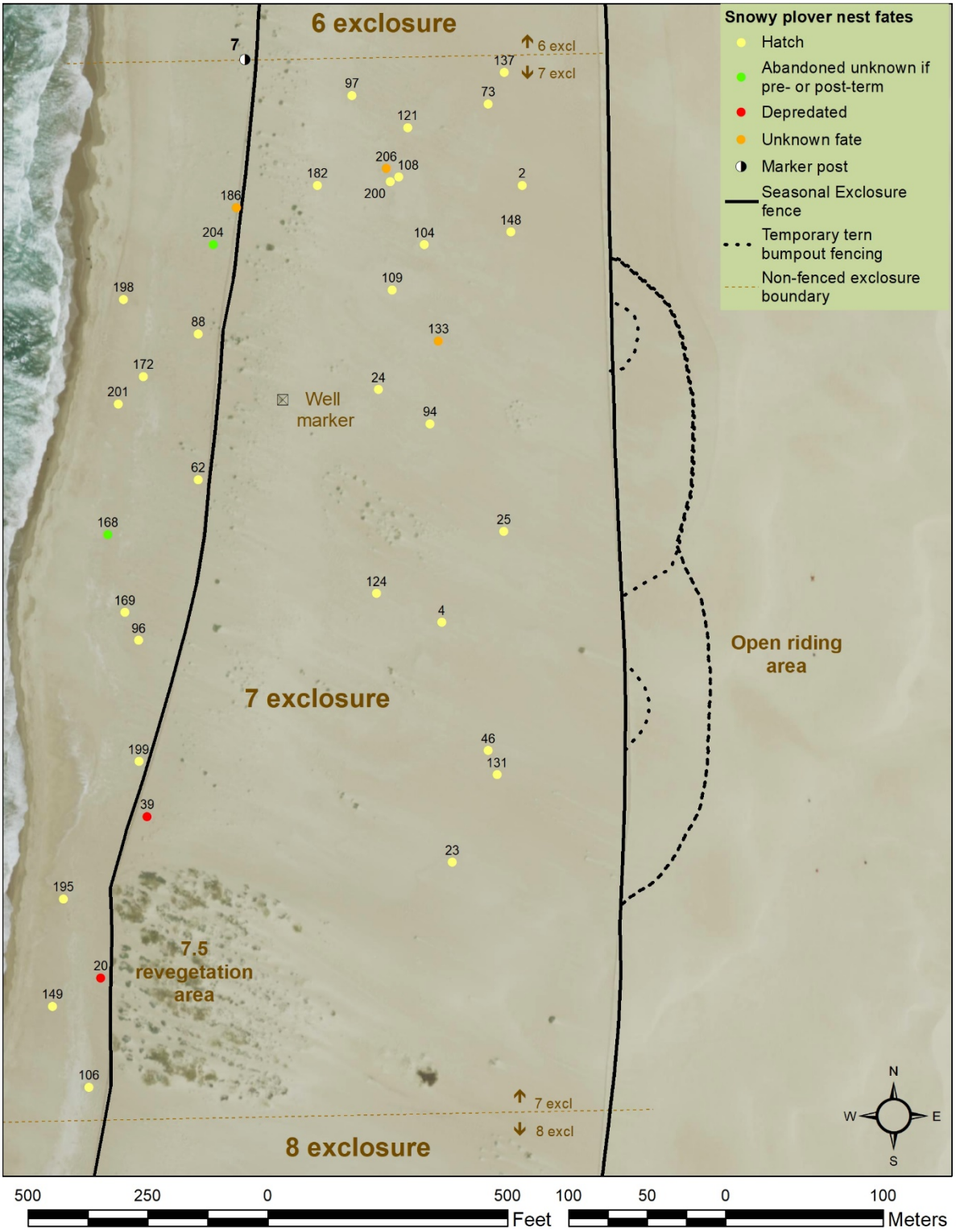


Figure C.5. Snowy plover nest locations at ODSVRA 7 exclosure in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

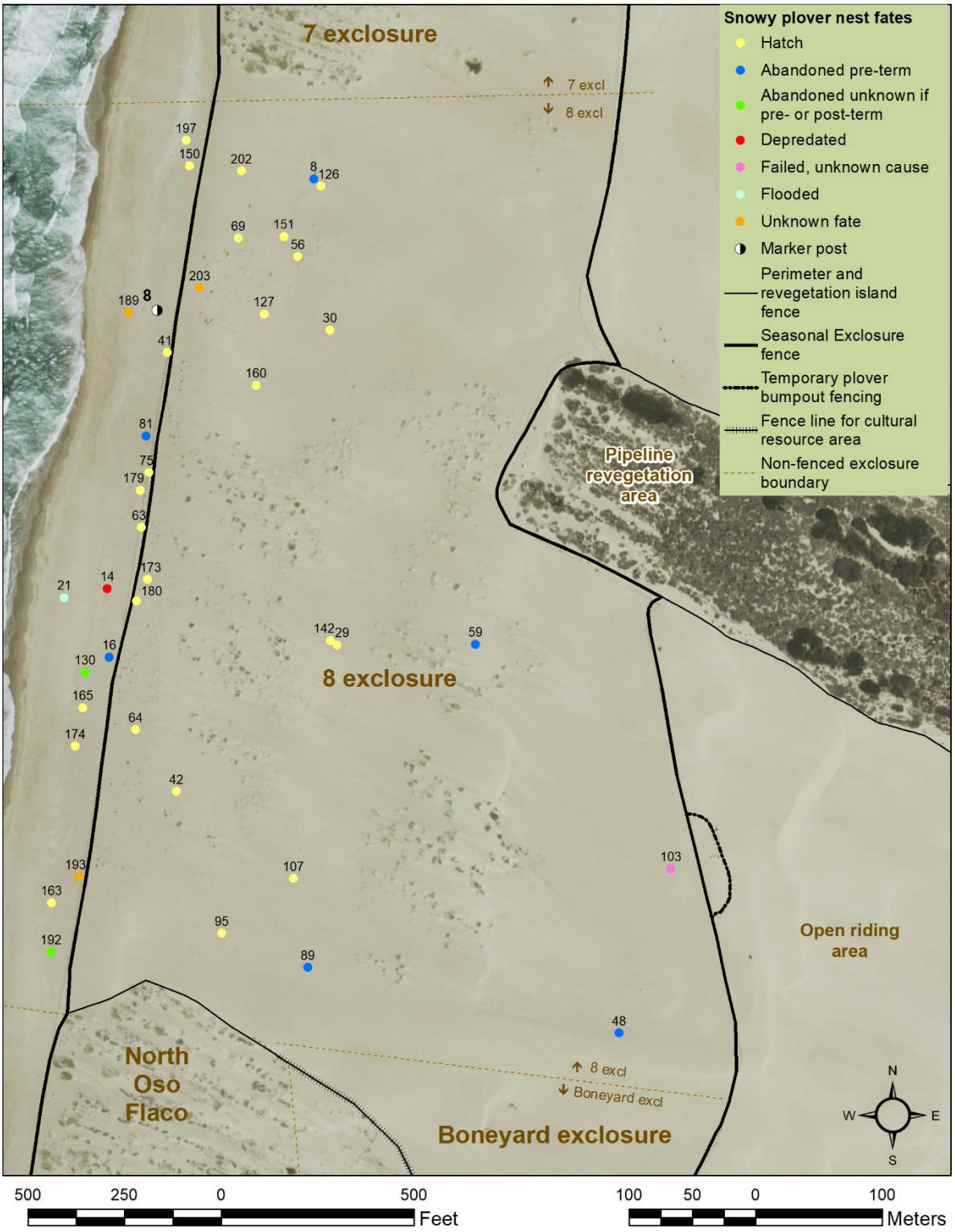


Figure C.6. Snowy plover nest locations at ODSVRA 8 exclosure in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

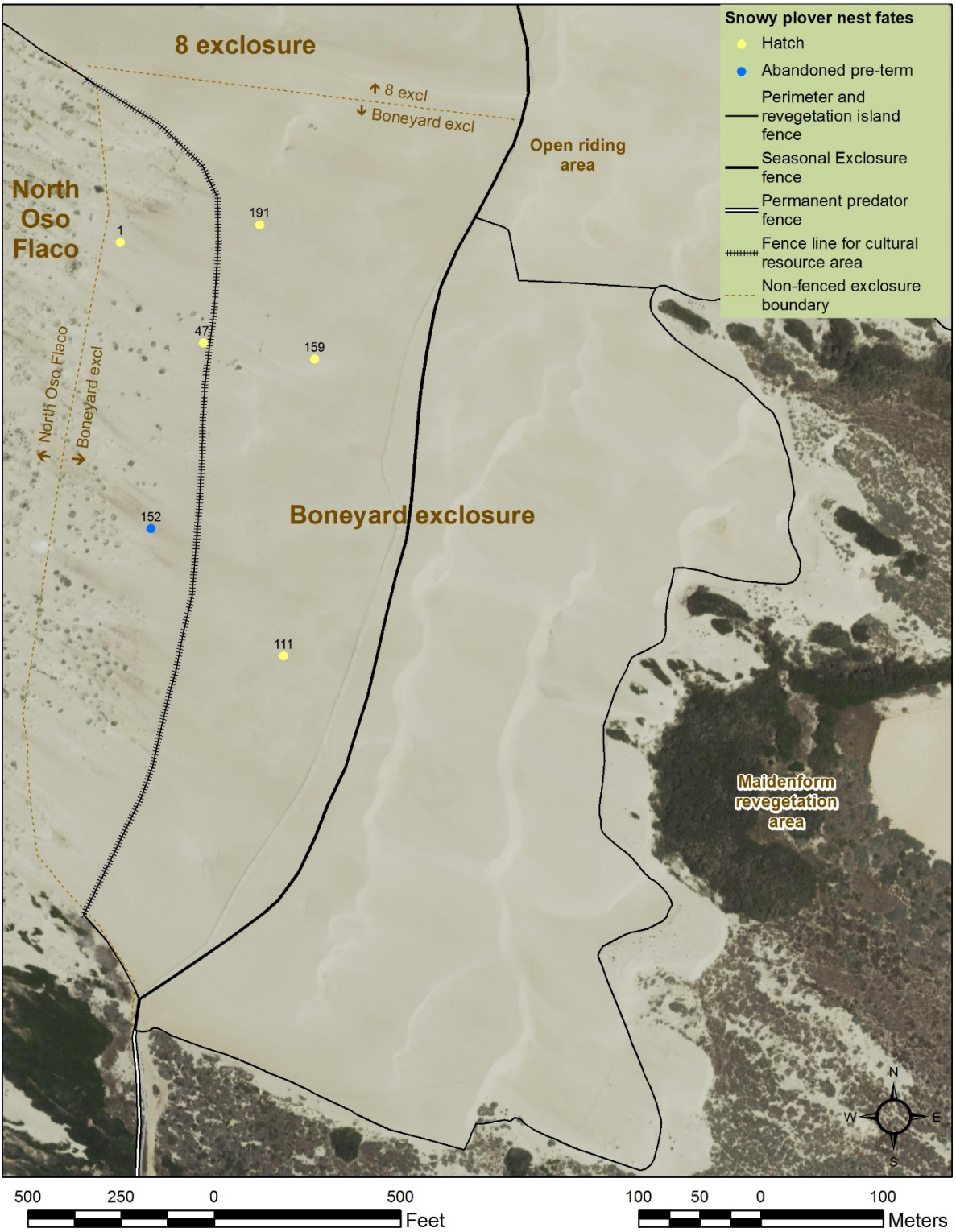


Figure C.7. Snowy plover nest locations at ODSVRA Boneyard exclosure in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

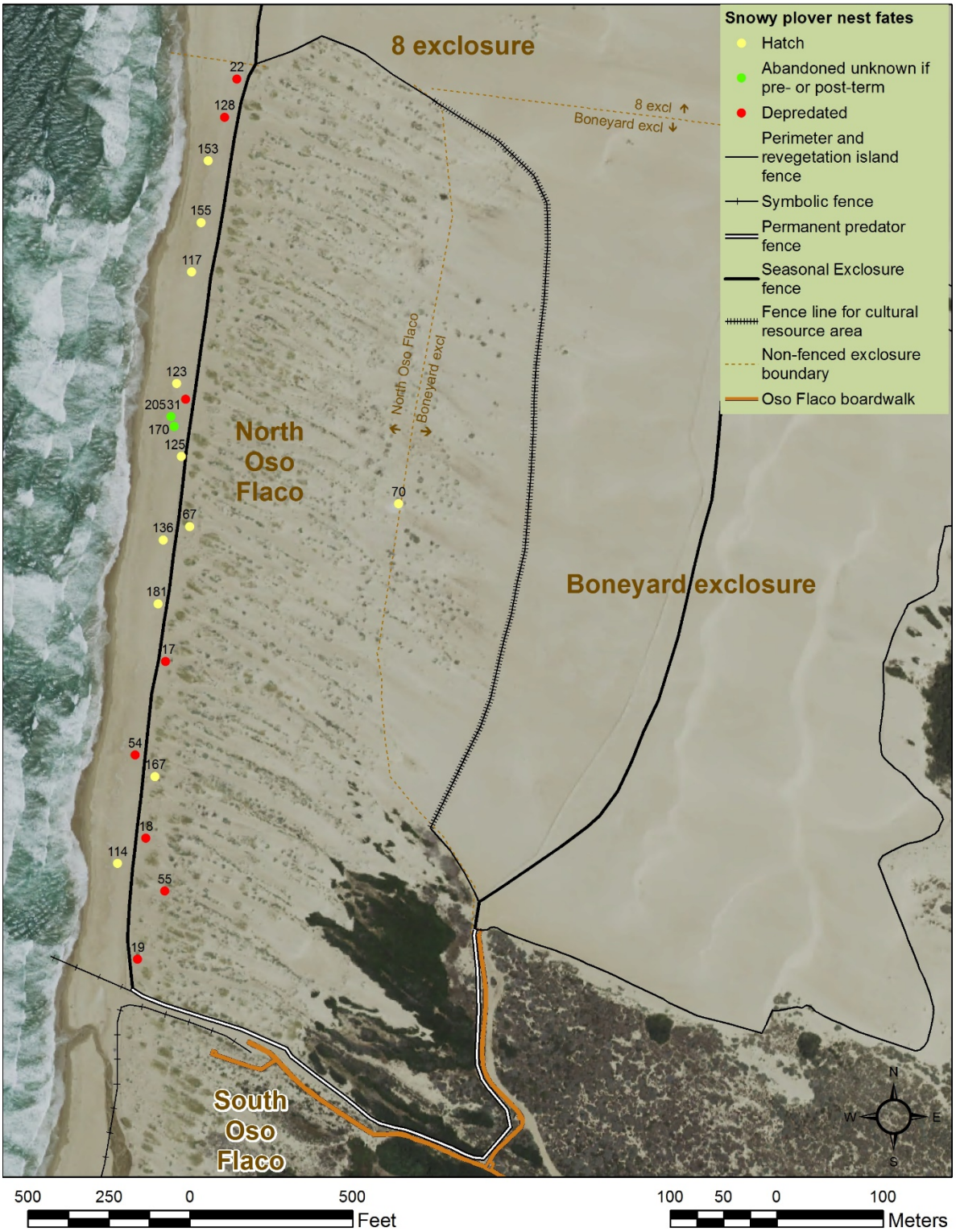


Figure C.8. Snowy plover nest locations at ODSVRA North Oso Flaco in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

Figure C.9. Snowy plover nest locations at ODSVRA South Oso Flaco in 2018.

APPENDIX D. BANDED LEAST TERNS AND SNOWY PLOVERS.

Table D.1. Banded least terns recorded at ODSVRA in 2018.

Juveniles fledged from ODSVRA in 2018 are not included. All birds from ODSVRA were banded as chicks. Additional color-banded birds were recorded but combinations not confirmed. A number of birds had a band on only one leg. These birds may have been banded on only one leg or have lost a band. All possible band combinations of birds known fledging from ODSVRA are listed for incomplete band combinations or for band combinations that were used multiple years. Sex is included if copulation was observed and bands could be determined at that time. (For a description of color band letter codes see Appendix B.)

Band	Dates Seen	Origin and Year Banded	Notes
-:A/B	8/13, 8/15, 8/16, 8/17, 8/18, 8/20	ODSVRA unknown year	Multiple birds banded at ODSVRA with A/B on the right leg. **LT25 breeding adult.**
-:A/W	7/29, 8/24	ODSVRA unknown year	Multiple birds banded at ODSVRA with A/W on the right leg.
-:A/W/A	5/22	ODSVRA 2008 or 2016	G/Y:A/W/A in 2008, Y/G:A/W/A in 2016.
-:G/O	7/12	ODSVRA 2008 or 2011	G/Y:G/O in 2008 or B/W:G/O in 2011.
-:S	5/20, 7/1	Unknown	Multiple sites may band with only the federal band. Also may be any ODSVRA fledgling from 2004 when all banded G/Y:S, or any ODSVRA fledgling that lost the left band and tape on a metal band.
-:W/A	8/16	ODSVRA 2006, 2008, 2010, or 2011	
-:W/A/W	8/9, 8/13, 8/15, 8/16, 8/17, 8/18	ODSVRA 2008	G/W:W/A/W in 2008. **LT22 breeding adult.**
-:W/B	8/13	ODSVRA 2006, 2009, or 2013	Multiple birds banded at ODSVRA with W/B on the right leg.
-:W/R/W	7/8	ODSVRA 2008	G/Y:W/R/W in 2008
-:Y	5/20	ODSVRA unknown year	Multiple birds banded at ODSVRA with Y on the right leg.
A/Y:B/W	5/20, 6/23, 7/14	ODSVRA 2012	
A:G/Y	8/6	ODSVRA 2007 or 2014	
B/A:G/Y	8/16, 8/22, 8/24, 8/25, 8/27	ODSVRA 2014	**Breeding adult** associated with unbanded juvenile.
B/O:-	8/20, 8/22, 8/24, 8/27	ODSVRA unknown year	Multiple birds banded at ODSVRA with B/O on the left leg.
B/R:Y/G	6/13, 8/1, 8/6, 8/13	ODSVRA 2015	
B/W:G/W	8/4	ODSVRA 2011	
B/W:G/Y	8/20	ODSVRA 2007, 2011, or 2014	
B/W:O/Y	8/1	ODSVRA 2011	
B/W:W/R	8/6	ODSVRA 2011	
B/Y:Y/G	6/18	ODSVRA 2015	
B:W/B	7/1	ODSVRA 2009 or 2013	
G/B:Y/G	7/18, 8/10, 8/11	ODSVRA 2015	
G/W:G/Y	5/20	ODSVRA 2007 or 2014	
G:B/W	6/22	ODSVRA 2012	
O/G:B/W	8/15, 8/16, 8/17, 8/18, 8/21, 8/24, 8/25, 8/27	ODSVRA 2012	
O/Y:B/W	5/20	ODSVRA 2012	
O:B/W	5/20, 7/30	ODSVRA 2012	
R/W:W/B	5/20, 7/12, 8/16, 8/17, 8/18	ODSVRA 2009 or 2013	**LT35 breeding adult.**
S:-	5/20	Unknown	Multiple sites may band with only the federal band. Also may be any ODSVRA fledgling from 2003 when all banded S:G/Y, or any ODSVRA fledgling that lost the right band and tape on a metal band.

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

Table D.1. Banded least terns recorded at ODSVRA in 2018 (continued).

Band	Dates Seen	Origin and Year Banded	Notes
S:B	8/16, 8/17, 8/18	VAFB 2018	Juvenile.
W/B:B/Y	8/3	ODSVRA 2010	
W/B:R/Y	5/20, 7/10, 7/29, 8/9, 8/10, 8/13, 8/14, 8/15, 8/16, 8/17, 8/18	ODSVRA 2010	**LT24 breeding adult.**
W/B:W	6/18, 6/22	ODSVRA 2010	**LT3 breeding adult.**
W/R:B/W	8/9, 8/10, 8/13	ODSVRA 2012	
W/B:W/Y	6/18	ODSVRA 2010	**LT4 breeding adult.**
W/Y:W/B	5/20, 5/21	ODSVRA 2009 or 2013	
Y/G:-	6/20	ODSVRA 2006	
Y/G:B/W	7/1, 7/11, 7/25, 7/28, 8/1, 8/8, 8/9, 8/13, 8/21	ODSVRA 2006, 2012, or 2016	**LT10 breeding adult.**
Y/G:G/A	7/1	ODSVRA 2016	
Y/G:R/B	5/20, 6/28, 7/28, 7/29, 7/30, 8/15, 8/16, 8/18, 8/24	ODSVRA 2016	
Y/G:R/W	8/11, 8/20	ODSVRA 2006 or 2016	
Y/G:W/B	8/9	ODSVRA 2006, 2013, or 2016	
Y/G:W/R	8/8	ODSVRA 2006 or 2016	
Y/G:W/R/W	8/1, 8/8, 8/9, 8/10, 8/13, 8/14, 8/15, 8/16, 8/17, 8/18, 8/20, 8/21, 8/22, 8/24, 8/25	ODSVRA 2016	**LT22 breeding adult.**
Y/G:W/Y	8/1	ODSVRA 2006 or 2016	
Y/G:Y/A	7/1	ODSVRA 2016	
Y/O:W/B	5/21, 7/27, 8/1	ODSVRA 2009	**LT7 breeding adult.**
Y/R:W/B	7/17	ODSVRA 2009 or 2013	**LT26 breeding adult.**

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

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2017 to 28 February 2018.

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

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

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
R/G:K	Coos Bay 2017	Coos, OR	10/4, 10/7, 10/12, 10/14, 10/16, 10/22	
AG:AV	Salinas River NWR 2017	Monterey, CA	10/1, 10/7, 10/8, 10/10, 10/11, 10/14, 10/16, 10/17, 10/20, 10/22, 10/23, 10/25, 11/3, 11/7, 11/9, 11/12, 11/15, 11/18, 11/19, 11/20, 11/26, 12/6, 12/12, 12/13, 12/14, 12/16, 12/17, 12/31, 1/3, 1/10, 1/17, 1/23, 2/28	
OL:GP	Salinas River NWR 2009	Monterey	11/15, 11/18, 11/29, 11/30, 12/22, 1/23	
YP:OL	Salinas River NWR 2008	Monterey	10/1, 10/7, 10/9, 10/12, 10/13, 10/29, 11/1, 11/3, 11/4, 11/5, 11/6, 11/8, 11/11, 11/21, 11/22, 12/2, 12/9, 12/11, 12/12, 12/15, 12/21, 12/22, 12/23, 12/26, 12/29, 1/10, 2/21, 2/25	
YG:WL	Reservation Road 2016	Monterey	10/13, 10/16, 10/18, 10/21, 10/22, 10/23, 10/25, 10/26, 10/28, 11/3, 11/21, 11/24, 11/26, 12/1, 12/5, 12/12, 12/14, 12/22, 12/29, 1/10, 1/23, 1/31, 2/6, 2/19	
OW:GL	Elkhorn Slough 2016	Monterey	10/4, 10/6, 10/16, 10/19, 10/21, 10/22, 10/24, 10/25, 10/26, 10/28, 10/29, 10/31, 11/5, 11/10, 11/14, 11/18, 11/19, 11/22, 12/2, 12/11, 12/14, 12/23, 12/28, 12/30, 1/3, 1/17, 1/31, 2/6	
AG:GA	Moss Landing Salt Ponds 2014	Monterey	10/4, 10/9, 10/11, 10/16, 10/21, 10/22, 10/23, 10/24	
YR:AV	Fort Ord 2017	Monterey	10/13	
AY:GV	Fort Ord 2017	Monterey	1/23, 1/31, 2/6	
BB:BR	ODSVRA 2017	SLO, CA	10/11	
BB:BY	ODSVRA 2010 or 2013	SLO	10/1, 10/4, 10/7, 10/8, 10/9, 10/11, 10/12, 10/13, 10/14, 10/16, 10/20, 10/21, 10/22	
BB:GR	ODSVRA 2012 or 2015	SLO	2/21, 2/25	
BB:GY	ODSVRA 2006	SLO	10/4, 10/8, 10/13, 10/23, 11/4, 11/17, 12/10	
BB:RR	ODSVRA 2016 or 2017	SLO	10/20, 10/29, 11/15	
BB:VG	ODSVRA 2017	SLO	10/4, 10/9, 10/18, 10/22	
BB:VR	ODSVRA 2011, 2013, or 2014	SLO	10/10, 10/20, 11/1, 11/6, 11/8, 11/9, 11/10, 11/11, 11/19, 11/28, 12/4, 12/17, 1/3, 1/17, 1/23, 2/19	
BB:VY	ODSVRA 2016 or 2017	SLO	10/11, 10/13, 10/14, 10/16, 10/17, 10/19, 10/23, 10/25, 10/26, 10/28, 10/29, 11/1, 11/4, 11/6, 11/7, 11/8, 11/9, 11/10, 11/11, 11/18, 11/20, 11/21, 11/23, 11/26, 12/9, 12/16, 12/17, 12/21, 12/26, 12/29, 1/17, 1/23, 1/31, 2/6	
BB:WY	ODSVRA 2013	SLO	10/6	
BB:YB	ODSVRA 2011, 2013 or 2015	SLO	10/13	
BB:YG	ODSVRA 2011 or 2015	SLO	10/31	
BB:YR	ODSVRA 2015 or 2016	SLO	10/4	
BB:YW	ODSVRA 2013	SLO	10/1, 10/7, 10/9, 10/11, 10/14, 10/15, 10/18, 10/20, 10/22, 10/25, 10/26, 11/1, 11/3, 11/4, 11/7, 11/8, 11/9, 11/10, 11/18, 11/20, 11/21, 11/24, 11/29, 12/8, 12/9, 12/10, 12/14, 12/15, 12/22, 12/29, 1/17, 1/31, 2/21, 2/28	

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

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2017 to 28 February 2018 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
BB:YY	ODSVRA 2010	SLO	2/21	
GA:OY	ODSVRA 2014 or 2015	SLO	10/4, 10/14, 10/15, 10/17, 10/19, 10/22, 10/23, 10/25, 10/26, 11/3, 11/4, 11/5, 11/6, 11/8, 11/9, 11/10, 11/11, 11/14, 11/15, 11/17, 11/26, 12/8, 12/9, 12/13, 12/17, 12/28, 12/29, 1/10, 1/17, 1/23, 1/31, 2/25	
GA:PG	ODSVRA 2015 or 2017	SLO	10/9, 10/11, 10/23, 11/7, 11/17, 11/19, 11/21, 11/27, 12/1, 12/2, 12/5, 12/17, 12/21, 12/22, 12/24, 12/29, 1/10, 1/31	
GA:PR	ODSVRA 2016 or 2017	SLO	11/8, 11/9, 11/10, 11/11, 12/2, 12/5, 12/9, 12/21, 1/10, 1/17, 1/31, 2/6	
GA:WW	ODSVRA 2016 or 2017	SLO	10/4, 10/6, 10/11, 10/12, 11/8, 11/15, 11/19, 11/24, 12/13, 12/17, 1/10, 1/23, 1/31, 2/6, 2/14, 2/28	
GA:YY	ODSVRA 2017	SLO	10/6, 10/11, 10/12, 10/13, 10/16, 10/17, 10/20, 10/21, 10/22, 10/23, 10/24, 10/25, 10/26, 10/29, 11/6, 11/7, 11/8, 11/9, 11/15, 11/21, 11/22, 11/30, 12/12, 12/14, 12/16, 12/19, 12/25, 12/29, 12/30, 1/10, 1/23, 2/6, 2/14, 2/18, 2/25	
GG:GG	ODSVRA 2011 or 2013	SLO	10/1, 10/4, 10/7, 10/8, 10/9, 10/11, 10/12, 10/14, 10/16, 10/17, 10/22, 10/23, 10/26, 11/3, 11/4, 11/5, 11/7, 11/10, 11/18, 11/19, 11/20, 11/21, 11/22, 11/26, 12/1, 12/12, 12/14, 12/17, 12/21, 12/26, 12/29, 1/17, 2/6, 2/19	On 28 February 2018, carcass found at ODSVRA (see Appendix H).
GG:OR	ODSVRA 2014 or 2015	SLO	10/4, 10/6, 10/7, 10/11, 10/12, 10/13, 10/14, 10/15, 10/16, 10/17, 10/18, 10/20, 10/21, 10/22, 10/23, 10/24, 10/25, 10/26, 10/28, 10/29, 10/31, 11/3, 11/4, 11/6, 11/7, 11/9, 11/12, 11/14, 11/17, 11/18, 11/20, 11/29, 12/11, 12/12, 12/13, 12/15, 12/16, 12/1	
GG:PW	ODSVRA 2013 or 2014	SLO	10/4, 10/6, 10/7, 10/11, 10/12, 10/15, 10/16, 10/19, 10/22, 10/28, 10/29, 10/30, 10/31, 11/1, 11/6, 11/7, 11/8, 11/9, 11/10, 11/11, 11/12, 11/14, 11/15, 11/20, 11/21, 11/26, 11/29, 12/6, 12/11, 12/12, 12/13, 12/15, 12/16, 12/17, 12/30, 1/3, 1/10, 1/17, 1/23, 1/31	
GG:PY	ODSVRA 2017	SLO	11/4	
GG:RW	ODSVRA 2014 or 2015	SLO	10/11, 10/13, 10/18, 10/22, 10/23, 10/26	
PG:-	ODSVRA unknown	SLO	10/4, 10/23, 11/8	
PG:BG	ODSVRA 2015 or 2016	SLO	11/17	
PG:BY	ODSVRA 2017	SLO	10/12, 12/2, 12/13, 1/3, 1/10, 1/31	
PG:OG	ODSVRA 2015	SLO	10/4, 10/6, 10/11, 10/12, 10/13, 10/14, 10/15, 10/17, 10/20, 10/23, 10/29, 11/3, 11/4, 11/5, 11/6, 11/7, 11/8, 11/9, 11/10, 11/17, 11/19, 11/20, 11/21, 11/26, 12/1, 12/8, 12/12, 12/13, 12/15, 12/17, 12/21, 1/2, 1/3, 1/10, 1/23	
PG:OR	ODSVRA 2017	SLO	10/4, 10/5, 10/8, 10/12, 10/13, 10/18, 10/23, 10/29, 11/6, 11/7, 11/8, 11/10, 11/15, 11/17, 11/19, 11/20, 11/21, 11/24, 11/27, 11/29, 11/30, 12/2, 12/11, 12/13, 12/17	
PG:OW	ODSVRA 2015 or 2016	SLO	10/4, 10/12, 10/18, 10/22, 10/23, 11/8, 11/15, 11/17, 11/19, 11/29, 12/1, 12/4, 12/13, 12/17, 12/22, 1/3, 1/10, 1/17, 1/23, 1/31, 2/6, 2/23, 2/28	
PG:OY	ODSVRA 2017	SLO	10/11, 10/16, 10/17, 10/19, 10/23, 10/24, 10/25, 10/26, 10/28, 10/29, 11/3, 11/4, 11/8, 11/11, 11/18, 11/21, 11/26, 12/6, 12/8, 12/9, 12/14, 12/15	

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

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2017 to 28 February 2018 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
PG:PB	ODSVRA 2014 or 2015	SLO	1/10	
PG:PG	ODSVRA 2014 or 2015	SLO	10/7, 10/14, 10/16, 10/21, 10/22, 10/26, 11/1, 11/3, 11/6, 11/8, 11/9, 11/10, 11/11, 11/15, 11/17, 11/20, 11/22, 11/28, 11/29, 12/2, 12/5, 12/9, 12/12, 12/13, 12/17, 12/26, 1/10	
PG:PW	ODSVRA 2012 or 2014	SLO	10/4, 10/18, 10/23, 10/30, 11/8, 11/15, 11/19, 12/13, 12/31, 1/3, 1/10, 1/17, 1/23, 1/31, 2/6, 2/19, 2/28	
PG:RY	ODSVRA 2014	SLO	10/25, 11/21	
PG:VG	ODSVRA 2014 or 2015	SLO	10/1, 10/7, 10/8, 10/10, 10/11, 10/13, 10/14, 10/15, 10/17, 10/22, 10/23, 10/29, 11/7, 11/10, 11/12, 11/18, 11/20, 11/26, 11/29, 12/6, 12/9, 12/11, 12/12, 12/14, 12/15, 12/21, 1/10, 1/23, 1/31	
PG:YG	ODSVRA 2014 or 2016	SLO	11/10	
PG:YR	ODSVRA 2017	SLO	12/12	
PG:YY	ODSVRA 2015	SLO	10/12, 10/18, 11/17, 12/5, 1/3	
PV:-	ODSVRA unknown	SLO	10/1, 10/8, 10/11, 10/12, 10/13, 10/15, 10/20, 10/25, 10/26, 11/3, 11/5, 11/6, 11/15, 11/17, 11/20, 11/21, 11/29, 12/2, 12/7, 12/9, 12/15, 12/16, 12/22, 2/19	
PV:AW	ODSVRA 2016 or 2017	SLO	2/6	
PV:BB	ODSVRA 2014 or 2015	SLO	10/4	
PV:GW	ODSVRA 2015 or 2017	SLO	10/4, 10/12	
PV:OB	ODSVRA 2015 or 2017	SLO	10/4, 10/18, 10/29, 11/15, 12/13, 1/3, 1/10, 1/23, 1/31	
PV:OR	ODSVRA 2015 or 2017	SLO	10/4, 10/8, 10/9, 10/10, 10/12, 10/16, 10/17, 10/18, 10/19, 10/20, 10/23, 11/1, 11/3, 11/5, 11/8, 11/9, 11/12, 11/14, 12/3	
PV:OY	ODSVRA 2016 or 2017	SLO	10/4, 10/7, 10/12, 10/14, 10/15, 10/18, 10/19, 10/21, 10/22, 11/11, 11/14, 11/17, 11/18, 11/20, 11/22, 11/25, 11/26, 11/27, 12/1, 12/8, 12/9, 12/12, 12/13, 12/15, 12/17, 12/21	
PV:PR	ODSVRA 2017	SLO	10/4, 10/5, 10/6, 10/7, 10/30	
PV:VB	ODSVRA 2017	SLO	10/5, 10/8, 10/9, 10/11, 10/12, 10/14, 10/15, 10/18, 10/22, 10/23	
PV:VY	ODSVRA 2009	SLO	10/1, 10/4	
PV:WB	ODSVRA 2010	SLO	10/6	
PV:YB	ODSVRA 2012	SLO	10/4, 2/19, 2/23	
PV:YG	ODSVRA 2015	SLO	10/1, 10/4, 10/9, 10/12, 10/13, 10/14, 10/17, 10/19, 10/22, 10/30, 11/3, 11/4, 11/5, 11/6, 11/8, 11/11, 11/12, 11/18, 12/12, 12/15, 12/16, 12/22, 1/23, 2/18	
PV:YR	ODSVRA 2017	SLO	11/5	
RR:AB	ODSVRA 2016 or 2017	SLO	10/1, 10/5, 10/10, 10/11, 10/12, 10/13, 10/14, 10/16, 12/29	
RR:AG	ODSVRA 2017	SLO	10/4, 10/11, 10/12, 10/18, 10/23, 11/1, 11/18, 11/29, 12/13, 12/17	
RR:BB	ODSVRA 2016 or 2017	SLO	10/9, 10/10, 10/11, 10/13, 10/15, 10/16, 10/17, 10/22, 11/1, 11/4, 11/5, 11/6, 11/8, 11/9, 11/12, 11/19, 12/6, 12/9, 12/14, 12/21, 12/22, 12/28, 12/31, 1/17, 1/31, 2/6, 2/21, 2/25, 2/28	
RR:BG	ODSVRA 2016	SLO	10/4, 10/10, 10/18, 11/8, 11/15, 11/19	

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

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2017 to 28 February 2018 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
RR:BW	ODSVRA 2016 or 2017	SLO	10/5, 10/9, 10/10, 10/14, 10/15, 10/17, 10/18, 10/20, 10/23, 10/24, 10/28, 10/29, 11/1, 11/3, 11/8, 11/9, 11/11, 11/18, 11/19, 11/22, 11/25, 11/30, 12/2, 12/10, 12/12, 12/13, 12/16, 12/26, 12/28, 1/3, 1/10, 1/23, 1/31, 2/20, 2/25	
RR:BY	ODSVRA 2010	SLO	10/13	
RR:WY	ODSVRA 2017	SLO	10/11, 10/12, 10/13, 10/14, 10/15, 10/22, 10/29, 11/3, 11/4, 11/6, 11/7, 11/8, 11/11, 11/14	
VG:AG	ODSVRA 2017	SLO	10/9, 10/11, 10/12, 10/14, 10/15, 10/17, 10/29, 11/3, 11/5, 11/6, 11/8, 11/9, 11/14, 12/8, 12/12, 12/29, 12/30, 1/10, 1/17, 1/23, 1/31, 2/6, 2/14, 2/25	
VG:BW	ODSVRA 2016 or 2017	SLO	10/6, 10/13, 10/14, 10/15, 10/18, 10/21, 10/23, 10/25, 10/26, 10/30, 10/31, 11/1, 11/3, 11/5, 11/9, 11/10, 11/11, 11/19, 11/20, 11/21, 11/27, 11/29, 12/1, 12/4, 12/8, 12/12, 12/17, 12/21, 1/10, 1/17, 1/31, 2/6, 2/19, 2/20	
VG:BY	ODSVRA 2012 or 2013	SLO	10/11	
VG:GB	ODSVRA 2017	SLO	10/9, 10/10, 10/12, 11/1, 11/3, 11/10, 11/11, 11/15, 11/17, 11/18, 11/19, 11/20, 11/22	
VG:GW	ODSVRA 2011 or 2013	SLO	10/4, 10/12, 1/10, 1/23, 2/19, 2/28	
VG:OW	ODSVRA 2016 or 2017	SLO	10/4, 10/6, 10/13, 10/14, 10/15, 10/21, 10/24, 10/26, 10/28, 10/29, 11/4, 11/7	
VG:OY	ODSVRA 2015 or 2016	SLO	10/11, 10/23	
VG:RG	ODSVRA 2017	SLO	10/5, 10/9, 10/12, 10/18, 10/23, 10/31, 11/1, 11/3, 11/5, 11/7, 11/10, 11/12, 11/15, 11/20, 11/22, 12/1, 12/4, 12/5, 12/13, 12/16	
VG:VW	ODSVRA 2011 or 2013	SLO	12/9	
VO:BW	ODSVRA 2014 or 2015	SLO	10/23	
VV:AA	ODSVRA 2011	SLO	10/1, 10/4, 10/7, 10/8, 10/11, 10/14, 10/15, 10/20, 10/21, 10/22, 10/28, 11/4, 11/5, 11/6, 11/9, 11/12, 11/14, 11/17, 11/18, 11/19, 12/6, 12/8, 12/9, 12/11, 12/30, 12/31, 1/17, 1/23, 1/31, 2/20, 2/25	
VV:BG	ODSVRA 2013	SLO	10/1, 10/4, 10/7, 10/11, 10/12, 10/13, 10/20, 10/21, 10/22, 10/25, 10/26, 11/8, 11/15, 11/17, 11/21, 11/29, 11/30, 12/2, 12/4, 12/5, 12/8, 12/9, 12/11, 12/14, 12/15, 12/16, 12/21, 12/22, 1/3, 1/31, 2/6, 2/25	
VV:GR	ODSVRA 2012 or 2013	SLO	10/11, 10/12, 10/13, 10/14, 10/15, 10/25, 11/6, 11/8, 11/9, 11/20, 12/16, 12/28, 1/17	
VV:GW	ODSVRA 2015 or 2017	SLO	2/28	
VV:GY	ODSVRA 2014	SLO	2/6	
VV:OR	ODSVRA 2015 or 2016	SLO	11/10	
VV:OY	ODSVRA 2015 or 2016	SLO	10/21	
VV:RG	ODSVRA 2015 or 2017	SLO	10/12, 10/14, 10/17, 10/20, 10/22, 10/25, 10/26, 10/29, 10/31, 11/4, 11/5, 11/10, 11/15, 11/18, 11/30, 12/6, 12/8, 12/9, 12/12, 12/21, 12/30, 1/10, 1/23, 2/6, 2/19, 2/21	
VV:RY	ODSVRA 2015 or 2016	SLO	10/1, 10/4, 10/8, 10/9, 10/11, 10/12, 10/13, 10/15, 10/22, 10/25, 11/3, 11/5, 11/6, 11/8, 11/9, 11/15, 11/18, 11/19, 11/20, 11/21, 11/26, 11/30, 12/21, 12/22, 12/29, 2/19, 2/20, 2/21, 2/25	

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

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2017 to 28 February 2018 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
VV:VB	ODSVRA 2011 or 2013	SLO	10/7, 10/10, 10/23, 11/19, 12/13, 12/17, 1/3, 1/10, 1/31, 2/14, 2/19, 2/23	
VV:WY	ODSVRA 2012 or 2013	SLO	10/4, 10/6, 10/10, 10/11, 10/12, 11/1, 11/5, 11/6, 11/8, 11/9, 11/11, 11/14, 11/19, 12/5, 12/13, 12/23, 1/17, 1/23, 2/19	
VV:YB	ODSVRA 2017	SLO	10/4, 10/5, 10/13, 10/14, 10/16, 10/18, 10/22, 10/23, 10/25, 10/28, 10/29, 11/6, 11/9, 11/10, 11/12, 11/19, 11/20, 11/25, 11/26, 11/29, 11/30, 12/6, 12/8, 12/9, 12/21, 12/22, 1/10, 1/17, 1/31	
VV:YG	ODSVRA 2013 or 2015	Santa Barbara, CA	11/14	
A:G/O/G	VAFB 2017	Santa Barbara	10/4, 10/12, 1/3, 1/17, 1/23, 2/6	
B:G/Y	VAFB 2017	Santa Barbara	10/7, 10/12, 10/13, 10/14, 10/15, 10/17, 10/19, 10/20, 10/22, 10/26, 10/28, 10/29, 11/5, 11/6, 11/8, 11/9, 11/10, 11/12, 11/15, 11/18, 11/21, 12/2, 12/11, 12/12, 12/14, 1/23, 2/6, 2/14	
B:Y/G	VAFB 2013	Santa Barbara	10/9, 11/9, 11/11, 11/15, 11/18, 11/20, 11/30	
GN:RR	VAFB 2017	Santa Barbara	10/12, 11/3, 11/15, 11/17, 11/18, 11/21, 11/22, 12/8, 12/9, 12/10, 12/11	
L:Y/G	VAFB 2016	Santa Barbara	10/4, 10/18, 11/19, 12/13, 12/17, 12/22, 12/30, 12/31, 1/10, 1/31, 2/23	On federal service band on right leg there is exposed metal above yellow tape.
NB:G-	VAFB unknown	Santa Barbara	10/10, 11/8, 1/3	On federal service band on left leg there is exposed metal above blue tape. Brown plastic band on left leg is missing tape and fading.
NO:OR	VAFB 2016	Santa Barbara	12/1	
NO:RG	VAFB 2017	Santa Barbara	10/4, 10/6, 10/7, 10/8, 10/9	
NO:YG	VAFB 2015	Santa Barbara	10/11	
NR:AY	VAFB 2017	Santa Barbara	10/11, 10/13, 10/15, 10/18, 10/23, 10/24, 10/25, 10/26, 10/29, 11/1, 11/3, 11/6, 11/8, 12/8, 12/11, 12/12, 12/15, 12/21, 12/26, 12/29	On federal service band on left leg there is exposed metal below red tape.
NR:BY	VAFB 2017	Santa Barbara	10/24	
NR:YG	VAFB 2017	Santa Barbara	10/4, 10/6, 10/9, 10/12, 10/13, 10/14, 10/21, 10/22, 10/23, 10/26, 11/1, 11/6, 11/7, 11/8, 11/9, 11/10, 11/14, 11/15, 11/17, 11/18, 11/20, 11/22, 11/29, 11/30, 12/10, 12/16, 12/21, 12/29, 12/30, 1/23, 1/31, 2/14, 2/25	On federal service band on left leg there is exposed metal above red tape.
NS:WB	VAFB Unknown	Santa Barbara	10/26, 10/28	
NW:YG	VAFB 2017	Santa Barbara	10/8	
NY:WB	VAFB 2016	Santa Barbara	10/7, 10/12, 10/13, 10/14, 10/16, 10/25, 10/29, 11/3, 11/5, 11/25, 11/26, 11/28, 12/21, 12/22	On federal service band on left leg the yellow band has peeled to expose most of the metal band.
NY:WG	VAFB 2017	Santa Barbara	10/4, 10/6, 10/7, 10/11, 10/12, 10/14, 10/15, 10/23	
O-:AG	VAFB 2013	Santa Barbara	10/1, 10/22, 10/23, 10/26, 10/29, 11/1, 11/3, 11/9, 12/16, 12/21, 12/25, 12/29	Originally banded NO:AG, top brown band missing and now banded O-:AG. On federal service band on left leg there is exposed metal above orange tape.

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

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2017 to 28 February 2018 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
O-:PB	VAFB 2014	Santa Barbara	2/23, 2/28	Originally banded NO:PB, top brown band missing and now banded O-:PB. On federal service band on left leg there is exposed metal below orange tape.
O-:WG	VAFB Unknown	Santa Barbara	10/21, 10/23, 11/11, 12/6, 2/6, 2/14, 2/20	Originally banded NO:WG, top brown band missing and now banded O-:WG. On federal service band on left leg there is exposed metal above orange tape.
O-:WY	VAFB 2013	Santa Barbara	10/4, 10/12	Originally banded NO:WY, top brown band missing and now banded O-:WY. On federal service band on left leg there is exposed metal below orange tape and in other worn areas.
-:AY	Unknown	Unknown	10/1, 10/12, 10/13, 10/16, 10/18, 10/19, 10/21, 10/26, 10/30, 11/4, 11/5, 11/6, 11/8, 11/9, 11/10, 11/11, 11/20, 11/26, 11/29, 12/9, 12/12, 12/16	

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

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018.

Juveniles fledged from ODSVRA in 2018 are not included. All birds were banded as chicks unless otherwise noted. Chicks banded outside of San Luis Obispo County are noted in order north to south. Some sites band to brood and can have more than one bird with the same combination. (For a description of color band letter codes see Appendix B.)

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

F = Female, M = Male

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
OW:GL		Elkhorn Slough 2016	Monterey, CA	3/1, 3/4, 3/12, 3/14	
AG:GA	M	Moss Landing Salt Ponds 2014	Monterey	3/19, 4/11, 4/12, 4/14, 5/11, 5/14, 5/22, 5/25, 5/27, 5/29, 5/31, 6/2, 6/3, 6/12, 6/17, 6/28, 6/30, 7/2, 7/3, 7/4, 7/7, 7/9, 7/16, 7/17, 7/28, 7/30, 8/7, 8/12, 8/13, 8/21, 8/25, 8/27, 9/22	ODSVRA breeding male.
AG:AV		Salinas River NWR 2017	Monterey	3/5, 3/7, 3/17, 8/4, 8/16, 8/17, 8/19, 9/10, 9/13	
YG:WL		Reservation Road 2016	Monterey	3/3, 6/15	
AY:GV		Fort Ord 2017	Monterey	3/11, 3/16	
BB:AR	M	ODSVRA 2017	SLO, CA	4/26, 5/5, 5/22, 6/2, 6/10, 6/23, 6/24, 7/1, 7/9, 7/11, 7/12, 7/13, 7/15, 7/16, 7/17, 7/21, 7/24, 7/30, 8/4, 8/12, 8/18	ODSVRA breeding male.
BB:BG	M	ODSVRA 2015 or 2016	SLO	5/8, 5/15, 5/17, 5/21, 5/22, 5/26, 5/27, 6/3, 6/21, 6/26	ODSVRA breeding male.
BB:BY		ODSVRA 2010 or 2013	SLO	3/13, 4/25, 9/20	
BB:GR	F	ODSVRA 2012 or 2015	SLO	5/22, 6/21, 6/23, 6/26, 6/29, 7/1, 7/4, 7/5, 7/7	ODSVRA breeding female.
BB:OB	M (2)	ODSVRA 2014 or 2016	SLO	4/1, 4/7, 5/24, 6/6, 6/29, 6/30, 7/2, 7/6, 7/11, 7/16, 7/28, 7/29, 8/8, 8/15, 8/16, 8/21, 8/24, 9/9	ODSVRA breeding males (2).
BB:OR	M	ODSVRA 2016 or 2017	SLO	5/3, 5/25, 5/26, 6/14, 6/15, 6/16, 6/17, 6/19, 6/20, 6/22, 7/1, 7/5, 7/21	ODSVRA breeding male.
BB:OW	F	ODSVRA 2015 or 2016	SLO	6/14, 6/15, 6/17, 6/19, 6/21, 6/23	ODSVRA breeding female.
BB:PW	F	ODSVRA 2014 or 2016	SLO	6/24, 7/19, 8/4	ODSVRA breeding female.
BB:PY	M	ODSVRA 2017	SLO	4/7, 5/9, 5/12, 5/17, 5/22, 5/25, 6/2, 6/3, 6/15, 6/17, 6/22, 6/30, 7/3, 8/10, 8/12, 8/14, 8/19, 8/24, 8/26	ODSVRA breeding male.
BB:RB	M	ODSVRA 2015	SLO	4/7, 4/12, 4/18, 4/20, 4/26, 4/29, 5/11, 5/12, 5/18, 5/28, 5/29, 5/30, 5/31, 6/2, 6/3, 6/6, 6/12, 6/16, 6/21, 6/22, 6/29	ODSVRA breeding male.
BB:RR	M	ODSVRA 2016 or 2017	SLO	4/14, 4/16, 4/19, 4/20, 4/26, 5/14, 5/20, 5/25, 5/27, 5/29, 5/30, 6/1, 6/4, 6/8, 6/12, 6/15, 6/16, 6/17, 6/22, 6/29, 7/1, 7/3, 7/4, 7/6, 7/9, 7/11, 7/12, 7/16, 7/18, 9/12, 9/17	ODSVRA breeding male.
BB:RW		ODSVRA 2014 or 2015	SLO	5/11	

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

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
BB:VG	F	ODSVRA 2017	SLO	5/8, 5/11, 6/12, 6/14, 6/17, 6/25, 7/4, 9/1, 9/8, 9/10, 9/13, 9/16	ODSVRA breeding female.
BB:VR	M	ODSVRA 2011, 2013, or 2014	SLO	5/22, 6/1, 6/2, 6/3, 6/12, 6/14, 6/29, 7/3, 7/11, 7/26, 7/31, 8/2, 8/4, 8/6, 8/11, 8/16, 8/17, 9/15	ODSVRA breeding male.
BB:VY	M	ODSVRA 2016 or 2017	SLO	3/5, 3/11, 4/7, 4/11, 5/8, 5/9, 6/27, 7/5, 7/13, 7/16, 7/22, 7/26, 7/31, 8/1, 8/2, 8/4, 8/12, 8/21, 8/27, 8/29, 8/30, 9/3, 9/16, 9/17, 9/24	ODSVRA breeding male.
BB:WB	M	ODSVRA 2013	SLO	4/9, 5/22, 5/29, 5/31, 6/6, 6/17, 6/21	ODSVRA breeding male.
BB:WY		ODSVRA 2013	SLO	3/4, 4/1, 4/4	
BB:YB		ODSVRA 2011, 2013 or 2015	SLO	4/26, 4/28, 5/3, 5/11, 5/12, 5/14, 5/22, 5/25, 5/26, 6/1, 6/9, 6/12, 6/13, 6/18, 6/19, 7/2, 7/6	
BB:YW	F	ODSVRA 2013	SLO	3/1, 3/27, 4/17, 4/19, 4/20, 5/11, 5/14, 5/22, 5/25, 5/26, 5/30, 6/2, 6/4, 7/6, 7/9, 7/10, 7/11, 7/12, 7/16, 7/24, 7/26, 7/30, 8/22, 8/27, 8/29, 9/2, 9/12, 9/16, 9/17, 9/20, 9/23, 9/24, 9/27	ODSVRA breeding female.
BB:YY		ODSVRA 2010	SLO	3/15	
GA:AB		ODSVRA 2013 or 2015	SLO	5/29, 6/3, 7/16	
GA:AR	M	ODSVRA 2015	SLO	4/11, 5/3, 5/4, 5/9, 5/11, 5/14, 5/23, 5/25, 5/30, 6/2, 6/22, 6/25, 6/29, 7/4, 7/10, 7/12, 7/23, 7/24, 7/26, 7/27, 7/31, 8/2, 8/5, 8/6, 8/9	ODSVRA breeding male.
GA:BB		ODSVRA 2017	SLO	7/12, 8/5, 9/24	
GA:GR		ODSVRA 2015 or 2016	SLO	5/18, 7/4, 8/24	
GA:O-	F	ODSVRA Unknown	SLO	5/4, 5/8, 6/16, 6/21, 7/4	ODSVRA breeding female. Bird missing right foot.
GA:OG		ODSVRA 2014 or 2015	SLO	5/28	
GA:OR	M and F	ODSVRA 2016 or 2017	SLO	3/31, 4/16, 5/2, 5/4, 5/10, 5/18, 5/31, 6/3, 6/4, 6/15, 6/20, 6/22, 6/23, 6/28, 6/30, 7/3, 7/4, 7/12, 7/14, 7/16, 9/8	ODSVRA breeding male and female.
GA:OW	M	ODSVRA 2013 or 2014	SLO	3/28, 4/17, 5/4, 5/14, 5/20, 5/28, 5/30, 6/6, 6/13, 6/15, 7/2, 8/8, 8/9, 8/11, 8/14, 8/16, 8/18, 8/19, 8/21, 8/24, 8/28	ODSVRA breeding male.
GA:OY		ODSVRA 2014 or 2015	SLO	4/1, 8/24, 9/12, 9/13, 9/18, 9/24, 9/27	
GA:PG		ODSVRA 2015 or 2017	SLO	4/1	
GA:PR	M and F	ODSVRA 2016 or 2017	SLO	4/7, 4/26, 5/3, 5/13, 5/29, 6/11, 6/13, 6/16, 6/20, 6/29, 7/2, 7/16, 7/19, 7/20, 7/21, 7/28, 8/10, 8/16, 8/17, 8/25, 8/26, 9/4, 9/16	ODSVRA breeding male and female.
GA:RG	F	ODSVRA 2015 or 2016	SLO	4/1, 4/5, 4/15, 4/27, 7/7, 7/19, 7/20, 8/16, 8/19, 8/20, 9/8	ODSVRA breeding female.

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

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
GA:RY	M and F (2)	ODSVRA 2017	SLO	3/13, 4/1, 5/5, 5/22, 5/27, 5/28, 6/4, 6/12, 6/14, 6/17, 6/20, 7/7, 7/11, 7/16, 7/29, 7/31, 8/2, 8/6, 8/9, 8/10, 8/13, 8/14, 8/15, 8/16, 8/18, 8/19, 8/27, 9/4, 9/12, 9/15, 9/16, 9/17	ODSVRA breeding male and females (2).
GA:WG	M	ODSVRA 2016 or 2017	SLO	5/11, 5/20, 6/28, 7/5, 7/10, 8/16, 8/18, 8/19, 8/28	ODSVRA breeding male.
GA:WR	M	ODSVRA 2015 or 2016	SLO	5/6, 5/14, 5/16, 5/19, 5/22, 5/23, 6/11, 6/12, 6/14, 6/18, 6/21, 7/1, 7/6	ODSVRA breeding male.
GA:WW	M (2)	ODSVRA 2016 or 2017	SLO	3/31, 4/25, 4/29, 5/4, 5/14, 5/18, 5/20, 5/22, 5/26, 5/27, 6/6, 6/7, 6/12, 6/13, 6/20, 6/22, 6/24, 6/27, 6/29, 7/1, 7/2, 7/3, 7/4, 7/8, 7/9, 7/10, 7/13, 7/15, 7/16, 7/17, 7/24, 7/29, 7/30, 7/31, 8/6, 8/11, 8/16, 8/17, 8/18, 8/20	ODSVRA breeding males (2).
GA:Y-	M	ODSVRA unknown	SLO	6/27, 7/1, 7/3, 7/11, 7/12, 7/17, 7/28	ODSVRA breeding male.
GA:YB	M	ODSVRA 2017	SLO	5/11, 5/18, 5/22, 6/18, 6/27, 6/28, 7/1, 7/2, 7/3, 7/17, 7/18, 7/22, 7/29, 7/30, 8/3, 8/9, 8/13, 8/15, 8/16, 8/20	ODSVRA breeding male.
GA:YR		ODSVRA 2014	SLO	4/8, 5/6, 6/6, 7/2, 7/31, 8/14	
GA:YY	F	ODSVRA 2017	SLO	3/16, 4/27, 5/22, 7/2, 8/25, 8/27	ODSVRA breeding female.
GG:AB	F	ODSVRA 2015 or 2016	SLO	3/21, 4/6, 4/14, 4/28, 6/27, 6/29, 6/30, 7/2, 7/11	ODSVRA breeding female.
GG:AY	M	ODSVRA 2012 or 2013	SLO	5/23, 5/30, 6/21, 6/27, 6/28, 7/1, 7/4, 7/10	ODSVRA breeding male.
GG:BW		ODSVRA 2012	SLO	7/12, 9/5	
GG:GR	F	ODSVRA 2011 or 2013	SLO	5/11, 5/16, 5/22, 7/4, 7/8, 7/9, 7/16, 7/18, 7/27, 7/31, 8/2, 8/4, 8/6	ODSVRA breeding female.
GG:OR	M (2)	ODSVRA 2014 or 2015	SLO	3/5, 3/17, 4/7, 4/10, 4/11, 4/13, 4/14, 4/21, 5/11, 5/17, 5/18, 5/28, 5/30, 5/31, 6/2, 6/3, 6/14, 6/16, 6/21, 7/19, 7/20, 7/22, 7/24, 7/27, 7/28, 7/30, 7/31, 8/6, 8/11, 8/12, 8/13, 8/14, 8/16, 8/17, 8/18, 8/19, 8/21, 8/22, 8/26, 9/3, 9/4, 9/7, 9/13, 9/14	ODSVRA breeding males (2).
GG:OW		ODSVRA 2014 or 2015	SLO	3/3	
GG:PR	M	ODSVRA 2017	SLO	5/14, 6/3, 6/4, 7/2, 7/12, 7/18	ODSVRA breeding male.
GG:PW	M	ODSVRA 2013 or 2014	SLO	3/4, 4/24, 5/2, 5/16, 5/18, 5/22, 5/25, 5/29, 6/21, 6/26, 6/27, 6/29, 7/3, 7/4, 7/6, 7/9, 7/31, 8/18, 9/15	ODSVRA breeding male.
GG:WB	M	ODSVRA 2011 or 2013	SLO	4/3, 4/7, 4/16, 4/17, 4/26, 4/29, 4/30, 5/1, 5/3, 5/29, 5/30, 6/2, 6/3, 6/4, 6/17, 6/20, 6/27, 7/4	ODSVRA breeding male.
GG:WR		ODSVRA 2014 or 2016	SLO	5/7	
GG:YR		ODSVRA 2017	SLO	8/28	
PG:-	F	ODSVRA unknown	SLO	4/7, 5/11, 5/13, 5/22, 5/29, 6/6, 6/12, 6/21, 8/26, 9/6	ODSVRA breeding female.
PG:BG		ODSVRA 2015 or 2016	SLO	9/2	
PG:OB		ODSVRA 2012 or 2014	SLO	8/16	
PG:OG		ODSVRA 2015	SLO	3/5, 6/12, 7/22, 8/13, 8/18, 8/25, 9/13	

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

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
PG:OW	M and F	ODSVRA 2015 or 2016	SLO	4/7, 4/15, 4/28, 5/7, 5/13, 5/14, 5/15, 5/22, 6/6, 6/11, 6/12, 6/14, 6/20, 6/30, 7/1, 7/4, 7/7, 7/11, 7/15, 7/28, 7/29, 8/6, 8/9, 8/19, 8/21	ODSVRA breeding male and female.
PG:PB	F	ODSVRA 2014 or 2015	SLO	3/31, 4/5, 4/9, 6/8, 6/28, 7/6, 8/18, 9/4, 9/12	ODSVRA breeding female.
PG:PG	F	ODSVRA 2014 or 2015	SLO	5/2, 6/16, 7/7, 7/26, 7/28, 7/29, 8/3, 8/19, 8/28, 9/13	ODSVRA breeding female.
PG:PW	M	ODSVRA 2012 or 2014	SLO	3/15, 3/28, 4/27, 4/28, 4/29, 4/30, 5/1, 5/3, 5/8, 5/14, 5/22, 5/23, 5/31, 6/2, 6/3, 6/6, 6/10, 6/12, 6/25, 6/29, 7/28, 7/29, 7/30, 8/6, 8/10, 8/11, 8/12, 8/19, 8/24, 8/29, 9/1, 9/12, 9/14, 9/15, 9/16	ODSVRA breeding male.
PG:VB	M	ODSVRA 2015 or 2016	SLO	6/8, 6/15, 6/17, 6/19, 6/30, 7/1, 7/3, 7/4	ODSVRA breeding male.
PG:VG	M	ODSVRA 2014 or 2015	SLO	3/3, 3/28, 3/31, 4/1, 5/22, 5/26, 5/27, 5/28, 5/30, 7/1, 8/12, 8/13, 8/20, 8/21, 9/14, 9/16, 9/18, 9/21, 9/24	ODSVRA breeding male.
PG:VY		ODSVRA 2015	SLO	9/14	
PG:YB	F	ODSVRA 2015 or 2017	SLO	4/11, 5/22, 6/18, 7/4, 7/13, 8/24, 9/7	ODSVRA breeding female.
PG:YG		ODSVRA 2014 or 2016	SLO	7/9	
PG:YY		ODSVRA 2015	SLO	8/1, 9/15, 9/16, 9/17	
PV:-	F	ODSVRA unknown	SLO	3/7, 5/23, 5/26, 5/27, 5/29, 7/30, 8/1, 8/21, 8/23, 9/1, 9/4, 9/14, 9/17	ODSVRA breeding female.
PV:AW	F	ODSVRA 2016 or 2017	SLO	4/14, 5/18, 5/22, 6/27, 7/7, 7/14, 7/18, 7/19, 7/22, 7/28, 8/1, 8/2, 8/3, 8/5, 8/6, 8/7, 8/13, 8/14, 8/19	ODSVRA breeding female.
PV:BW		ODSVRA 2012 or 2014	SLO	7/31	
PV:BY	F	ODSVRA 2015	SLO	6/12, 6/30, 7/1, 7/3, 7/6, 7/8, 7/10, 7/11, 7/12, 7/16, 7/27, 7/28, 7/31, 8/2, 8/6, 8/13, 8/16	ODSVRA breeding female.
PV:GW		ODSVRA 2015 or 2017	SLO	7/19, 8/16, 9/7, 9/8, 9/9	
PV:OB		ODSVRA 2015 or 2017	SLO	3/20, 7/11, 7/13, 8/17, 8/18, 8/21	
PV:OW		ODSVRA 2015	SLO	6/2	
PV:PG	F	ODSVRA 2015 or 2017	SLO	4/18, 5/20, 5/22, 5/25, 6/22, 8/18	ODSVRA breeding female.
PV:PR	F	ODSVRA 2017	SLO	3/31, 4/7, 5/12, 5/14, 5/29, 6/2, 6/4	ODSVRA breeding female.
PV:RB		ODSVRA 2016	SLO	8/6, 8/14, 8/21, 8/29	
PV:RY		ODSVRA 2015	SLO	7/16	
PV:VW	F	ODSVRA 2014 or 2015	SLO	5/10, 5/11, 6/18, 6/21, 6/24, 7/3, 7/16, 7/28, 8/3, 8/8, 8/12, 8/13, 8/14, 8/26	ODSVRA breeding female.
PV:VY	F	ODSVRA 2009	SLO	6/12, 6/27, 6/29, 7/1, 8/10, 8/12, 8/17, 8/22, 8/27, 8/29, 9/4, 9/14, 9/16	ODSVRA breeding female.
PV:WB		ODSVRA 2010	SLO	8/8	

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

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
PV:WY	M	ODSVRA 2014 or 2015	SLO	5/7, 5/13, 5/14, 5/15, 5/16, 5/20, 5/22, 5/23, 5/25, 6/2, 6/3, 6/17, 6/27, 7/2, 7/4, 7/16, 8/28, 9/9	ODSVRA breeding male.
PV:YB	M	ODSVRA 2012	SLO	5/18, 5/20, 5/22, 5/26, 5/28, 6/13, 7/11, 7/17, 7/19, 7/20, 7/22, 7/23, 7/29, 7/30, 7/31, 8/3, 8/6, 8/8, 8/9, 8/11, 8/17	ODSVRA breeding male.
PV:YG	M	ODSVRA 2015	SLO	4/1, 5/29, 6/6, 6/8, 6/23, 6/29, 7/2, 7/19, 7/21, 8/8, 8/16, 8/21	ODSVRA breeding male.
PV:YW		ODSVRA 2015 or 2017	SLO	4/9, 4/18	
PV:YY	F	ODSVRA 2015 or 2017	SLO	5/5, 5/16, 6/27, 6/30, 7/26, 7/27, 8/19, 9/8	ODSVRA breeding female.
RR:AB	M	ODSVRA 2016 or 2017	SLO	4/16, 4/18, 4/19, 4/20, 5/11, 5/15, 5/22, 5/23, 6/6, 6/14, 6/17, 6/22	ODSVRA breeding male.
RR:AW	M	ODSVRA 2017	SLO	5/11, 5/14, 5/17, 6/12, 6/26, 7/1, 7/2, 7/9, 7/15, 7/16, 7/17, 7/23, 7/25, 7/29, 7/30, 7/31, 8/6, 8/8, 8/12, 8/13, 8/16	ODSVRA breeding male.
RR:BB	F	ODSVRA 2016 or 2017	SLO	3/3, 3/11, 3/12, 3/16, 5/18, 5/19, 5/22, 5/27, 5/28, 7/7, 7/10, 7/11, 7/16, 7/18, 7/22, 8/11, 8/14, 8/18, 9/10, 9/14, 9/15	ODSVRA breeding female.
RR:BG		ODSVRA 2016	SLO	9/1	On 1 September, carcass found at ODSVRA (see Appendix H). Two birds banded with the same combination in 2016.
RR:BW	M and F	ODSVRA 2016 or 2017	SLO	3/3, 3/7, 4/23, 5/9, 5/18, 5/23, 6/5, 6/15, 7/1, 7/3, 7/4, 8/6, 8/18, 8/22, 8/28, 8/31, 9/1, 9/10, 9/12, 9/24	ODSVRA breeding male and female.
RR:OR	M	ODSVRA 2010	SLO	5/7, 5/16, 5/20, 5/31, 6/2, 6/8, 6/12, 6/15, 6/16, 6/20, 7/4, 7/24, 7/27, 7/28, 7/30, 8/1, 8/4, 8/6, 8/10, 8/12	ODSVRA breeding male.
RR:PW	F	ODSVRA 2014	SLO	4/22, 5/5, 6/1, 6/4, 6/14, 6/16, 7/23, 7/26, 7/27, 7/31, 8/10, 8/11, 8/12, 8/13, 8/14, 8/16, 8/18, 8/21, 8/22, 8/23, 8/24	ODSVRA breeding female.
RR:WB		ODSVRA 2017	SLO	5/12	
RR:WG		ODSVRA 2012	SLO	8/19	
VG:AG	M	ODSVRA 2017	SLO	3/4, 5/3, 5/15, 5/28, 5/30, 6/1, 6/6, 6/18, 6/23, 6/26, 7/5, 7/8, 7/24, 7/27, 8/2, 8/8, 8/22, 9/1, 9/4, 9/7, 9/10, 9/15, 9/16, 9/18	ODSVRA breeding male.
VG:AW	F	ODSVRA 2011 or 2013	SLO	4/24, 5/28, 6/1, 6/15	ODSVRA breeding female.
VG:BW	F	ODSVRA 2016 or 2017	SLO	3/3, 3/20, 5/8, 6/2, 6/11, 6/22, 7/4, 7/11, 8/24, 8/27, 9/2, 9/9, 9/24	ODSVRA breeding female.
VG:GR	F	ODSVRA 2017	SLO	6/29, 7/1	ODSVRA breeding female.
VG:GW	F	ODSVRA 2011 or 2013	SLO	4/15, 6/2, 6/15, 6/17, 6/20, 7/27, 7/28, 8/10, 8/14, 8/18, 8/28	ODSVRA breeding female.
VG:OW		ODSVRA 2016 or 2017	SLO	4/10	
VG:PB		ODSVRA 2015 or 2017	SLO	8/17, 8/19	

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

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018 (continued).

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

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

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
NR:NB		VAFB 2017	Santa Barbara	8/19, 9/8	On federal service band on left leg there is exposed metal below red tape.
NR:WB	M	VAFB 2016	Santa Barbara	4/26, 5/11, 5/13, 5/17, 5/22, 6/12, 6/15, 7/1, 7/15, 8/6, 8/19	ODSVRA breeding male.
NR:YG	F	VAFB 2017	Santa Barbara	3/4, 3/7, 3/20, 6/29, 8/9, 8/13, 8/17, 8/20, 8/21, 8/27, 9/16, 9/18	ODSVRA breeding female. On federal service band on left leg there is exposed metal above red tape.
NW:RR		VAFB 2018	Santa Barbara	7/12	
NY:WG	M	VAFB 2017	Santa Barbara	6/14, 6/28, 7/13, 7/16, 7/17	ODSVRA breeding male.
O-:AG	F	VAFB 2013	Santa Barbara	3/3, 7/29, 7/31, 8/2, 8/3, 8/16, 8/21, 8/27, 9/1, 9/24	ODSVRA breeding female. Originally banded NO:AG, top brown band missing and now banded O-:AG. On federal service band on left leg there is exposed metal above orange tape.
O-:PB	M	VAFB 2014	Santa Barbara	4/14, 4/26, 6/2, 6/5, 6/22, 6/26, 7/3, 7/4, 7/10, 7/12, 7/16	ODSVRA breeding male. Originally banded NO:PB, top brown band missing and now banded O-:PB. On federal service band on left leg there is exposed metal below orange tape.
O-:WG		VAFB 2012	Santa Barbara	8/17, 8/29	Originally banded NO:WG top brown band missing and now banded O-:WG. On federal service band on left leg there is exposed metal above orange tape.
-:YG	M	Unknown	Unknown	6/22, 7/5, 8/10, 8/14, 8/16, 8/17, 8/18, 8/20, 9/15, 9/24	ODSVRA breeding male.
B-:G-	F	Unknown	Unknown	5/24, 7/4, 7/6, 7/8, 7/9, 7/11, 7/13, 9/12	ODSVRA breeding female.
Y-:GO	M	Unknown	Unknown	5/18, 5/25, 6/2, 6/4, 6/6, 6/16, 7/20, 7/23, 7/29, 7/31, 8/7, 8/8	ODSVRA breeding male.

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

Table D.4. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2017 to 28 February 2018.

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.)

VAFB = Vandenberg Air Force Base, SLO = San Luis Obispo, Guadalupe NWR = Guadalupe-Nipomo Dunes National Wildlife Refuge, SB = State Beach, SP = State Park

Band Combination	Year Banded	Location Seen	County	Dates Seen
RR:PW	2014	Manchester Beach	Mendocino, CA	10/4, 11/2, 11/12, 1/22
GA:PB	2016 or 2017	San Carpoforo	SLO, CA	10/17, 10/31, 11/7, 1/16, 1/24
GA:RY	2017	San Carpoforo	SLO	10/17
GG:PB	2012 or 2013	Arroyo Laguna	SLO	10/17
GG:PR	2017	Arroyo Laguna	SLO	10/24, 11/7, 11/15
PV:AW	2016 or 2017	Arroyo Laguna	SLO	10/17, 1/3
VV:GW	2015 or 2017	Arroyo Laguna	SLO	10/17, 11/15
BB:GR	2012 or 2015	San Simeon SP	SLO	1/23
BB:RR	2016 or 2017	San Simeon SP	SLO	12/19, 12/25
BB:VG	2017	San Simeon SP	SLO	1/30
GA:RY	2017	San Simeon SP	SLO	1/23, 1/30
GG:PB	2012 or 2013	San Simeon SP	SLO	11/7, 1/16, 1/30
GG:PR	2017	San Simeon SP	SLO	1/23
PG:OR	2017	San Simeon SP	SLO	10/17, 10/24
PV:AW	2016 or 2017	San Simeon SP	SLO	10/11, 11/21, 1/23
PV:GW	2015 or 2017	San Simeon SP	SLO	11/7
PV:YR	2017	San Simeon SP	SLO	10/17
RR:VY	2016 or 2017	San Simeon SP	SLO	11/21, 1/16
VV:GW	2015 or 2017	San Simeon SP	SLO	11/7, 12/19, 1/23, 1/30
BB:VG	2017	Villa Creek	SLO	11/23
RR:AG	2017	Villa Creek	SLO	10/10, 10/24
BB:GB	2014 or 2015	Morro Strand SB	SLO	10/3
BB:OB	2014 or 2016	Morro Strand SB	SLO	10/3
BB:OR	2016 or 2017	Morro Strand SB	SLO	10/31
BB:VG	2017	Morro Strand SB	SLO	12/12, 1/16
GA:GR	2015 or 2016	Morro Strand SB	SLO	10/10, 11/7, 12/12
GA:RG	2015 or 2016	Morro Strand SB	SLO	12/5
GA:RY	2017	Morro Strand SB	SLO	2/14
GG:PB	2012 or 2013	Morro Strand SB	SLO	11/14, 2/22
PG:OB	2012 or 2014	Morro Strand SB	SLO	10/3
PG:OR	2017	Morro Strand SB	SLO	1/16
PV:AW	2016 or 2017	Morro Strand SB	SLO	11/19, 12/9, 2/14
PV:BB	2014 or 2015	Morro Strand SB	SLO	12/5
PV:PR	2017	Morro Strand SB	SLO	10/3
PV:VB	2017	Morro Strand SB	SLO	11/7, 12/21, 1/30, 2/1
PV:YR	2017	Morro Strand SB	SLO	10/10, 10/31
RR:AG	2017	Morro Strand SB	SLO	10/31, 11/7, 12/12, 12/21, 2/1
RR:VY	2016 or 2017	Morro Strand SB	SLO	11/14
V-:W-	2008	Morro Strand SB	SLO	12/12, 12/21, 1/16, 1/23
VV:GW	2015 or 2017	Morro Strand SB	SLO	2/14

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

Table D.4. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2017 to 28 February 2018 (continued).

Band Combination	Year Banded	Location Seen	County	Dates Seen
BB:GB	2014 or 2015	Morro Bay Sandspit	SLO	10/10, 10/17, 10/24, 10/31, 11/7, 12/16, 1/18, 1/30
BB:OB	2014 or 2016	Morro Bay Sandspit	SLO	10/10, 10/17, 10/24, 10/31, 11/14, 1/2, 1/9, 2/14, 2/20
GG:OG	2013 or 2014	Morro Bay Sandspit	SLO	10/10, 10/17, 10/24, 10/31, 11/7, 11/14, 12/9, 12/16, 1/9, 1/20, 1/23
GG:WB	2011 or 2013	Morro Bay Sandspit	SLO	10/10, 10/17, 11/7, 12/5
PG:OB	2012 or 2014	Morro Bay Sandspit	SLO	10/10, 10/17, 10/24, 1/2, 1/9, 1/30, 2/14
PG:OR	2017	Morro Bay Sandspit	SLO	1/18, 1/30
PV:VB	2017	Morro Bay Sandspit	SLO	10/24
PV:YR	2017	Morro Bay Sandspit	SLO	10/17, 10/24, 2/14
RR:AG	2017	Morro Bay Sandspit	SLO	11/3
RR:WW	2010	Morro Bay Sandspit	SLO	10/17, 10/31, 11/14, 12/5, 1/22, 1/30, 2/27
GA:GY	2012 or 2013	Guadalupe NWR	SLO	10/4
GG:AW	2017	Guadalupe NWR	SLO	10/4
PG:OR	2017	Guadalupe NWR	SLO	10/4
PG:PG	2014 or 2015	Guadalupe NWR	SLO	10/4
PG:YY	2015	Guadalupe NWR	SLO	10/4
PV:GW	2015 or 2017	Guadalupe NWR	SLO	10/4
PV:PR	2017	Guadalupe NWR	SLO	10/4
RR:AW	2017	Guadalupe NWR	SLO	10/4
RR:GB	2017	Guadalupe NWR	SLO	10/4
RR:OB	2017	Guadalupe NWR	SLO	10/4
RR:VG	2016 or 2017	Guadalupe NWR	SLO	10/4
RR:WY	2017	Guadalupe NWR	SLO	10/4
VG:RG	2017	Guadalupe NWR	SLO	10/4
BB:RR	2016 or 2017	VAFB	Santa Barbara, CA	10/12, 1/23, 2/20
GA:GR	2015 or 2016	VAFB	Santa Barbara	11/13, 12/18, 1/2, 1/23, 2/20
GA:PR	2016 or 2017	VAFB	Santa Barbara	10/12
GA:RB	2010	VAFB	Santa Barbara	10/12
GA:RG	2015 or 2016	VAFB	Santa Barbara	10/12
PV:GW	2015 or 2017	VAFB	Santa Barbara	11/13, 2/20
RR:AW	2017	VAFB	Santa Barbara	11/13, 12/18
RR:BW	2016 or 2017	VAFB	Santa Barbara	10/12, 11/13, 12/18
RR:LY	2010	VAFB	Santa Barbara	10/13, 11/13, 12/18, 1/23, 2/20
VG:AG	2017	VAFB	Santa Barbara	11/13
VG:PB	2015 or 2017	VAFB	Santa Barbara	11/13, 12/18, 1/2, 2/20
VG:RG	2017	VAFB	Santa Barbara	10/17, 11/13, 12/18
VV:WB	2013 or 2014	VAFB	Santa Barbara	10/12, 12/18, 1/23
PV:AW	2016 or 2017	Hollywood Beach	Ventura, CA	11/12

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

Table D.4. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2017 to 28 February 2018 (continued).

Band Combination	Year Banded	Location Seen	County	Dates Seen
RR:OR	2010	Hollywood Beach	Ventura	11/12
VG:AW	2011 or 2013	Hollywood Beach	Ventura	11/12
VG:PR	2017	Hollywood Beach	Ventura	10/19
PV:RB	2016	Salt Creek Beach	Orange, CA	11/23, 12/13
VG:WY	2017	San Clemente SB	Orange	1/22
BB:VB	2011, 2013 or 2014	Camp Pendleton	San Diego, CA	11/9, 11/15, 11/22, 11/30, 12/7, 12/14, 12/21, 12/29, 1/4, 1/13, 1/18, 1/25, 2/1, 2/8, 2/20
VV:GW	2015 or 2017	Camp Pendleton	San Diego	10/5, 10/19
BB:BG	2015 or 2016	Tijuana River Mouth	San Diego	10/3, 10/13, 11/20, 12/17, 1/23, 1/26, 2/21, 2/22
BB:OR	2016 or 2017	La Bocana	Baja California, Mexico	1/19

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

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2018.

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 bands have been used multiple years so it is possible to have more than one bird with the same combination. SLO = San Luis Obispo, Guadalupe NWR = Guadalupe-Nipomo Dunes National Wildlife Refuge, NWR = National Wildlife Refuge, SB = State Beach, VAFB = Vandenberg Air Force Base, Bolsa Chica = Bolsa Chica Ecological Reserve
M = male, F = female.

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
VG:RY	2017		South Spit, Humboldt	Humboldt, CA	5/9, 7/29	
PV:YB	2012		Eden Landing	Alameda, CA	9/10	
PG:BG	2015 or 2016		Pajaro Spit	Santa Cruz, CA	4/24, 4/26	
BB:GR	2012 or 2015		Zmudowski SB	Monterey, CA	4/2, 4/3, 4/5, 4/17, 4/20, 5/9, 5/18, 6/19	
PV:AG	2015 or 2016		Moss Landing Salt Ponds	Monterey	4/25	
PV:AG	2015 or 2016	M	Moss Landing SB	Monterey	4/11, 4/12, 4/20, 5/29, 6/12, 6/14, 6/20, 6/29	Moss Landing SB breeding male.
GG:GW	2014 or 2015		Salinas River NWR	Monterey	3/6, 5/22	
PG:BG	2015 or 2016		Salinas River SB	Monterey	6/6	
VG:BG	2011 or 2013	M	Salinas River SB	Monterey	3/8, 3/12, 3/19, 3/23, 3/26, 3/29, 4/3, 4/9, 4/13, 4/17, 4/23, 4/26, 5/3, 5/15, 5/18, 5/22, 5/29, 6/13, 6/19, 6/21, 6/27, 7/6, 8/16, 8/20	Salinas River SB breeding male.
GG:GW	2014 or 2015		Marina Beach SB	Monterey	3/12, 3/15, 4/4, 5/21, 5/23, 7/13, 7/16, 7/20, 7/23, 8/16	
VG:VR	2018		Marina Beach SB	Monterey	8/24, 8/28	Juvenile.
GG:GW	2014 or 2015		Reservation Road	Monterey	5/20	
GA:PB	2016 or 2017		San Carpoforo	SLO, CA	3/5, 3/7, 3/19	
PV:AW	2016 or 2017		San Carpoforo	SLO	5/15	
GA:RY	2017		Arroyo Laguna	SLO	3/19, 3/27, 4/10, 4/11, 4/12, 5/15	
GG:PB	2012 or 2013		Arroyo Laguna	SLO	9/18	
GG:PR	2017		Arroyo Laguna	SLO	3/19	
PG:WB	2018		Arroyo Laguna	SLO	9/18	Juvenile.
PV:AW	2016 or 2017		Arroyo Laguna	SLO	3/19, 3/27, 4/10, 4/11, 4/12, 5/17, 5/22	
BB:AR	2017 or 2018		Villa Creek	SLO	8/24, 8/29, 9/4, 9/11, 9/14, 9/18	
BB:GW	2018		Villa Creek	SLO	8/8	Juvenile.
GA:AW	2018		Villa Creek	SLO	8/21	Juvenile.
PG:WB	2018		Villa Creek	SLO	9/11	Juvenile.
RR:VY	2016 or 2017		Villa Creek	SLO	6/13, 6/19, 6/29, 7/3, 7/4, 7/6, 7/10, 7/12, 7/16, 7/19, 7/20, 7/23, 7/25, 7/26, 7/27, 7/30, 8/1, 8/3, 8/6, 8/7, 8/8, 8/10, 8/13, 8/14, 8/15, 8/16, 8/17, 8/20, 8/21, 8/22, 8/24, 8/27, 8/29, 9/4, 9/11, 9/14, 9/18	
V-:W-	2008		Villa Creek	SLO	5/13, 5/14, 5/15, 5/16, 5/17, 5/18, 5/30	Originally banded PV:PW, top pink bands missing from both legs and now banded V-:W-.
BB:AR	2017 or 2018		Morro Strand SB	SLO	8/21	
BB:OB	2014 or 2016		Morro Strand SB	SLO	3/5	
BB:RG	2018		Morro Strand SB	SLO	9/5	Juvenile.
BB:VG	2017 or 2018		Morro Strand SB	SLO	3/22, 3/27, 9/18	
GA:WY	2018		Morro Strand SB	SLO	8/27	Juvenile.

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

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2018 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
GG:PB	2012 or 2013		Morro Strand SB	SLO	4/10	
GG:PG	2018		Morro Strand SB	SLO	8/10, 8/12	Juvenile.
GG:PR	2017		Morro Strand SB	SLO	6/3	
PG:GY	2016 or 2018		Morro Strand SB	SLO	9/11, 9/18, 9/20	
PV:PB	2015		Morro Strand SB	SLO	3/5	
PV:VB	2017		Morro Strand SB	SLO	3/19, 3/20, 3/27, 4/10, 4/11, 4/12, 4/18, 4/19	
RR:AG	2017		Morro Strand SB	SLO	3/5, 3/19, 3/20, 7/15, 7/17, 7/22, 7/25, 7/29, 8/3, 8/12, 9/11, 9/14, 9/18	
RR:WY	2017 or 2018		Morro Strand SB	SLO	7/8, 7/10, 7/11, 7/12, 7/13, 7/15, 7/17, 7/24, 7/27, 7/28	
V-:W-	2008	M	Morro Strand SB	SLO	3/6, 3/7, 3/29, 4/10, 4/12, 4/20, 4/24, 4/27, 5/1, 5/2, 5/29, 6/1, 6/3, 6/6, 6/8, 6/13, 6/14, 6/15, 6/20, 6/21, 6/22, 6/24, 6/29, 6/30, 7/3, 7/6, 7/7, 7/9, 7/10, 7/11, 7/12, 7/13, 7/16, 7/17, 7/18, 7/19, 7/22, 7/24, 7/25, 7/27, 8/10, 8/18, 9/14, 9/18	Morro Strand breeding male. Originally banded PV:PW, top pink bands missing from both legs and now banded V-:W-.
VG:VR	2018		Morro Strand SB	SLO	8/17	Juvenile.
VG:YG	2018		Morro Strand SB	SLO	8/18	Juvenile.
VG:YR	2015		Morro Strand SB	SLO	8/29	
VG:YW	2017 or 2018		Morro Strand SB	SLO	8/10, 8/18, 8/21, 9/14	
VV:GW	2015 or 2017		Morro Strand SB	SLO	8/31, 9/14	
VV:OR	2015 or 2016	M	Morro Strand SB	SLO	3/20, 3/28, 3/29, 3/30, 4/10, 4/12, 4/13, 4/17, 4/18, 4/19, 4/20, 4/26, 4/27, 5/1, 5/4, 5/9, 5/18, 5/22, 5/24, 5/25, 5/29, 5/31, 6/3, 6/5, 6/6, 6/7, 6/8, 6/13, 6/14, 6/15, 6/21, 6/22, 6/23, 6/24, 6/27, 6/28, 6/29, 6/30, 7/3, 7/4, 7/5, 7/7, 7/10, 7/11, 7/1	Morro Strand breeding male.
BB:OB	2014 or 2016		Morro Bay Sandspit	SLO	3/26, 3/27	
GA:AW	2018		Morro Bay Sandspit	SLO	9/18	Juvenile.
GG:OG	2013 or 2014	M	Morro Bay Sandspit	SLO	3/5, 3/6, 3/9, 3/26, 3/27, 4/12, 4/17, 4/24, 4/25, 4/27, 4/28, 5/1, 5/2, 5/3, 5/4, 5/8, 5/9, 5/10, 5/14, 5/15, 5/16, 5/17, 5/18, 5/21, 5/23, 5/24, 5/31, 6/1, 6/6, 6/7, 6/8, 6/12, 6/13, 6/14, 6/15, 6/19, 6/20, 6/21, 6/22, 6/23, 6/25, 6/27, 6/28, 7/5, 7/6,	Morro Bay Sandspit breeding male.
GG:PB	2012 or 2013	F	Morro Bay Sandspit	SLO	3/7, 3/26, 4/25, 4/26, 4/30, 5/1, 5/3, 5/4, 5/7, 5/8, 5/14, 5/15, 5/17, 5/18, 5/21, 5/22, 5/23, 5/29, 6/8, 6/11, 6/13, 6/14, 6/18, 6/27, 6/29, 7/3, 7/16, 7/17, 7/18, 7/19, 7/25, 8/2, 8/12, 8/15, 8/16, 8/20, 8/21	Morro Bay Sandspit breeding female.
GG:PG	2018		Morro Bay Sandspit	SLO	8/9	Juvenile.
GG:YG	2011 or 2013		Morro Bay Sandspit	SLO	8/16	
PG:RB	2016 or 2018		Morro Bay Sandspit	SLO	9/11, 9/14, 9/18	
PV:GY	2018		Morro Bay Sandspit	SLO	8/21, 9/20	Juvenile.
PV:YR	2017		Morro Bay Sandspit	SLO	3/5	
RR:VY	2016 or 2017		Morro Bay Sandspit	SLO	6/28	
RR:WW	2010		Morro Bay Sandspit	SLO	3/5, 3/19, 3/20	

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

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2018 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
VG:RY	2017		Morro Bay Sandspit	SLO	4/24, 4/25, 4/26	
VG:YG	2018		Morro Bay Sandspit	SLO	8/21	Juvenile.
VV:AB	2017 or 2018		Morro Bay Sandspit	SLO	7/24	
VV:OR	2015 or 2016		Morro Bay Sandspit	SLO	4/25, 5/15, 6/18	
GA:AW	2018		Guadalupe NWR	SLO	8/2, 8/15	Juvenile.
GA:AY	2018		Guadalupe NWR	SLO	8/2	Juvenile.
GA:OG	2014 or 2015		Guadalupe NWR	SLO	3/8, 3/15, 3/29, 4/19, 7/11	
GA:PR	2016 or 2017		Guadalupe NWR	SLO	8/30	
GA:PW	2014 or 2015		Guadalupe NWR	SLO	7/11	
GA:RB	2010		Guadalupe NWR	SLO	8/15, 8/22	
GA:RY	2017		Guadalupe NWR	SLO	8/30, 9/8, 9/27	
GA:WY	2018		Guadalupe NWR	SLO	8/8, 8/15	Juvenile.
GG:BB	2018		Guadalupe NWR	SLO	7/11	Juvenile.
GG:OY	2018		Guadalupe NWR	SLO	8/30	Juvenile.
GG:YW	2013 or 2015		Guadalupe NWR	SLO	8/2	
GG:YY	2018		Guadalupe NWR	SLO	8/22	Juvenile.
PG:-	unknown		Guadalupe NWR	SLO	9/20	
PG:BY	2017		Guadalupe NWR	SLO	3/15, 3/29, 4/19, 4/26, 5/16, 7/11, 8/2, 8/15, 9/27	
PG:OG	2015		Guadalupe NWR	SLO	9/27	
PG:OR	2017		Guadalupe NWR	SLO	8/30	
PG:PW	2012 or 2014		Guadalupe NWR	SLO	9/27	
PG:VR	2018		Guadalupe NWR	SLO	8/22	Juvenile.
PG:YB	2015 or 2017		Guadalupe NWR	SLO	4/26, 5/3, 6/5, 9/12	
PG:YY	2015		Guadalupe NWR	SLO	3/20, 5/10, 6/5, 7/25, 8/15, 8/22	
PV:OB	2015 or 2017		Guadalupe NWR	SLO	3/15, 5/16, 5/30, 6/5, 8/2, 8/8	
PV:PR	2017 or 2018		Guadalupe NWR	SLO	8/30	
PV:YB	2012		Guadalupe NWR	SLO	7/11	
PV:YY	2015 or 2017		Guadalupe NWR	SLO	8/22	
RR:AW	2017		Guadalupe NWR	SLO	9/20, 9/27	
RR:BB	2016 or 2017		Guadalupe NWR	SLO	8/22, 9/20	
RR:PW	2014		Guadalupe NWR	SLO	6/5	
RR:VY	2016 or 2017		Guadalupe NWR	SLO	9/8	
VG:AY	2018		Guadalupe NWR	SLO	8/15	Juvenile.
VG:GB	2017 or 2018		Guadalupe NWR	SLO	9/27	
VG:RG	2017 or 2018		Guadalupe NWR	SLO	9/27	
VG:RY	2017		Guadalupe NWR	SLO	9/27	
VV:BB	2011 or 2013		Guadalupe NWR	SLO	3/29	
BB:BB	2018		Guadalupe Restoration Project	SLO	7/20, 9/14	Juvenile.
GA:AR	2015		Guadalupe Restoration Project	SLO	8/3	
GA:GR	2015 or 2016		Guadalupe Restoration Project	SLO	4/16, 4/27, 5/2, 5/8, 5/11, 5/22, 6/4, 7/13, 7/26, 7/30	
GA:OG	2014 or 2015		Guadalupe Restoration Project	SLO	5/25	

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

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2018 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
GA:PW	2014 or 2015		Guadalupe Restoration Project	SLO	4/20, 4/27, 5/8, 5/11, 5/29, 6/22, 7/18	
GA:YB	2017 or 2018		Guadalupe Restoration Project	SLO	4/27, 5/11, 5/22, 6/14, 6/28, 7/13, 7/18	
GG:AW	2017 or 2018		Guadalupe Restoration Project	SLO	7/20	
GG:GB	2016 or 2018		Guadalupe Restoration Project	SLO	7/16, 7/20	
GG:GR	2011 or 2013		Guadalupe Restoration Project	SLO	4/23	
GG:PG	2018		Guadalupe Restoration Project	SLO	7/30	Juvenile.
GG:YG	2011 or 2013		Guadalupe Restoration Project	SLO	6/4	
PG:YB	2015 or 2017		Guadalupe Restoration Project	SLO	5/9	
PG:YR	2017		Guadalupe Restoration Project	SLO	6/14	
PV:BY	2015		Guadalupe Restoration Project	SLO	4/20	
PV:YR	2017		Guadalupe Restoration Project	SLO	5/22, 5/25, 5/29, 6/1, 6/4	
PV:YY	2015 or 2017		Guadalupe Restoration Project	SLO	4/16, 9/14	
RR:BY	2010		Guadalupe Restoration Project	SLO	5/2	
RR:WB	2017		Guadalupe Restoration Project	SLO	5/8, 6/28	
RR:WG	2012		Guadalupe Restoration Project	SLO	3/13, 4/16, 4/18, 4/20, 5/2, 5/22, 5/29, 6/1, 7/16, 7/26, 7/30	
VG:VG	2018		Guadalupe Restoration Project	SLO	7/20	Juvenile.
VV:AY	2018		Guadalupe Restoration Project	SLO	8/21	Juvenile.
VV:OW	2017		Guadalupe Restoration Project	SLO	4/20, 5/18, 5/22	
VV:RW	2015 or 2017		Guadalupe Restoration Project	SLO	5/14	
VV:WW	2018		Guadalupe Restoration Project	SLO	7/27	Juvenile.
BB:AR	2018		VAFB	Santa Barbara, CA	7/26	Juvenile.
BB:BW	2018		VAFB	Santa Barbara	7/20	Juvenile.
BB:GW	2018		VAFB	Santa Barbara	7/23	Juvenile.
BB:OR	2016 or 2017	F	VAFB	Santa Barbara	6/1, 6/15, 6/18, 6/20, 6/26, 6/28, 7/9, 7/11, 7/13, 7/23, 7/26, 7/30, 9/10	VAFB breeding female.
BB:RG	2018		VAFB	Santa Barbara	9/26	Juvenile.

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

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2018 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
BB:RR	2016 or 2017		VAFB	Santa Barbara	3/15, 3/23, 4/10, 4/17, 4/19, 4/25, 4/26, 5/3, 5/8, 5/31, 6/12, 6/25, 7/5	
BB:VG	2018		VAFB	Santa Barbara	7/25	Juvenile.
GA:GR	2015 or 2016		VAFB	Santa Barbara	3/5	
GA:OR	2016 or 2017		VAFB	Santa Barbara	3/29, 7/19, 8/16, 8/24	
GA:PB	2016 or 2017	M	VAFB	Santa Barbara	5/14, 5/29, 6/14, 6/19, 6/25, 6/29, 7/3	VAFB breeding male.
GA:PG	2015 or 2017		VAFB	Santa Barbara	3/23	
GA:WY	2018		VAFB	Santa Barbara	8/24	Juvenile.
GA:YG	2018		VAFB	Santa Barbara	9/5, 9/19	Juvenile.
GA:YY	2017		VAFB	Santa Barbara	5/29, 5/31, 6/19, 6/21, 6/27	
GG:GB	2018		VAFB	Santa Barbara	7/20, 7/26, 7/30	Juvenile.
GG:OY	2018		VAFB	Santa Barbara	7/20, 7/25, 8/23	Juvenile.
GG:PB	2012 or 2013		VAFB	Santa Barbara	4/5, 8/9	
GG:PG	2018		VAFB	Santa Barbara	8/3	Juvenile.
GG:PR	2017	F	VAFB	Santa Barbara	3/15, 3/28, 4/3, 4/5, 4/26, 5/8, 5/14, 5/22, 5/29, 6/21, 6/25, 7/3, 7/5, 7/9, 7/12, 7/16, 7/25, 7/30, 8/3, 8/16, 8/17, 8/30, 9/19	VAFB breeding female.
GG:RB	2018		VAFB	Santa Barbara	8/8, 8/14, 8/24, 8/30	Juvenile.
GG:WB	2011 or 2013	M	VAFB	Santa Barbara	3/23, 3/29, 4/4, 4/9, 4/18, 4/20, 4/23, 4/25, 4/27, 5/2, 5/10, 5/14, 5/28, 5/30, 6/1, 6/6	VAFB breeding male.
GG:WW	2018		VAFB	Santa Barbara	7/23	Juvenile.
GG:YR	2018		VAFB	Santa Barbara	9/10	Juvenile.
PV:BY	2015		VAFB	Santa Barbara	8/28	
PV:GW	2015 or 2017	M	VAFB	Santa Barbara	3/20, 3/23, 3/28, 4/5, 5/3, 5/11, 5/16, 5/22, 6/5, 6/12, 6/19, 7/25	VAFB breeding male.
PV:PG	2015 or 2017		VAFB	Santa Barbara	6/27, 7/11, 7/13, 7/17	
PV:RB	2016		VAFB	Santa Barbara	9/10	
PV:WG	2016 or 2018		VAFB	Santa Barbara	7/30, 8/8	
RR:AW	2017		VAFB	Santa Barbara	3/15, 3/23, 4/10, 4/24, 4/26, 5/8, 9/6, 9/10, 9/14, 9/16	
RR:LY	2010	M	VAFB	Santa Barbara	3/8, 3/19, 3/27, 3/29, 4/4, 4/9, 4/16, 4/18, 4/20, 4/25, 4/27, 5/2, 5/14, 5/19, 5/30, 6/6, 6/13, 6/15, 6/18, 6/22, 6/25, 6/27, 7/4, 7/11, 7/13, 7/17, 7/19, 7/23, 7/31, 8/24, 9/5, 9/19	VAFB breeding male.
VG:BB	2011, 2013, or 2014		VAFB	Santa Barbara	7/20	
VG:GB	2018		VAFB	Santa Barbara	6/25, 7/5	Juvenile.
VG:PB	2015 or 2017		VAFB	Santa Barbara	9/6, 9/10	
VG:RY	2017		VAFB	Santa Barbara	4/20	
VG:VG	2018		VAFB	Santa Barbara	8/13, 8/15	Juvenile.
VG:YG	2018		VAFB	Santa Barbara	7/16, 7/25, 9/20	Juvenile.
VG:YW	2018		VAFB	Santa Barbara	7/26, 7/30, 8/14, 9/16	Juvenile.
VV:AB	2017 or 2018		VAFB	Santa Barbara	7/16, 7/20	
VV:AG	2018		VAFB	Santa Barbara	7/11	Juvenile.
VV:VY	2018		VAFB	Santa Barbara	7/13, 7/16, 8/30	Juvenile.

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

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2018 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
VW:BB	2015	M	VAFB	Santa Barbara	3/15, 3/20, 3/23, 3/28, 4/10, 5/8, 5/22, 6/4, 6/13, 6/25, 7/5	VAFB breeding male.
GA:AW	2018		Jalama Beach	Santa Barbara	9/20	Juvenile.
PG:RB	2016 or 2018		Jalama Beach	Santa Barbara	9/20	
PV:RG	2017		Coal Oil Point Reserve	Santa Barbara	4/18	
VV:AY	2018		Ormond Beach	Ventura, CA	9/3	Juvenile.
GG:PG	2018		Malibu Lagoon	Los Angeles, CA	9/14, 9/21	Juvenile.
BB:AY	2014 or 2016		Bolsa Chica	Orange, CA	3/9, 4/11, 4/15, 4/16, 4/18	Bolsa Chica breeding female.
GG:AY	2012 or 2013		Bolsa Chica	Orange	4/11	
GG:GB	2016 or 2018		Bolsa Chica	Orange	8/10	
BB:VW	2018		Huntington Beach	Orange	8/1, 8/22	Juvenile.
GA:YB	2017 or 2018		Huntington Beach	Orange	5/2	
GA:BB	2017 or 2018		Huntington Beach	Orange	8/22	
VV:AB	2017 or 2018		Newport Beach	Orange	8/25	
VG:WY	2017		San Clemente SB	Orange	9/17	
BB:VB	2011, 2013 or 2014		Camp Pendleton	San Diego, CA	3/1, 3/6, 3/15	
GG:AW	2017 or 2018		Camp Pendleton	San Diego	7/30	
PG:BW	2014		Camp Pendleton	San Diego	8/2	
VG:BW	2016 or 2017		Camp Pendleton	San Diego	7/11	
VG:WY	2017		Camp Pendleton	San Diego	5/17, 5/22, 5/26, 5/29, 5/31, 6/5, 6/9, 6/14, 6/16, 6/19, 6/23, 6/26, 6/30, 7/3	Camp Pendleton breeding male.
PG:BY	2017 or 2018		San Elijo SB	San Diego	8/31	
GA:WW	2016 or 2017		Coronado	San Diego	8/3	
GG:GW	2014 or 2015		Coronado	San Diego	7/31	
GG:WW	2018		Coronado	San Diego	8/3, 8/17	Juvenile.
PG:WB	2018		Coronado	San Diego	8/31	Juvenile.
VG:BW	2016 or 2017		Coronado	San Diego	5/4	
VG:GR	2017		Coronado	San Diego	7/5	
VV:VY	2018		Coronado	San Diego	8/17	Juvenile.
GG:GB	2016 or 2018		Silver Strand SB	San Diego	8/2, 8/12, 8/17	
BB:BG	2015 or 2016		Tijuana River Mouth	San Diego	3/1, 3/8, 3/15, 3/21	
BB:VW	2018		Tijuana River Mouth	San Diego	8/9	Juvenile.
VG:AY	2018		Tijuana River Mouth	San Diego	9/12	Juvenile.

APPENDIX E. CALIFORNIA LEAST TERN REPRODUCTIVE SUCCESS FOR SAN LUIS OBISPO AND SANTA BARBARA COUNTIES FROM 2004-18.

Note that chicks are not banded at Rancho Guadalupe Dunes County Park (RGDCP) or Coal Oil Point Reserve (COPR) and other methods are used to estimate number of juveniles produced. In 2018, Vandenberg Air Force Base (VAFB) banded chicks to site and year for the first time. Sources: RGDCP (pers. comm. Tom Applegate), VAFB (pers. comm. Dan Robinette), and COPR (pers. comm. staff).

Year	Site	No. pairs	No. nests	No. nests hatching	No. chicks	No. juveniles	No. juveniles per total no. nest	No. juveniles per pair
2004	ODSVRA	47	63	44	69	25	0.40	0.53
	RGDCP	8	8	3	7	0	0.00	0.00
	VAFB[1]	1	1	0	0	0	0.00	0.00
	COPR	6	6	0	0	0	0.00	0.00
2005	ODSVRA	47-53	59	39	66	20	0.34	0.38-0.43
	RGDCP	4	4	0	0	0	0.00	0.00
	VAFB	44	44	18	32	1	0.02	0.02
	COPR	0	0	0	0	0	0.00	0.00
2006	ODSVRA	31-35	38	28	45	36	0.95	1.04-1.16
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB[2]	2	2	0	0	0	0.00	0.00
	COPR	5	5	4	7	7	1.40	1.40
2007	ODSVRA	54-60	66	51	90	70	1.06	1.17-1.3
	RGDCP	1	1	1	1	1	1.00	1.00
	VAFB	18	18	13	20	16	0.89	0.89
	COPR	4	6	2	4	0	0.00	0.00
2008	ODSVRA	55-56	56	50	99	70	1.25	1.26-1.27
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	18	18	17	32-33	19	1.06	1.06
	COPR	1	1	0	0	0	0.00	0.00
2009	ODSVRA	25-26	26	23	43	33	1.27	1.29-1.32
	RGDCP	2-3	3	2	3	3	1.00	1.00-1.50
	VAFB	30	31	28	56	37	1.19	1.23
	COPR	0	0	0	0	0	0.00	0.00
2010	ODSVRA	23	23	20	35	29	1.26	1.26
	RGDCP	1	1	1	2	2	2.00	2.00
	VAFB	33	34	29	57	29	0.85	0.88
	COPR	0	0	0	0	0	0.00	0.00
2011	ODSVRA	33-34	35	31	55	50	1.43	1.47-1.52
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	32	32	19	36	4	0.13	0.13
	COPR	1	1	0	0	0	0.00	0.00
2012	ODSVRA	41-44	46	33	52	42	0.91	0.97-1.02
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	18	18	12	21	10	0.56	0.56
	COPR	0	0	0	0	0	0.00	0.00
2013	ODSVRA	48-53	57	45	85	56	0.98	1.07-1.17
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	15	15	15	25	19	1.27	1.27
	COPR	0	0	0	0	0	0.00	0.00
2014	ODSVRA	47-48	49	42	76	58	1.18	1.21-1.23
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	17	21	15	30	20	0.95	1.18
	COPR	0	0	0	0	0	0.00	0.00

Appendix E. California Least Tern reproductive success for San Luis Obispo and Santa Barbara Counties from 2004-18 (continued).

Year	Site	No. pairs	No. nests	No. nests hatching	No. chicks	No. juveniles	No. juveniles per total no. nest	No. juveniles per pair
2015	ODSVRA	44-49	54	48	84	69	1.28	1.41-1.57
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	22	22	22	45	29	1.32	1.32
	COPR	0	0	0	0	0	0.00	0.00
2016	ODSVRA	47-48	49	46	78	59	1.20	1.23-1.26
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	25	27	21	38	18	0.67	0.72
	COPR	0	0	0	0	0	0.00	0.00
2017	ODSVRA	42-47	52	22	39	7	0.13	0.15-0.17
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	27	28	23	41	8	0.29	0.30
	COPR	0	0	0	0	0	0.00	0.00
2018	ODSVRA	30-33	35	28	42	35	1.00	1.06-1.17
	RGDCP	10-11	11	5	10	4	0.36	0.36-0.40
	VAFB	60	83	33	57	35	0.42	0.58
	COPR	0	0	0	0	0	0.00	0.00

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

APPENDIX F. ADDENDUMS TO SNOWY PLOVER NESTING SUCCESS.

Table F.1. Nesting success of snowy plovers in identifiable areas at ODSVRA, 2001-18.

Nests from unknown locations (identified only by presence of broods) are not included in table. Percent nests hatching is calculated using number of hatching nests from known location divided by number of known location and fate nests. Those chicks whose specific area where hatching could not be identified are not included in table. Beginning in 2006, an additional 0.4 miles of shoreline at the southern end of the park has been monitored by ODSVRA (a survey conducted by the Guadalupe-Nipomo Dunes NWR in 2005 determined this area was part of the ODSVRA and not the refuge, as was previously thought). Between 1998-2003, increases occurred in the size of the seasonal Southern Exclosure; size has remained consistent since 2004. Information on areas in table is provided in the report Site Description section on page 33.

Excl. = Exclosure, BY = Boneyard

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

Table F.1. Nesting success of snowy plovers in identifiable areas at ODSVRA, 2001-18 (continued).

Year	Area	No. known location nests	No. nests with known location and known fate	No. nests with known location hatching	% nests hatching	No. chicks from known location	No. chicks from known location and with known fate	No. chicks from known location and with known fate fledged	% chicks known fledged
	Pismo Lagoon	1	1	0	0	0	0	0	0
	Southern Exclosure	125	124	86	69	221	221	79	36
	Oso Flaco	23	22	8	36	22	22	2	9
2009	**Total**	**149**	**147**	**94**	**64**	**243**	**243**	**81**	**33**
	Carpenter Creek	1	1	0	0	0	0	0	0
	Arroyo Grande Creek	3	3	0	0	0	0	0	0
	Open Riding Area	1	1	1	100	2	2	2	100
	Southern Exclosure	126	123	95	77	234	234	86	37
	Oso Flaco	22	22	13	59	33	33	15	45
2010	**Total**	**153**	**150**	**109**	**73**	**269**	**269**	**103**	**38**
	Open Riding Area	2	2	2	100	5	5	1	20
	Southern Exclosure	140	135	113	84	300	300	129	43
	Oso Flaco	23	23	16	70	40	40	18	45
2011	**Total**	**165**	**160**	**131**	**82**	**345**	**345**	**148**	**43**
	Open Riding Area	3	3	0	0	0	0	0	0
	Southern Exclosure	194	186	143	77	353	353	85	24
	Oso Flaco	14	14	9	64	21	21	4	19
2012	**Total**	**211**	**203**	**152**	**75**	**374**	**374**	**89**	**24**
	Southern Exclosure	147	144	115	80	288	288	147	51
	Oso Flaco	23	23	15	65	39	39	25	64
2013	**Total**	**170**	**167**	**130**	**78**	**327**	**327**	**172**	**53**
	Open Riding Area	1	1	0	0	0	0	0	0
	Southern Exclosure	201	194	173	89	428	428	142	33
	Oso Flaco	44	44	33	75	86	86	35	41
2014	**Total**	**246**	**239**	**206**	**86**	**514**	**514**	**177**	**34**
	Arroyo Grande Creek[3]	1	-	1	-	2	2	0	0
	Southern Exclosure	182	175	153	87	401	401	215	54
	Oso Flaco	20	20	14	70	39	39	24	62
2015	**Total**	**203**	**195**	**168**	**86**	**442**	**442**	**239**	**54**
	Arroyo Grande Creek[3]	1	-	1	-	2	2	1	50
	Southern Exclosure	169	156	136	87	326	326	91	28
	Oso Flaco	40	37	29	78	82	82	33	40
2016	**Total**	**210**	**193**	**166**	**85**	**410**	**410**	**125**	**30**
	Arroyo Grande Creek	1	1	0	0	0	0	0	0
	Southern Exclosure	195	165	107	65	252	252	105	42
	Oso Flaco	77	72	38	53	96	96	55	57
2017	**Total**	**273**	**238**	**145**	**61**	**348**	**348**	**160**	**46**
	Southern Exclosure	145	139	111	80	274	274	131	48
	Oso Flaco	61	61	33	54	84	84	43	51
2018	**Total**	**206**	**200**	**144**	**72**	**358**	**358**	**174**	**49**

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

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

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

Table F.2. Attributed causes of snowy plover nest loss in Southern Exclosure and Oso Flaco at ODSVRA from 2002-18.

Flooded nests include nests overwashed by tide and nests flooded by creek and tide. The percentage of total loss for each cause is shown for the 17-year period 2002-18. Prior to 2010, nest abandonment suspected due to wind was included with nests abandoned pre-term; these causes of nest loss are shown separately for 2010-18.
So. Excl. = Southern Exclosure, Aband.=Abandoned

Year	Area	Aband. pre-term	Aband. post-term	Aband., suspected wind	Aband. unknown pre- or post-term	Failed, cause unknown	Unidentified predator	Avian predator	Gull	Corvid	Raven	Northern harrier	Peregrine falcon	Coyote	Raccoon	Skunk	Flooded	Total
2002	So. Excl.				6	1								1				**8**
	Oso Flaco				2													**2**
2003	So. Excl.	17	2				3				1							**23**
	Oso Flaco	2				1	1				4							**8**
2004	So. Excl.	12				7	2				2			1				**24**
	Oso Flaco	4				2	3										1	**10**
2005	So. Excl.	9	3			7												**19**
	Oso Flaco	2	1				1											**4**
2006	So. Excl.	5	4			2	1		3					4				**19**
	Oso Flaco				1		1		3								2	**7**
2007	So. Excl.	4	1			9					1							**15**
	Oso Flaco	2				2					1			1				**6**
2008	So. Excl.	10			3	2	2	5	1			2					1	**26**
	Oso Flaco	3			1			4	1			1					2	**12**
2009	So. Excl.	9	1			3	5	16	2			1					1	**38**
	Oso Flaco	4				2	1	5								1	1	**14**
2010	So. Excl.	5	2	9			4	6									2	**28**
	Oso Flaco	1		2				2							1	2	1	**9**
2011	So. Excl.	6	3	1	1	2	1	5		3								**22**
	Oso Flaco						2			2					1	2		**7**
2012	So. Excl.	11	1	6	3	3	3	5		3		5	1	1			1	**43**
	Oso Flaco	3	1	1														**5**
2013	So. Excl.	5	5	15		3	1											**29**
	Oso Flaco	3	2	2					1									**8**
2014	So. Excl.	13	1		4	2											1	**21**
	Oso Flaco	6		1	1		1							1			1	**11**
2015	So. Excl.	11	1	1	4	2		2			1						2	**24**
	Oso Flaco	1				1	1				3							**6**

Table F.2. Attributed causes of snowy plover nest loss in Southern Exclosure and Oso Flaco at ODSVRA from 2002-18 (continued).

Year	Area	Aband. pre-term	Aband. post-term	Aband., suspected wind	Aband. unknown pre- or post-term	Failed, cause unknown	Unidentified predator	Avian predator	Gull	Corvid	Raven	Northern harrier	Peregrine falcon	Coyote	Raccoon	Skunk	Flooded	Total
2016	So. Excl.	5	7	2	2	3										1		**20**
	Oso Flaco	4				1	1		1								1	**8**
2017	So. Excl.	5	3	1	3	11	9	2	2		6			1		15		**58**
	Oso Flaco	5		2	2	15					4			1		3	2	**34**
2018	So. Excl.	9	3		5	2		3			5						1	**28**
	Oso Flaco	2		3	2		2	10	5					4				**28**
2002-18 Total nest loss	So. Excl.	**136**	**37**	**35**	**31**	**59**	**31**	**44**	**8**	**6**	**16**	**8**	**1**	**8**	**0**	**16**	**9**	**445**
		30.6%	8.3%	7.9%	7.0%	13.3%	7.0%	9.9%	1.8%	1.3%	3.6%	1.8%	0.2%	1.8%	0.0%	3.6%	2.0%	
	Oso Flaco	**42**	**4**	**11**	**9**	**24**	**14**	**21**	**11**	**2**	**12**	**1**	**0**	**7**	**2**	**8**	**11**	**179**
		23.5%	2.2%	6.1%	5.0%	13.4%	7.8%	11.7%	6.1%	1.1%	6.7%	0.6%	0.0%	3.9%	1.1%	4.5%	6.1%	
2002-18 Grand Total So. Excl. and Oso Flaco		**178**	**41**	**46**	**40**	**83**	**45**	**65**	**19**	**8**	**28**	**9**	**1**	**15**	**2**	**24**	**20**	**624**
		28.5%	6.6%	7.4%	6.4%	13.3%	7.2%	10.4%	3.0%	1.3%	4.5%	1.4%	0.2%	2.4%	0.3%	3.8%	3.2%	

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

Table F.3. Nest protection used at ODSVRA in 2018.

Nests with unknown location and unknown fate nests are excluded. Percent in parenthesis is percent nests hatched. Circular = single nest circular exclosure; un = unknown predator; av = avian; rav = common raven; sku = skunk; gul = gull, unknown species; coy = coyote; pre = abandoned pre-term; pos = abandoned post-term; ukp = abandoned unknown pre- or post-term; win = abandoned, suspected wind; fld = flooded; unk = failed, cause unknown.

	Seasonal Exclosure			Symbolic fencing	
Area	**No additional fencing**	**Bumpout**	**Circular**	**No additional fencing**	**Circular**
6 exclosure	**39**	**1**	**0**	**23**	**0**
Nests hatched	30 (77%)	1 (100%)		20 (87%)	
Nests depredated	4 (3 rav, 1 av)			1 (1 rav)	
Nests failed other causes	5 (1unk, 2 pre, 2 pos)			2 (1 ukp, 1 pos)	
7 exclosure	**20**	**0**	**0**	**14**	**0**
Nests hatched	19 (95%)			11 (79%)	
Nests depredated	1 (1 rav)			1 (1 av)	
Nests failed other causes				2 (2 ukp)	
8 exclosure	**20**	**1**	**0**	**15**	**0**
Nests hatched	16 (80%)			9 (60%)	
Nests depredated				1 (1 av)	
Nests failed other causes	4 (4 pre)	1 (unk)		5 (2 ukp, 2 pre, 1 ove)	
Boneyard	**6**	**0**	**0**		
Nests hatched	5 (83%)				
Nests depredated					
Nests failed other causes	1 (1 pre)				
SOUTHERN EXCLOSURE TOTALS	**85**	**2**	**0**	**52**	**0**
Nests hatched	70 (82%)	1 (50%)		40 (77%)	
Nests depredated	5 (4 rav, 1 av)			3 (2 av, 1 rav)	
Nests failed other causes	10 (7 pre, 2 pos, 1 unk)	1 (1 unk)		9 (5 ukp, 2 pre, 1 pos, 1 ove)	
North Oso Flaco	**7**	**0**	**0**	**13**	**1**
Nests hatched	3 (43%)			7 (54%)	1 (100%)
Nests depredated	4 (4 av)			4 (3 av, 1 coy)	
Nests failed other causes				2 (2 ukp)	
South Oso Flaco				**20**	**20**
Nests hatched				6 (30%)	16 (80%)
Nests depredated				13 (3 av, 3 coy, 5 gul, 2 un)	
Nests failed other causes				1 (1 win)	4 (2 pre, 2 win)
OSO FLACO TOTALS	**7**	**0**	**0**	**33**	**21**
Nests hatched	3 (43%)			13 (39%)	17 (81%)
Nests depredated	4 (4 av)			17 (6 av, 4 coy, 5 gul, 2 un)	
Nests failed other causes				3 (2 ukp, 1 win)	4 (2 pre, 2 win)
GRAND TOTAL	**92**	**2**	**0**	**85**	**21**
Nests hatched	73 (79%)	1 (50%)		53 (62%)	17 (81%)
Nests depredated	9 (5 av, 4 rav)			20 (8 av, 4 coy, 5 gul, 1 rav, 2 un)	
Nests failed other causes	10 (2 pos, 7 pre, 1 unk)	1 (1 unk)		12 (1 ove, 1 pos, 2 pre, 7 ukp, 1 win)	4 (2 pre, 2 win)

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

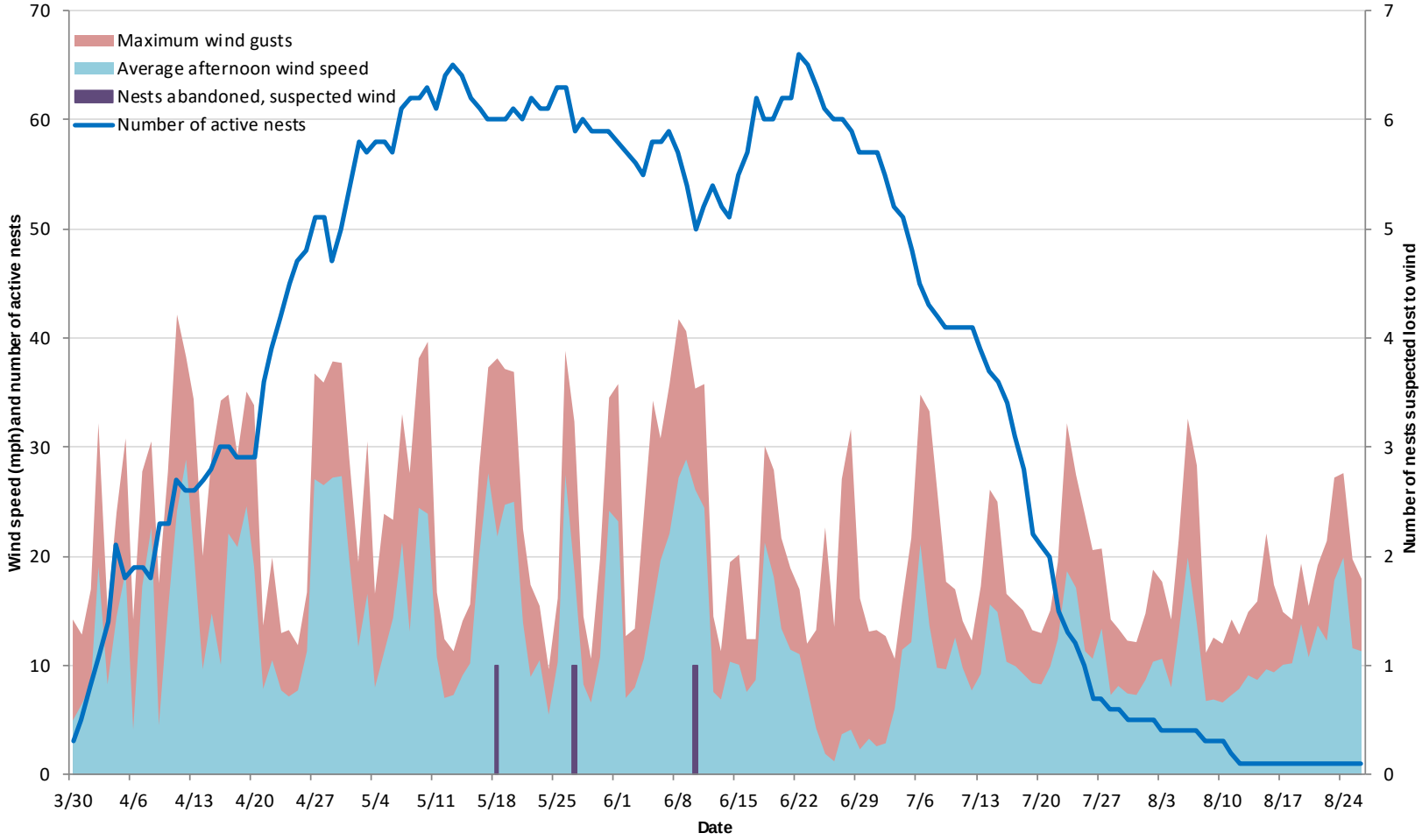


Figure F.1. Daily wind speed data (daily afternoon average and daily maximum wind gust) and snowy plover nest loss attributed to wind at ODSVRA from 30 March to 26 August 2018.

The left y-axis corresponds to wind speed in miles per hour (mph) and total number of active nests. The right y-axis corresponds to number of nests lost with fate abandoned, suspected wind. (Only nests with entire clutch lost, whether partial or complete, are included and not eggs lost from a nest that remained active.) Wind speed was collected at the 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.

APPENDIX G. PREDATOR SUMMARY TABLES AND FIGURES.

Table G.1. Summary of predators detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2018.

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

Species	First date observed	Last date observed	No. days detected	Min. no. individ.	Notes
Mammalian					
Bobcat	25 Jun	18 Aug	8	-	Tracks of bobcat (*Lynx rufus*) encountered in Boneyard on eight days and inside 8 exclosure on two days. One bobcat caught in trap intended for skunks was released.
Coyote	7 Mar	8 Sep	101	-	Most common on South Oso Flaco shoreline. Tracks also present on the Southern Exclosure and North Oso Flaco shoreline. Four plover nests documented depredated by coyote (three in South Oso Flaco and one in North Oso Flaco). Noted inside the Seasonal Exclosure on 11 days (22 occurrences).
Opossum	13 Apr	8 Sep	23	-	Activity primarily noted in the Southern Exclosure and North Oso Flaco during July-September.
Raccoon	6 Mar	8 Sep	55	-	Activity noted inside the Southern Exclosure and shoreline. Tracks also present in North and South Oso Flaco.
Skunk	9 Mar	5 Sep	49	-	Activity primarily noted in 8 and Boneyard exclosures. Tracks also present in 6 exclosure, 7 exclosure, North and South Oso Flaco.
Avian					
American crow	1 Apr	21 Aug	7	2	Mostly seen flying over NOF foredunes and SOF. Three sightings of a single crow on separate days flying over 6, 8, and Boneyard exclosures. On 1 and 2 April, two crows seen flying together over sensitive areas south of 8 exclosure.
American kestrel	6 Mar	9 Sep	34	3	Frequent sightings in August and September. Observed perch-hunting in all areas of the Southern Exclosure and Oso Flaco. Minimum of three individuals (based on sex characteristics) observed during season: one male and two females.
Common raven	9 Apr	24 Aug	6	3	Primarily observed flying over exclosure areas in April. Three ravens seen at same time flying over 7 exclosure on 17 April. Five nests documented lost to raven (three in 6 exclosure on 5 April, and two on 6 and 7 shoreline on 17 April).
Gull spp.	Present daily throughout season				Gulls were present the length of the shoreline of the Southern Exclosure and Oso Flaco. Five plover nests documented depredated by gull in South Oso Flaco (presence of tracks at depredated nests). Gulls were documented taking a minimum of 11 plover chicks (see Table H.2 in Appendix H).
Loggerhead shrike	8 Jul	8 Sep	5	1	All observations in North Oso Flaco and Boneyard.
Merlin	4 Apr	9 May	20	2	Primarily observed hunting over North Oso Flaco and Boneyard. Minimum of two individuals (based on sex characteristics) observed during season: one male and one female.
Northern harrier	2 Mar	9 Sep	25	3	Almost all observations in flight and often hunting primarily over North and South Oso Flaco. Minimum of three individuals (based on age and sex characteristics) observed during season: one adult female, one sub-adult male, and one juvenile.
Osprey	Common throughout season				Although not documented as a predator of plovers or terns, ospreys (*Pandion haliaetus*) are included in this table due to the disturbance they can cause when perched for long periods of time in sensitive areas. Primarily observed flying over 6, 7 and 8 exclosures and occasionally perched and eating fish.

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 2018 (continued).

Species	First date observed	Last date observed	No. days detected	Min. no. individ.	Notes
Large owl spp.	7 Mar	7 Sep	32		Great horned owl and barn owl documented on-site but observations and tracks indicate great horned owl make up the majority of owl presence. Activity primarily noted in 8 exclosure, North Oso Flaco, and Boneyard exclosure. Noted inside South Oso Flaco on two days, 7 exclosure on two days, and 6 exclosure on one day.
Peregrine falcon	1 Mar	9 Sep	88	5	Observed throughout the Southern Exclosure and Oso Flaco in flight and perching, sometimes over an extended time period. Observed multiple times pursuing and/or consuming prey on the shoreline and inside exclosures. Peregrines were documented taking one juvenile or adult plover, one adult plover, and three plover chicks (see Table G.1 in Appendix H). Minimum of five individuals (based on bands and/or age and sex characteristics) observed during season: three uniquely banded birds, one unbanded adult, and one unbanded sub-adult.
Red-tailed hawk	1 Mar	9 Sep	30	4	Observed primarily perch-hunting in Oso Flaco foredunes. Minimum of four individuals (based on age characteristics) observed during season: two adults, one sub-adult, and one juvenile.

Table G.2. Mammalian and avian predators removed under predator management actions for least terns and snowy plovers at ODSVRA in 2018.

Seven coyotes, one red fox, two raccoons, one opossum, five striped skunks, three common ravens, three California gulls, and one western gull were lethally removed. Two raccoons were caught in traps intended for skunks and were euthanized. One American kestrel, two great horned owls, and two peregrine falcons were live-trapped and relocated. The relocation date is given in parenthesis. All animals trapped or removed were within ODSVRA boundaries, with the exception of three ravens off-site removed with the permission of the landowner.

Date	Species	Age/Sex	Location
Lethally removed			
4-April	coyote	adult male	North Oso Flaco
5-April	raccoon	adult female	Pipeline revegetation area
5-April	coyote	adult male	North Oso Flaco
10-April	striped skunk	adult male	between Pawprint revegetation areas
11-April	raccoon	adult female	North Eucalyptus revegetation area
17-April	coyote	adult male	North Oso Flaco
25-April	common raven	adult	Oso Flaco Lake Road (east of Oso Flaco Lake)
27-April	common raven	adult	east of Oso Flaco Lake
29-April	common raven	adult	east of Oso Flaco Lake
18-May	red fox	adult male	between Pawprint revegetation areas
19-May	coyote	adult female	between Pawprint revegetation areas
24-May	coyote	adult female	between Pawprint revegetation areas
30-May	western gull	immature	6 exclosure
6-June	striped skunk	adult female	Boneyard exclosure
13-June	striped skunk	adult male	Boneyard exclosure
17-June	California gull	immature	6 exclosure
15-July	coyote	adult male	South Oso Flaco
27-July	California gull	immature	6 exclosure
31-July	striped skunk	adult male	8 exclosure
7-August	California gull	immature	6 exclosure
13-August	opossum	adult male	8 exclosure
21-August	striped skunk	juvenile female	Boneyard exclosure
27-August	coyote	adult male	North Oso Flaco
Live-trapped and relocated			
16-May (17-May)	great horned owl	adult	Pipeline revegetation area
24-May (25-May)	great horned owl	adult	Pipeline revegetation area
8-June (8-June)	American kestrel	adult female	South Oso Flaco
10-July (13-July)	peregrine falcon	adult male	South Oso Flaco
31-August (3-Sept.)	peregrine falcon	juvenile male	South Oso Flaco

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

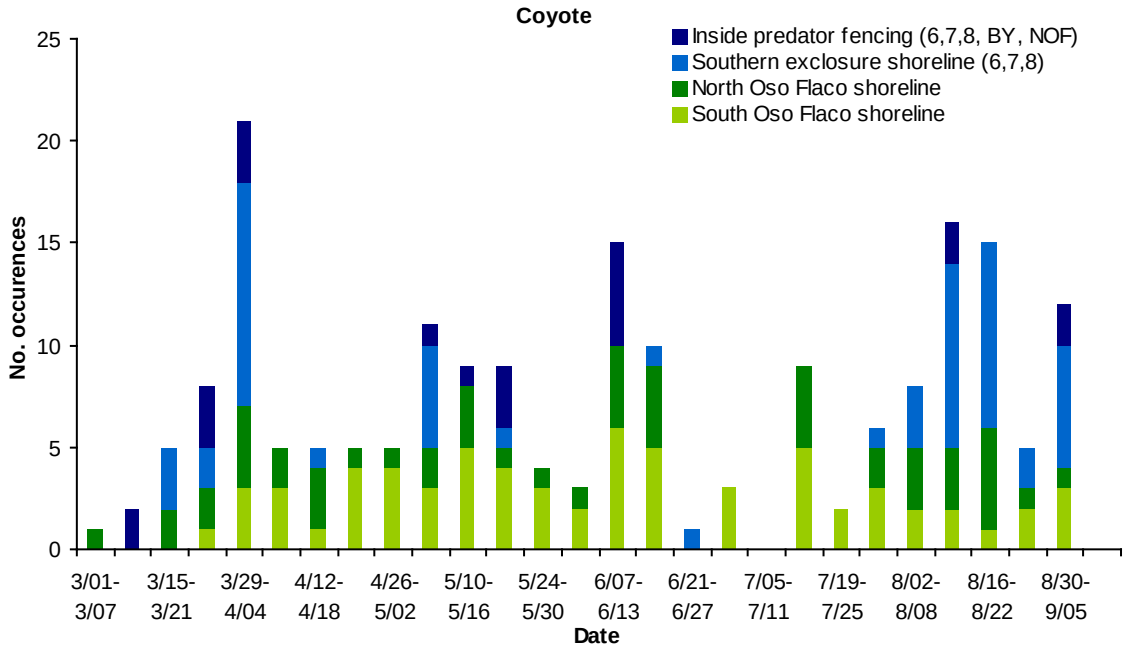


Figure G.1. Coyote occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018.

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

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

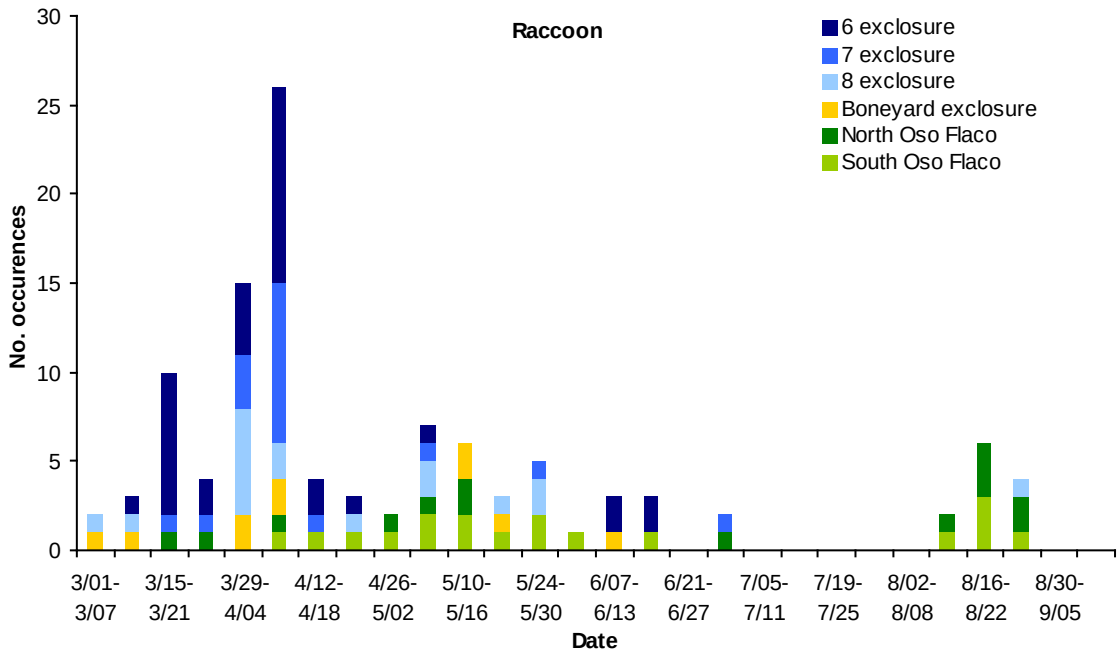


Figure G.2. Raccoon occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018.

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

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

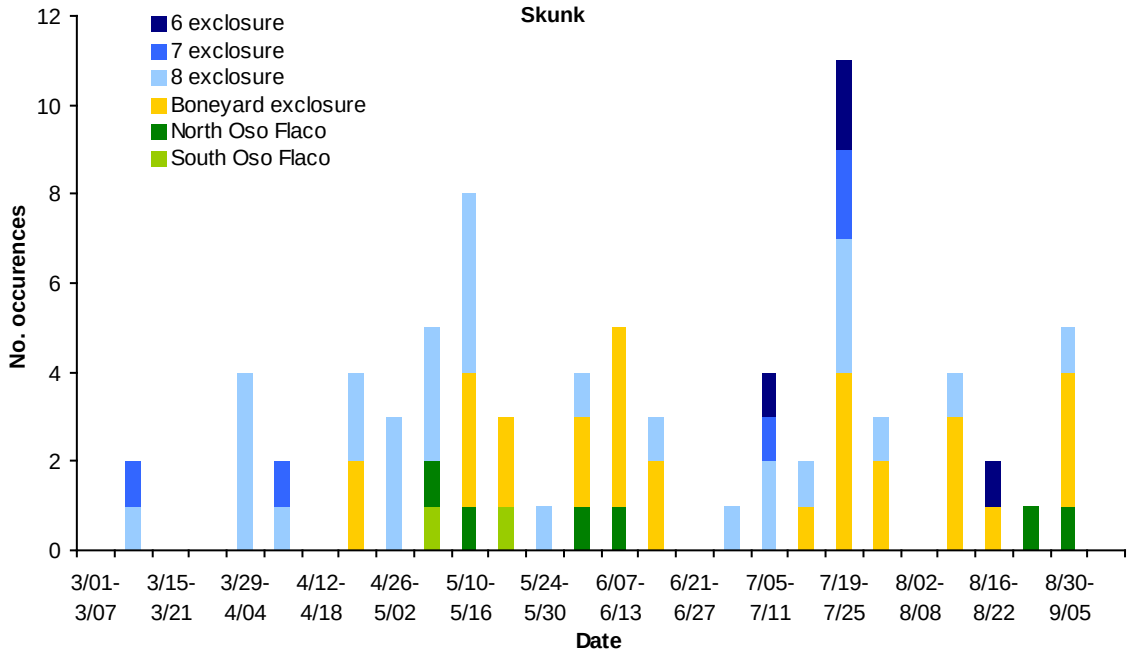
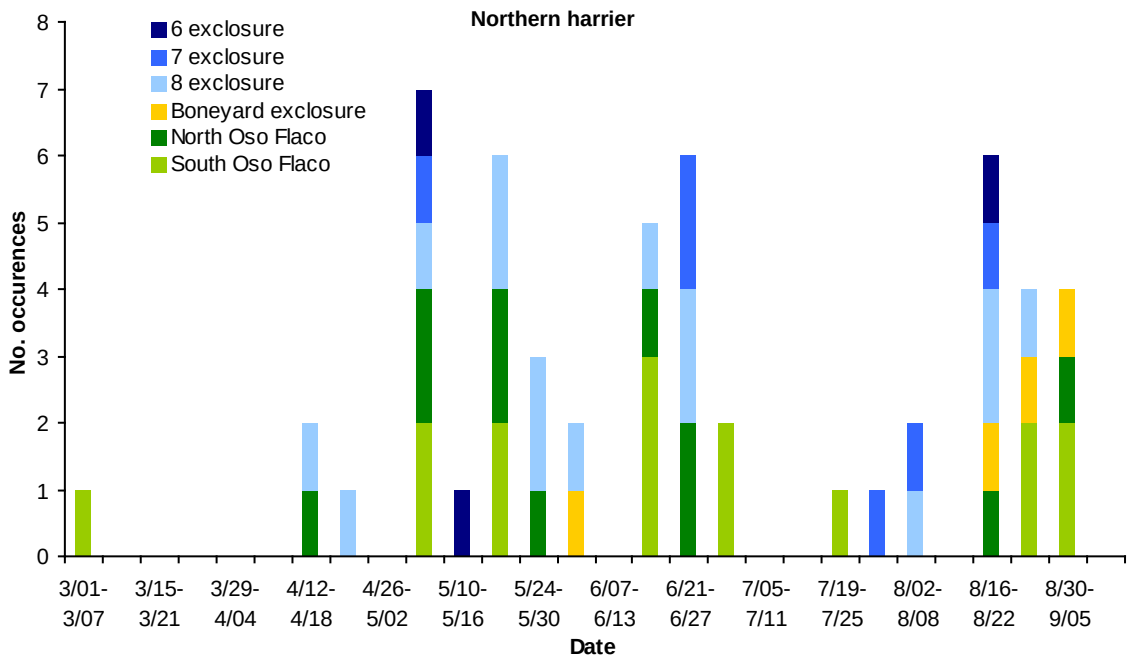


Figure G.3. Skunk occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018.

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

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



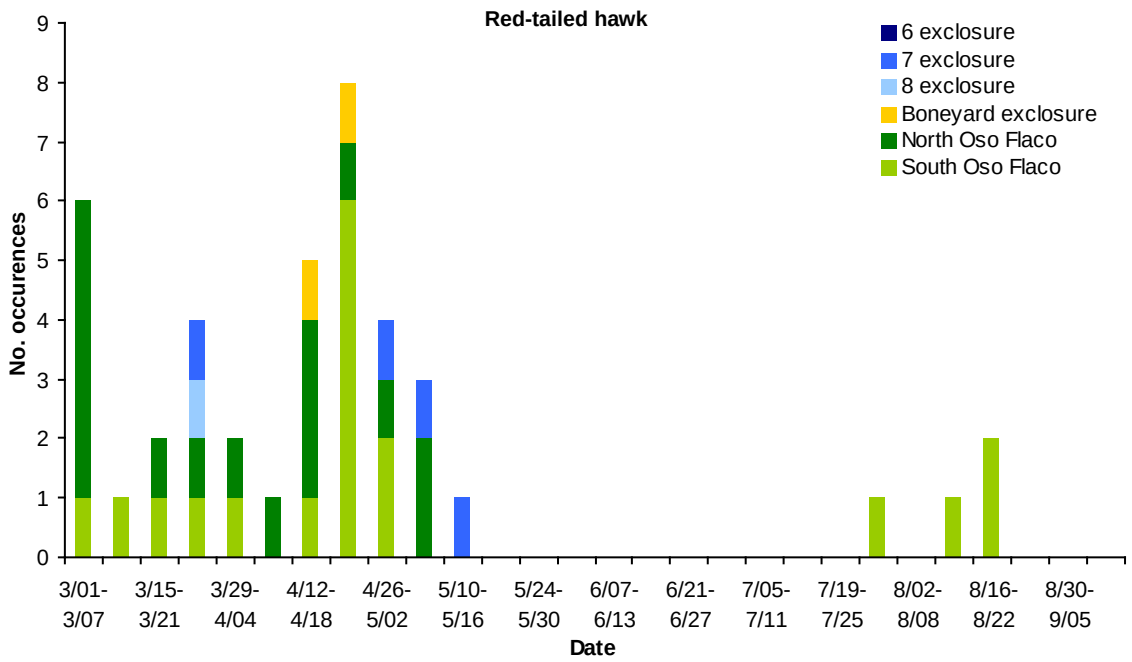
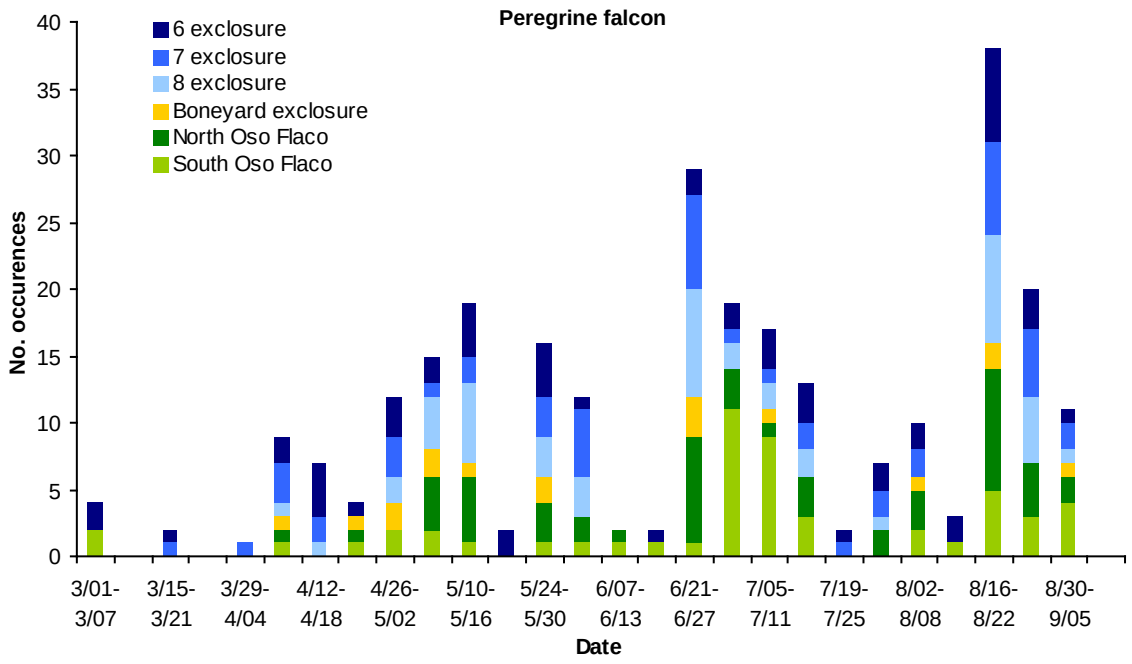


Figure G.4. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018.

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

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



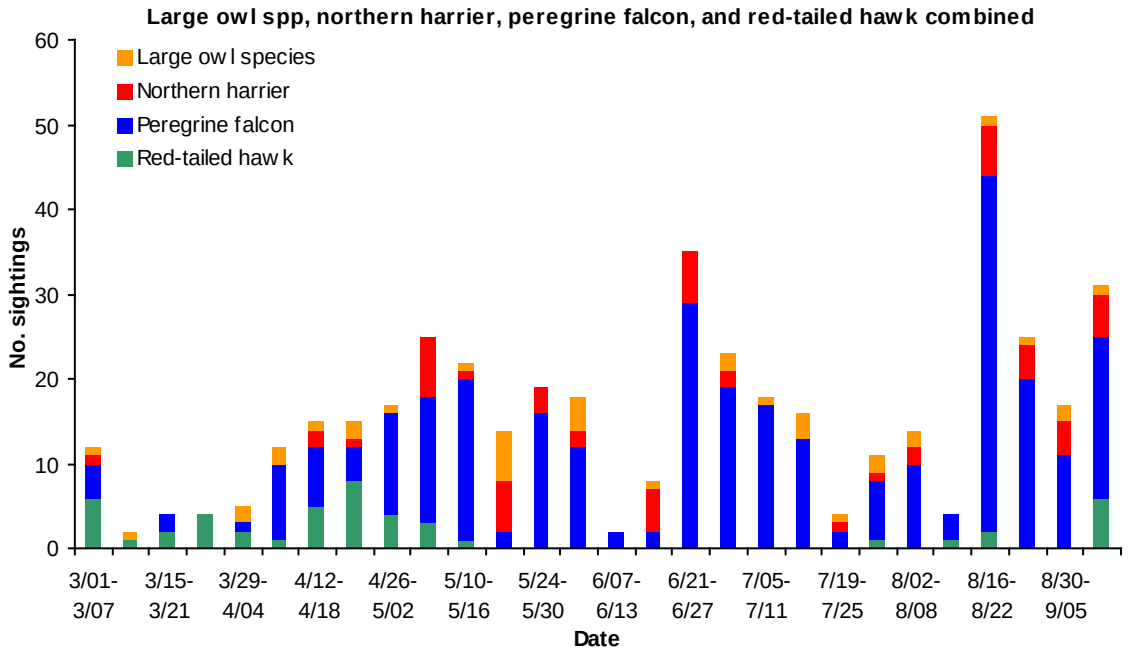


Figure G.4. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018 (continued).
Observations from 1 March–10 September (a 194-day period).

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

Table H.1. Documented predation of least terns from 1 March to 30 September 2018.

See Notes section and attached necropsy report for more detail.

No. (age)	Predator	Location	Notes
1 (juvenile)	Unknown avian	8 exclosure	On 26 August, a dead least tern fledgling, banded G/Y:B/A from the LT34 nest, was found on the 8 exclosure shoreline. The intact carcass had a wound on the back of neck with fresh blood. The necropsy report indicates the bird died from acute trauma with wounds presumably caused by attempted predation by an avian predator. The fledgling was last seen alive 25 August on the 7 exclosure shoreline at 23 days old.

Table H.2. Documented predation of snowy plovers from 1 March to 30 September 2018.

No. (age)	Predator	Location	Notes
9 (chick)	Western gull (immature)	6 exclosure	On 30 May at 8:22 am, an immature western gull was observed eating an unbanded 10-day-old chick from the SP35 nest and a second unbanded chick (likely the sibling chick from the same nest) on 6 exclosure shoreline. What is believed to be the same gull was observed later the same day eating prey on 6 exclosure shoreline and adult plovers were displaying at the gull. The gull was lethally removed by USDA Wildlife Services and the remains of nine plover chicks were found in the gut, including two three-day-old banded chicks from the SP79 nest, one six-day old banded chick from the SP72 nest, one six-day-old banded chick from the SP73 nest, one 12-day-old banded chick from the SP65 nest, and four small unbanded chicks from unknown nests.
1 (adult)	Peregrine falcon (banded adult male)	7 exclosure	On 26 June, a banded adult male peregrine falcon was observed eating an adult plover on 7 exclosure shoreline. The falcon was live-trapped on 10 July and released on 13 July at the Butte Valley Wildlife Area, Siskiyou County, California, 475 miles north of ODSVRA. On 10 August, this bird was observed back on-site.
3 (chick)	Peregrine falcon (banded adult male)	7 exclosure, North Oso Flaco	On 27 June, the same adult male peregrine falcon noted above taking an adult plover, was observed catching three prey items (evidence supports these were three plover chicks): one inside 7 exclosure, one on 7 exclosure shoreline, and one on North Oso Flaco shoreline.
2 (chick)	California gull (immature)	6 exclosure	On 7 August, an immature California gull was observed eating a 20-day-old banded chick from the SP161 nest and a 15-day-old banded chick from the SP187 nest. The gull was lethally removed by USDA Wildlife Services and no additional remains were found in the gut.
1 (juvenile or adult)	Peregrine falcon (juvenile)	7 exclosure	On 19 August, a juvenile peregrine falcon was observed catching and eating a juvenile or adult plover on 7 exclosure shoreline. The peregrine was live-trapped on 31 August and released on 3 September in the Owens Valley, Inyo County, California, 179 miles northeast of ODSVRA.

Table H.3. Mortality, other than documented predation, of snowy plovers from 1 February 2018 to 12 October 2018.
See Notes section and attached necropsy or medical reports for more detail. All remains not sent for necropsy were saved as specimens for a designated depository. One injured adult that died later while receiving medical care is included in table.

No. (age)	Location	Notes
1 (adult)	Open riding area	On 1 February, the intact carcass of an adult banded VV:YB, was found north of marker post 6. The carcass appeared flattened and fresh.
1 (adult)	Open riding area	On 9 February, the carcass of an unbanded adult plover was found south of marker post 4 in fresh tire tracks and appeared flattened.
1 (adult)	Open riding area	On 28 February, the carcass of an adult female banded GG:GG was found at the base of the exclosure fence north of marker post 7. The carcass was partially buried and appeared fairly fresh. A GG:GG plover was last seen in this same general area on 19 February.
1 (adult)	Open riding area	On 1 March, the carcass of an unbanded adult plover was found east of marker post 7. The area had multiple vehicle tracks and was closed to riding later that morning. One wing of the bird appeared twisted and no predator tracks were seen.
1 (adult)	8 exclosure	On 26 April, an unbanded adult with a left leg injury was taken to Pacific Wildlife Care for medical treatment. Fine hair-like material and one necrotic toe were surgically removed, and the bird was given antibiotics and pain medication. On 30 April, the bird was found dead at Pacific Wildlife Care.
1 (chick)	8 exclosure	On 13 May, one unbanded seven-day-old chick from the SP29 nest was observed lying immobile on the 8 exclosure shoreline and unattended by an adult. The chick was placed in a brooder where it died by the following morning. The chick was last seen actively foraging on 8 May at two days old.
1 (chick)	6 exclosure	On 11 June, one eight to nine-day-old chick from the SP77 nest appeared dead and seen dragged by the associated male on the 6 exclosure shoreline. The chick was last seen alive earlier on this day. The carcass could not be recovered to avoid disturbance to young nearby plover broods.
1 (juvenile)	8 exclosure	On 2 July, the carcass of a banded juvenile plover from the SP64 nest was found on the immediate edge of the active SP174 nest bowl on the 8 exclosure shoreline. The intact carcass was in rigor and appeared fresh. The necropsy report indicates it died from pulmonary hemorrhage, but the cause of the hemorrhage was not determined. The juvenile was last seen alive on the 8 exclosure shoreline on 30 June when 38 to 39 days old.
1 (chick)	7 exclosure	On 12 July, the carcass of one unbanded chick from the SP169 brood was observed on the 7 exclosure shoreline with the sibling and associated adults nearby. Two chicks hatched from this nest and both chicks were seen 11 July at four days old. The carcass was not recovered to avoid disturbance to young nearby plover broods.
1 (chick)	6 exclosure	On 24 July, an unbanded chick carcass was observed held in the bill of a whimbrel on the 6 exclosure shoreline. The carcass was limp and likely dead prior to the whimbrel picking it up. The whimbrel flew a short distance with it and the chick carcass was not relocated.
1 (juvenile)	8 exclosure	On 9 August, the carcass of an unbanded juvenile plover was found on the 8 exclosure shoreline. The intact carcass was wet and there was a small amount of blood on the underside of the bird. Radiographs did not show any fractures and the carcass was too desiccated for additional necropsy analysis.
1 (chick)	7 exclosure	On 14 August, the desiccated carcass of an unbanded newly hatched sized chick from the SP200 brood was found five feet from the nest bowl in 7 exclosure. The chick hatched sometime after 7 August, when the egg was pipped and peeping. An adult continued attending the nest until 10 August and the unbanded chick was not observed alive.
1 (adult)	8 exclosure	On 1 September, the desiccated remains of an adult plover banded RR:BG were found on the 8 exclosure shoreline. Parts found included a decomposed skeleton and leg bones. A male with this combination was known breeding at our site in 2017 and was last seen 19 November 2017.

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

Table H.3. Mortality, other than documented predation, of snowy plovers from 1 February 2018 to 12 October 2018 (continued).

No. (age)	Location	Notes
1 (chick)	South Oso Flaco	On 6 September, the desiccated carcass of a small chick banded VV:YB from the SP49 brood was found on the South Oso Flaco shoreline in the general area of the nest and where the brood was raised. Three chicks were last seen 28 May, two last seen on 13 June, and the remaining chick was last seen on 15 June at 19 days old.
1 (suspected adult)	South Oso Flaco	On 6 September, the desiccated partial remains of a snowy plover, suspected to be an adult, were found in South Oso Flaco. Parts found included a partial bill, leg, and feathers.
1 (adult)	Open riding area	On 22 September, the carcass of an unbanded adult plover was found north of marker post 5. The carcass appeared fresh and was found in an area with multiple vehicle tracks and adjacent to a large roosting flock of plovers.
1 (chick)	South Oso Flaco	On 23 September, desiccated partial remains of a small chick from the SP105 brood were found in South Oso Flaco near the nest location. Remains were partially buried and only two of the bands were found. Three chicks from this brood were last seen 28 June at 10 days old.
2 (adult)	Open riding area	On 30 September, two unbanded adult plover carcasses were found 10 feet apart north of marker post 5. The birds were found in an area with multiple vehicle tracks, adjacent to a large roosting flock of plovers, and appeared flattened and partially buried.
1 (adult)	Open riding area	On 12 October, the carcass of an unbanded adult plover was found between markers post 4 and 5. The carcass appeared fresh and was found in an area with multiple vehicle tracks and adjacent to a large roosting flock of plovers.

Oceano Dunes State Vehicular Recreation Area

2018 Predator Management Report

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Introduction

Prior to the 2018 California Least Tern (*Sternula antillarum browni*)(CLTE) and Western Snowy Plover (*Charadrius nivosus nivosus*)(SNPL) nesting season, USDA-APHIS-Wildlife Services entered into an agreement with Oceano Dunes State Vehicular Recreation Area (ODSVRA) to conduct predator management activities in the CLTE and SNPL nesting areas. Wildlife Specialist (WS) Alexander Schaefer was assigned to the ODSVRA project to monitor and selectively remove mammalian or avian predators for protection of nesting CLTE and SNPL.

WSS Alexander Schaefer began working the ODSVRA project on April 2, 2018 and worked through September 7, 2018. Prior to beginning, WS Schaefer underwent USDA mandatory training including the use of firearms, trapping equipment, defensive driving, civil rights, and all aspects of safety.

Methods of Predator Management

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

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

Trapping was the most common method for predator management during the 2018 nesting season. Methods included the use of Woodstream® #3 and #1-1/2 padded jaw leg-hold traps for predators such as coyotes (*Canis latrans),* red fox (*Vulpes vulpes)* common ravens (*Corvus corax*), and striped skunks (*Mephitis mephitis).* Traps were baited with commercially available lures made from different scents, glands and meat based baits as well as with hard boiled chicken eggs. Single door cage traps manufactured by Tomahawk Live Trap® were also used in an attempt to capture skunks, opossums and raccoons. Cage traps were baited with either dry or wet canned cat food. The model of firearm used to remove trapped animals was a Ruger® 10/22 chambered in .22 long rifle, while the ammunition of choice was CCI® Short Range Green that fired a 21 grain non-lead cartridge. A Browning® BPS 20 gauge shotgun was also used on site that fired Federal® brand 3 inch shells with steel #2 shot.

Euthanasia of captured animals is conducted in compliance with standards set by the American Veterinary Medical Association. Where practical, captured animals are euthanized by a single shot at close range with a .22 caliber rifle. Circumstances sometimes require the use of euthanasia drugs to remove a target predator that is trapped. When necessary, sodium pentobarbital is administered through a needle and syringe that is

fastened to a metal rod with a collar twisted in place to hold the syringe. The effects of sodium pentobarbital are rapid unconsciousness, followed by a reduction of respiration and central nervous system activity, and ending with cardiac arrest. When injected into the heart or major artery, the results are almost instantaneous. Sodium pentobarbital is a schedule II controlled substance whose use is monitored by the U.S. Drug Enforcement Administration. Use of sodium pentobarbital by WS employees is restricted to those that have received training and are certified in its use. Mammals euthanized in this fashion are given an injection of the drug and disposed of according to WS directives, and all applicable state and federal laws and regulations. Injections are placed in the intraperitoneal cavity. The typical dosage rate is 1 cc for every 10 pounds of body weight. A sliding internal rod within the larger metal rod allows the applicant to inject the drug with the use of their thumb while holding the end of the rod farthest away from the animal.

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

Baiting efforts to attract common ravens using hard boiled chicken eggs were employed in attempt to entice ravens to a location to feed on the hard boiled eggs. Once ravens have become habituated to feeding on the hard boiled eggs, eggs that have been injected with the corvicide DRC-1339 are then placed in the area where the pre-baiting occurred (see Appendix 2). Although attempts were made to attract common ravens to pre-bait eggs, no ravens fed on them. DRC-1339 was not utilized during the 2018 nesting season.

Results of Predator Management Methods

When predator management efforts by Wildlife Services began for the 2018 season, the SNPL nesting season had already commenced. The main predation concerns this season were by common ravens, gulls, coyotes, and striped skunks in or near SNPL and CLTE habitat. Coyote track evidence suggested that individuals were hunting and foraging primarily along the shoreline areas in South Oso Flaco in areas where SNPL nests and chicks were found. In past nesting seasons, coyotes have been documented taking SNPL eggs and chicks at ODSVRA. In 2012, four coyote scats were found to contain a total of 11 bands (representing a minimum of one plover chick, two unknown age plovers, and one unknown age tern). Coyote tracks along the shoreline or past the Oso Flaco Boardwalk was often documented and four SNPL nests were confirmed to have been predated by coyotes during the nesting season.

The 2018 nesting season saw an increase of common raven predation events on SNPL nests. Multiple sightings were observed of individual birds frequenting the exclosure areas

throughout the park with documented nest losses to ravens. Aggressive trapping efforts using replicated plover nest sets baited with quail eggs was attempted. Baiting efforts using hard boiled chicken eggs was attempted to attract ravens to feed on the eggs. Motion activated cameras were placed at each bait site to verify raven consumption of the egg baits. The use of #1-1/2 padded jaw leg-hold traps baited with hard boiled chicken eggs were placed exclusively in South Oso Flaco, North Oso Flaco shore, and six exclosure. It is believed most ravens traveled north from the south or from the east via the Oso Flaco agriculture fields. Ravens failed to visit either the quail egg sets or chicken egg baits. Predator watch shifts were employed by park resources staff and by WS Schaefer. Raven activity on nearby neighboring farm fields allowed WS Schaefer to focus effort toward removing ravens when given a safe opportunity. WS Michael Thompson assisted WS Schaefer and took one raven on 25 April off of Oso Flaco Road near Highway 1. WS Schaefer removed two adult ravens on 27 April and on 29 April on these neighboring properties. All raven damage on Oceano Dunes property ceased with no further raven predation during the remainder of the season following the removal of these individuals.

Gull predation to SNPL chicks at ODSVRA was observed during the 2018 season. On May 30, an immature Western gull *(Larus occidentalis)* was observed displaying suspicious foraging and hunting behavior among broods of young SNPL chicks on the six shoreline. A project lead and other resources staff then observed the gull take two SNPL chicks and were able to monitor the gull as WS Schaefer arrived at the scene. WS Schaefer was instructed to remove the gull, however the gull flushed and resources staff could not relocate the gull. WS Schaefer remained on the shoreline to observe gulls and later witnessed a different immature Western gull take a SNPL chick. WS Schaefer was in close proximity and quickly euthanized the gull. The gull was necropsied, and the remains of nine SNPL chicks were recovered. On June 17 and July 27, resources staff witnessed suspicious behavior from immature California gulls *(Larus californicus)* on six shoreline. WS Schaefer arrived and was requested to take the gulls as a precaution. The gulls were euthanized and upon necropsy, no SNPL remains or bands were found in either gull. On August 7, resources staff observed an immature California gull take two SNPL chicks on the six shoreline. District Supervisor Eric Covington arrived on scene and removed the gull. Necropsy results recovered two SNPL chicks.

Peregrine Falcons *(Falco peregrinis)* and other raptors were observed perching on or within exclosure fences and flying low over the shoreline on many occasions. WS Schaefer would locate avian predators and assist park staff and Bloom Biological, Inc. contractor Robert Chapman in hazing and some trapping efforts.

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

Seven coyotes were lethally removed during the 2018 season using #3 and #1.5 foot hold traps (Table 1). A coyote was trapped in North Oso Flaco vegetation after it had been consistently digging into the North Oso Flaco exclosure. A coyote was trapped on North Oso Flaco shoreline. A coyote was trapped in North Oso Flaco near the boardwalk. Two coyotes were trapped between Cottonwood and Acacia revegetation islands east of six exclosure. A coyote was trapped in South Oso Flaco in the fore dunes south of the Oso Flaco Creek lagoon. The last coyote was trapped on North Oso Flaco shoreline. Dates, age and sex can be found on Table 1.

During May, park staff and contractors captured trail camera photos of a nonnative red fox that had taken up residency in the vegetation islands immediately east of six exclosure. Track evidence revealed this animal to forage in the ORA as well as in the six pole alleyway near six shoreline. WS Schaefer was asked to trap this animal. On May 18, WS Schaefer was successful in capturing and removing an adult male red fox.

Two raccoons (*Procyon lotor*) were trapped using Tomahawk® cage traps. One adult raccoon was removed within west end of Pipeline revegetation. A second raccoon was removed from North Eucalyptus revegetation island. (Table 1 and Appendix 1).

One Virginia opossum *(Didelphis virginiana)* was removed during the 2018 season at the request of resources staff after the animal had been foraging throughout the exclosure among SNPL and CLTE chicks.

Five striped skunks (*Mephitis mephitis*) were removed using #1.5 foot hold traps and Tomahawk® cage traps during the 2018 season. The 2017 nesting season saw a high level of striped skunk predations that focused on SNPL nests and CLTE nests. Predation of CLTE chicks were suspected but not documented. Preemptive trapping efforts targeting striped skunks in 2018 took place in the North Oso Flaco fore dunes, West Boneyard, East Boneyard, eight exclosure, seven and a half exclosure/revegetation, six exclosure and in revegetation islands such as Pipeline, West Maidenform, Humpback Tabletop, Eucalyptus, and North Eucalyptus. The islands directly east of the exclosure areas are where WS Schaefer had repeatedly tracked most skunks across the Off Road Area from their point of exit/entrance in the exclosures to their denning areas (Table 1 and Appendix 1). Four striped skunks were trapped and removed with cage traps and one was trapped and removed with a padded jaw #1.5 foot hold trap. Spotlighting attempts were made this season to remove striped skunks found near the exclosure areas, but were unsuccessful.

Future Recommendations

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

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

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

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

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

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

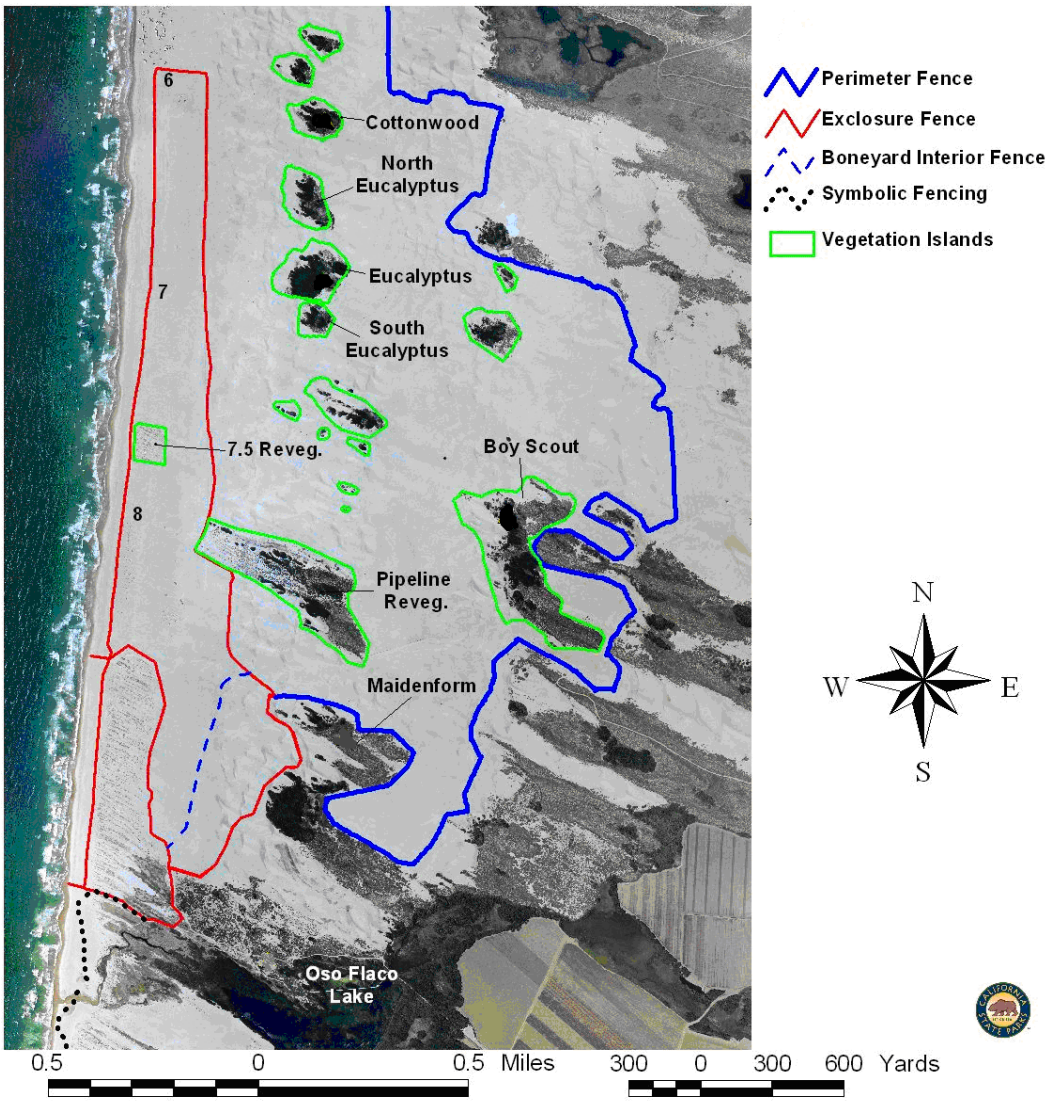
Table 1: Predator Removal Summary

Date	Species	Age/Sex	Location
4/4/18	Coyote	Adult Male	NOF/BW
4/5/18	Raccoon	Adult Female	W.PLR
4/5/18	Coyote	Adult Male	NOF Shore
4/10/18	Skunk	Adult Male	Cottonwood
4/11/18	Raccoon	Adult Female	N. Eucalyptus
4/17/18	Coyote	Adult Male	NOF/BW
4/25/18	Raven	Adult N/A	Oso Flaco Lake Rd
4/27/18	Raven	Adult N/A	Teixeira Farms
4/29/18	Raven	Adult N/A	Teixeira Farms
5/18/18	Red Fox	Adult Male	Heather/Acacia
5/19/18	Coyote	Adult Female	Cottonwood/Acacia
5/24/18	Coyote	Adult Female	Cottonwood/Acacia
5/30/18	Western Gull	Sub Adult N/A	Six Shoreline
6/6/18	Skunk	Adult Female	West Boneyard
6/13/18	Skunk	Adult Male	East Boneyard
6/17/18	California Gull	Sub Adult N/A	Six Shoreline
7/15/18	Coyote	Adult Male	SOF/Lagoon
7/27/18	California Gull	Sub Adult N/A	Six Shoreline
7/31/18	Skunk	Adult Male	Eight Exclosure
8/7/18	California Gull	Sub Adult N/A	Six Shoreline
8/13/18	Opossum	Adult male	Eight Exclosure
8/21/18	Skunk	Sub Adult female	East Boneyard
8/27/18	Coyote	Adult Male	NOF Shoreline

Alexander Schaefer, Wildlife Specialist
San Luis District
CA Wildlife Services

Eric Covington, District Supervisor
San Luis District
CA Wildlife Services

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



Appendix 2: DRC-1339 EPA Label

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

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BLOOM BIOLOGICAL INC.
research | consulting | conservation

September 29, 2018

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

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

SUBJECT: Summary of results of avian predator management activities during the 2018 season at Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California

Dear Mr. Glick:

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

This letter provides a summary of predator observations and predator management activities associated with the 2018 plover and tern breeding season.

INTRODUCTION

This report summarizes avian predator observations and hazing efforts made by BBI contractors between 1 February and 7 September 2018 (hereafter '2018 Season'). This period includes early-season observations made during February, before the start of the standard monitoring season (1 March, annually). Additional observations and hazing efforts were made by CDPR staff and other contractors, which are not represented in this report (see ODSVRA 2018 Annual Report).

The presence and behavior of avian predators changed with time throughout the 2018 Season, as described below (Summary of Predator Species Occurrence).

Raptor observations are addressed according to the following seasonal periods:

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

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

Hazing is a term used in this report to refer to an act directed at a potential predator to get it to leave an area. Hazing was performed by approaching the predator on foot (human approach), in a vehicle (by car), or by using Bird Whistlers®, which are pyrotechnic deterrent devices that make a very loud "SCREECH" sound designed to scare away pest birds and wildlife.

SUMMARY OF PREDATOR TRAPPING ACTIVITIES

During the 2018 Season, six raptors were targeted for capture and relocation, including one merlin (*Falco columbarius*), two great horned owls (*Bubo virginianus*), two peregrine falcons (*Falco peregrinus*), and one American kestrel (*Falco sparverius*). All targets except the merlin were eventually captured and relocated. All trapping and relocation actions were authorized by existing permits and through coordination with the California Department of Fish & Wildlife (CDFW; Carie Battistone, Senior Environmental Scientist) and the U.S. Fish & Wildlife Service (USFWS; Jennifer Brown, Wildlife Biologist). Justification for removal was based on the observed predation of plover fledglings/adults and chicks and the habitual disturbance to the nesting colonies. Information pertaining to the five relocated birds is summarized below (Table 1), and additional information for all six birds targeted for capture is provided in the following paragraphs.

Table 1. Raptors Captured and Relocated During 2018 Season

Species	VID Band #	Age/Sex	Date	Trapping Location	Release Location	Distance
GHOW	None	Adult/U	16 May 2018	35°02'40.41" N, 120°37'28.09" W	35°17'51.49" N, 118°36'46.13" W	115 Miles
GHOW	None	Adult/U	24 May 2018	35°02'40.41" N, 120°37'28.09" W	35°17'51.49" N, 118°36'46.13" W	115 Miles
PEFA	74/D	Adult/M	10 Jul 2018	35°01'55.89" N, 120°37'59.10" W	41°51'21.60" N, 122°04'21.54" W	475 Miles
PEFA	W/03	Juv/M	31 Aug 2018	35°01'55.89" N, 120°37'59.10" W	36°33'35.88" N, 118°03'28.15" W	179 Miles
AMKE	None	Adult/F	8 Jun 2018	35°00'45.57" N, 120°38'08.01" W	35°44'00.65" N, 119°35'21.04" W	77 Miles

Early in the season, a juvenile male merlin was habitually hunting the east side of the North Oso Flaco foredunes/ West Boneyard sensitive areas. Merlins usually depart the Central California coast by 1 April[1] and not typically overlap very long with breeding terns and plovers, but this individual lingered in the area until mid-May. The bird was identified as a target for trapping and relocation due to its consistent presence in a sensitive area where plover nests were due to hatch. However, despite the allocation of four trap days and 4.75 trap hours from 27 April through 9 May, the bird evaded capture. This individual eventually did move out of the area and no plover predations were documented.

Two apparently un-paired and non-breeding great horned owls, resident in the Pipeline revegetated area (PLR), were identified for trapping and relocation based on their habitual disturbance to the plover and tern colonies during the nesting period. These PLR birds were captured via the same verbail trap (CDFW-approved leg snare) positioned along the north ridge of PLR. Both birds were captured over a period of 6

[1] Edell, T. The Birds of San Luis Obispo County, California. Fourth Edition. April 2006.

trapping days between 14 and 24 May, comprising 125.75 trap hours. Both birds were relocated to the Tehachapi Mountains near Caliente, Kern County, California.

The first relocated peregrine falcon was an adult male with visual identification (VID) band '74/D' (white lettering on black) on the left leg and a USGS band on the right leg. This bird is known from Vandenberg AFB as the 'Lion's Head' male and was originally banded in 2007 by J. Pagel and N. Todd at the Lobo Canyon aerie, Santa Rosa Island, California. This individual was identified for trapping and relocation due to its repeated targeting and taking of SNPLs (see ODSVRA 2018 Annual Report for additional information). The adult male was successfully trapped during the 2018 Season near the mouth of Oso Flaco Creek in South Oso Flaco on 10 July. The capture of this bird required 44 trap hours over eight trapping days. A GPS satellite transmitter was affixed to the bird using a 'backpack' harness. The bird was then released on 13 July at the Butte Valley Wildlife Area, Siskiyou County, California, 475 miles to the north. This individual was observed back on site one month later 10 August. He was sighted once again by the APS on 23 August.

The second relocated peregrine falcon was an unbanded juvenile male, which was captured on 31 August, also near the mouth of Oso Flaco Creek in South Oso Flaco. Capture of this bird required 32.5 trap hours over eight trapping days. This bird was banded with a USGS band (#2206-85657) on the right leg and VID band 'W/03' (white lettering on black) on the left leg. It was released on 3 September in the Owen's Valley, Inyo County, California, 179 miles to the northeast.

A female American kestrel was identified for trapping and relocation due to its persistent foraging in a sensitive area of South Oso Flaco where newly hatched plover chicks were present. This 'after second year' (ASY) adult female was observed hunting at the south boundary of the Project on several occasions. No food carrying behavior was observed, but the bird's continued presence indicated it was a floater with no current nest attachment. This individual was trapped on 8 June on one trapping day comprising 0.25 trap hours. The bird was relocated to the Kern National Wildlife Refuge, Kern County, California, 77 miles to the northeast.

SUMMARY OF PREDATOR SPECIES OCCURRENCE

AMERICAN KESTREL

No American kestrel nests were found in the Project area and this species was not observed predating or attempting to predate a plover or tern. However, the species was regularly observed throughout the Project area, particularly early and late in the season. The highest numbers of observations occurred during the months of February (n=6), March (n=8) and August (n=13). Nesting was suspected at the Phillips 66 refinery adjacent to the Project to the east, with numerous observations of territorial behavior and food carrying behavior. At least one pair was believed to have nested on the refinery grounds in the refinery structure itself. Dead willow trees (*Salix spp.*) at Long Valley, located 1.05 miles east of PLR and Jack Lake, located 1.3 miles east southeast of PLR, both of which are in the eastern portion of the Project area, provide numerous cavities, suitable for kestrel nesting, but no evidence of nesting was documented. Two, or possibly three other kestrel pairs were suspected of nesting within the Project, with territorial birds observed regularly at the following locations: 1) Carpenter creek, 2) the dune area immediately south of Grand Avenue ramp and 3) the Oceano Campground north of the Interpretive Trail. During the 2018 Season, observations were documented through the wintering and pre-nesting period, from 1 February through 5 April. Observations of kestrels were lower in April (n=2) and declined or stayed steady through July. In August, during the post-breeding dispersal period, the number of observations increased markedly as numerous birds passed through the Project area. A definitive south to north movement was noted and seemed to be made up of juvenile birds. The 13 observations of kestrels in August was the monthly high for the 2018 Season. Observations of individuals continued through 7 September, with many of these observations occurring in sensitive areas. One female was trapped and relocated (see above, 'Summary of Predator Observations and Trapping Activities').

Merlin

Merlins winter in the Project area and migrate out of San Luis Obispo County, typically becoming 'casual' by 1 April annually and 'vagrant' after 1 May[2]. Twenty-two merlin observations were documented during the 2018 Season; a much higher number than the six observations during the 2017 Season, but more comparable to the 16 observations during the 2016 Season. Authorization was obtained to trap and relocate one 'jack' (species-specific term for a male) merlin but attempts to capture the bird were unsuccessful (see above, 'Summary of Predator Observations and Trapping Activities'). This late jack merlin was observed hunting West Boneyard on five days in May and was last observed 9 May. This represents a significant record with only a small handful of May records for the county (n=7)[3]. No merlins were documented after 9 May and none had returned to the Project area as of 7 September.

Peregrine Falcon

Two peregrine falcons were trapped and relocated, with CDFW and USFWS authorization, during the 2018 Season on 10 July and 31 August. The complete details associated with these birds can be found above (see 'Summary of Predator Observations and Trapping Activity') and are not repeated here.

Through the 2018 Season, peregrine falcons were the most numerous raptors onsite at the Project. Red-tailed hawks and great horned owls, while numerous, are mainly non-migratory residents and their numbers remain relatively stable from year-to-year, restricted by available appropriate habitat. Peregrine falcons wander greatly, primarily during the 'winter' and 'post-breeding dispersal' periods. As specialists in avian prey, they are a significant threat to plovers and terns. The precise number of peregrine falcons observed is impossible to ascertain but numbers appear to increase each year. Ninety-six observations of peregrine falcons were made during the 2018 season by the APS. Unbanded males and females of all age classes (adults, sub-adults and juveniles) were present onsite at some point during the season. In addition to numerous observations of unbanded individuals, four uniquely banded birds were identified, including the newly banded and relocated juvenile male (see 'Summary of Predator Observations and Trapping Activity'):

1. **VID '17/D' black right, 1687-2214 silver left**, an adult female banded in Southern California in 2013. This large female was photographed onsite on 12 April and again on 7 June. She has been documented each of the last 3 seasons and is a frequent visitor.
2. **VID '90/AH' black left, 1947-27427 silver right,** a juvenile female, was banded this spring as a nestling at the Point Loma aerie in San Diego, California by Diego Johnson of the American Eagle Research Institute.
3. **VID '74/D' black left, silver right,** an adult male, previously discussed.
4. **VID 'W/03' black left, 2206-85657 silver right,** the juvenile male trapped, banded, and relocated this season.

Peregrine falcon observations occurred throughout the Project area, from Pismo Creek to the north, south to the Guadalupe-Nipomo NWR border, and east to the Project limits, this includes the protected and sensitive areas. Common locales for resting birds were near the mouths of Pismo, Carpenter, Arroyo Grande and Oso Flaco creeks. Oso Flaco Creek and the associated lagoon warrant special notation here; this creek is the only flowage onsite that reaches the ocean throughout the Project term. This constant flow is due to the irrigation of the agricultural fields to the east, making this a popular bathing and hunting location.

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[2] Edell, T. The Birds of San Luis Obispo County, California. Fourth Edition. April 2006.

[3] T. Edell, personal communication.

Hunting raptors were documented in areas populated by appropriate avian prey; the shoreline by gulls, terns and shorebirds, and the dunes by horned larks (*Eremophila alpestris*), Brewer's blackbirds (*Euphagus cyanocephalus*) and house finches (*Carpodacus mexicanus*). The composition and number of the shoreline prey base fluctuated throughout the 2018 Season, with June being the least populous month for sanderlings (*Calidris alba*) and western sandpipers (*Calidris mauri*), the two most numerous shorebird species along the Central California coast. Several species of locally nesting and nonbreeding (floater) gulls, including California (*Larus californicus*), Heermann's (*Larus heermanni*) and western (Larus *occidentalis*), provided an adequate prey base for the larger more aggressive individuals such as '17/D'. Documented kills; observed predations, clipped-wings or feather piles indicative of peregrine kills, were of the following species (2016-2018):

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

Peregrine falcons were hazed out of sensitive areas on six occasions, all by use of bird whistler. Passive flushing by approach of vehicle was incidental and occurred on numerous occasions.

Peregrine falcons were observed throughout the 2018 Season, however the frequency and age composition changed by season. A total of 28 peregrine falcons were observed during the 'wintering' and 'pre-nesting' periods of February and March. During this period, subadult birds comprised the majority of age-identified observations (n=19 of 27). This trend was reversed during the 'nesting' period (i.e., from April through June), when a total of 31 peregrine falcon observations were made. During this period, *adults* comprised the majority of age-identified observations (n=16 of 23). Finally, during the 'post-breeding dispersal' period (July through early August), a total of 33 peregrine falcon observations were made, and the number of juvenile bird observations increased sharply, comprising 16 of 30 age-identified observations (the remainder were of adult or subadult birds, which are difficult to distinguish at this time of year).

Species Unknown

Unidentified raptors were documented six times in the Project during the 2018 Season by the APS. These observations represent quick glimpses of birds where few field marks could be obtained and are of relatively little significance.

Sharp-shinned Hawk

The Sharp-shinned hawk (*Accipiter striatus*) is an uncommon winter resident in San Luis Obispo County[4], and likely overwinters in small numbers in and around the Project area, particularly to the east where there are thick stands of eucalyptus. They appear during migration, but usually pass through the area quickly.

Two migrants were observed on 29 and 30 March 2018, one perched at Carpenter Creek and one hunting Indian Midden revegetation island (approximately one mile east of marker post 7 and the nesting area shore). The species is not documented to pose a threat to plovers and terns at the Project.

Cooper's Hawk

Over the course of the 2018 Season, Cooper's hawks (*Accipiter cooperi*) were observed on 29 occasions in the Project by the APS. All but one of the sightings in March (n=14) and April (n=6), were of subadult birds still in juvenal plumage. The occurrence of this species significantly dropped after 30 April with one sighting in May, one in June, none in July, and just two in August, while only one was observed in September. Twenty of the identified 28 birds were subadults or juveniles. Five observations were of birds hunting from the large dune just south of the boardwalk overlook in South Oso Flaco, and six observations were of birds hunting the back bowl of PLR. No Cooper's hawks were hazed. While observations of this species are typically 'rare' after 15 April annually in San Luis Obispo County[3], it probably nests on the fringes of the Project area in small numbers. This species has not been identified as a threat to plovers and terns at the Project.

Northern Harrier

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

There were 12 observations of Northern harrier during the 2018 Season with nine of these sightings being in sensitive areas. At least three unique individuals were observed during the 2018 Season: an adult female, a subadult male and a juvenile of unknown sex.

Red-tailed Hawk

Red-tailed hawks (*Buteo jamaicensis*) are ubiquitous throughout the Project area. One nest was found in the Project area, in Long Valley, 1.05 miles east of PLR. Two other historic nests are located very near and adjacent to the Project. One nest in a eucalyptus grove 0.80 mile east of the mouth of south Oso Flaco Creek, at the western edge of the agricultural fields. A second nest is located 50 yards south of the boundary

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[4] Edell, T. The Birds of San Luis Obispo County, California. Fourth Edition. April 2006.

within Guadalupe-Nipomo National Wildlife Refuge, and 0.6 mile east-southeast of the shoreline. These two nests each fledged three young in 2017 but were not inspected in 2018. The Long Valley nest was determined to be active early in 2018, but there was no follow-up and the fate of this nest was unknown.

There were 113 documented observations of red-tailed hawks in February (n=33), March (n=41) and April (n=39) during the 'wintering' and 'pre-nesting' periods and only 5 for the remainder of the season. This is not surprising, as this species' routine has been well-established at the Project. The South Oso Flaco and North Oso Flaco foredunes, the creek areas, and the Dunes Preserve each provide rich hunting grounds for these large buteos, but little in the way of nesting habitat. By May these birds have moved east into appropriate nesting habitat, set-up territories and initiated nesting, after which they tend to remain out of sensitive areas until later in the season. Surprisingly, no juveniles were observed during the 'post breeding dispersal' period of July and August.

Prior to 2017, red-tailed hawks had not been documented predating plovers, terns or their chicks at the Project, although they have been documented doing so at other sites. On 17 August 2017, a juvenile red-tailed hawk was observed predating a plover chick. The young red-tailed hawk was one of two similar looking juveniles documented hunting the dunes of South and North Oso Flaco sensitive areas. There were no such incidents during the 2018 Season.

Three red-tailed hawk hazing events occurred from 7 March through 24 April by way of bird whistler. All were in North Oso Flaco and South Oso Flaco foredunes.

Great Horned Owl and Large Owl Species Unknown

Two great horned owls were identified for trapping and relocation during the 2018 Season and two birds were successfully trapped in PLR on 16 May and 24 May 2018 respectively. The complete details of these birds are described above (see 'Summary of Predator Observations and Trapping Activities') and will not be repeated here. While other great-horned owls were considered for trapping and relocation there was no directive to initiate trapping efforts.

Great horned owls are ubiquitous in the Project and occupy every niche available to them. They have been documented by their sign, including track, scat, pellets and feathers, the entire length and breadth of the Project area. The physical observation of an owl is a highly opportunistic occurrence due to their secretive and nocturnal habits. Therefore, their actual impact on plover and tern nesting colonies is not well known. The historic nests and the associated trees which held them have all collapsed in the last few years, and no new great-horned owl nests were identified this season.

Great horned owls are an important management concern at the Project due to their abundance throughout the Project area, invariably resulting in disturbance to the nesting colonies. While there has been no documented loss due to great horned owls at the Project they are considered a substantial threat. Owl pellets are examined when found, through the course of each season, and while there are slight changes to the make-up of these remains, depending on location, the majority contain, in varying combinations: kangaroo rat (*Dipodomys sp*.), Norway rat (*Rattus norvegicus*), California vole (*Microtus californicus*), mice *(Peromyscus spp)*, Western harvest mouse (*Reithrodontomys megalotis*), woodrat (*Neotoma spp*.), Jerusalem cricket (*Stenopelmatus intermedius*), or other various insect remains and some vegetative matter. Of the many dozens of pellets found and inspected on the Project only one pellet, found near the Oso Flaco gate by Resource personnel in 2016, contained avian remains (they were not identifiable to species).

Barn owls possibly forage with some regularity in the Project area and are known to nest in the eucalyptus groves and hunt the agricultural fields to the east. There has not been any documentation of this species nesting in the Project area. It is apparent that they are present to some extent within the Project area; the

impact to terns and plovers is unknown, but could be diminished in part because of competition with great horned owls. No barn owls were documented this season.

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

Burrowing Owl

The burrowing owl occurs rarely along the coast and has been designated a 'Species of Special Concern' (SSC) by the CDFW[5]. During the 2018 Season, a lone bird was present at the Fence Corral from 6-16 March. This species has not been identified as a threat to plovers or terns at the Project.

Loggerhead Shrike

Loggerhead shrikes are a threat to plovers and terns at the Project, and their numbers fluctuate from year to year. Historically shrikes were a regular nester in the Project area, but in recent years there has been no documented or suspected nesting. From 9-16 February 2018, a lone adult was present at the fence corral. No other observations of loggerhead shrike were documented by the APS.

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

Sincerely,

BLOOM BIOLOGICAL, INC.

Robert Chapman
Biologist

Michael Kuehn
Senior Biologist/Statistical Analyst

[5] CDFW, Natural Diversity Database. August 2018. Special Animals List. Periodic publication. 66 pp.

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#: 18-0430
Species: LETE
Band: G/Y:B/A
Report Status: Gross

EVENT PROFILE

COMMON NAME: California Least Tern

SCIENTIFIC NAME: *Sterna antillarum browni*

DATE: 8/26/2018

COLLECTION AREA: Oceano Dunes State Vehicular Recreation Area

COUNTY: San Luis Obispo County

STATE: California

CARCASS CONDITION: Moderate

OILED/FOULED: No

NECROPSY DATE: 8/28/2018

NECROPSY BY: Corinne Gibble

REPORT DATE: 9/25/2018

REPORT BY: Corinne Gibble

HISTOPATHOLOGY TAKEN (Y/N?): N

REVIEWING PATHOLOGIST: Melissa Miller

EVENT BACKGROUND

This California Least Tern was a banded G/Y:B/A fledgling found in the wash zone of the Oceano Dunes State Vehicular Recreation Area (ODSVRA) exclosure shoreline on 8/26/2018 at 1240pm. The bird was known to have fledged on 8/2/20183 and was from a known nest, LT34 hatching on 8/2/2018. This bird was last seen alive on 8/25/2018 in the same stretch of beach it was found dead. Other juvenile terns were noted to have been in the area at the same time.

NECROPSY SUMMARY

No bone fractures or luxations were observed on postmortem radiographs (Figure 1). This bird was moderately decomposed, and was actively molting. Externally, two puncture wounds were visible in the dorsal thoracic subcutis near the junction between the lower cervical spine and upper thoracic spine (Figure 2A, 2B). Hemorrhage was visible surrounding the wounds. Subcutaneous and intramuscular hemorrhage and congestion were found internally at the wound site. Moderate systemic venous dilation, and congestion and possible hemorrhage at the back of the skull were noted (Figure 3B, Figure 4) potentially due to shock. Although the cause of the acute trauma is unknown, wounds from predation by a large bird is plausible. Predation is one of the leading causes of decline in this species.

The bird was a juvenile male based on plumage characteristics, reproductive anatomy size and type, and presence of a prominent bursa of Fabricius. The proventriculus and ventriculus were full of small scales and fish bones, and the gastrointestinal tract was full of digesta, indicating that the fledgling was actively foraging prior to death. Adequate pericardial, subcutaneous and internal adipose, and absence of pectoralis muscle atrophy indicate the bird was in excellent nutritional condition (Figure 3A). There was no gross evidence of significant disease or postmortem scavenging.

COMPLETED TESTS/PROCEDURES

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

GROSS FINDINGS

Acute trauma, presumptive, characterized by:

- Acute puncture wounds at dorsal thoracic subcutis near insertion of cervical spine (Figure 1A, 1B).
- Marked, vascular congestion and hemorrhage throughout body, but especially concentrated near wound site (Figure 3B)
- Acute congestion at back of skull (Figure 4)

INCIDENTAL FINDINGS

N/A

HISTOPATH SUMMARY

Histopathology not taken

HISTOPATH DIAGNOSES

Histopathology not taken

FINAL DIAGNOSES

Presumptive cause of death: Acute trauma

COMMENT

N/A.

SAMPLES SAVED

Cryoarchived samples (-20): pectoral muscle, liver, kidney, spleen, bile, gastric, cecum and cloacal content.

IMAGES

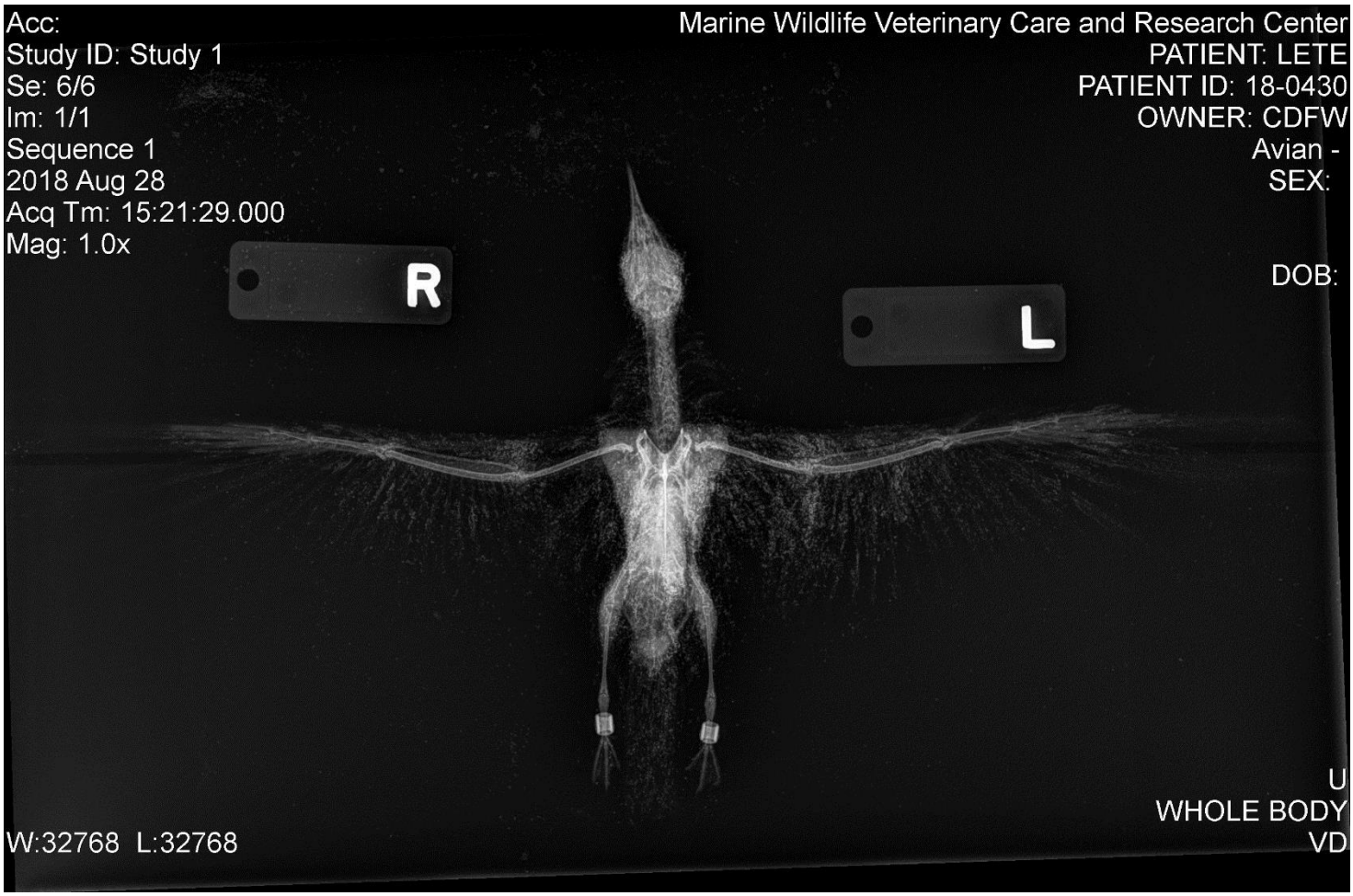

Figure 1. Ventrodorsal radiograph

Figure 2A. External view of moderately decomposed fledgling with two dorsal puncture wounds; Figure 2B. Two dorsal puncture wounds

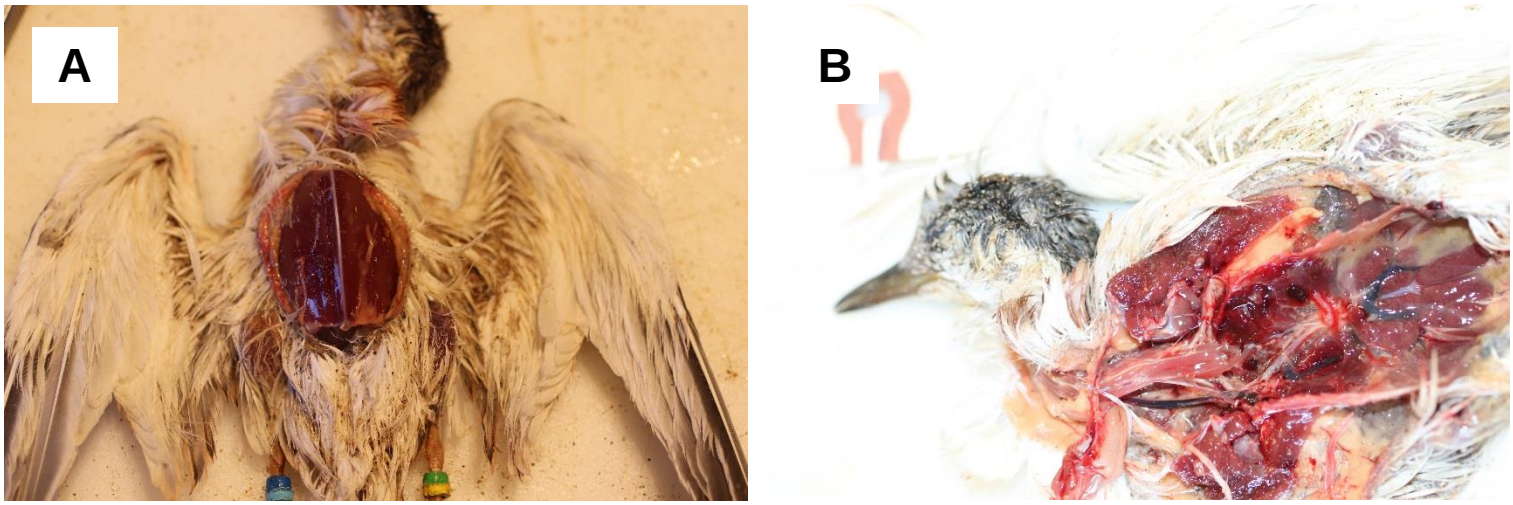

Figure 3A. Adequate subcutaneous adipose and absence of pectoralis muscle atrophy 3B. Internal view showing moderate systemic venous dilation and congestion

Figure 4. Congestion and possible hemorrhage at the back of the skull

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NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road
Madison, Wisconsin 53711-6223
608-270-2400 (FAX 608-270-2415)

DIAGNOSTIC SERVICES CASE REPORT

Case: **28801**

Final Report

7/26/2018

Epizoo:

Legal ☐ **Declassified** ☐ **INV#:**

Submitter:

Ronnie Glick
California Department of Parks and Recreation/Pismo Beach
340 James Way
Suite 270
Pismo Beach, CA 93449

Date Submitted: 7/10/2018

Specimen description/Identification/Location:

ACC	*SPECIES*	*SPECIMEN TYPE*	*BAND NUMBER*	*SUBMITTER's ID*	*COUNTY*	*STATE*
001	Plover, Western Snowy	CARCASS	SF64 1 BB:VG		San Luis Obispo	CA

Diagnosis:

1. Pulmonary hemorrhage, severe
2. Intestinal cestodiasis
3. Intestinal trematodiasis

Event History:

One Western snowy plover fledge was found dead at the Oceano Dunes State Vehicular Recreation Area breeding site on 7/2/18. This is a federally threatened species. The plover was from ODSVRA nest SF64-18. This bird was last seen alive on 6/30/18 at 38 days old and appeared normal. It was found lying immediately on the north edge of an active nest bowl (SP174) of another plover while the SP174 adult was incubating. The carcass was in rigor and appeared very fresh when found. No indication that weather or other environmental conditions played a part in the death of this bird.

Two chicks banded BB:VG fledged from the SF64 nest (reached 28 days on 20 June) and both were last seen alive on 30 June at 38 days old in the same area this carcass was found (8 shoreline: west of marker posts W66W-W67W). They have recently had two other sightings of two different young plover fledges on separate days brooding at two other nest sites in the last week. This is not necessarily abnormal behavior but it is uncommon to observe.

Comment:

Accession 001

Necropsy findings/Histology:

A fledgling Western Snowy Plover in poor body condition and fair postmortem state is presented for necropsy. On external examination, eyes are severely sunken and eyelids are covered with sand. Abundant fecal material is present in the feathers around the vent. There are no palpable fractures. On internal examination, there is scant subcutaneous, visceral and epicardial fat. The esophagus and proventriculus are empty. The ventriculus contains sand. Intestines are sent to parasitology for possible acanthocephalan ID. Kidneys are pale with a prominent reticular pattern. The cloaca is very distended. There is moderate autolysis of most visceral organs. There are no additional significant gross findings. Histopathologic evaluation was hindered by postmortem autolysis. Significant histologic findings included severe pulmonary hemorrhage.

Diagnostic test results:

Routine culture of the liver yielded light mixed growth of *Enterococci* sp. and *Escherichia coli* which are considered contaminants. No parasites were observed on a Sheather's exam. Within the intestine, 162 cestodes and 3 *Microphallid* (trematode) were observed. An Avian Influenza Virus matrix RT-PCR Screen using tracheal and cloacal swabs was negative.

Comments:

Cause of death in this Western Snowy Plover is pulmonary hemorrhage, but the cause of the hemorrhage is not determined. On histopathology, suspect protozoal organisms were identified in several organs but could not be confirmed due to tissue decomposition. Cestodes and trematodes were identified in the intestines, but no acanthocephalans were observed.

Case: **28801**
Epizoo:

Final Report

7/26/2018

Legal ☐ **Declassified** ☐ **INV#:**

Susan Knowles

Susan Knowles DVM, PhD, DACVP

Staff Pathologist

Phone: 608-270-2462 **Email:** sknowles@usgs.gov

The USGS-National Wildlife Health Center conducts wildlife disease investigations with state, federal and tribal partners, and we welcome collaborative dissemination of this information (e.g., publication, press release, technical report, etc.). Please contact the pathologist or wildlife disease epidemiologist assigned to this case to ensure that information is accurately interpreted and appropriately credited.

Copies To:

MIGRATORY BIRD COORDINATOR (R8)
USFWS Sacramento (RO8), 2800 Cottage Way W-2606, Sacramento, CA 95825

ENDANGERED SPECIES (RO8)
USFWS Sacramento (RO8), 2800 Cottage Way W-2606, Sacramento, CA 95825

KRYSTA ROGERS
California Dept of Fish & Game/WildlifeInvLab/Rancho Cordova, Wildlife Investigations Lab, 1701 Nimbus Rd. Suite D, Rancho Cordova, CA 95670

LENA CHANG
UWFWS Fish&Wildlife Office (ES/EC/SE)/Ventura, 2493 Portola Rd, Suite B, Ventura, CA 93003

LAIRD HENKEL
California Dept of Fish & Game/Santa Cruz, 1451 Shaffer Road, Santa Cruz, CA 95060

This is a Report for your submission to the National Wildlife Health Center.

For consultation regarding diagnostic findings or laboratory testing and results, please contact the pathologist. Contact information can be found underneath the signature line on this report.

For consultation on the significance of this disease to wildlife populations in your area, assistance with disease control and response, or to report field updates (numbers and species affected, geographical distribution, end date, etc.), please contact an NWHC epidemiologist at NWHC-epi@usgs.gov or 608-270-2480.

CASE#: 18-540 SPECIES: SNOWY PLOVER

Date Admitted	Band	Reference Number	Name
1:53 pm			

Intake

Admitted By	Sue Morgenthaler		
Address Found	928 Pacific Blvd. – Oceano, CA	**Date Found**	
Reasons for Admission	filament injury to foot		
Care by Rescuer			

Initial Exam

Dehydration	Mild	**Weight**	37g	**Sex**	Unknown
Age	Adult	**Attitude**	Alert	**BCS**	Thin
Mucous Membrane Color		**Temperature**	F		

Eyes / Ears / Mouth / Nares	Slight malocclusion tip of bill
Feathers / Skin	Lice-maybe not preening efficiently b/c of malocclusion?
Legs / Feet / Hocks	Fine hair wrapped multiple times around foot and bases of digits, L foot. Third digit almost completely severed-necrotic. D4 dangling, but still viable. D2 has significant wound at base, but is in the best shape of all of the digits.
Comments	Removed constriction w/small suture scissors. Deep lacerations around all digits. Removed D3 b/c barely attached and devitalized. Flushed other sites w/saline. Injected w/bupivacaine. Wound sites very vascular, so hoping will be some healing. Placed several horiz matt sutures using 7-0 vicryl around bases of D2 and D4 to appose skin in effort to preserve digits. Covered site w/tegaderm. House on sheets for next few days until sutures have a chance to heal a bit. Recheck tomorrow.
Treatments	Removed constriction, midazolam, butorphanol, sutured remaining digits, 4ml LRS SQ, enrofloxacin, meloxicam, tramadol, pentoxifylline, ivermectin
Examiner	SR/ES

Treatment Log

Apr 26, 2018	RX: 0.01ml of 10mg/ml Butorphanol im sd from 4/26/2018 until 4/26/2018
Apr 26, 2018	RX: 0.02ml of 1mg/ml DILUTE midazolam im sd from 4/26/2018 until 4/26/2018
Apr 26, 2018	RX: 0.03ml of 22.7mg/ml Enrofloxacin po bid from 4/26/2018 until open
Apr 26, 2018	RX: 0.02ml of 1.6mg/ml Meloxicam po bid from 4/26/2018 until 4/30/2018
Apr 26, 2018	RX: 0.03ml of 25mg/ml Tramadol po bid from 4/26/2018 until 4/28/2018
Apr 26, 2018	RX: 0.04ml of 20mg/ml Pentoxifylline po bid from 4/26/2018 until open
Apr 26, 2018	RX: 0.01ml of 1mg/ml DILUTE ivermectin po sd from 4/26/2018 until 4/26/2018
Apr 26, 2018	**Intake Exam**, **Weight**: 37g, **Temperature**: F, **Age**: Adult, **Sex**: Unknown, **BCS**: Thin, **Dehydration**: Mild, **Attitude**: Alert, **Comments:** Removed constriction w/small suture scissors. Deep lacerations around all digits. Removed D3 b/c barely attached and devitalized. Flushed other sites w/saline. Injected w/bupivacaine. Wound sites very vascular, so hoping will be some healing. Placed several horiz matt sutures using 7-0 vicryl around bases of D2 and D4 to appose skin in effort to preserve digits. Covered site w/tegaderm. House on sheets for next few days

	until sutures have a chance to heal a bit. Recheck tomorrow., **Treatment:** Removed constriction, midazolam, butorphanol, sutured remaining digits, 4ml LRS SQ, enrofloxacin, meloxicam, tramadol, pentoxifylline, ivermectin, **Examiner:** SR/ES
Apr 26, 2018 1:56 pm	Moved to TXR
Apr 27, 2018	FECAL: Float=Negative, Direct=Negative, NSF. Technician: SR
Apr 27, 2018 12:00 pm	Moved to SBR
Apr 27, 2018 6:56 pm	**BW: 36.00g** Very BAR. Difficult to assess use of leg b/c moving around so quickly, but obviously bearing some weight on it. Dressing in place and tissue looks clean underneath, so left alone. Recheck Monday. SR
Apr 29, 2018	FECAL: Float=Negative, Direct=Positive, D+ giardia, 2 trophozoites seen. Technician: VM
Apr 29, 2018	RX: 0.03ml of 50mg/ml Metronidazole po bid from 4/29/2018 until 5/3/2018
Apr 30, 2018 8:12 am	Found dead in enclosure in AM. ES

Disposition

Disposition	Died +24hr	**Criminal Activity?**	**Transfer Type**
Disposition Date		**Carcass Saved?**	**Release Type**
Disposition Location	PWC CA		

CASE#: 18-1432 SPECIES: SNOWY PLOVER

Date Admitted 2:15 pm **Band** White/Yellow R; Pink/Green L **Name**

Reference Number **Microchip Number**

Intake

Admitted By MA

Address Found 928 Pacific Blvd. – Oceano, CA **Date Found**

Reasons for Admission broken leg/wing

Care by Rescuer

Notes About Rescue

Initial Exam

Dehydration	Moderate	**Weight**	6g	**Sex**	Unknown
Age	Hatchling / Chick	**Attitude**	Depressed	**BCS**	Reasonable
Mucous Membrane Color	Pink	**Temperature**	F		

Legs / Feet / Hocks R leg held fully extended, possible knee luxation or slipped tendon. Knuckling R foot, mild abrasion on top of R pedal joint

Comments biologists reported observing injured leg for several days

Treatments placed in 103F incubator, .6 ml LRS with b complex SQ, meloxicam

Examiner VM

Treatment Log

Jul 8, 2018 FECAL: Float=Negative, Direct=Positive, D+2 giardia. Technician: VM

Jul 8, 2018 RX: 0.01ml of 25mg/ml Flagyl bid from 7/8/2018 until 7/13/2018

Jul 8, 2018 **Intake Exam**, **Weight**: 6g, **Temperature**: F, **Age**: Hatchling / Chick, **Sex**: Unknown, **BCS**: Reasonable, **Dehydration**: Moderate, **Mucous Membrane Color**: Pink, **Mucous Membrane Texture**: Tacky, **Attitude**: Depressed, **Comments:** biologists reported observing injured leg for several days, **Treatment:** placed in 103F incubator, .6 ml LRS with b complex SQ, meloxicam, **Examiner:** VM

Jul 8, 2018 RX: 0.02ml of 0.4mg/ml Dilute Meloxicam bid, (Loading Dose: 0.03ml) from 7/8/2018 until 7/12/2018

Jul 8, 2018 3:31 pm Moved to SBR, incubator

Jul 8, 2018 3:41 pm Stressed, open-mouthed breathing, not stable enough to withstand much handling. Housed in soft cup nest to keep R leg in more natural position. Handfeeding 1-2 mini-mealworms soaked in 5% dextrose q 30 minutes (natural food items unavailable until tomorrow per ODSVRA staff, and bird very unlikely to self feed in current condition). Plan to apply tape splint to R leg when bird more stable. VM

Jul 9, 2018 RX: 0.01ml of 100mg/ml Calcium Carbonate sid from 7/9/2018 until open

Jul 9, 2018 9:31 pm **BW: 6.00g** Much more alert, standing, and walking though still knuckling R foot. Continued handfeeding regimen throughout day. Applied splint/shoe to R foot at 9 PM, seems to be holding foot normally with splint in place. Continue housing in incubator and hope to test for self feeding

	tomorrow. VM
Jul 10, 2018 7:38 pm	**BW: 6.00g** BAR, holding foot normally with shoe on though still not bending R knee. Introduced talitrids into incubator in AM, at 130 wt up to 6.9 g, at 7 to 7.3 g; eating well. VM
Jul 12, 2018 7:48 pm	BAR. Very active in enclosure. Shoe on R foot in place. Foot in normal position, but doesn't appear to be able to bring leg forward from stifle. Looks like sciatic nerve injury. If no improvement with a week of treatment, would be quite skeptical of bird's ability to function well enough for release. Plan to remove shoe tomorrow and see how things go. SR
Jul 13, 2018 7:25 pm	BAR. Active. Vocal. Still not flexing R leg at hock. Removed shoe R foot. Continued to place foot normally after shoe removed. Bears weight normally on R leg at rest, even seemed to be shifting weight from L onto R, but when tries to move quickly, tends to hop on L leg only. Difficult to say if improvement overall since just saw bird yesterday. Left foot unwrapped. Recheck Monday. SR/Nalana
Jul 16, 2018 6:21 pm	Very BAR. Walking normally! Placing R foot normally. Flexing and extending hock normally, although does feel a bit weaker on palpation. Made remarkable improvement over the weekend. Continue to monitor for another couple of days, but after that, might be able to return to nest site. SR
Jul 18, 2018	RX: 0.01ml of 12mg/ml Ronidazole sid from 7/18/2018 until 7/22/2018
Jul 18, 2018	FECAL: Direct=Positive, D+giardia, 1 seen. Technician: VM
Jul 18, 2018 6:14 pm	BAR. Running around, looking like a pretty normal plover. Was concern that vocalizations were sounding abnormal, but sounding OK to me. Ausculation WNL. ODSVRA may want to transfer to SB zoo until fledging rather than attempt reunite. We will keep through weekend while they decide what they will do. SR/Marianna
Jul 19, 2018 12:00 pm	Moved to SBR, basket
Jul 22, 2018	FECAL: Direct=Negative. Technician: VM
Jul 23, 2018 6:47 pm	BAR. Has grown noticeably since last seen. Walking normally, but noticed mild swelling of R pedal joint. Joint doesn't feel hot and bird is using normally. Small abrasion on dorsal surface, likely from when bird was knuckling. Recheck Wed to see if has changed. SR
Jul 25, 2018	RX: 0.02ml of 22.7mg/ml Enrofloxacin po bid from 7/25/2018 until 8/1/2018
Jul 25, 2018	RX: 0.01ml of 1.6mg/ml Meloxicam po bid from 7/25/2018 until 7/29/2018
Jul 25, 2018 6:09 pm	**BW: 22.00g** BAR, but limping noticeably on R foot. Looks little more swollen, red. Feels warm. Third digit folds under foot intermittently. Doesn't appear that bands are tight. Rx enrofloxacin and meloxicam. Recheck Friday. SR
Jul 27, 2018 1:33 pm	BAR and vocal, but still favoring R leg significantly. Swelling of foot resolved, but now swelling has moved up to the hock area. Removed bands on that leg just in case they are a complicating factor. Continue meds. Recheck Monday. SR
Jul 31, 2018 7:02 pm	BAR, but still heavily favoring R leg. Hock more swollen, esp along posterior surface. Has trouble extending completely. Might need to make small incision and see if can flush out any material. Plan for tomorrow. SR
Aug 1, 2018	RX: 0.03ml of 2mg/ml Butorphanol im sd from 8/1/2018 until 8/1/2018
Aug 1, 2018	RX: 0.01ml of 1mg/ml Midazolam im sd from 8/1/2018 until 8/1/2018
Aug 1, 2018 8:48 pm	BAR, but placing minimal weight on R leg. Sedated w/midazolam and butorphanol. Injected R hock w/bupivacaine. Cleaned site w/saline. Made small incision along lateral surface of joint w/25g needle. Expressed small amt debris. Joint feels a little lax-concerned about damage that may have been done to stabilizing ligaments. Covered incision w/telfa and tegaderm. Placed supporting wrap of cast padding and vetwrap around R hock. Change ABs to cefpodoxime. Recheck Friday. SR/Marianna
Aug 2, 2018	RX: 0.04ml of 25mg/ml Cefpodoxime po bid from 8/2/2018 until open
Aug 3, 2018 7:42 pm	BAR and vocal. Running around, but not using R leg much. Removed wrap from R hock. Swelling decreased, but still signficant. ROM still slightly reduced, more so in extension. Seems to place a little more weight on than was on Wed. Covered incision site w/tegaderm, but left otherwise unwrapped. Recheck Monday. SR/ES
Aug 4, 2018 6:16 pm	**BW: 26.00g** JM

Aug 8, 2018	RX: 0.02ml of 1.6mg/ml Meloxicam po bid from 8/8/2018 until 8/12/2018
Aug 8, 2018 12:00 pm	Moved to F5 Annex
Aug 8, 2018 3:29 pm	**BW: 30.00g** BAR. Good body condition. Still heavily favoring R leg, but is placing significantly more weight on that foot. Swelling of hock decreased, but not completely resolved. ROM of joint WNL. Doesn't feel lax. Continue ABs. Start another round of meloxicam. Recheck Friday. SR/Brian
Aug 13, 2018 2:15 pm	BAR. Good body condition. Use of R leg improving in small increments every time seen. R hock still mildly swollen. ROM WNL. Continue ABs. Recheck Thurs. SR
Aug 15, 2018 12:12 pm	BAR. Good body condition. Limp almost undetectable when bird running, but still shifts weight off of R foot when standing still. FF almost completely emerged. Swelling noticeably improved as well. Since going to be gone this weekend, going to continue meds to make sure nothing goes awry while I'm gone. Recheck Tues. SR
Aug 17, 2018 12:00 pm	Moved to AV1
Aug 22, 2018 6:41 pm	Very BAR and vocal. Runs around quickly, so much so, that you can barely tell that bird doesn't place R foot completely flat. Seems like still may not be able to fully extend R hock. Regardless, very mobile. Swelling of R hock resolved. Isn't developing any wear lesions on either foot. D/C meds. Think OK to transfer for continued evaluation as to whether or not the bird will be releasable. SR
Aug 24, 2018 8:10 pm	BAR. Good body condition. Practically an adult by this time. Moves quickly, but does only toe touch w/R foot, not extending R hock fully. Hock continues to look a little thickened, but not inflamed. Plan to reassess Monday and if no change in condition, will transfer to SB Zoo. SR
Aug 25, 2018 1:53 pm	Stringy seaweed was tightly wrapped around L leg. Removed. KD
Aug 27, 2018 2:14 pm	Very BAR. Good body condition. Moves quickly. Still only toe-touching w/R foot. No change in appearance of R leg. Think it is what it is. OK to transfer to SB Zoo and evaluate potential for release. SR

Disposition

Disposition	Transferred	**Criminal Activity?**	**Transfer Type**
Disposition Date		**Carcass Saved?**	**Release Type**
Disposition Location	ODSVRA CA		

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CASE#: 18-1631 SPECIES: SNOWY PLOVER

Date Admitted 11:16 am **Band** **Reference Number** **Name**

Intake

Admitted By	Nicole Graham		
Address Found	on beach – Oceano, CA	**Date Found**	
Reasons for Admission	pecked/thrown around by adult in area		
Care by Rescuer			
Notes About Rescue			

Initial Exam

Dehydration	Moderate	**Weight**	5.5g	**Sex**	Unknown
Age	Hatchling / Chick	**Attitude**	Depressed	**BCS**	Reasonable
Mucous Membrane Color		**Temperature**	F		

Eyes / Ears / Mouth / Nares	Large amt (for size of bird) sand in conjunctival sac OU. Flushed w/saline
Feathers / Skin	Matted feathers on neck. Tiny puncture wounds visible on either side
Comments	Placed in incubator on arrival. After ~30 minutes, performed exam, gave fluids. Couple hours later, was walking around a bit, although still quite weak. HF small mealworms and talitrids.
Treatments	Heat, oral 50% dextrose, 0.5ml LRS SQ
Examiner	SR/Keely

Treatment Log

Jul 27, 2018	**Intake Exam**, **Weight**: 5.5g, **Temperature**: F, **Age**: Hatchling / Chick, **Sex**: Unknown, **BCS**: Reasonable, **Dehydration**: Moderate, **Attitude**: Depressed, **Comments:** Placed in incubator on arrival. After ~30 minutes, performed exam, gave fluids. Couple hours later, was walking around a bit, although still quite weak. HF small mealworms and talitrids., **Treatment:** Heat, oral 50% dextrose, 0.5ml LRS SQ, **Examiner:** SR/Keely
Jul 27, 2018 6:11 pm	Moved to TXR-incubator
Jul 27, 2018 6:19 pm	Moving around a bit in pm, but intermittently open-mouthed breathing. Doesn't appear too warm in incubator. Check again before leaving. SR
Jul 28, 2018 9:24 am	Dehydrated in AM. All food and water dish dried out. Lost weight overnight, FF soaked MW. Gave 0.5 ml LRS SQ. ES
Jul 28, 2018 9:15 pm	Turned incubator down a little. Bird was open mouth breathing, eyes partially closed, gave 0.4ml LRS SQ. Perked up shortly after. KD
Jul 29, 2018	FECAL: Float=Negative, Direct=Negative, direct inconclusive. Technician: VM
Jul 29, 2018 7:26 pm	**BW: 5.50g** BAR. Observed eating small mealworms from floor of enclosure. Discontinued handfeeding @ 10 AM, @ 1 PM wt= 5.7. Eating well throughout day. VM
Jul 30, 2018	FECAL: Float=Negative, Direct=Negative. Technician: VM
Jul 31, 2018 7:13 pm	**BW: 6.80g** BAR. Running around in incubator. NSF on physical exam. Would be OK to return anytime, if that is the plan. SR

Disposition

Disposition	Transferred	**Criminal Activity?**		**Transfer Type**	Other
Disposition Date		**Carcass Saved?**		**Release Type**	
Disposition Location	Santa Barbara Zoo CA				