

**Western Snowy Plovers and California Least Terns on
Rancho Guadalupe Dunes Preserve, Guadalupe CA
2019 Final Report**



Prepared for:

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Summary

This report summarizes the 2019 Western snowy plover (snowy plover, plover) and California least tern (least tern, tern) breeding season monitoring on Rancho Guadalupe Dunes Preserve (RGDP). RGDP is owned and operated by the County of Santa Barbara (County). Monitoring was conducted by Thomas Applegate (Wildwing Recovery Permit # TE-823990-4) under contract to the County of Santa Barbara. This was the twelfth season Wildwing conducted the monitoring at RGDP.

Sixty-four plover surveys were conducted between March 11 and August 27, 2019. The first known snowy plover nest was initiated on approximately March 22 and the last on July 14. Sixty-five nests were found and the fates of 51 were determined. Seventeen nests hatched at least 1 chick, 29 were lost to predators, 6 were destroyed by unknown causes, 3 were abandoned, 1 was lost to wind, and the fates of 9 nests could not be determined. Forty-six chicks hatched from the 17 successful nests. The first known hatch occurred on approximately June 3 and the last on July 31. Color banding of chicks did not occur so chick survival rates could not be determined.

Least tern monitoring was conducted concurrently with snowy plover monitoring when terns were present. The first known least tern nests were documented on June 4 when 2 nests were confirmed. Seventeen tern nests were found, and the fates of 9 were determined. Eight nests hatched producing 15 chicks. One nest was destroyed by a coyote, and the fates of the remaining 8 nests could not be determined. Chicks were not color banded therefor a fledge rate could not be determined due to an influx of least tern juveniles from other breeding sites

Introduction

Western snowy plovers (*Charadrius nivosus nivosus*) are small shorebirds measuring about 6 inches in length with pale brown to grey upper parts, a white belly and dark patches on the head and shoulders. The Pacific coast population nests near tidal waters of the Pacific Ocean on sand beaches and dunes, adjacent bays, and coastal river bars. The current known breeding range is from Damon Point, Washington to Bahia Magdalena, Baja California, Mexico. Snowy plovers that nest inland at alkaline lakes, ponds and river bars in the western states are not considered part of the coast population. The U.S. Fish and Wildlife Service (USFWS) designated the Pacific Coast population as “Threatened” on March 5, 1993 (Federal Register 58(42)12864-12874) under provisions of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

California least terns (*Sterna antillarum brownii*) are grey, white and black, and measure about 9 inches in length. They are the smallest North American tern. Least terns utilize suitable breeding habitat from Baja California, Mexico to the San Francisco Bay area in California. Nesting occurs on open sand, sand-shell beaches, and sand-fill sites where little vegetation exists. Breeding colonies are typically located within close proximity to waterways where birds forage for small fish. Least terns tolerate a considerable range in colony sizes. Some colonies have hundreds of birds, while some pairs nest alone or with a few other pairs. The species was given state and federal endangered status in 1970 (Federal Register 35(106)8491-8498) under the provisions of the Endangered Species Conservation Act of 1969 (16 USC 851 *et seq.*). Least terns are present in their breeding areas from late May through August and are absent the remainder of the year.

RGDP contains suitable breeding habitat for both snowy plovers and least terns. The site was monitored in 2001, and from 2003 through 2019. Prior to 2001 some non-intensive intermittent monitoring occurred, but no comparable data resulted from those efforts. Plovers have been documented nesting and wintering yearly and terns have nested 8 seasons since monitoring began. This report compares available and applicable yearly data collected since 2001 with the 2019 breeding season data (Applegate and Schultz 2003, 2004, 2007 through 2012, 2016 through 2018, Kelly 2014, 2015, Kelly and Applegate 2013, SRS 2006, Sandoval 2005, Persons 2001).

Study Area

RGDP encompasses approximately 592 acres of dune, scrub and riparian habitat immediately south of the Santa Maria River in northern Santa Barbara County, and borders the Pacific Ocean for approximately 1.3 miles. It extends inland up to 1.4 miles, and is part of the 18 mile long Guadalupe-Nipomo Dunes Complex. Additional suitable plover and tern breeding habitat extends north through the Guadalupe Restoration Project, Guadalupe-Nipomo Dunes National Wildlife Refuge, and Oceano Dunes State Vehicular Recreation Area (Oceano Dunes SVRA). South of RGDP, contiguous breeding habitat exists on Gordon Sand and the Leroy Trust properties.

The majority of RGDP is suitable breeding habitat for snowy plovers and least terns. Breeding habitat consists of a coastal beach strand bordered by open sand sheets with partially vegetated foredunes, backdunes, manmade gravel flats, sections of old asphalt road and pad, and seasonal mudflats along the Santa Maria River. Beaches have numerous logs, small plant debris, kelp, rocks and shells of varying sizes, and human litter. The remainder of the habitat is coastal dune scrub with a riparian corridor. An access road on the north side of the property leads to a parking area near the beach. Strong westerly and northwesterly winds of 25 to 35 miles per hour are common in spring and early summer but generally decrease as the season progresses. Heavy winter surf generally erodes and narrows the beach, and sand returns and widens beaches in the summer.

Vegetation on RGDP is relatively stable, and the quality of tern and plover breeding habitat is high. Dominant native plant species are sand verbena (*Abronia latifolia*, *A. maritima*), beach morning glory (*Calystegia soldanella*), beach saltbrush (*Atriplex leucophylla*), and beach bur (*Ambrosia chamissonis*). Dominant non-native species are sea rocket (*Cakile maritima*) and iceplant (sea fig, *Carpobrotus chilensis*). European beachgrass (*Ammophila arenaria*), a problematic invasive found on the northern portion of the Dunes Complex, is absent on RGDP.

Methods

Snowy Plovers

Snowy plover monitoring was conducted in suitable breeding habitat from March 11 to August 27, 2019. A total of 64 field surveys were conducted on foot. Seven surveys were conducted in March, 12 in April, 12 in May, 14 in June, 13 in July, and 6 in August. In an attempt to avoid frequent afternoon high winds, most surveys were conducted during morning hours. Late in the season when high winds became less frequent some afternoon and evening surveys were conducted.

An attempt was made to locate all nests. "Nests" include scrapes containing 1 or more eggs, and empty scrapes with convincing evidence that one or more eggs had been present. Empty scrapes without evidence of eggs or chicks, and single "dumped" eggs are not counted as nests. Nests were consecutively numbered and pertinent information was recorded. Regular subsequent visits to each nest were made to monitor its status. Plover nests within the tern colony were not checked as often to reduce disturbance to nesting terns. Nests were not physically marked: their locations were recorded using existing landmarks, and locations were recorded using GPS equipment in August.

Nest fates were determined by evidence at the nest sites. Those that disappeared before their expected hatch date were examined for the probable cause of loss. Empty nests near or past their expected hatch date were checked for chicks in the vicinity of the nest, displaying adults, eggshell pips in the nest, a flattened nest area, or for evidence of predators or other causes of loss. Hatching dates were estimated by known or estimated egg laying dates, and were projected 31 days after clutch initiation (Warriner et.al., 1986). Eggs were not floated, and chicks were not banded.

A snowy plover census was conducted on May 21 as part of a coordinated range-wide survey. This yearly census is coordinated by the U.S. Fish and Wildlife Service and occurs when the population is expected to be stable and consist primarily of breeding plovers. Census data includes age, sex, location, and the number and size of chicks. Each plover was checked for color-bands.

California Least Terns

Least tern monitoring was conducted concurrently with snowy plover monitoring. Searches for least terns began in mid-May and extended into August. When least terns were observed, their number, location and activities were recorded. To minimize disturbance, terns were monitored from a distance and birds were not approached during courtship and nest initiation. Most monitoring was done from 4 specific locations using binoculars and a spotting scope. Nest locations were mapped from these observation points. When nests were established occasional walk through surveys were made to determine the number of eggs in nests and nest status. Fates were determined by evidence at the nest sites. Broods were monitored from a distance from various locations. No chick banding occurred.

Results

Snowy Plovers

Nesting Population

The number of nesting snowy plovers was estimated using active nest data. Bi-weekly population estimates (Table 1) include only nesting plovers and do not include birds that were rearing broods or in the process of nest initiations. Topography and wide spread habitat use precludes accurate visual census of all on site plovers.

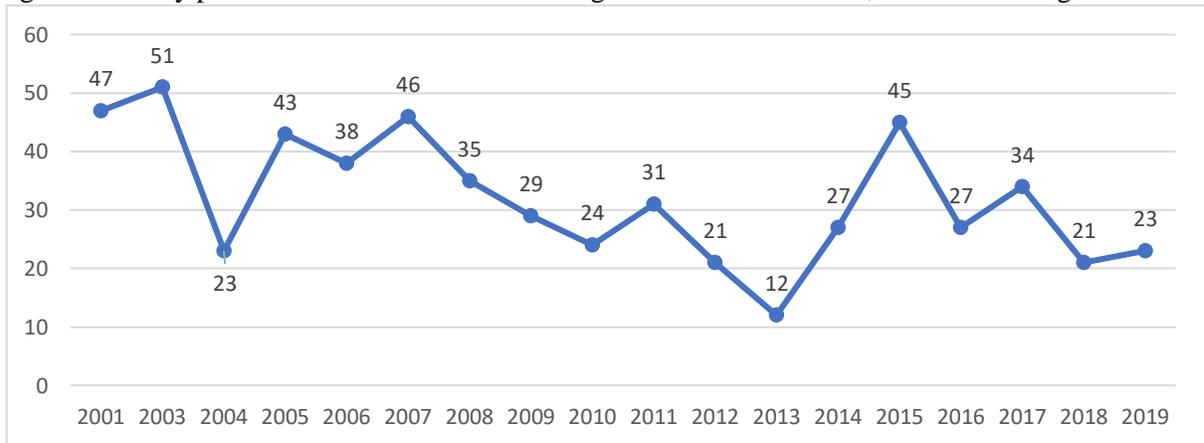
Table 1. Estimated bi-weekly nesting pairs during the 2019 season.

March		April		May		June		July		August	
Early	Late	Early	Late								
0	7	10	21	25	18	21	15	12	9	2	0

On May 21 a snowy plover population census was conducted as part of the annual coordinated range-wide survey. Beach and backdune habitats were surveyed. Twenty-three adult plovers including 14 males and 9 females were observed. The sex of 3 birds was not determined. No juveniles or chicks were seen (Figure 1).

Three plovers were color banded. One male was banded NW:YR (brown over white on the right leg and yellow over red on the left leg). Another male was banded YR:YB (yellow over red on the left and yellow over blue on the right), and a female was banded W:WG (white left and white over green right). The number of plovers observed on the census is not considered the total number onsite on that date because plovers may be hidden from view, or move during the survey. Nest data shows that approximately 18 adult pairs were nesting on RGDP during the late May indicating approximately 36 plovers were breeding on RGDP at the time of the census. No nests had hatched prior to the census so no plovers were rearing broods on RGDP at the time of the survey.

Figure 1. Snowy plovers counted on the RGDP range-wide census in 2001, and 2003 through 2019.



Nesting and Productivity

Sixty-five plover nests were found on RGDP during the season (Appendix 1, Figure 2). The fates of 50 were determined. Seventeen nests hatched at least 1 chick, 29 were lost to predators, 6 were destroyed by unknown causes, 3 were abandoned, 1 was lost to wind, and the fates of the remaining 9 nests were not determined (Table 2). The number of nests and their fates from 2001 through 2019 are compared in Appendix 3. Forty-six chicks hatched from the 17 successful nests (Figure 3).

Figure 2. Number of snowy plover nests on RGDP in 2001, and 2003 through 2019.

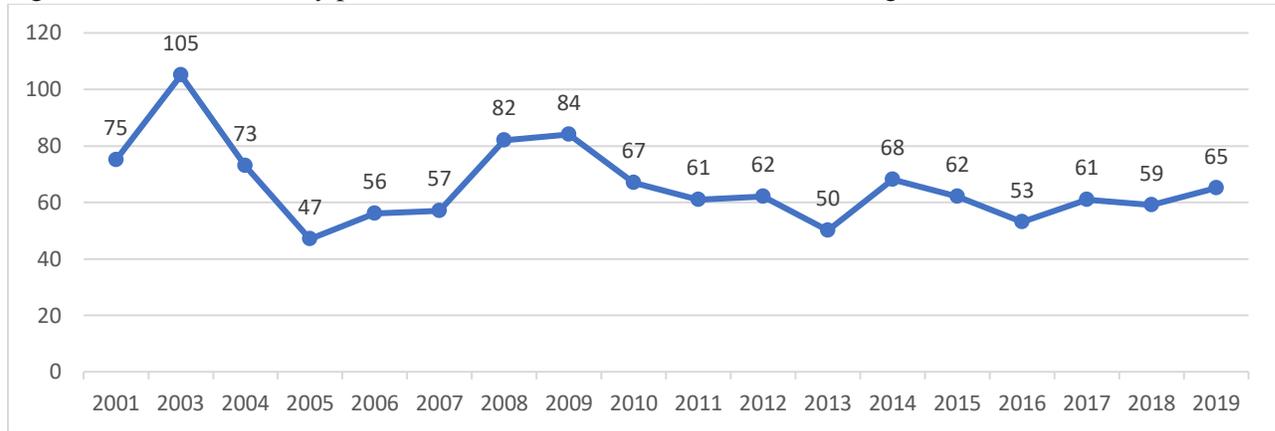


Table 2. The number and fates of snowy plover nests in 2019.

Year	Total Nests	Hatch	Predator	Dst. Unk	Aband.	Wind	Unk. Fate
2019	65	17	29	6	3	1	9
		26%	45%	9%	5%	2%	13%

Hatch - hatched one or more eggs, Predator - destroyed by predator, Dst.Unk. - destroyed, cause undetermined, Aband. - abandoned before hatch, Unk. Fate - unknown, disappeared without evidence of hatch or loss.

A total of 1,245 snowy plover nests have been documented on RGDP over the past 18 monitored breeding seasons (Appendix 3). Of these, 485 hatched, resulting in an overall hatch rate of 39%. At least 1,155 chicks hatched during the 17 reported years.

Completion status for 55 of the 65 nests was determined. Forty-nine had 3-egg clutches, 2 had 2-egg clutches and 2 were a single egg nest resulting in a total of 159 eggs and an average of 2.89 eggs per clutch (Table 3). Completion status of 10 nests was not determined. Eight of those were destroyed by predators before status could be confirmed, 1 was destroyed by unknown causes before status could be documented, and 1 nest was located near a least tern nest so was not checked.

Table 3. Mean clutch size 2003 through 2019.*

Year	2003	2004	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Mean	2.99	2.90	2.96	2.93	2.94	2.88	2.93	2.89	2.90	2.98	2.98	2.91	2.91	2.91	2.89

*Data not available for 2001, 2005, and 2006.

Estimated or actual initiation dates were determined for 58 nests. The estimated number of monthly nest initiations compared with available data from previous years is shown in Table 4.

Figure 3. Number of chicks hatched 2001 through 2019 (data not available for 2002 and 2006).

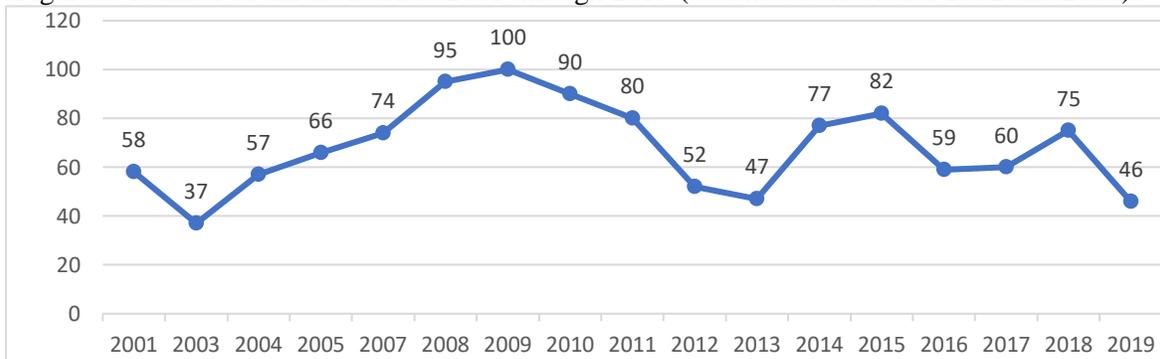


Table 4. Nest initiations by month in 2003, 2004, and 2007 through 2019.*

Month	Number of Nests														
	2003	2004	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
March	7	0	0	4	4	1	3	0	0	3	3	0	10	1	7
April	15	20	17	11	24	10	22	20	7	23	26	14	13	21	14
May	23	21	18	23	15	23	14	13	13	15	16	15	13	17	19
June	33	21	13	19	31	23	15	20	23	19	14	21	15	16	14
July	11	6	8	22	10	10	7	9	7	7	3	3	7	4	4
August	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Total	89	68	56	79	84	67	61	62	50	68	62	53	58	59	58

* Data not available for 2001, 2002, 2005, and 2006. Nests with estimated or known initiation dates only.

Brood Movement

The earliest possible fledge date was approximately July 1 and the last fledging was expected to occur about August 26. Chicks were not color banded so brood movement and chick survival rates could not be determined. Broods are evasive by nature and were not often seen during the breeding season but indications of brood presence were common. Brood activity was most common from the mid dune and west to the shoreline in areas that offered more cover than open sand expanses. Broods that hatched on the sand spit tended to stay north of the parking area and used the vegetated humps there for cover. When the tern colony was established, many broods moved into or adjacent to the colony.

Predators

Predators destroyed at least 29 (45%) of the 65 nests this season (Table 6). Ravens were the main predator destroying at least 12 nests. Gulls of undetermined species destroyed 5 nests, coyotes destroyed 4 nests, 2 nests were destroyed by unidentified avian predators, and 6 nests were destroyed by unknown predator species.

Other potential plover and nest predators observed visually or by tracks this season were American kestrel (*Falco sparverius*), California gull (*Larus californicus*), Cooper's hawk (*Accipiter cooperii*),

feral pig (*Sus scrofa*), great blue heron (*Ardea herodias*), great horned owl (*Bubo virginianus*), Heermann’s gull (*Larus heermanni*), mouse (*Peromyscus sp.*), northern racoon (*Procyon lotor*), peregrine falcon (*Falco peregrinus*), raccoon (*Procyon lotor*), red-tailed hawk (*Buteo jamaicensis*), ring-billed gull (*Larus delawarensis*), striped skunk (*Mephitis mephitis*), Western gull (*Larus occidentalis*) and whimbrel (*Numenius phaeopus*).

Table 6. Number of snowy plover nests lost to predators on RGDP in 2001, and 2003 through 2019.

Year	Raven	Coyote	Gull	Crow	Harrier	Skunk	Feral Pig	Great Horned Owl	Avian Pred.	Corvid Species	Unk. Pred. Species	Total Nests
2019	12	4	5	0	0	0	0	0	2	0	6	29
2018	0	11	2	0	0	0	0	0	0	0	3	16
2017	6	1	8	0	0	0	0	0	3	0	0	18
2016	0	3	11	0	0	1	1	0	2	0	3	21
2015	12	0	0	0	0	0	0	0	0	0	14	26
2014	7	1	0	0	0	0	0	2	1	0	12	23
2013	8	1	0	0	0	0	0	0	0	0	2	11
2012	19	1	0	0	0	0	0	0	3	0	4	27
2011	11	0	0	1	0	0	0	0	6	0	2	20
2010	1	6	0	0	1	0	0	0	4	2	10	24
2009	0	7	1	2	0	0	0	0	9	0	8	27
2008	0	8	4	0	0	0	0	0	0	0	14	26
2007	6	10	1	0	0	0	0	0	0	0	5	22
2006	0	10	1	0	0	0	0	0	0	0	5	16
2005	0	4	2	0	0	0	0	0	0	0	2	8
2004	20	7	0	0	0	0	0	0	0	0	9	36
2003	16	14	4	2	0	0	0	0	0	0	28	64
2001	0	0	0	4	0	0	0	0	0	0	14	18
Total	118	88	39	9	1	1	1	2	30	2	141	432

Least Terns

Population

Least terns were first observed on May 8, and last seen on August 12. Accurate counts of terns were difficult due to frequent fog, wind, and their erratic flight. Nest numbers show that at least 34 terns nested on RGDP in 2019.

Tern numbers on RGDP reflected the number of active nests until mid-June when an influx of new terns were observed onsite. On June 19, 38 terns were observed when there were 14 active nests giving a nesting population of 28. This number declined in early July but increased again in mid-July when terns from Oceano Dunes SVRA began to arrive at the site. On July 22, 33 terns were observed and on August 2 a high of 45 terns were observed of which 20 were adults and 25 were juveniles. Sixteen of the Juveniles had been banded at Oceano Dunes SVRA. The number of terns fluctuated and then began to decline by mid-August.

Nesting and Productivity

Seventeen least tern nests were found on RGDP during the 2019 breeding season (Appendix 2). The first nests were confirmed on June 4 and the last on August 5. Ten nests were confirmed by the first half of July, 5 through the latter half of July, and 2 in August. Nest data showed that 1 of the August nests had been initiated in July, and it is possible the first 2 nests discovered could have been initiated in the last days of May.

The fates of 9 of the 17 nests were determined (Table 7). Of these, 8 nests hatched producing 15 chicks. The other known fate nest was destroyed by a coyote. The fates of the remaining 8 nests could not be determined due to a high wind event that erased all evidence of their fates. Some of these nests were near their expected hatch dates and may have hatched. All 17 nests contained 2 eggs.

The first nests hatched on June 24 and the last on July 31. Initially tern chicks appeared to be brooded in the area where they hatched but the topography hid most chicks from view so obtaining actual counts was not possible. When tern fledglings began to arrive from other breeding sites RGDP chicks moved closer to the fence line and comingled with these new terns.

Table 7. Least tern nests, fates, and chick and fledgling numbers from 2001 - 2019.*

Year	Total Nests	Hatch	Dst. Predator	Dst. Unk.	Aband.	Unk. Fate	Number chicks	Number Fledged
2019	17	8	1	0	0	8	15	unknown
2018	11	5	2	0	0	4	10	4
2017	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0
2010	1	1	0	0	0	0	2	1
2009	3	2	1	0	0	0	3	3
2008	0	0	0	0	0	0	0	0
2007	1	1	0	0	0	0	1	1
2006	0	0	0	0	0	0	0	0
2005	4	0	1	0	0	3	0	0
2004	8	3	1	3	1	0	7	0
2003	0	0	0	0	0	0	0	0
2001	12	8	2	1	0	1	14	6 to 8

Fate Codes

Hatch - hatched one or more eggs, Dst. Predator - destroyed by predator, Dst.Unk. - destroyed, cause undetermined, Aband. - abandoned before hatch, Unk. Fate - unknown, disappeared without evidence of hatch or loss. * No least tern monitoring was conducted in 2002.

Human Activities Affecting Plovers and Terns

RGDP is open to the public during daylight hours 7 days per week year-round. Some closures occur due to hazardous road conditions, and scheduled road maintenance. During the hours the Preserve is closed, 2 locked gates prohibit public entry.

To protect nesting plovers and terns, visitor access is restricted to designated areas during the breeding season. Visitors are allowed access to the road, parking area, and the beach west of a symbolic fence line. The symbolic fence is in place yearly from March 1 through September and consists of a single strand of yellow nylon rope stretched between metal or wood posts. Habitat closure signs written in English and Spanish are mounted on approximately every fifth post. The fence runs a short distance above the mean high tide line along the beach from the north to the south boundary, along both sides of the access road, and along the south boundary. Visitors cannot access the north or east boundaries so fences are not installed there. Fencing is maintained by County staff.

From 1 to 4 County Rangers were on site during all open hours throughout the breeding season. In addition to other duties, Rangers educate and inform visitors of the closures, monitor beach users to prevent entry into the closed breeding habitat, and remove visitors who enter closed areas. Even with Ranger presence, trespassing still occurs. The size and topographical features of the Preserve make it difficult for the staff to effectively monitor the entire area. Incidents of trespass into breeding habitat were recorded but it was not possible to document all trespass due to frequent winds that erase evidence. Intrusions into habitat varied in length, some were short, but some people traveled long distances within breeding habitat. Trespassers entered over most of the western boundary, from the parking lot, and from several locations along the access road.

Fifty-eight trespass incidences involving 111 people were documented during the breeding season. This number is an increase from 2018 when 26 incidents involving 48 people were documented.

Discussion

This was the eighteenth season with comprehensive plover and tern monitoring on RGDP and while plover trends remained consistent, least terns established the highest number of nests yet recorded. The previous high was in 2001 with 12 tern nests. This was also the second consecutive year terns nested on RGDP. They had not nested there since 2010. Another unique event was the influx of terns from the Oceano Dunes SVRA breeding colony and possibly other sites later in the season.

We cannot say why terns used RGDP more than in previous breeding seasons, but one factor appeared to be the good foraging conditions in the Santa Maria River. The river mouth remained closed throughout the season as it had in 2018 and the water appeared relatively clean with fairly abundant fish. Terns were also observed foraging offshore in the ocean with success. The influx of terns from Oceano also may have been due to the river conditions. In fact, late in the season the entire colony moved north toward the river until it was immediately south of the parking lot.

As in previous seasons plovers utilized breeding habitat closer to the shoreline more often than backdune areas. Fifty-three nests were initiated within 1,000 feet of the shoreline and the remaining 12 were initiated in backdune areas. This season there was a high amount of early predator activity so the

first nest did not hatch until June 3. A gull or gulls preyed on nests between April 8 and 18 and destroyed 5 nests, then ravens preyed on nests from May 1 through May 19 and destroyed at least 12 nests. The predator activity accounted for this season's low hatch rate of 26%. Only 2003 had a lower hatch rate (13%), also due to raven depredation.

Monitors at breeding sites north of RGDP reported similar predator issues with gull then raven activity. (K. Paradis, Trihydro Corp., pers. Comm. 2019), (R. Slack, Ocean Dunes SVRA, pers. comm. 2019). An adult herring gull that was believed to be destroying nests at Oceano Dunes was lethally removed there on April 28 (J. Iwanicha, Ocean Dunes SVRA, pers. comm. 2019). No additional nests were lost to gulls on RGDP after that date. Oceano Dunes contractors attempted to remove ravens with little success.

Trespass into breeding habitat is the most significant negative impact by humans on RGDP. Trespass causes both plover and tern adults to flush from active nests and leave broods, which could cause nest or chick loss especially during periods of high winds. Nests and chicks can also be stepped on or intentionally destroyed if found. Least terns are particularly susceptible to disturbance and can abandon nests and broods. Part of the increase in trespass numbers in 2019 may be due to this season's lower than typical wind conditions which caused footprints to remain visible longer. Frequent high winds can erase tracks before detection so in seasons with higher winds the number of trespass incidents recorded may be artificially low. The Rangers were diligent and many of these visitors were removed from habitat and some ejected from the Preserve.

Breeding habitat directly south of RGDP on Gordon Sand and Leroy Trust properties is not protected and continues to be negatively impacted by beach users from RGDP. This access to unprotected breeding habitat causes a significant negative human impact from RGDP visitors.

Management Recommendations

RGDP is important nesting habitat for snowy plovers and least terns, and important wintering habitat for snowy plovers. The County has the ability to protect habitat and direct management goals toward habitat improvements that may increase overall populations. To increase productivity and reduce disturbance to plovers and terns on RGDP, we present the following recommendations:

Management – The County has actively supported the Preserve and its resources with ongoing management strategies. We recommend that the County continue proactively managing the Preserve and explore ways to improve the protection of the habitat while keeping RGDP open to the public.

Visitor use - To protect nesting plovers and terns, continue to install the symbolic fence and closure signs from March 1 through at least mid-September each year. Continue to staff RGDP with Rangers during all open hours during the breeding season with a priority of monitoring visitors and preventing trespass into breeding habitat. Explore options to reduce speeding on the access road.

Trespass – Trespass into breeding habitat continues to put plovers and terns at risk. Rangers staffing the Preserve should be trained to monitor visitors as a priority during breeding season. In addition to a

presence in the parking area, Rangers should patrol the road, beach, and staff the kiosk when possible. If visitors enter breeding habitat they should be ejected from the Preserve.

Predators - Predator management strategies should be developed to reduce the incidence of depredation. Partnerships and coordination with other nearby breeding sites addressing predator issues in the dunes complex should be continued and expanded.

Park staff – Staff should continue to practice good predator management activities such as daily removal of trash from the beach area and the discouragement of visitors feeding wildlife. Additionally, since staff is onsite while RGDP is open, the current monitor should provide training to staff to identify potential predators and record their observations. This would provide valuable information for the monitor who is onsite less often. The monitor should also provide limited plover and tern training to give staff a good understanding of the species.

Least terns - We recommend that when least terns nest on RGDP they receive priority protection given their sensitive nature and endangered status. Strategies to protect nests and chicks from predators, and protecting the colony from human disturbance should be developed.

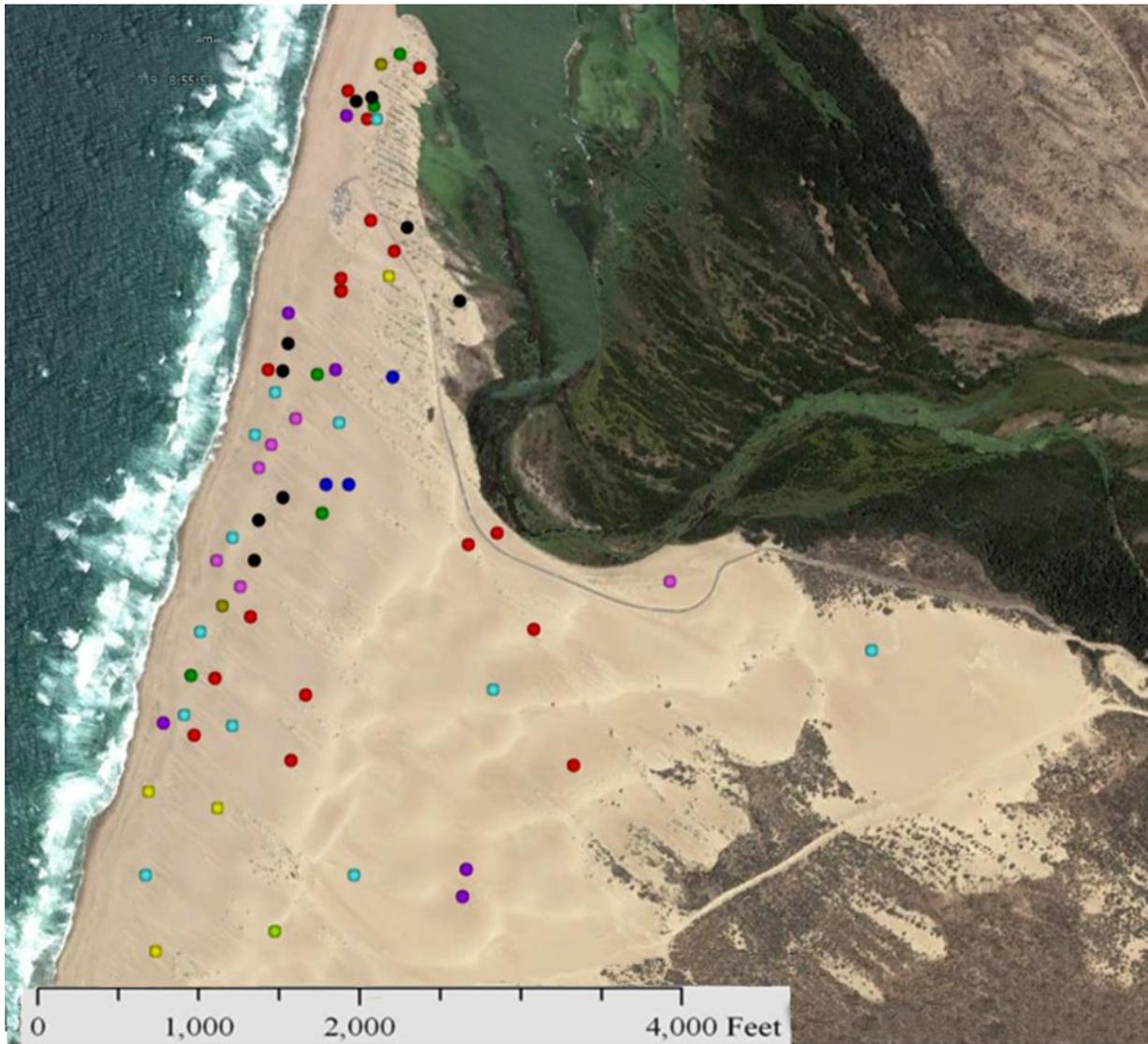
Habitat enhancement - Exotic invasive plant species reduce and degrade breeding habitat. Iceplant and sea rocket have the ability to overtake suitable plover and tern nesting habitat. We recommend the County explore options to address invasive plants during winter months.

Monitoring - We recommend that RGDP continue to support ongoing quality monitoring that addresses population, nesting, depredation, hatching and fledging success, along with other issues such as impacts of public use. Successful management of the site will depend on the use of this information as a basis for sound short- and long-term management practices.

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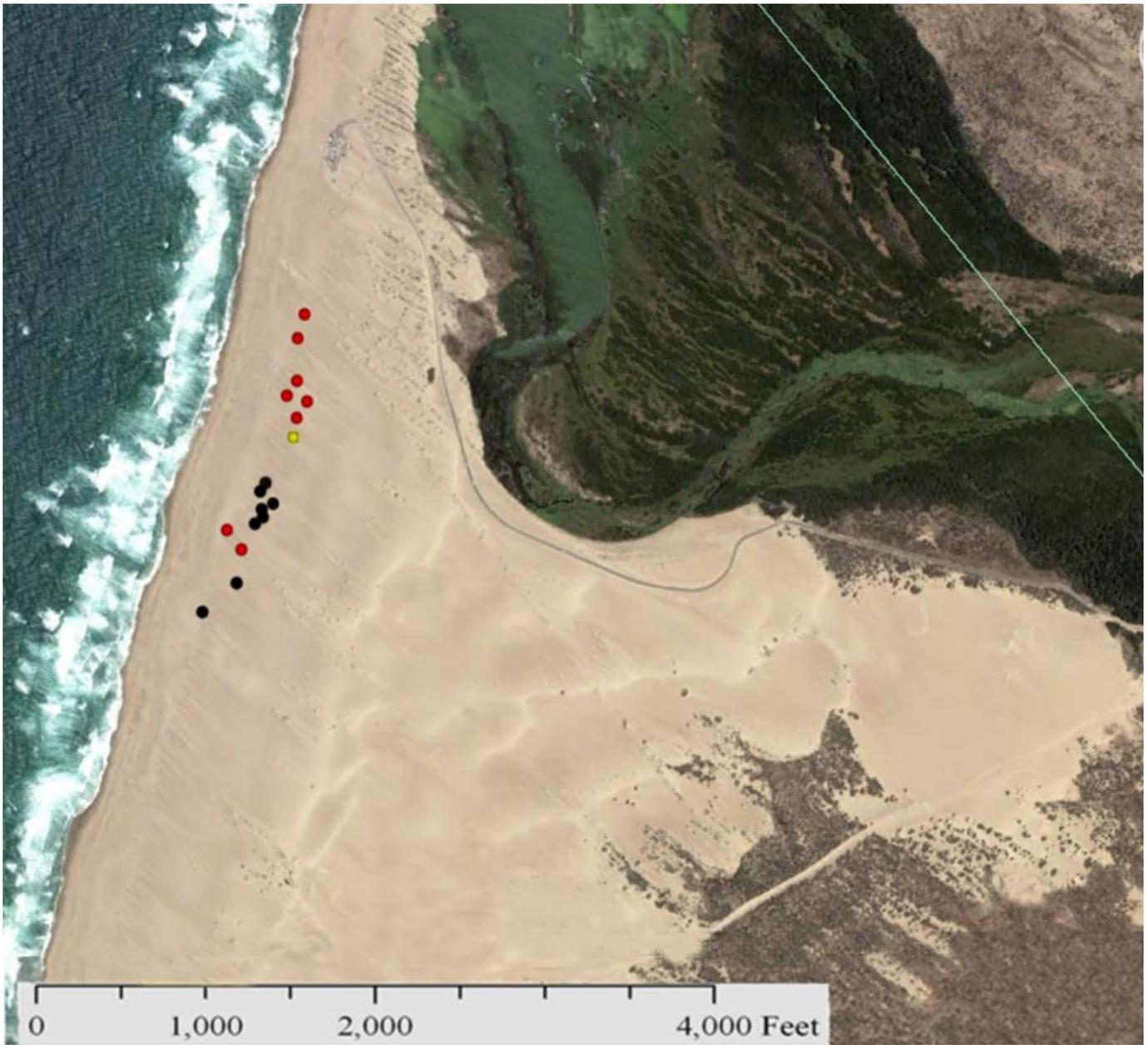
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Appendix 1. Snowy plover nest locations and fates during the 2019 breeding season.



- | | | | |
|---------|----------------|-------------------------------|--------|
| ● Hatch | ● Coyote | ● Unidentified Avian Predator | ● Wind |
| ● Gull | ● Abandoned | ● Destroyed Unknown Cause | |
| ● Raven | ● Unknown Fate | ● Unknown Predator | |

Appendix 2. Least tern nest locations and fates during the 2019 breeding season.



● Hatch ● Coyote ● Unknown Fate

Appendix 3. Number and percent of snowy plover nests and their fates from 2001-2019.*

Year	Total Nests	Hatch (N) %	Predator (N) %	Dst. Unk (N) %	Unk. Fate (N) %	Aband. (N) %	Dst. Surf (N) %	Dst. Wind (N) %	Dst. Cattle (N) %	Dst. Riv. (N) %	Dst. Hu. (N) %
2019	65	(17) 26%	(29) 45%	(6) 9%	9	(3) 5%	0	(1) 2%	0	0	0
2018	59	(30) 51%	(16) 27%	(2) 3%	(9) 15%	(2) 3%	0	0	0	0	0
2017	61	(26) 43%	(18) 29%	(4) 6.5%	(4) 6.5%	(9) 15%	0	0	0	0	0
2016	53	(26) 49%	(21) 39%	0	(1) 2%	(3) 6%	0	(2) 4%	0	0	0
2015	62	(31) 50%	(26) 42%	0	(2) 3%	(2) 3%	0	(1) 2%	0	0	0
2014	68	(31) 46%	(23) 34%	0	(5) 7%	(6) 9%	0	(3) 4%	0	0	0
2013	50	(21) 42%	(11) 22%	0	(10) 20%	(8) 16%	0	0	0	0	0
2012	62	(20) 32%	(27) 43%	(2) 93%	(1) 2%	(11) 18%	(1) 2%	0	0	0	0
2011	61	(29) 47%	(20) 33%	(1) 2%	(1) 2%	(10) 16%	0	0	0	0	0
2010	67	(34) 51%	(24) 36%	(4) 6%	(1) 1%	(3) 5%	0	0	0	0	(1) 1%
2009	84	(39) 46%	(27) 32%	(5) 6%	(5) 6%	(8) 10%	0	0	0	0	0
2008	82	(33) 40%	(26) 32%	(11) 14%	(6) 7%	(5) 6%	0	(1) 1%	0	0	0
2007	57	(27) 47%	(22) 39%	(1) 2%	(4) 7%	(3) 5%	0	0	0	0	0
2006	56	(32) 57%	(16) 29%	0	(2) 3%	(5) 9%	0	0	0	0	(1) 2%
2005	47	(27) 57%	(8) 17%	0	(2) 4%	(10) 21%	0	0	0	0	0
2004	73	(23) 32%	(36) 49%	(2) 3%	(3) 4%	(4) 5%	0	(1) 1%	0	(4) 5%	0
2003	105	(14) 13%	(64) 61%	(10) 9%	(5) 5%	(5) 5%	0	(5) 5%	(2) 2%	0	0
2001	75	(25) 33%	(18) 24%	(25) 33%	(1) 1%	(4) 5%	0	(2) 3%	0	0	0

Fate Codes

Hatch - hatched one or more eggs, Predator - destroyed by predator, Dst.Unk. - destroyed, cause undetermined, Unk. Fate - unknown, disappeared without evidence of hatch or loss, Aband. - abandoned before hatch, Dst. Surf - destroyed by surf wash, Dst. Wind - destroyed by wind, Dst. Cattle - destroyed by cattle, Dst. Riv. - destroyed by river flooding, Dst. Hu. - destroyed by human activity.

* Snowy plover monitoring was not conducted in 2002.